MBR340

Preferred Device

Axial Lead Rectifier

. . . employing the Schottky Barrier principle in a large area metal–to–silicon power diode. State–of–the–art geometry features epitaxial construction with oxide passivation and metal overlap contact. Ideally suited for use as rectifiers in low–voltage, high–frequency inverters, free wheeling diodes, and polarity protection diodes.

- Extremely Low V_F
- Low Power Loss/High Efficiency
- Highly Stable Oxide Passivated Junction
- Low Stored Charge, Majority Carrier Conduction

Mechanical Characteristics:

- Case: Epoxy, Molded
- Weight: 1.1 gram (approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead and Mounting Surface Temperature for Soldering Purposes: 220°C Max. for 10 Seconds, 1/16″ from case
- Shipped in plastic bags, 500 per bag
- Available Tape and Reeled, 1500 per reel, by adding a “RL’’ suffix to the part number
- Polarity: Cathode indicated by Polarity Band
- Marking: B340

MAXIMUM RATINGS

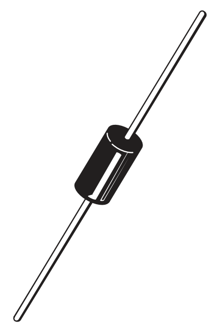
Rating	Symbol	Max	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	V_{RRM} V_{RWM} V_R	40	V
Average Rectified Forward Current T_A = 65°C ($R_{\theta JA}$ = 28°C/W, P.C. Board Mounting)	I_O	3.0	A
Non–Repetitive Peak Surge Current (Note 1.) (Surge Applied at Rated Load Conditions Halfwave, Single Phase, 60 Hz, T_L = 75°C)	I_{FSM}	80	A
Operating and Storage Junction Temperature Range (Reverse Voltage Applied)	T_J, T_{stg}	–65 to +150	°C
Peak Operating Junction Temperature (Forward Current Applied)	$T_{J(pk)}$	150	°C

1. Lead Temperature reference is cathode lead 1/32″ from case.

ON Semiconductor™

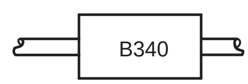
http://onsemi.com

SCHOTTKY BARRIER RECTIFIER
3.0 AMPERES
40 VOLTS



AXIAL LEAD
CASE 267–03
STYLE 1

MARKING DIAGRAM



B340 = Device Code

ORDERING INFORMATION

Device	Package	Shipping
MBR340	Axial Lead	500 Units/Bag
MBR340P	Axial Lead	500 Units/Bag
MBR340PRL	Axial Lead	1500/Tape & Reel
MBR340RL	Axial Lead	1500/Tape & Reel

Preferred devices are recommended choices for future use and best overall value.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient (see Note 3., Mounting Method 3)	$R_{\theta JA}$	28	°C/W

ELECTRICAL CHARACTERISTICS (T_L = 25°C unless otherwise noted) (Note 1.)

Characteristic	Symbol	Max	Unit
Maximum Instantaneous Forward Voltage (Note 2.) (i_F = 1.0 Amp) (i_F = 3.0 Amp) (i_F = 9.4 Amp)	v_F	 0.500 0.600 0.850	V
Maximum Instantaneous Reverse Current @ Rated dc Voltage (Note 2.) T_L = 25°C T_L = 100°C	i_R	 0.60 20	mA

1. Lead Temperature reference is cathode lead 1/32″ from case.
2. Pulse Test: Pulse Width = 300 µs, Duty Cycle = 2.0%.

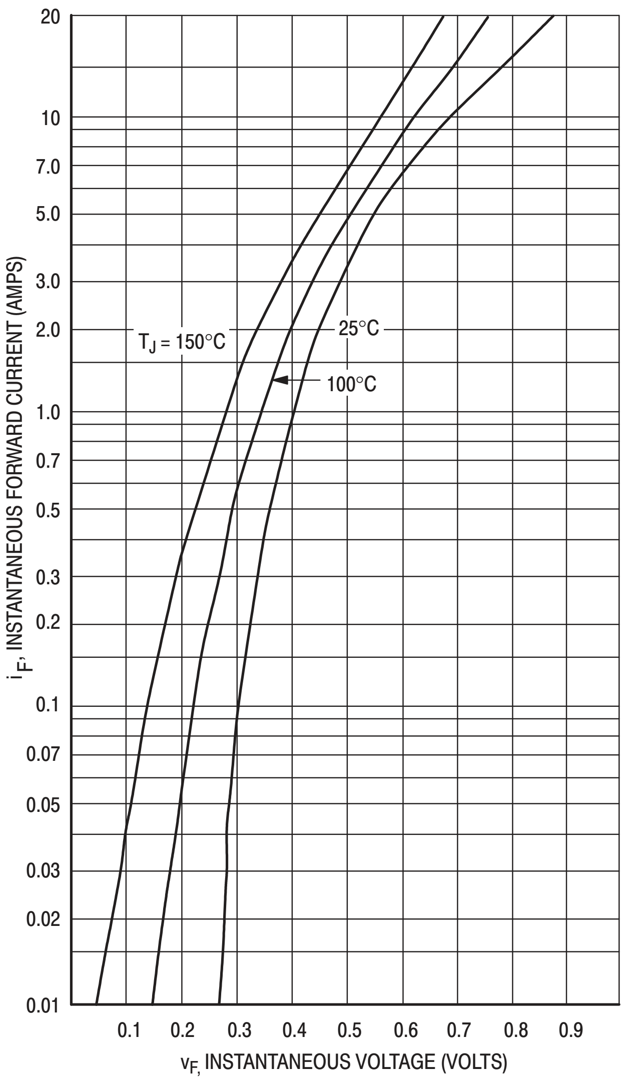


Figure 1. Typical Forward Voltage

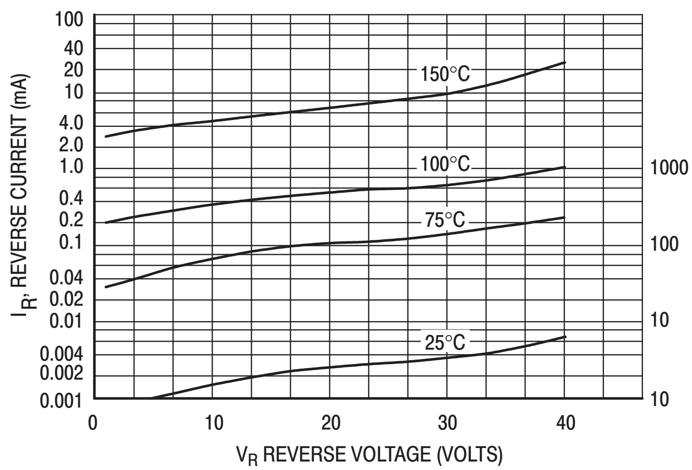


Figure 2. Typical Reverse Current*

*The curves shown are typical for the highest voltage device in the voltage grouping. Typical reverse current for lower voltage selections can be estimated from these same curves if V_R is sufficiently below rated V_R.

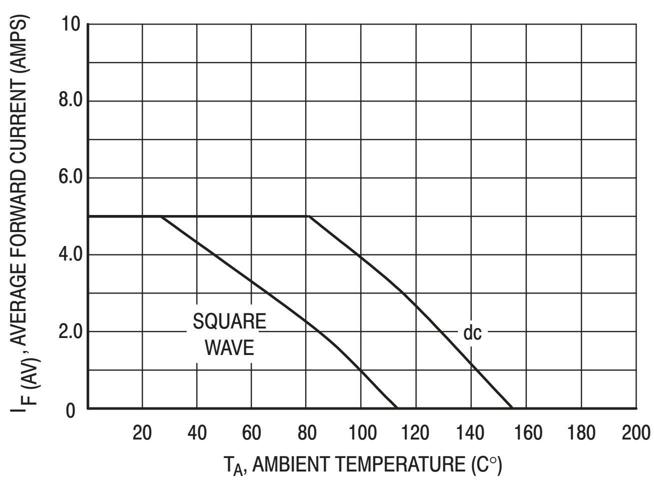


Figure 3. Current Derating
(Mounting Method #3 per Note 3.)

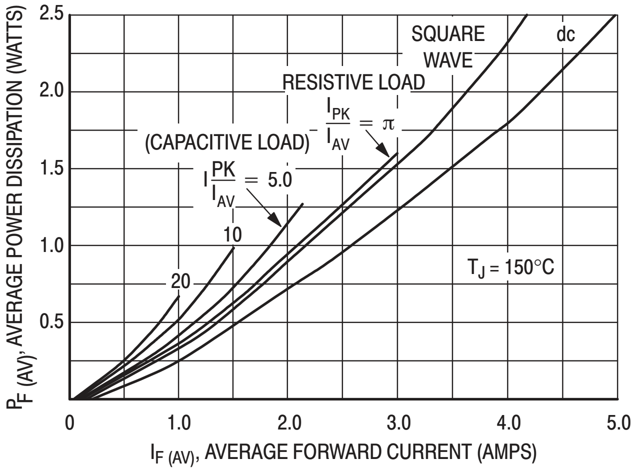


Figure 4. Power Dissipation

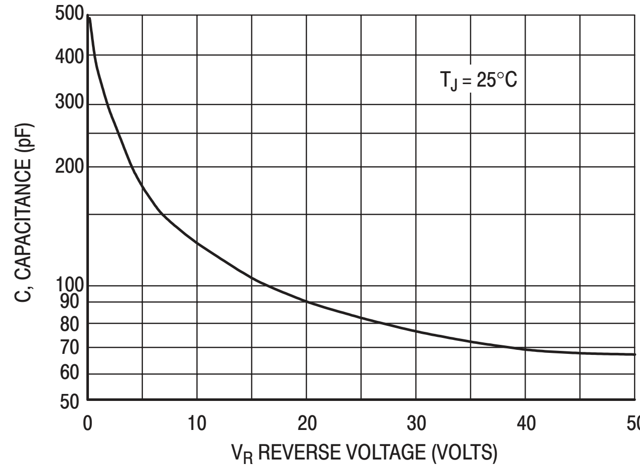


Figure 5. Typical Capacitance

NOTE 3. — MOUNTING DATA

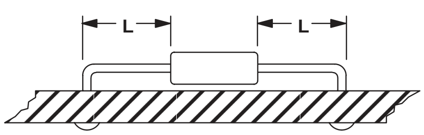
Data shown for thermal resistance junction–to–ambient ($R_{\theta JA}$) for the mountings shown is to be used as typical guideline values for preliminary engineering, or in case the tie point temperature cannot be measured.

TYPICAL VALUES FOR $R_{\theta JA}$ IN STILL AIR

Mounting Method	Lead Length, L (in)				$R_{\theta JA}$
	1/8	1/4	1/2	3/4	
1	50	51	53	55	°C/W
2	58	59	61	63	°C/W
3	28				°C/W

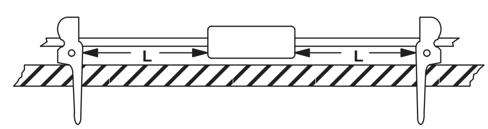
Mounting Method 1

P.C. Board where available copper surface is small.



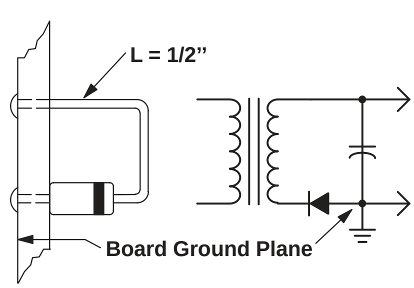
Mounting Method 2

Vector Push–In Terminals T–28



Mounting Method 3

P.C. Board with 2–1/2″ X 2–1/2″ copper surface.



RECTIFIER NUMBERING SYSTEM

PART NUMBER KEY XXX X XX XX XX X XX

PREFIX (TYPE DESIGNATOR)

- F = FULLY ISOLATED
- A = SURFACE MT (SMA)
- S = SURFACE MT (SMB/SMC)
- D = DPAK
- B = D²PAK
- H = MEGAHERTZ
- M = POWERMITE
- P = POWERTAP

I_O

V_R (X10 EXCEPT SCHOTTKY)

SUFFIX (DUAL DESIGNATOR)

- R = REVERSE
- L = LOW V_F
- E = ENERGY

PACKAGING DESIGNATOR*

PREFIX KEY

MUR	=	ULTRA FAST RECTIFIER
MBR	=	(SCHOTTKY) BARRIER RECTIFIER
MR	=	STANDARD & FAST RECOVERY
MSR	=	ULTRASOFT

SUFFIX KEY

CT	=	CENTER TAP (DUAL) TO–220, POWERTAP, DPAK, D²PAK
PT	=	CENTER TAP (DUAL) TO–218 PACKAGE
WT	=	CENTER TAP (DUAL) TO–247

EXAMPLE:

MUR	30	20	WT
ULTRAFAST	30 AMP	200 V	CENTER TAP (DUAL) TO–247

EXAMPLE:

MBR	30	45	WT
SCHOTTKY	30 AMP	45 V	CENTER TAP (DUAL) TO–247

*For available packaging options consult Sales Office or see Data Sheet.

Application Specific Rectifiers

Table 1. Low V_F Schottky Rectifiers

Device	I_O (Amps)	V_{RRM} (Volts)	V_F @ Rated I_O and T_C = 25°C Volts (Max)	I_R @ Rated V_{RRM} mAmps (Max)	Package
MBR0520LT1, T3	0.5	20	0.33	0.25	SOD-123
MBRS130LT3	1	30	0.395	1	SMB
MBRD835L	8	35	0.41	1.4	DPAK
MBRD1035CTL	10	35	0.41	6	DPAK
MBR2030CTL	20	30	0.48	5	TO-220
MBRB2535CTL	25	35	0.41	10	D^2PAK
MBR2535CTL	25	35	0.41	5	TO-220
MBRB2515L	25	15	0.42	15	D^2PAK
MBR2515L	25	15	0.42	15	TO-220
MBRB3030CTL	30	30	0.51	5	D^2PAK
MBR4015LWT	40	15	0.42	5	TO-247
MBRP20030CTL	200	30	0.52	5	POWERTAP II
MBRP20035L	200	35	0.57	10	POWERTAP III
MBRP30035L	300	35	0.57	10	POWERTAP III
MBRP40045CTL	400	45	0.57	10	POWERTAP II
MBRP400100CTL	400	100	0.83	6	POWERTAP II
MBRP60035CTL	600	35	0.57	10	POWERTAP II

Table 2. MEGAHERTZ™ Rectifiers

Device	I_O (Amps)	V_{RRM} (Volts)	Maximum		t_{rr} (Nanosecond)
			V_F @ Rated I_O and Temp. (Volts)	I_R @ Rated V_{RRM} (mAmps)	
MURH840CT/MURHB840CT	8	400	1.7	0.01	28
MURH860CT	8	600	2.0	0.01	35
MURHB860CT	8	600	2.0	0.01	35
MURHF860CT	8	600	2.0	0.01	35

Table 3. UltraSoft Rectifiers (For High Speed Rectification)

Device	I_O (Amps)	V_{RRM} (Volts)	Max V_F @ I_F (Volts)	Max t_{rr} (ηSec)	T_JMax (°C)
MSRP10040	100	400	1.75 @ 100 A	75	150
MSRD620CT	6	200	1.2 @ 6.0 A	55	150
MSR860	8	600	1.7 @ 8.0 A	120	150
MSR1560	15	600	1.8 @ 15 A	45	150

Table 4. Energy Rated Rectifiers

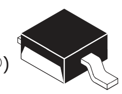
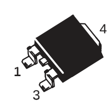
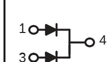
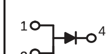
Device	I_O (Amps)	V_{RRM} (Volts)	Max V_F @ Rated unless Noted (Volts)	I_R @ V_{RRM} (mAmps)	Waval (M_J)
MUR180E	1.0	800	1.75	10	10
MUR1100E	1.0	1000	1.75	10	10
MUR480E	4.0	800	1.75	25	20
MUR4100E	4.0	1000	1.75	25	20
MUR880E	8.0	800	1.8	25	20
MUR8100E	8.0	1000	1.8	25	20
MUR10120E	10	1200	2.2 @ 6.5 A	100	20
MUR10150E	10	1500	2.5 @ 6.5 A	100	20
MUR5150E	5.0	1500	2.4	50	20

Table 5. Automotive Transient Suppressors

Device	I_O (Amps)	V_{RRM} (Volts)	Max V_F @ I_F (Volts)	I_{RSM} (Amps)	T_JMax (°C)
MR2535L	6.0	20	1.1 @ 100 A	62 @ 10 mS	175
MR2835S	32	23	1.1 @ 100 A	62 @ 10 mS	175
MR3227N, P	32	18	1.18 @ 100 A	90 @ 10 mS	200
MR4027N, P	40	18	1.1 @ 100 A	110 @ 10 mS	200
MR4045N, P	40	30	1.1 @ 100 A	55 @ 10 mS	200

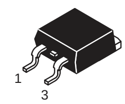
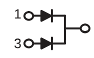
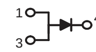
SCHOTTKY Rectifiers

Table 6. Surface Mount Schottky Rectifiers

V_{RRM} (Volts)	I_O[1] (Amperes)	I_O Rating Condition	Device	Max V_F @ i_F T_C = 25°C (Volts)	I_{FSM} (Amperes)	T_J Max (°C)	Max I_R[2] T_J = 25°C (mA)	Max I_R[3] (mA)	Package
20	0.5	T_L = 90°C	***MBR0520LT1*** ***MBR0520LT3***	0.310 @ 0.1 A 0.385 @ 0.5 A	5	125	.075 @ 10 V .250 @ 20 V	5 @ 10 V 8 @ 20 V	**CASE 425-04** (SOD-123) Cathode = Band 
30	0.5	T_L = 100°C	***MBR0530T1*** ***MBR0530T3***	0.375 @ 0.1 A 0.430 @ 0.5 A	5	125	.020 @ 15 V .130 @ 30 V	–	
40	0.5	T_L = 110°C	***MBR0540T1*** ***MBR0540T3***	0.53 @ 0.5 A	5	150	.010 @ 20 V .020 @ 40 V	–	
20	1	T_C = 130°C	***MBRM120ET3***	0.455 @ 0.1 A 0.530 @ 1.0 A	50	150	0.010 @ 20 V	1.6 @ 20 V	**CASE 457–04** (POWERMITE®) 
20	1	T_{tab} ≤ 100°C	***MBRM120LT3***	0.36 @ 0.1 A 0.45 @ 1 A	50	125	0.4 @ 20 V	N/A	
30	1	T_C = 135°C	***MBRM130LT3***⋆	0.45 @ 1.0 A	50	125	1	N/A	
40	1	T_{tab} ≤ 100°C	***MBRM140T3***	0.39 @ 0.1 A 0.55 @ 1 A	50	125	0.5 @ 40 V	N/A	
30	1	T_C ≤ 105°C	***MBRA130LT3***	0.41 @ 1 A 0.47 @ 2 A	25	125	1.0 @ 30 V 0.4 @ 15 V	25 @ 30 V	**CASE 403B-01** (SMA) Cathode = Notch or Polarity Band 
40	1	T_C ≤ 100°C	***MBRA140T3***	0.60 @ 1 A 0.73 @ 2 A	25	125	0.5 @ 40 V 0.1 @ 20 V	10 @ 40 V	
20	1	T_L = 115°C	***MBRS120T3***	0.55 @ 1.0 A	40	125	1	10	**CASE 403-03** (SMB) Cathode = Notch or Polarity Band 
30	1	T_L = 120°C	***MBRS130LT3***	0.395 @ 1.0 A	40	125	1	10	
30	1	T_L = 115°C	***MBRS130T3***	0.55 @ 1.0 A	40	125	1	10	
40	1	T_L = 115°C	***MBRS140T3***	0.6 @ 1.0 A	40	125	1	10	
40	1	T_C = 110°C	***MBRS140LT3***	0.5 @ 1.0 A	40	125	0.4	10	
90	1	T_L = 120°C	***MBRS190T3***	0.75 @ 1.0 A	50	125	0.5	5	
100	1	T_L = 120°C	***MBRS1100T3***	0.75 @ 1.0 A	40	150	0.5	5	
40	1.5	T_C = 100°C	***MBRS1540T3***	0.46 @ 1.5 A	40	125	0.8	5.7	
40	2	T_C ≤ 95°C	***MBRS240LT3***	0.43 @ 2 A 0.53 @ 4 A	25	125	2.0 @ 40 V 0.5 @ 20 V	60 @ 40 V 40 @ 20 V	
40	2	T_C = 103°C	***MBRS2040LT3***	0.43 @ 2 A 0.50 @ 4 A	70	125	0.80 @ 40 V 0.10 @ 20 V	20 @ 40 V 6.0 @ 20 V	
20	3	T_L = 100°C	***MBRS320T3***	0.50 @ 3.0 A	80	125	2	20	**CASE 403A-03** (SMC) Cathode = Notch 
30	3	T_L = 100°C	***MBRS330T3***	0.50 @ 3.0 A	80	125	2	20	
40	3	T_L = 100°C	***MBRS340T3***	0.525 @ 3.0 A	80	125	2	20	
60	3	T_L = 100°C	***MBRS360T3***	0.74 @ 3.0 A	80	125	0.5	20	
20	3	T_C = 125°C	***MBRD320T4***	0.60 @ 3.0 A	75	150	0.2	20 @ 125°C	**CASE 369A-13** (DPAK)   “CT” Suffix  Non-“CT” Suffix
30	3	T_C = 125°C	***MBRD330T4***	0.60 @ 3.0 A	75	150	0.2	20 @ 125°C	
40	3	T_C = 125°C	***MBRD340T4***	0.60 @ 3.0 A	75	150	0.2	20 @ 125°C	
50	3	T_C = 125°C	***MBRD350T4***	0.60 @ 3.0 A	75	150	0.2	20 @ 125°C	
60	3	T_C = 125°C	***MBRD360T4***	0.60 @ 3.0 A	75	150	0.2	20 @ 125°C	
20	6	T_C = 130°C	***MBRD620CTT4***	0.70 @ 3.0 A	75	150	0.1	15 @ 125°C	
30	6	T_C = 130°C	***MBRD630CTT4***	0.70 @ 3.0 A	75	150	0.1	15 @ 125°C	
40	6	T_C = 130°C	***MBRD640CTT4***	0.70 @ 3.0 A	75	150	0.1	15 @ 125°C	
50	6	T_C = 130°C	***MBRD650CTT4***	0.70 @ 3.0 A	75	150	0.1	15 @ 125°C	
60	6	T_C = 130°C	***MBRD660CTT4***	0.70 @ 3.0 A	75	150	0.1	15 @ 125°C	
35	8	T_C = 100°C	***MBRD835L***	0.40 @ 3.0 A 0.51 @ 8.0 A	100	125	1.4	35	
35	10	T_C = 90°C	***MBRD1035CTL***	0.49 @ 10 A	100	125	2	130 @ 125°C	

SCHOTTKY Rectifiers

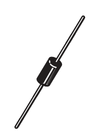
Table 6. Surface Mount Schottky Rectifiers (continued)

V_{RRM} (Volts)	I_O(1) (Amperes)	I_O Rating Condition	Device	Max V_F @ i_F T_C = 25°C (Volts)	I_{FSM} (Amperes)	T_J Max (°C)	Max I_R(2) T_J = 25°C (mA)	Max I_R(3) (mA)	Package	
10	45	T_C = 135°C	***MBRB1045★***	0.84 @ 20 A	150	150	0.1	15 @ 125°C	**CASE 418B-03** (D²PAK) 	 "CT" Suffix  Non-"CT" Suffix
45	15	T_C = 105°C	***MBRB1545CT***	0.84 @ 15 A	150	150	0.1	15 @ 125°C		
60	20	T_C = 110°C	***MBRB2060CT***	0.95 @ 20 A	150	150	0.15	150 @ 125°C		
100	20	T_C = 110°C	***MBRB20100CT***	0.85 @ 10 A 0.95 @ 20 A	150	150	0.1	6 @ 125°C		
200	20	T_C = 125°C	***MBRB20200CT***	1.0 @ 20 A	150	150	1	50 @ 125°C		
15	25	T_C = 90°C	***MBRB2515L***	0.45 @ 25 A	150	100	15	200 @ 70°C		
35	25	T_C = 110°C	***MBRB2535CTL***	0.47 @ 12.5 A 0.55 @ 25 A	150	125	10	500 @ 125°C		
45	25	T_C = 130°C	***MBRB2545CT***	0.82 @ 30 A	150	150	0.2	40 @ 125°C		
30	30	T_C = 115°C	***MBRB3030CT***	0.54 @ 15 A 0.67 @ 30 A	300	150	1.2	145 @ 150°C 46 @ 10 V, 150°C		
30	30	T_C = 95°C	***MBRB3030CTL***	0.45 @ 15 A 0.51 @ 30 A	150	125	2	195 @ 125°C 75 @ 10 V, 125°C		
30	40	T_C = 110°C	***MBRB4030***	0.46 @ 20 A 0.55 @ 40 A	300	150	1	150 @ 125°C		

(1)I_O is total device current capability.
(2)V_{RRM} unless noted
(3)V_{RRM}, T_J = 100°C unless noted
★New Product

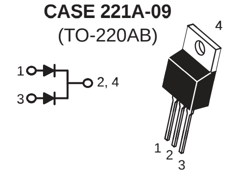
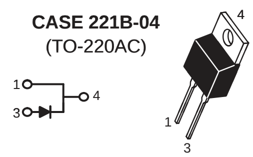
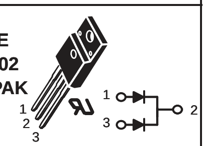
All devices listed are ON Semiconductor preferred devices

Table 7. Axial Lead Schottky Rectifiers

V_{RRM} (Volts)	I_O (Amperes)	I_O Rating Condition	Device	Max V_F @ i_F T_C = 25°C (Volts)	I_{FSM} (Amperes)	T_J Max (°C)	Max I_R(2) T_L = 25°C (mA)	Max I_R(3) T_L (mA)	Package
20	1	T_A = 55°C $R_{\theta JA}$ = 80°C/W	***1N5817***	0.45 @ 1.0 A	25	125	1	10	**CASE 59–04 Plastic**  Cathode = Polarity Band
30	1	T_A = 55°C $R_{\theta JA}$ = 80°C/W	***1N5818***	0.55 @ 1.0 A	25	125	1	10	
40	1	T_A = 55°C $R_{\theta JA}$ = 80°C/W	***1N5819***	0.60 @ 1.0 A	25	125	1	10	
50	1	T_A = 55°C	***MBR150***	0.75 @ 1.0 A	25	150	0.5	5	
60	1	T_A = 55°C $R_{\theta JA}$ = 80°C/W	***MBR160***	0.75 @ 1.0 A	25	150	0.5	5	
100	1	T_A = 120°C $R_{\theta JA}$ = 50°C/W	***MBR1100***	0.79 @ 1.0 A	50	150	0.5	5	
20	3	T_A = 76°C $R_{\theta JA}$ = 28°C/W	***1N5820***	0.457 @ 3.0 A	80	125	2	20	**CASE 267-03 Plastic**  Cathode = Polarity Band
30	3	T_A = 71°C $R_{\theta JA}$ = 28°C/W	***1N5821***	0.500 @ 3.0 A	80	125	2	20	
40	3	T_A = 61°C $R_{\theta JA}$ = 28°C/W	***1N5822***	0.525 @ 3.0 A	80	125	2	20	
40	3	T_A = 65°C $R_{\theta JA}$ = 28°C/W	***MBR340***	0.600 @ 3.0 A	80	150	0.6	20	
50	3	T_A = 65°C	***MBR350RL***	0.600 @ 3.0 A	80	150	0.6	20	
60	3	T_A = 65°C $R_{\theta JA}$ = 28°C/W	***MBR360RL***	0.740 @ 3.0 A	80	150	0.6	20	
100	3	T_A = 100°C $R_{\theta JA}$ = 28°C/W	***MBR3100***	0.79 @ 3.0 A	150	150	0.6	20	

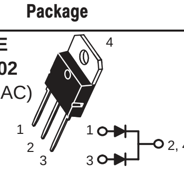
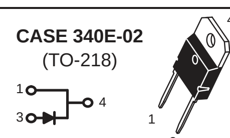
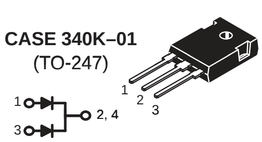
(2)V_{RRM} unless noted
(3)V_{RRM}, T_J = 100°C unless noted

Table 8. TO-220 Thru–Hole Schottky Rectifiers

V_{RRM} (Volts)	I_O (Amperes)	I_O Rating Condition	Device	Max V_F @ i_F $T_C = 25°C$ (Volts)	I_{FSM} (Amperes)	T_J Max (°C)	Max I_R[(2)] $T_C = 25°C$ (mA)	Max I_R[(3)] (mA)	Package
35	15	$T_C = 105°C$	***MBR1535CT***	0.84 @ 15 A	150	150	0.1	15 @ 125°C	**CASE 221A-09** (TO-220AB) 
45	15	$T_C = 105°C$	***MBR1545CT***	0.84 @ 15 A	150	150	0.1	15 @ 125°C	
100	16	$T_C = 133°C$	***MBR16100CT***	0.84 @ 16 A	150	175	0.1	5 @ 125°C	
30	20	$T_C = 137°C$	***MBR2030CTL***	0.52 @ 10 A 0.58 @ 20 A	150	150	5	40	
45	20	$T_C = 135°C$	***MBR2045CT***	0.84 @ 20 A	150	150	0.1	15 @ 125°C	
60	20	$T_C = 133°C$	***MBR2060CT***	0.85 @ 10 A 0.95 @ 20 A	150	150	0.1	6 @ 125°C	
80	20	$T_C = 133°C$	***MBR2080CT***	0.95 @ 20 A	150	150	0.1	6 @ 125°C	
90	20	$T_C = 133°C$	***MBR2090CT***	0.95 @ 20 A	150	150	0.1	6 @ 125°C	
100	20	$T_C = 133°C$	***MBR20100CT***	0.85 @ 10 A 0.95 @ 20 A	150	150	0.1	6 @ 125°C	
200	20	$T_C = 125°C$	***MBR20200CT***	1.0 @ 20 A	150	150	1	50 @ 125°C	
35	25	$T_C = 95°C$	***MBR2535CTL***	0.55 @ 25 A	150	125	5	500 @ 125°C	
45	25	$T_C = 130°C$	***MBR2545CT***	0.82 @ 30 A	150	150	0.2	40 @ 125°C	
45	30	$T_C = 130°C$	***MBR3045ST***	0.76 @ 30 A	150	150	0.2	40 @ 125°C	
35	7.5	$T_C = 105°C$	***MBR735***	0.84 @ 15 A	150	150	0.1	15 @ 125°C	**CASE 221B-04** (TO-220AC) 
45	7.5	$T_C = 105°C$	***MBR745***	0.84 @ 15 A	150	150	0.1	15 @ 125°C	
35	10	$T_C = 135°C$	***MBR1035***	0.84 @ 20 A	150	150	0.1	15 @ 125°C	
45	10	$T_C = 135°C$	***MBR1045***	0.84 @ 20 A	150	150	0.1	15 @ 125°C	
60	10	$T_C = 133°C$	***MBR1060***	0.80 @ 10 A	150	150	0.1	6 @ 125°C	
90	10	$T_C = 133°C$	***MBR1090***	0.70 @ 10 A	150	150	0.1	6 @ 125°C	
100	10	$T_C = 133°C$	***MBR10100***	0.80 @ 10 A	150	150	0.1	6 @ 125°C	
35	16	$T_C = 125°C$	***MBR1635***	0.63 @ 16 A	150	150	0.2	40 @ 125°C	
45	16	$T_C = 125°C$	***MBR1645***	0.63 @ 16 A	150	150	0.2	40 @ 125°C	
15	25	$T_C = 90°C$	***MBR2515L***	0.45 @ 25 A	150	100	15	200 @ 70°C	
60	20	$T_C = 133°C$	UL ***MBRF2060CT***	0.95 @ 20 A	150	150	0.15	15 @ 125°C	**CASE 221D-02 FULL PAK** 
100	20	$T_C = 133°C$	UL ***MBRF20100CT***	0.95 @ 20 A	150	150	0.15	15 @ 125°C	
200	20	$T_C = 125°C$	UL ***MBRF20200CT***	1.0 @ 20 A	150	150	1	50 @ 125°C	
45	25	$T_C = 125°C$	UL ***MBRF2545CT***	0.82 @ 25 A	150	150	0.2	40 @ 125°C	

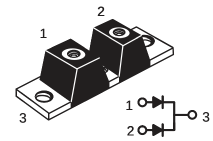
(2)V_{RRM} unless noted
(3)V_{RRM}, $T_J = 100°C$ unless noted
UL Indicates UL Recognized – File #E69369

Table 9. TO-218 and TO-247 Schottky Rectifiers

V_{RRM} (Volts)	I_O (Amperes)	I_O Rating Condition	Device	Max V_F @ i_F $T_C = 25°C$ (Volts)	I_{FSM} (Amperes)	T_J Max (°C)	Max I_R[(2)] $T_C = 25°C$ (mA)	Max I_R[(3)] (mA)	Package
45	30	$T_C = 105°C$	***MBR3045PT***	0.76 @ 30 A	200	150	1	100 @ 125°C	**CASE 340D-02** (TO-218AC) 
45	40	$T_C = 125°C$	***MBR4045PT***	0.70 @ 20 A 0.80 @ 40 A	400	150	1	50	
45	60	$T_C = 125°C$	***MBR6045PT***	0.62 @ 30 A 0.75 @ 60 A	500	150	1	50	
25	50	$T_C = 125°C$	***MBR5025L***	0.54 @ 30 A 0.62 @ 50 A	300	150	0.5	60	**CASE 340E-02** (TO-218) 
45	30	$T_C = 105°C$	***MBR3045WT***	0.76 @ 30 A	200	150	1	100 @ 125°C	**CASE 340K–01** (TO-247) 
15	40	$T_C = 125°C$	***MBR4015LWT***	0.42 @ 20 A 0.50 @ 40 A	400	100	5	150 @ 75°C	
45	40	$T_C = 125°C$	***MBR4045WT***	0.70 @ 20 A 0.80 @ 40 A	400	150	1	50	
45	60	$T_C = 125°C$	***MBR6045WT***	0.62 @ 30 A 0.75 @ 60 A	500	150	1	50	

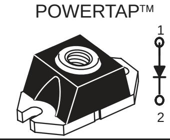
(2)V_{RRM} unless noted
(3)V_{RRM}, $T_J = 100°C$ unless noted

Table 10. POWERTAP II Schottky Rectifiers

V_{RRM} (Volts)	I_O(1) (Amperes)	I_O Rating Condition	Device	Max V_F @ i_F T_C = 25°C (Volts)	I_{FSM} (Amperes)	T_J Max (°C)	Max I_R(2) T_C = 25°C (mA)	Max I_R(3) (mA)	Package
30	200	T_C = 125°C	***MBRP20030CTL***	0.52 @ 100 A 0.60 @ 200 A	1500	150	5	–	**CASE 357C-03** POWERTAP™  Cathode = Mounting Plate Anode = Terminal
30	400	T_C = 100°C	***MBRP40030CTL***★	0.50 @ 200 A	1500	150	20	1000 @ 100°C	
35	600	T_C = 100°C	***MBRP60035CTL***	0.57 @ 300 A	4000	150	10	250	
45	200	T_C = 125°C	***MBRP20045CT***	0.78 @ 100 A	1500	150	0.5	50 @ 125°C	
45	300	T_C = 120°C	***MBRP30045CT***	0.70 @ 150 A 0.82 @ 300 A	2500	150	0.8	75 @ 125°C	
45	400	T_C = 100°C	***MBRP40045CTL***	0.57 @ 200 A	2500	150	10	–	
60	200	T_C = 125°C	***MBRP20060CT***	0.800 @ 100 A	1500	150	0.5	50 @ 125°C	
60	300	T_C = 120°C	***MBRP30060CT***	0.79 @ 150 A 0.89 @ 300 A	2500	150	0.8	75 @ 125°C	
100	400	T_C = 100°C	***MBRP400100CTL***	0.83 @ 200 A	2500	150	6	–	

(1)I_O is total device current capability.
(2)V_{RRM} unless noted
(3)V_{RRM}, T_J = 100°C unless noted

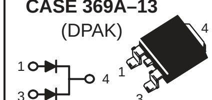
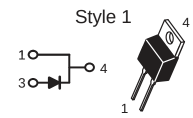
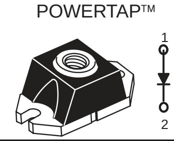
Table 11. POWERTAP III Schottky Rectifiers

V_{RRM} (Volts)	I_O(1) (Amperes)	I_O Rating Condition	Device	Max V_F @ i_F T_C = 25°C (Volts)	I_{FSM} (Amperes)	T_J Max (°C)	Max I_R(2) T_C = 25°C (μA)	Max I_R(3) (μA) T_J = 100°C	Package
35	200	T_C = 100°C	***MBRP20035L***	0.57 @ 200 A	2000	150	10	250	**CASE 357D-01** POWERTAP™ 
	300	T_C = 100°C	***MBRP30035L***	0.57 @ 300 A	3000	150	10	250	

(1)I_O is total device current capability. ★New Product
(2)V_{RRM} unless noted
(3)V_{RRM}, T_J = 100°C unless noted

NEW UltraSoft Rectifiers

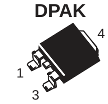
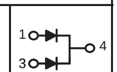
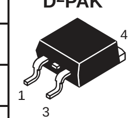
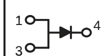
Table 12. UltraSoft Rectifiers (For High Speed Rectification)

V_{RRM} (Volts)	I_O(1) (Amperes)	I_O Rating Condition	Device	Max V_F @ i_F T_C = 29°C (Volts)	t_{rr} (ηSec)	T_J Max (°C)	Max I_R(2) T_C = 25°C (μA)	Max I_R(3) (μA) T_J = 150°C	Package
200	6	T_C = 145°C	***MSRD620CT***★	1.2 @ 6.0 A	55	150	5	200	**CASE 369A–13** (DPAK) 
600	8	T_C = 125°C	***MSR860***	1.7 @ 8.0 A	120	150	10 μA	1000	**CASE 221B–04** Style 1 
600	15	T_C = 125°C	***MSR1560***	1.8 @ 15 A	45	150	15	5000	
400	100	T_C = 100°C	***MSRP10040***★	1.75 @ 100 A	75	150	100	500	**CASE 357D-01** POWERTAP™ 

(1)I_O is total device current capability. ★New Product
(2)V_{RRM} unless noted
(3)V_{RRM}, T_J = 150°C unless noted

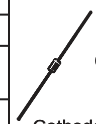
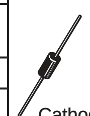
Ultrafast Rectifiers

Table 13. Surface Mount Ultrafast Rectifiers

V_{RRM} (Volts)	I_O[1] (Amperes)	I_O Rating Condition	Device	Max t_{rr} (ns)	Max V_F @ i_F $T_C = 25°C$ (Volts)	I_{FSM} (Amperes)	T_J Max (°C)	Max I_R[2] $T_J = 25°C$ (μA)	Max I_R[4] (μA) Package	Package
50	1	$T_L = 155°C$	***MURS105T3***	35	0.875 @ 1.0 A	40	175	2	50	**SMB** Cathode = Polarity Band 
100	1	$T_L = 155°C$	***MURS110T3***	35	0.875 @ 1.0 A	40	175	2	50	
150	1	$T_L = 155°C$	***MURS115T3***	35	0.875 @ 1.0 A	40	175	2	50	
200	1	$T_L = 155°C$	***MURS120T3***	35	0.875 @ 1.0 A	40	175	2	50	
400	1	$T_L = 150°C$	***MURS140T3***	75	1.25 @ 1.0 A	35	175	5	150	
600	1	$T_L = 150°C$	***MURS160T3***	75	1.25 @ 1.0 A	35	175	5	150	
200	2	$T_C = 145°C$	***MURS220T3***	35	0.95 @ 2.0 A	40	175	2	50	
300	2	$T_C = 125°C$	***MURS230T3***	65	1.15 @ 2.0 A	35	175	5	150	
400	2	$T_C = 125°C$	***MURS240T3***	65	1.15 @ 2.0 A	35	175	5	150	
600	2	$T_C = 125°C$	***MURS260T3***	75	1.15 @ 2.0 A	35	175	5	150	
400	3	$T_L = 130°C$	***MURS320T3***	35	0.875 @ 3.0 A	75	175	5	15	**SMC** Cathode = Notch 
400	3	$T_L = 130°C$	***MURS340T3***	75	1.25 @ 3.0 A	75	175	10	250	
600	3	$T_L = 130°C$	***MURS360T3***	75	1.25 @ 3.0 A	75	175	10	250	
200	6	$T_L = 145°C$	***MURD620CT***	35	1.0 @ 3.0 A	63	175	5	250 @ 125°C	**DPAK**   "CT" Suffix
200	3	$T_C = 158°C$	***MURD320***	35	.95 @ 3.0 A	75	175	5	500 @ 125°C	
400	8	$T_L = 120°C$	***MURHB840CT***	28	2.2 @ 4.0 A	100	175	10	500	**D²PAK**   Non-"CT" Suffix
600	8	$T_L = 120°C$	***MURHB860CT***	35	2.8 @ 4.0 A	100	175	10	500	
200	16	$T_L = 150°C$	***MURB1620CT***	35	0.975 @ 8.0 A	100	175	5	250	
600	16	$T_C = 150°C$	***MURB1660CT***	60	1.5 @ 8.0 A	100	175	10	500	

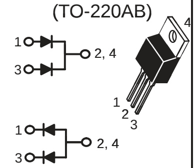
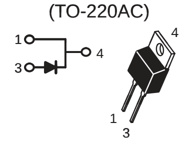
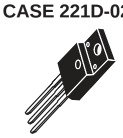
(1) I_O is total device current capability.
(2) V_{RRM} unless noted
(4) V_{RRM}, $T_J = 150°C$ unless noted
★New Product

Table 14. Axial Lead Ultrafast Rectifiers

V_{RRM} (Volts)	I_O (Amperes)	I_O Rating Condition	Device	Max t_{rr} (ns)	Max V_F @ i_F $T_C = 25°C$ (Volts)	I_{FSM} (Amperes)	T_J Max (°C)	Max I_R(2) $T_J = 25°C$ (μA)	Max I_R(4) (μA)	Package
50	1	$T_A = 130°C$	***MUR105***	35	0.875 @ 1.0 A	35	175	2	50	 **CASE 59-04** Plastic Cathode = Polarity Band
100	1	$T_A = 130°C$	***MUR110***	35	0.875 @ 1.0 A	35	175	2	50	
150	1	$T_A = 130°C$	***MUR115***	35	0.875 @ 1.0 A	35	175	2	50	
200	1	$T_A = 130°C$ $R_{\theta JA} = 50°C/W$	***MUR120***	25	0.875 @ 1.0 A	35	175	2	50	
300	1	$T_A = 120°C$	***MUR130***	75	1.25 @ 1.0 A	35	175	5	150	
400	1	$T_A = 120°C$	***MUR140***	75	1.25 @ 1.0 A	35	175	5	150	
600	1	$T_A = 120°C$ $R_{\theta JA} = 50°C/W$	***MUR160***	50	1.25 @ 1.0 A	35	175	5	150	
800	1	$T_A = 95°C$	***MUR180E***	100	1.75 @ 1.0 A	35	175	10	600	
1000	1	$T_A = 95°C$ $R_{\theta JA} = 50°C/W$	***MUR1100E***	75	1.75 @ 1.0 A	35	175	10	600 @ 100°C	
200	2	$T_A = 90°C$	***MUR220***	35	0.95 @ 2.0 A	35	175	2	50	
400	2	$T_A = 85°C$	***MUR240***	65	1.15 @ 2.0 A	35	175	5	150	
600	2	$T_A = 60°C$	***MUR260***	75	1.35 @ 2.0 A	35	175	5	150	
1000	2	$T_A = 35°C$	***MUR2100E***	100	2.2 @ 2.0 A	35	175	10	600	
50	4	$T_A = 80°C$	***MUR405***	35	0.89 @ 2.0 A	125	175	5	150	 **CASE 267-03** Plastic Cathode = Polarity Band
100	4	$T_A = 80°C$	***MUR410***	35	0.89 @ 2.0 A	125	175	5	150	
150	4	$T_A = 80°C$	***MUR415***	35	0.89 @ 2.0 A	125	175	5	150	
200	4	$T_A = 80°C$ $R_{\theta JA} = 28°C/W$	***MUR420***	25	0.875 @ 3.0 A	125	175	5	150	
400	4	$T_A = 40°C$	***MUR440***	75		75	175	10	250	
600	4	$T_A = 40°C$ $R_{\theta JA} = 28°C/W$	***MUR460***	50	1.25 @ 3.0 A	70	175	10	250	
800	4	$T_A = 35°C$	***MUR480E***	100	1.75 @ 3.0 A	70	175	25	900 @ 100°C	
1000	4	$T_A = 35°C$ $R_{\theta JA} = 28°C/W$	***MUR4100E***	75	1.75 @ 3.0 A	70	175	25	900 @ 100°C	

(2)V_{RRM} unless noted
(4)V_{RRM}, $T_J = 150°C$ unless noted

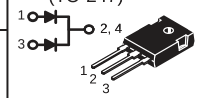
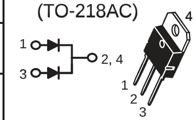
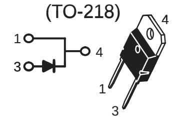
Table 15. TO-220 Ultrafast and MEGAHERTZ™ Rectifiers

V_{RRM} (Volts)	$I_O^{(1)}$ (Amperes)	I_O Rating Condition	Device	Max t_{rr} (ns)	Max V_F @ i_F T_C = 25°C (Volts)	I_{FSM} (Amperes)	T_J Max (°C)	Max $I_R^{(2)}$ T_C = 25°C (μA)	Max $I_R^{(4)}$ (μA)	Package
200	6	T_C = 130°C	***MUR620CT***	35	0.975 @ 3.0 A	75	175	5	250	**CASE 221A-09** (TO-220AB)  **MUR1620CTR Only**
400	8	T_C = 120°C	***MURH840CT***	28	2.0 @ 4.0 A	100	175	10	500	
600	8	T_C = 120°C	***MURH860CT***	35	2.8 @ 4.0 A	100	175	10	500	
100	16	T_C = 150°C	***MUR1610CT***	35	0.975 @ 8.0 A	100	175	5	250	
150	16	T_C = 150°C	***MUR1615CT***	35	0.975 @ 8.0 A	100	175	5	250	
200	16	T_C = 150°C	***MUR1620CT***	35	0.975 @ 8.0 A	100	175	5	250	
200	16	T_C = 160°C	***MUR1620CTR***	85	1.2 @ 8.0 A	100	175	5	500	
400	16	T_C = 150°C	***MUR1640CT***	60	1.30 @ 8.0 A	100	175	10	250	
600	16	T_C = 150°C	***MUR1660CT***	60	1.5 @ 8.0 A	100	175	10	500	
50	8	T_C = 150°C	***MUR805***	35	0.975 @ 8.0 A	100	175	5	250	**CASE 221B-04** (TO-220AC) 
100	8	T_C = 150°C	***MUR810***	35	0.975 @ 8.0 A	100	175	5	250	
150	8	T_C = 150°C	***MUR815***	35	0.975 @ 8.0 A	100	175	5	250	
200	8	T_C = 150°C	***MUR820***	35	0.975 @ 8.0 A	100	175	5	250	
400	8	T_C = 150°C	***MUR840***	50	1.30 @ 8.0 A	100	175	10	500	
600	8	T_C = 150°C	***MUR860***	50	1.50 @ 8.0 A	100	175	10	500	
800	8	T_C = 175°C	***MUR880E***	75	1.80 @ 8.0 A	100	175	25	500 @ 100°C	
100	15	T_C = 150°C	***MUR1510***	35	1.05 @ 15 A	200	175	10	500	
150	15	T_C = 150°C	***MUR1515***	35	1.05 @ 15 A	200	175	10	500	
200	15	T_C = 150°C	***MUR1520***	35	1.05 @ 15 A	200	175	10	500	
400	15	T_C = 150°C	***MUR1540***	60	1.25 @ 15 A	150	175	10	500	
600	15	T_C = 145°C	***MUR1560***	60	1.50 @ 15 A	150	175	10	1000	
200	20	T_C = 125°C	***MUR2020R***	95	1.10 @ 20 A	250	175	50	1000	
1000	8	T_C = 150°C	***MUR8100E***	75	1.80 @ 8.0 A	100	175	25	500 @ 100°C	
1200	10	T_C = 125°C	***MUR10120E***	175	2.2 @ 6.5 A	100	125	100	1000 @ 125°C	
1500	10	T_C = 125°C	***MUR10150E***	175	2.4 @ 6.5 A	100	125	100	1000 @ 125°C	
1500	5	T_C = 100°C	***MUR5150E***	175	2.4 @ 5 A	100	125	50	500 @ 125°C	
200	16	T_C = 150°C	UL ***MURF1620CT***	25	0.975 @ 8.0 A	100	150	5	250	**CASE 221D-02** 
600	16	T_C = 150°C	***MURF1660CT***	60	1.5 @ 8.0 A	100	175	10	500	
600	8	$T_C \leq$ 120°C	***MURHF860CT*** ★	35	2.8 @ 4.0 A	100	175	10	500	

(1) I_O is total device capability
(2) V_{RRM} unless noted
(4) V_{RRM}, T_J = 150°C unless noted

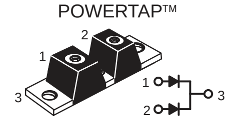
UL Indicates UL Recognized – File #E69369
★ New Product

Table 16. TO-218 and TO-247 Ultrafast Rectifiers

V_{RRM} (Volts)	I_O (Amperes)	I_O Rating Condition	Device	Max t_{rr} (ns)	Max V_F @ i_F T_C = 25°C (Volts)	I_{FSM} (Amperes)	T_J Max (°C)	Max I_R(2) T_J = 25°C (μA)	Max I_R(4) (mA)	Package
200	30	T_C = 145°C	***MUR3020WT***	35	1.05 @ 15 A	150	175	10	0.5	**CASE 340K–01** (TO-247) 
600	30	T_C = 145°C	***MUR3060WT***	60	1.70 @ 15 A	150	175	10	1	
200	30	T_C = 150°C	***MUR3020PT***	35	1.12 @ 15 A	200	175	10	0.5	**CASE 340D-02** (TO-218AC) 
400	30	T_C = 150°C	***MUR3040PT***	60	1.12 @ 15 A	150	175	10	0.5	
600	30	T_C = 145°C	***MUR3060PT***	60	1.20 @ 15 A	150	175	10	1	
400	30	T_C = 70°C	***MUR3040***	100	1.5 @ 30 A	300	175	35	6 @ 100°C	**CASE 340E-02** (TO-218) 
800	30	T_C = 70°C	***MUR3080***	110	1.90 @ 30 A	300	175	100	5 @ 100°C	
400	60	T_C = 70°C	***MUR6040***	100	1.50 @ 60 A	600	175	60	10 @ 100°C	

(1)I_O is total device capability
(2)V_{RRM} unless noted
(4)V_{RRM}, T_J = 150°C unless noted

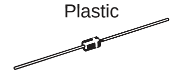
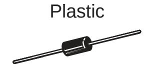
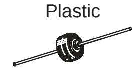
Table 17. POWERTAP II Ultrafast Rectifiers

V_{RRM} (Volts)	I_O(1) (Amperes)	I_O Rating Condition	Device	Max t_{rr} (ns)	Max V_F @ i_F T_C = 25°C (Volts)	I_{FSM} (Amperes)	T_J Max (°C)	Max I_R(2) T_J = 25°C (μA)	Max I_R(4) (mA)	Package
200	200	T_C = 130°C	***MURP20020CT***	50	1.00 @ 100 A	800	175	150	1 @ 125°C	**CASE 357C-03** POWERTAP™  Cathode = Mounting Plate Anode = Terminal
400	200	T_C = 100°C	***MURP20040CT***	50	1.30 @ 100 A	800	175	50	0.5 @ 125°C	

(1)I_O is total device current capability.
(2)V_{RRM} unless noted
(4)V_{RRM}, T_J = 150°C unless noted
⋆ New Product

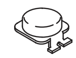
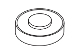
Fast Recovery Rectifiers/General-Purpose Rectifiers

Table 18. Fast Recovery Rectifiers/General Purpose Rectifiers

V_{RRM} (Volts)	I_O (Amperes)	I_O Rating Condition	Device	Max V_F @ i_F T_J = 25°C (Volts)	Max t_{rr} (ns)	I_{FSM} (Amperes)	T_J Max (°C)	Max I_R(2) T_J = 25°C (μA)	Max I_R(3) (μA)	Package
400	1.5	T_L = 118°C	***MRS1504T3***	1.04 @ 1.5 A	–	50	150	1	340	**CASE 403A-03 SMB** 
300	1	T_L = 150°C	***MRA4003T3*** ⋆	1.1 @ 1.0 A	–	30	175	10	50	**CASE 403B-01 SMA**  Cathode = Notch
400	1	T_L = 150°C	***MRA4004T3*** ⋆	1.1 @ 1.0 A	–	30	175	10	50	
600	1	T_L = 150°C	***MRA4005T3*** ⋆	1.1 @ 1.0 A	–	30	175	10	50	
800	1	T_L = 150°C	***MRA4006T3*** ⋆	1.1 @ 1.0 A	–	30	175	10	50	
1000	1	T_L = 150°C	***MRA4007T3*** ⋆	1.1 @ 1.0 A	–	30	175	10	50	
50	1	T_A = 75°C	***1N4001RL***	1.1 @ 1.0 A	–	30	150	10	50	**CASE 59-03(7)** Plastic  Cathode = Polarity Band
100	1	T_A = 75°C	***1N4002RL***	1.1 @ 1.0 A	–	30	150	10	50	
200	1	T_A = 75°C	***1N4003RL***	1.1 @ 1.0 A	–	30	150	10	50	
400	1	T_A = 75°C	***1N4004RL***	1.1 @ 1.0 A	–	30	150	10	50	
600	1	T_A = 75°C	***1N4005RL***	1.1 @ 1.0 A	–	30	150	10	50	
800	1	T_A = 75°C	***1N4006RL***	1.1 @ 1.0 A	–	30	150	10	50	
1000	1	T_A = 75°C	***1N4007RL***	1.1 @ 1.0 A	–	30	150	10	50	
50	1	T_A = 75°C	***1N4933RL***	1.2 @ 1.0 A	200	30	150	5	100	
100	1	T_A = 75°C	***1N4934RL***	1.2 @ 1.0 A	200	30	150	5	100	
200	1	T_A = 75°C	***1N4935RL***	1.2 @ 1.0 A	200	30	150	5	100	
400	1	T_A = 75°C	***1N4936RL***	1.2 @ 1.0 A	200	30	150	5	100	
600	1	T_A = 75°C	***1N4937RL***	1.2 @ 1.0 A	200	30	150	5	100	
50	3	T_L = 105°C	***1N5400RL***	1.2 @ 9.4 A	–	200	150	10	500 @ 150°C	**CASE 267-03** Plastic  Cathode = Polarity Band
100	3	T_L = 105°C	***1N5401RL***	1.2 @ 9.4 A	–	200	150	10	500 @ 150°C	
200	3	T_L = 105°C	***1N5402RL***	1.2 @ 9.4 A	–	200	150	10	500 @ 150°C	
400	3	T_L = 105°C	***1N5404RL***	1.2 @ 9.4 A	–	200	150	10	500 @ 150°C	
600	3	T_L = 105°C	***1N5406RL***	1.2 @ 9.4 A	–	200	150	10	500 @ 150°C	
800	3	T_L = 105°C	***1N5407RL***	1.2 @ 9.4 A	–	200	150	10	500 @ 150°C	
1000	3	T_L = 105°C	***1N5408RL***	1.2 @ 9.4 A	–	200	150	10	500 @ 150°C	
200	3	T_A = 80°C(8)	***MR852RL***	1.25 @ 3.0 A	200	100	150	10	150	
400	3	T_A = 80°C(8)	***MR854RL***	1.25 @ 3.0 A	200	100	150	10	150	
600	3	T_A = 80°C(8)	***MR856RL***	1.25 @ 3.0 A	200	100	150	10	150	
50	6	T_A = 60°C $R_{θJA}$ = 25°C/W	***MR750RL***	1.25 @ 100 A	–	400	175	25	1000	**CASE 194-04** Plastic  Cathode indicated by diode symbol
100	6	T_A = 60°C $R_{θJA}$ = 25°C/W	***MR751RL***	1.25 @ 100 A	–	400	175	25	1000	
200	6	T_A = 60°C $R_{θJA}$ = 25°C/W	***MR752RL***	1.25 @ 100 A	–	400	175	25	1000	
400	6	T_A = 60°C $R_{θJA}$ = 25°C/W	***MR754RL***	1.25 @ 100 A	–	400	175	25	1000	
600	6	T_A = 60°C $R_{θJA}$ = 25°C/W	***MR756RL***	1.25 @ 100 A	–	400	175	25	1000	
1000	6	T_A = 60°C $R_{θJA}$ = 25°C/W	***MR760RL***	1.25 @ 100 A	–	400	175	25	1000	
200	25	T_C = 150°C	***MR2502***	1.18 @ 78.5 A	–	400	175	100	500	**CASE 193-04** Plastic  Cathode = Polarity Band
400	25	T_C = 150°C	***MR2504***	1.18 @ 78.5 A	–	400	175	100	500	
1000	25	T_C = 150°C	***MR2510***	1.18 @ 78.5 A	–	400	175	100	500	
250	32	T_C = 150°C	***TRA3225***	1.15 @ 100 A	–	500	175	10	250	
250	25	T_C = 150°C	***TRA2525***	1.18 @ 100 A	–	400	175	10	250	

(2)V_{RRM} unless noted
(3)V_{RRM}, T_J = 100°C unless noted
(7)Package Size: 0.120” max diameter by 0.260” length.
(8)Must be derated for reverse power dissipation. See data sheet.
(9)Overvoltage Transient Suppressor: 24–32 volts avalanche voltage.
⋆ New Product

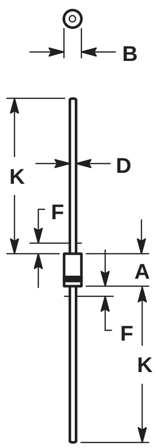
Table 19. Overvoltage Transient Suppressors

V_{RRM} (Volts)	V_{BR}(1) (Volts)	V_{BR} (Volts)	I_O (Amperes)	Device	Max V_F $T_J = 25°C$ (Volts)	I_{FSM} (Amperes)	T_J Max (°C)	I_{RSM} (Amperes)	Max I_R(7) (µA)	Package
23	24–32	40(4)	6 T_L = 125°C	***MR2520L***	1.25 I_F = 100A	400	175	58(5)	10	**CASE 194–04** Plastic  Cathode = Diode Symbol
20	24–32	40(2)	6 T_C = 125°C	***MR2535L***	1.1 I_F = 100A	400	175	62(5)	0.2	
20	24–32	40(3)	32 T_C = 150°C	***TRA2532***	1.18 I_F = 100A	500	175	80(5)	10	**CASE 193-04** Plastic  Cathode = Polarity Band
23	24–32	40(3)	32 T_C = 150°C	***MR2835S***	1.1 I_F = 100A	400	175	62(5)	5 @ 20 V	**CASE 460–02** Top Can  Cathode = Terminal
18	20–27	37(3) 35(4)	32 T_C = 185°C	***MR3227N*** and ***MR3227P***	1.18 I_F = 100A	400	200	90(5) 40(6)	1 @ 16 V	**CASE 193A–02** Button Can  N = Anode to Case P = Cathode to Case
18	20–27	37(3) 35(4)	40 T_C = 185°C	***MR4027N*** and ***MR4027P***	1.1 I_F = 100A	500	200	110(5) 50(6)	1 @ 16 V	
30	34–45	55(3) 53(4)	40 T_C = 185°C	***MR4045N*** and ***MR4045P***	1.1 I_F = 100A	500	200	55(5) 25(6)	1 @ 28 V	

(1)At Ir = 100 mA, 25°C
(2)At Ir = 90 A, Tc = 150°C, PW = 80 µS
(3)At Ir = 80 A, Tc = 85°C, PW = 80 µS
(4)At Ir = 80 A, Tc = 25°C, PW = 80 µS
(5)Time Constant = 10 mS, 25°C
(6)Time Constant = 80 mS, 25°C
(7)At V_{RRM}, T_j = 25°C unless noted

Package Outline Dimensions

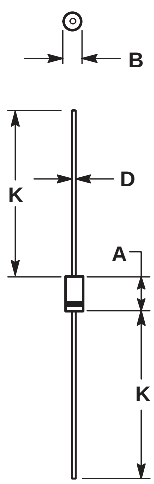
GLASS/PLASTIC
DO–41
CASE 59–03
ISSUE M



NOTES:
1. ALL RULES AND NOTES ASSOCIATED WITH JEDEC DO–41 OUTLINE SHALL APPLY.
2. POLARITY DENOTED BY CATHODE BAND.
3. LEAD DIAMETER NOT CONTROLLED WITHIN F DIMENSION.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.07	5.20	0.160	0.205
B	2.04	2.71	0.080	0.107
D	0.71	0.86	0.028	0.034
F	---	1.27	---	0.050
K	27.94	---	1.100	---

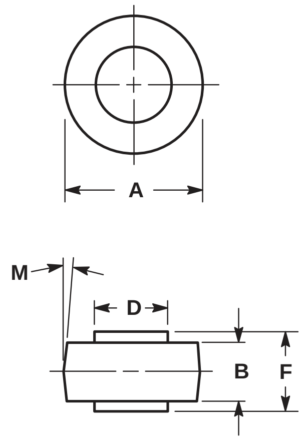
MINI MOSORB
CASE 59–04
ISSUE M



NOTES:
1. ALL RULES AND NOTES ASSOCIATED WITH JEDEC DO–41 OUTLINE SHALL APPLY.
2. POLARITY DENOTED BY CATHODE BAND.
3. LEAD DIAMETER NOT CONTROLLED WITHIN F DIMENSION.

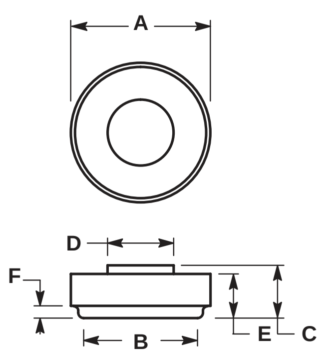
	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	5.97	6.60	0.235	0.260
B	2.79	3.05	0.110	0.120
D	0.76	0.86	0.030	0.034
K	27.94	---	1.100	---

MICRODE BUTTON
CASE 193–04
ISSUE J



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.43	8.69	0.332	0.342
B	4.19	4.45	0.165	0.175
D	5.54	5.64	0.218	0.222
F	5.94	6.25	0.234	0.246
M	5°NOM		5°NOM	

CAN BUTTON
CASE 193A–02
ISSUE A

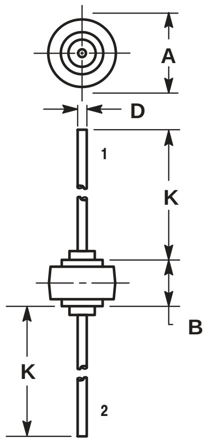


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	11.4	11.6	0.449	0.457
B	9.3	9.7	0.366	0.382
C	4.3	4.9	0.169	0.193
D	5.4	5.6	0.213	0.220
E	3.6	4.2	0.142	0.165
F	1.0	2.0	0.039	0.079

PACKAGE OUTLINE DIMENSIONS (continued)

AXIAL LEAD BUTTON
CASE 194–04
ISSUE F

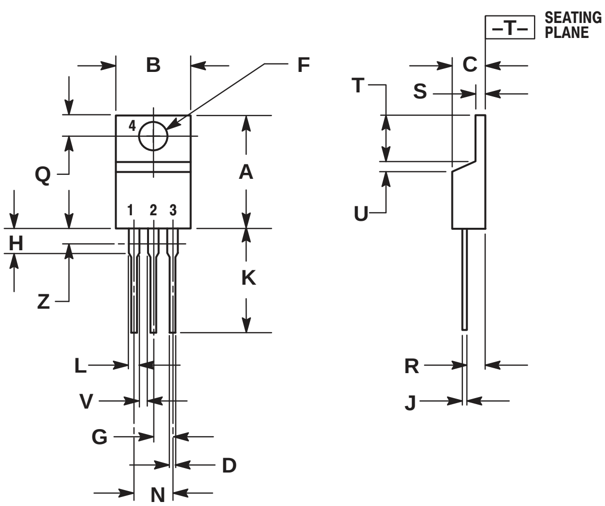


NOTES:
1. CATHODE SYMBOL ON PACKAGE.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	8.43	8.69	0.332	0.342
B	5.94	6.25	0.234	0.246
D	1.27	1.35	0.050	0.053
K	25.15	25.65	0.990	1.010

STYLE 1:
PIN 1. CATHODE
2. ANODE

TO–220 THREE–LEAD
TO–220
CASE 221A–09
ISSUE AA



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 2:
PIN 1. BASE
2. EMITTER
3. COLLECTOR
4. EMITTER

STYLE 3:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

STYLE 4:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. MAIN TERMINAL 2

STYLE 5:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

STYLE 6:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

STYLE 7:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE

STYLE 8:
PIN 1. CATHODE
2. ANODE
3. EXTERNAL TRIP/DELAY
4. ANODE

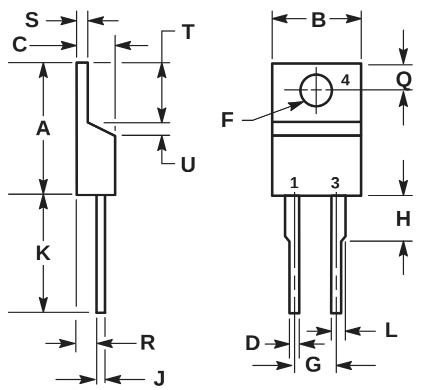
STYLE 9:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 10:
PIN 1. GATE
2. SOURCE
3. DRAIN
4. SOURCE

STYLE 11:
PIN 1. DRAIN
2. SOURCE
3. GATE
4. SOURCE

PACKAGE OUTLINE DIMENSIONS (continued)

TO–220 TWO–LEAD
CASE 221B–04
ISSUE D



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

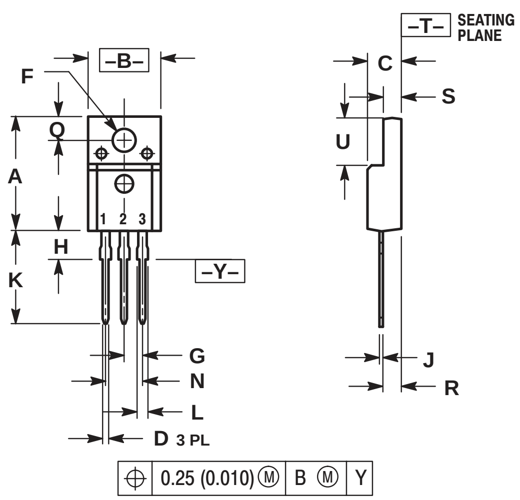
DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	0.595	0.620	15.11	15.75
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.82
D	0.025	0.035	0.64	0.89
F	0.142	0.147	3.61	3.73
G	0.190	0.210	4.83	5.33
H	0.110	0.130	2.79	3.30
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.14	1.52
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.14	1.39
T	0.235	0.255	5.97	6.48
U	0.000	0.050	0.00	1.27

STYLE 1:
PIN 1. CATHODE
2. N/A
3. ANODE
4. CATHODE

STYLE 2:
PIN 1. ANODE
2. N/A
3. CATHODE
4. ANODE

TO–220 FULLPACK TRANSISTOR
CASE 221D–02
ISSUE D

SCALE 1:1



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	0.621	0.629	15.78	15.97
B	0.394	0.402	10.01	10.21
C	0.181	0.189	4.60	4.80
D	0.026	0.034	0.67	0.86
F	0.121	0.129	3.08	3.27
G	0.100 BSC		2.54 BSC	
H	0.123	0.129	3.13	3.27
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.14	1.52
N	0.200 BSC		5.08 BSC	
Q	0.126	0.134	3.21	3.40
R	0.107	0.111	2.72	2.81
S	0.096	0.104	2.44	2.64
U	0.259	0.267	6.58	6.78

STYLE 1:
PIN 1. GATE
2. DRAIN
3. SOURCE

STYLE 2:
PIN 1. BASE
2. COLLECTOR
3. EMITTER

STYLE 3:
PIN 1. ANODE
2. CATHODE
3. ANODE

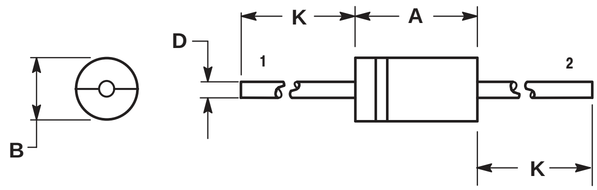
STYLE 4:
PIN 1. CATHODE
2. ANODE
3. CATHODE

STYLE 5:
PIN 1. CATHODE
2. ANODE
3. GATE

STYLE 6:
PIN 1. MT 1
2. MT 2
3. GATE

PACKAGE OUTLINE DIMENSIONS (continued)

AXIAL LEAD
CASE 267–03
ISSUE G



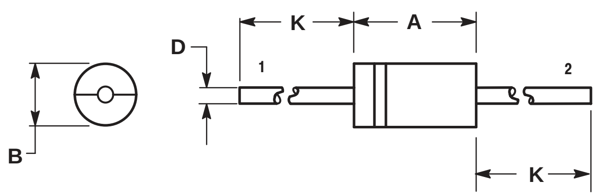
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.370	0.380	9.40	9.65
B	0.190	0.210	4.83	5.33
D	0.048	0.052	1.22	1.32
K	1.000	---	25.40	---

STYLE 1:
PIN 1. CATHODE (POLARITY BAND)
2. ANODE

STYLE 2:
NO POLARITY

AXIAL LEAD
CASE 267–05
ISSUE G



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

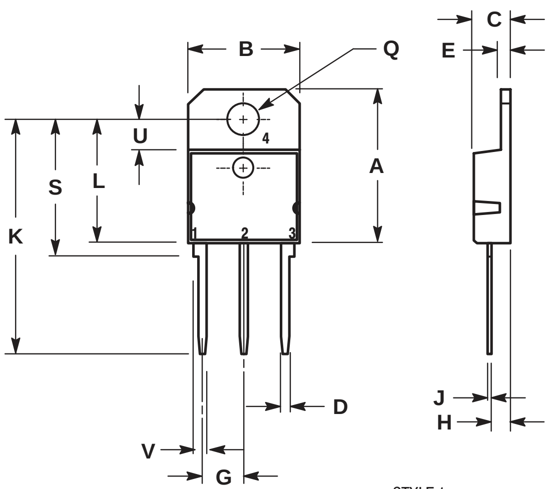
	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.287	0.374	7.30	9.50
B	0.189	0.209	4.80	5.30
D	0.047	0.051	1.20	1.30
K	1.000	---	25.40	---

STYLE 1:
PIN 1. CATHODE (POLARITY BAND)
2. ANODE

STYLE 2:
NO POLARITY

PACKAGE OUTLINE DIMENSIONS (continued)

TO–218 THREE LEAD
TO–218
CASE 340D–02
ISSUE B



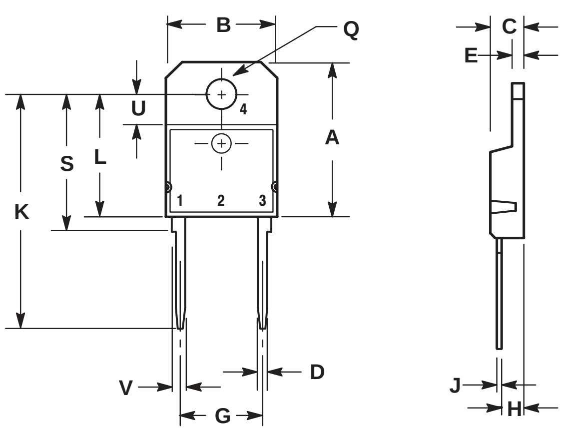
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	---	20.35	---	0.801
B	14.70	15.20	0.579	0.598
C	4.70	4.90	0.185	0.193
D	1.10	1.30	0.043	0.051
E	1.17	1.37	0.046	0.054
G	5.40	5.55	0.213	0.219
H	2.00	3.00	0.079	0.118
J	0.50	0.78	0.020	0.031
K	31.00 REF		1.220 REF	
L	---	16.20	---	0.638
Q	4.00	4.10	0.158	0.161
S	17.80	18.20	0.701	0.717
U	4.00 REF		0.157 REF	
V	1.75 REF		0.069	

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 2:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

TO–218 TWO LEAD
TO–218
CASE 340E–02
ISSUE A



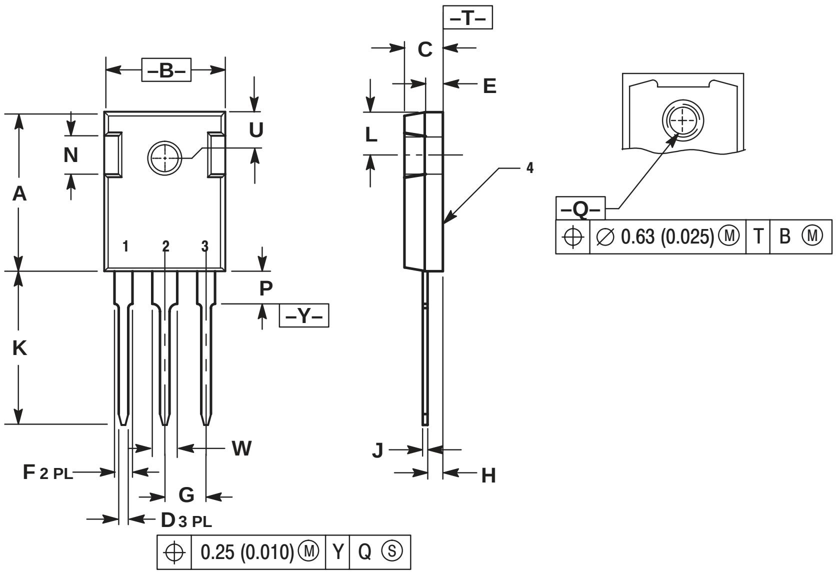
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982
2. CONTROLLING DIMENSION: MILLIMETER.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	---	20.35	---	0.801
B	14.70	15.20	0.579	0.598
C	4.70	4.90	0.185	0.193
D	1.10	1.30	0.043	0.051
E	1.17	1.37	0.046	0.054
G	10.80	11.10	0.425	0.437
H	2.00	3.00	0.079	0.118
J	0.50	0.78	0.020	0.031
K	31.00 REF		1.220 REF	
L	---	16.20	---	0.638
Q	4.00	4.10	0.158	0.161
S	17.80	18.20	0.701	0.717
U	4.00 REF		0.157 REF	
V	1.75 REF		0.069	

STYLE 1:
PIN 1. CATHODE
3. ANODE
4. CATHODE

PACKAGE OUTLINE DIMENSIONS (continued)

TO–247
CASE 340L–02
ISSUE D



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	20.32	21.08	0.800	8.30
B	15.75	16.26	0.620	0.640
C	4.70	5.30	0.185	0.209
D	1.00	1.40	0.040	0.055
E	2.20	2.60	0.087	0.102
F	1.65	2.13	0.065	0.084
G	5.45 BSC		0.215 BSC	
H	1.50	2.49	0.059	0.098
J	0.40	0.80	0.016	0.031
K	20.06	20.83	0.790	0.820
L	5.40	6.20	0.212	0.244
N	4.32	5.49	0.170	0.216
P	---	4.50	---	0.177
Q	3.55	3.65	0.140	0.144
U	6.15 BSC		0.242 BSC	
W	2.87	3.12	0.113	0.123

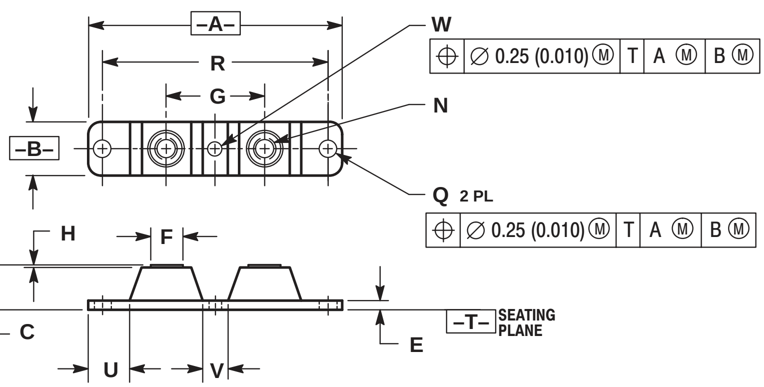
STYLE 1:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

STYLE 2:
PIN 1. ANODE
2. CATHODE (S)
3. ANODE 2
4. CATHODES (S)

STYLE 3:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 4:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

POWERTAP II
CASE 357C–03
ISSUE E

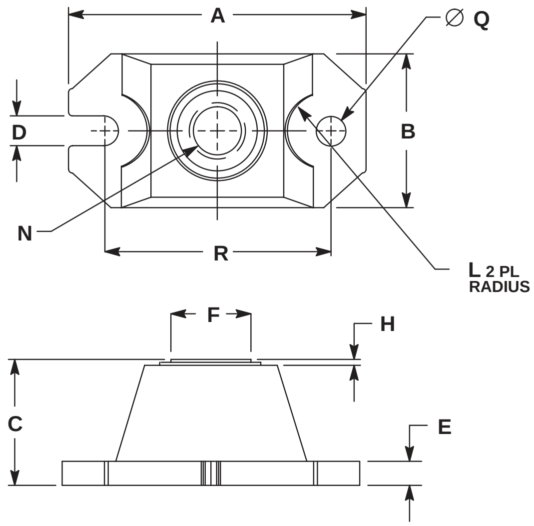


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. TERMINAL PENETRATION: 5.97 (0.235) MAXIMUM.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	3.450	3.635	87.63	92.33
B	0.700	0.810	17.78	20.57
C	0.615	0.640	15.63	16.26
E	0.120	0.130	3.05	3.30
F	0.435	0.445	11.05	11.30
G	1.370	1.380	34.80	35.05
H	0.007	0.030	0.18	0.76
N	1/4–20UNC–2B		1/4–20UNC–2B	
Q	0.270	0.285	6.86	7.23
R	31.50 BSC		80.01 BSC	
U	0.600	0.630	15.24	16.00
V	0.330	0.375	8.39	9.52
W	0.170	0.190	4.32	4.82

PACKAGE OUTLINE DIMENSIONS (continued)

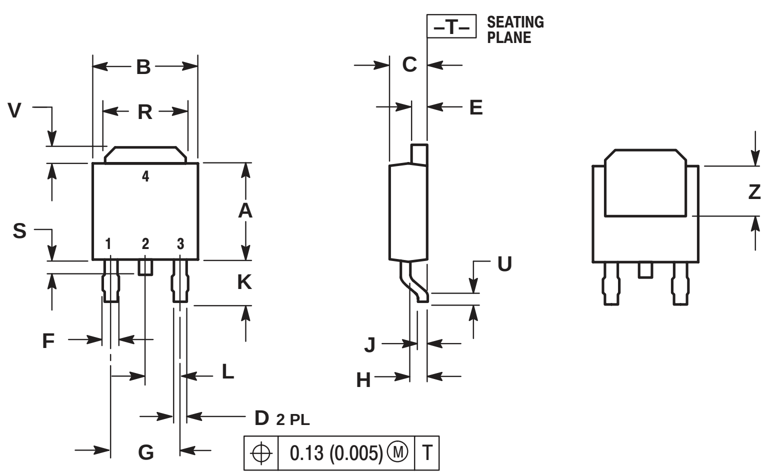
POWERTAP III
CASE 357D–01
ISSUE A



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. TERMINAL PENETRATION: 5.97 (0.235) MAXIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.520	1.560	38.61	39.62
B	0.783	0.813	19.89	20.65
C	0.615	0.635	15.62	16.13
D	0.152	0.162	3.86	4.11
E	0.120	0.130	3.05	3.30
F	0.435	0.445	11.05	11.30
H	0.007	0.030	0.18	0.76
L	0.210	0.230	5.33	5.84
N	1/4–20UNC–2B		1/4–20UNC–2B	
Q	0.152	0.162	3.86	4.11
R	1.175	1.195	29.85	30.35

DPAK
CASE 369A–13
ISSUE AA



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.250	5.97	6.35
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.033	0.040	0.84	1.01
F	0.037	0.047	0.94	1.19
G	0.180 BSC		4.58 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.102	0.114	2.60	2.89
L	0.090 BSC		2.29 BSC	
R	0.175	0.215	4.45	5.46
S	0.020	0.050	0.51	1.27
U	0.020	–––	0.51	–––
V	0.030	0.050	0.77	1.27
Z	0.138	–––	3.51	–––

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 2:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

STYLE 3:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

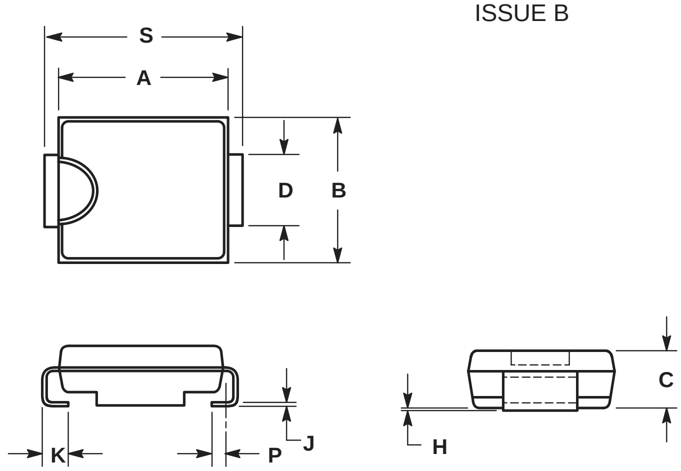
STYLE 4:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

STYLE 5:
PIN 1. GATE
2. ANODE
3. CATHODE
4. ANODE

STYLE 6:
PIN 1. MT1
2. MT2
3. GATE
4. MT2

PACKAGE OUTLINE DIMENSIONS (continued)

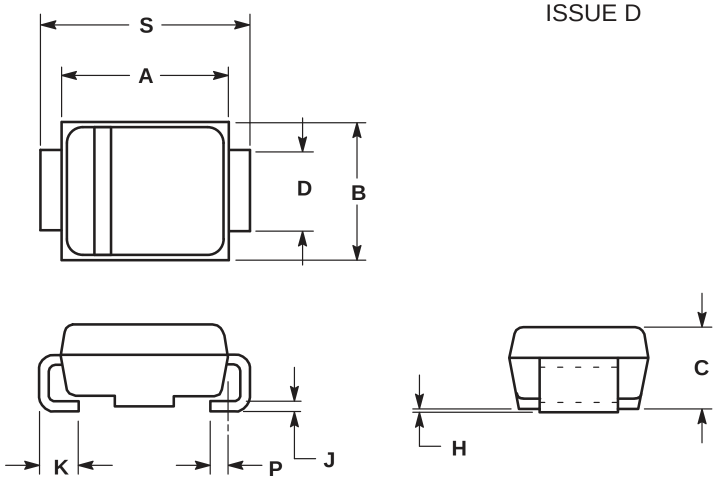
SMC
CASE 403–03
ISSUE B



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. D DIMENSION SHALL BE MEASURED WITHIN DIMENSION P.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.260	0.280	6.60	7.11
B	0.220	0.240	5.59	6.10
C	0.075	0.095	1.90	2.41
D	0.115	0.121	2.92	3.07
H	0.0020	0.0060	0.051	0.152
J	0.006	0.012	0.15	0.30
K	0.030	0.050	0.76	1.27
P	0.020 REF		0.51 REF	
S	0.305	0.320	7.75	8.13

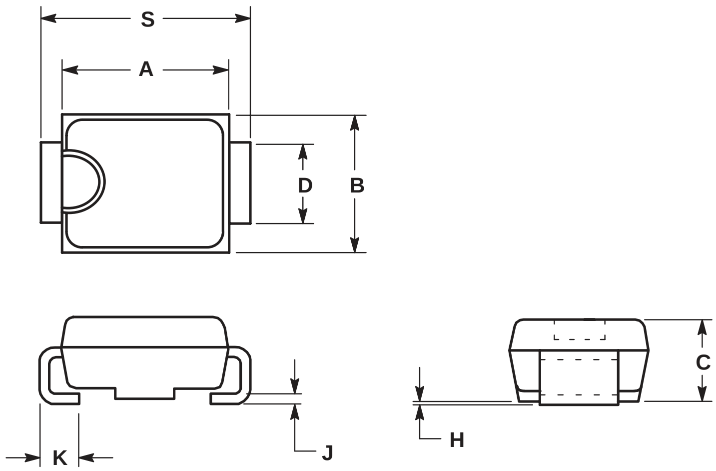
SMB
D0–214AA
CASE 403A–03
ISSUE D



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. D DIMENSION SHALL BE MEASURED WITHIN DIMENSION P.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.160	0.180	4.06	4.57
B	0.130	0.150	3.30	3.81
C	0.075	0.095	1.90	2.41
D	0.077	0.083	1.96	2.11
H	0.0020	0.0060	0.051	0.152
J	0.006	0.012	0.15	0.30
K	0.030	0.050	0.76	1.27
P	0.020 REF		0.51 REF	
S	0.205	0.220	5.21	5.59

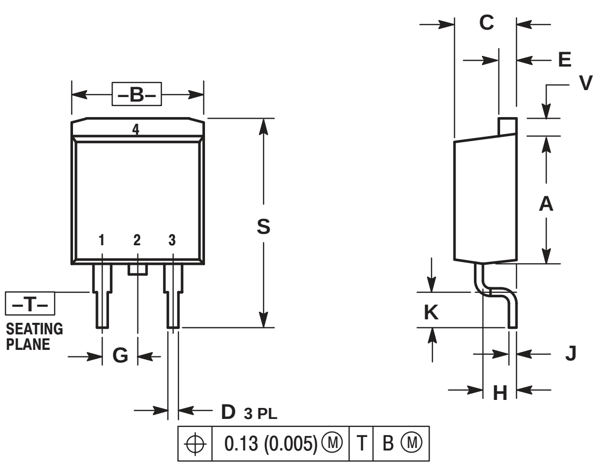
SMB
CASE 403B–01
ISSUE O



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	0.160	0.180	4.06	4.57
B	0.090	0.115	2.29	2.92
C	0.075	0.105	1.91	2.67
D	0.050	0.064	1.27	1.63
H	0.004	0.008	0.10	0.20
J	0.006	0.016	0.15	0.41
K	0.030	0.060	0.76	1.52
S	0.190	0.220	4.83	5.59

D^{2}PAK
CASE 418B–03
ISSUE D



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	0.340	0.380	8.64	9.65
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.83
D	0.020	0.035	0.51	0.89
E	0.045	0.055	1.14	1.40
G	0.100 BSC		2.54 BSC	
H	0.080	0.110	2.03	2.79
J	0.018	0.025	0.46	0.64
K	0.090	0.110	2.29	2.79
S	0.575	0.625	14.60	15.88
V	0.045	0.055	1.14	1.40

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

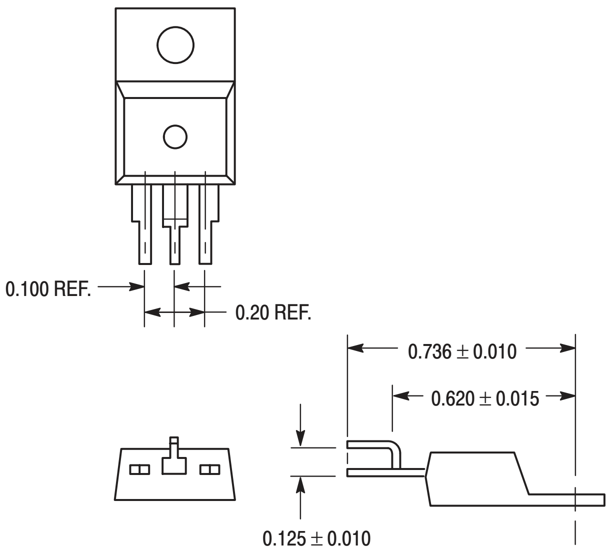
STYLE 2:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

STYLE 3:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

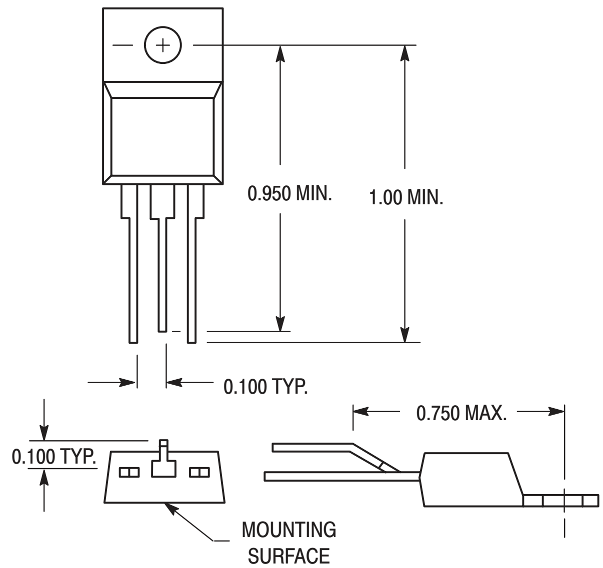
Leadform Options — TO-220 (Case 221A)

- Leadform options require assignment of a special part number before ordering.
- Contact your local ON Semiconductor representative for special part number and pricing.
- 10,000 piece minimum quantity orders are required.
- Leadform orders are non-cancellable after processing.
- Leadforms apply to both ON Semiconductor Case 221A-04 and 221A-06 except as noted.

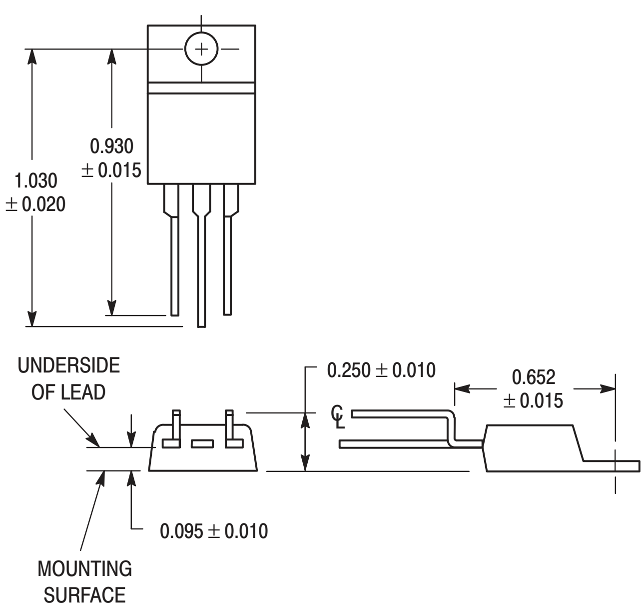
LEADFORM AS



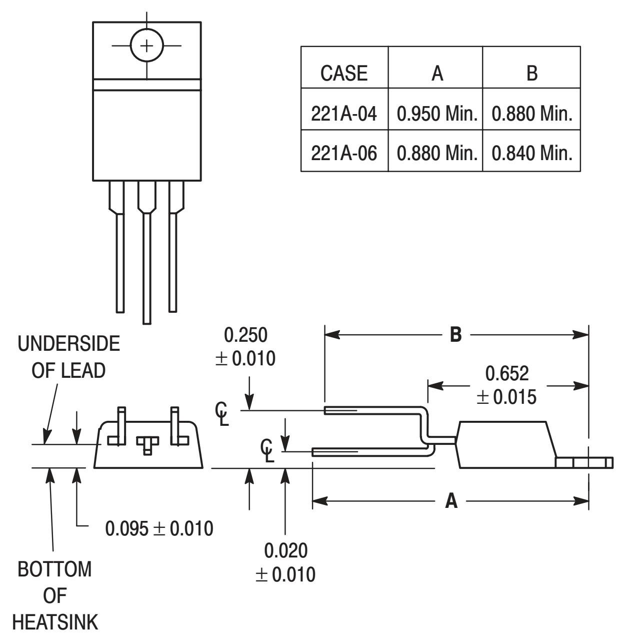
LEADFORM BC



LEADFORM AC



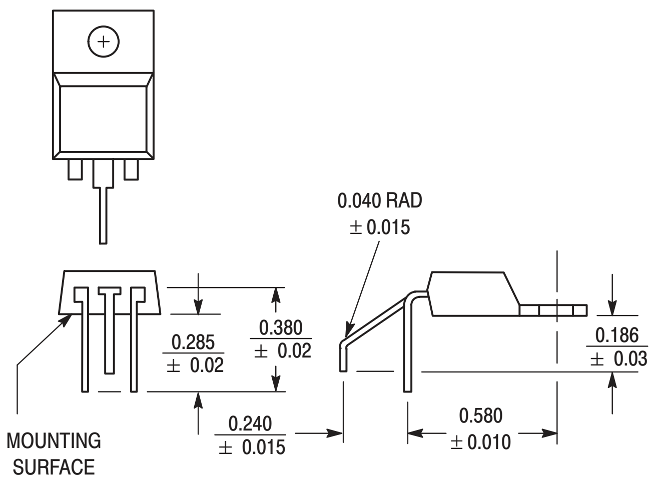
LEADFORM AD



CASE	A	B
221A-04	0.950 Min.	0.880 Min.
221A-06	0.880 Min.	0.840 Min.

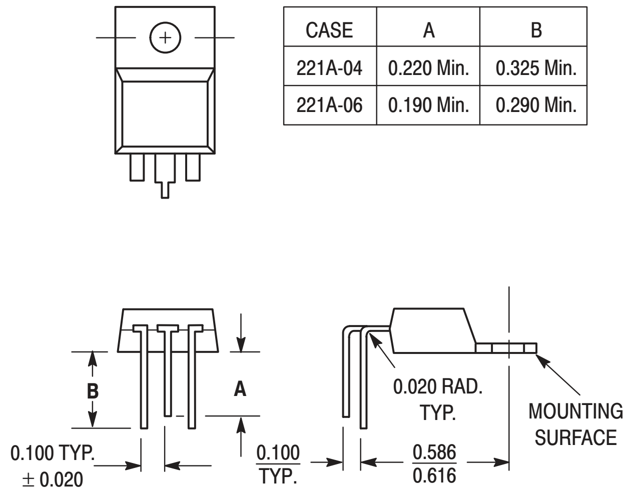
TO-220 Leadform Options (continued)

LEADFORM AN



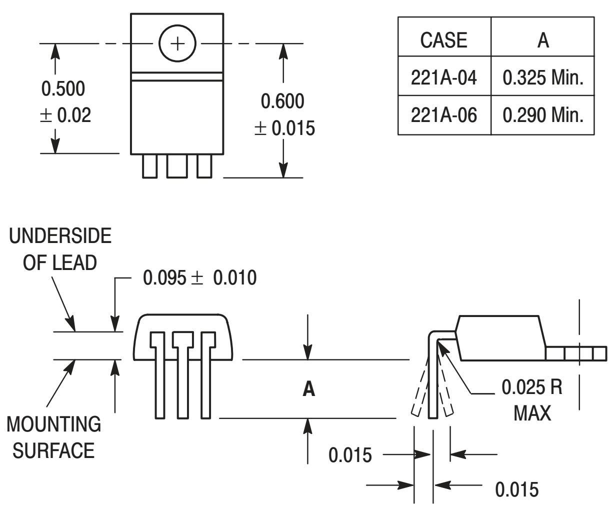
LEADFORM BA

CASE	A	B
221A-04	0.220 Min.	0.325 Min.
221A-06	0.190 Min.	0.290 Min.

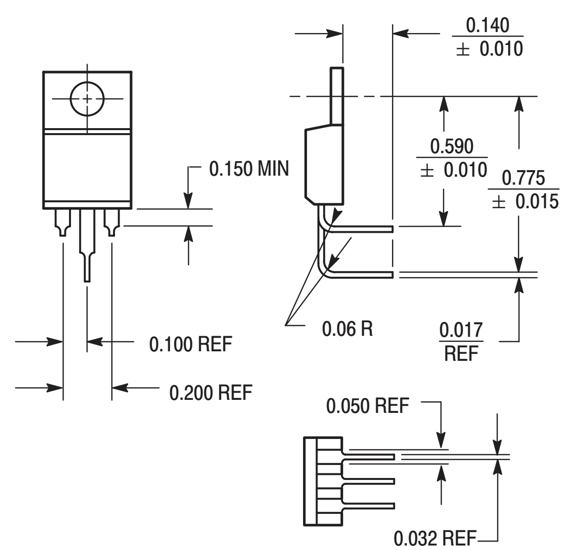


LEADFORM BL

CASE	A
221A-04	0.325 Min.
221A-06	0.290 Min.

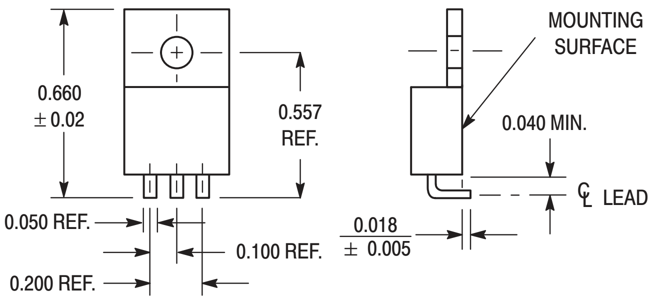


LEADFORM AK

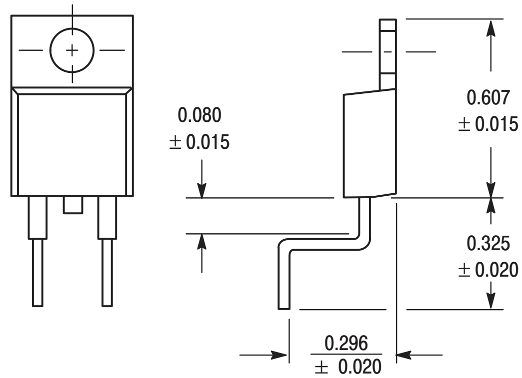


TO-220 Leadform Options (continued)

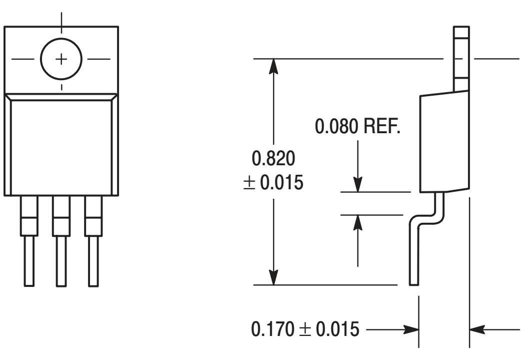
LEADFORM AF



LEADFORM BS

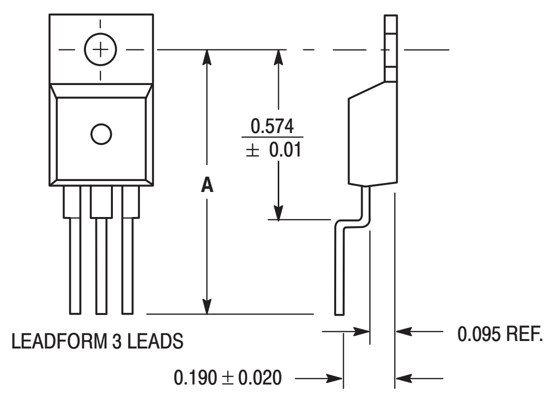


LEADFORM BR



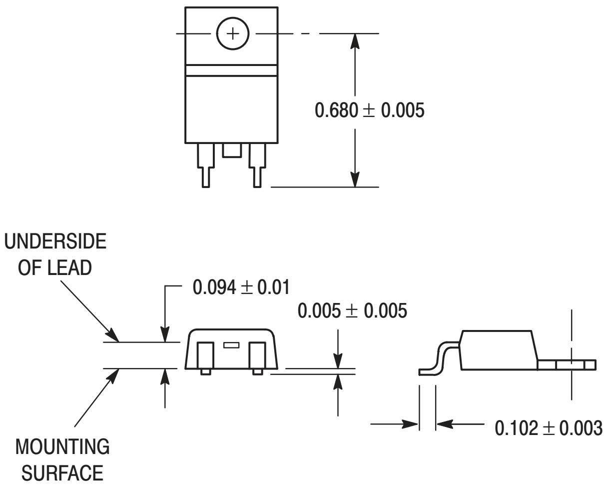
LEADFORM AU

CASE	A
221A-04	0.920 Min.
221A-06	0.885 Min.

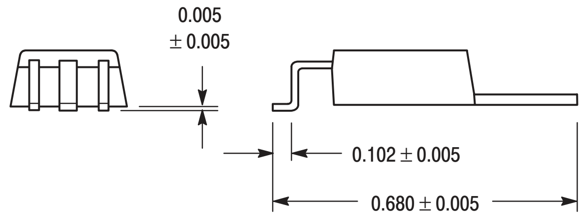


TO-220 Leadform Options (continued)

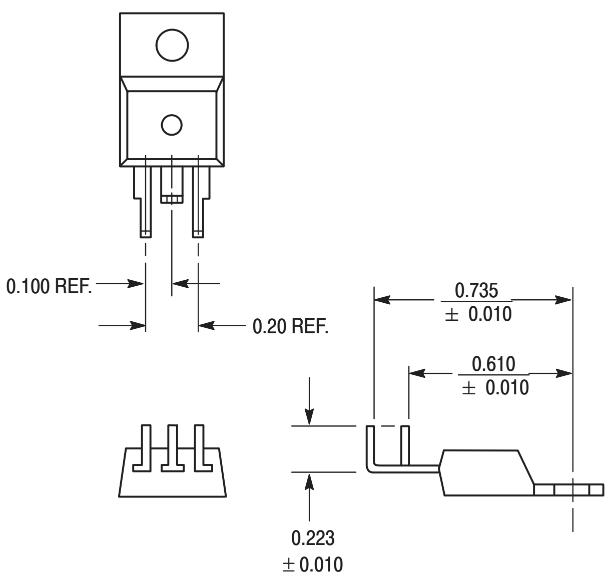
LEADFORM BU



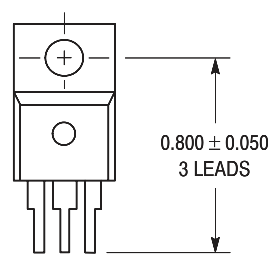
LEADFORM BV



LEADFORM BD

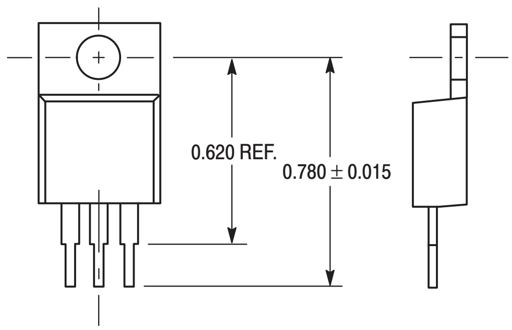


LEADFORM DW

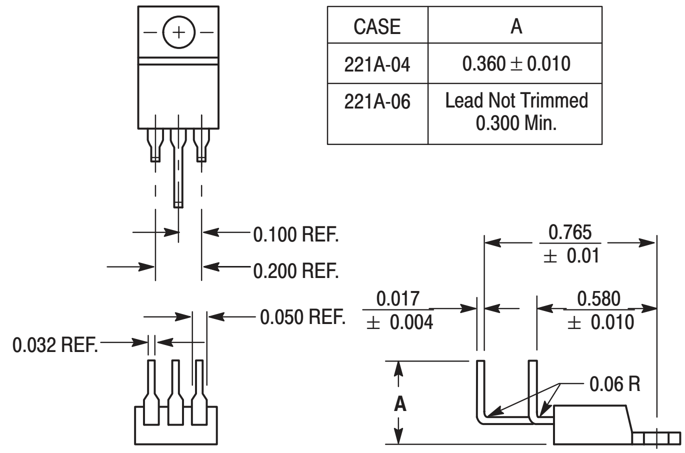


TO-220 Leadform Options (continued)

LEADFORM BG



LEADFORM AJ



CASE	A
221A-04	0.360 ± 0.010
221A-06	Lead Not Trimmed 0.300 Min.

INFORMATION FOR USING SURFACE MOUNT PACKAGES

RECOMMENDED FOOTPRINTS FOR SURFACE MOUNTED APPLICATIONS

Surface mount board layout is a critical portion of the total design. The footprint for the semiconductor packages must be the correct size to ensure proper solder connection interface between the board and the package. With the correct pad geometry, the packages will self align when subjected to a solder reflow process.

POWER DISSIPATION FOR A SURFACE MOUNT DEVICE

The power dissipation for a surface mount device is a function of the drain/collector pad size. These can vary from the minimum pad size for soldering to a pad size given for maximum power dissipation. Power dissipation for a surface mount device is determined by $T_{J(max)}$, the maximum rated junction temperature of the die, $R_{\theta JA}$, the thermal resistance from the device junction to ambient, and the operating temperature, T_A. Using the values provided on the data sheet, P_D can be calculated as follows:

$$P_D = \frac{T_{J(max)} - T_A}{R_{\theta JA}}$$

The values for the equation are found in the maximum ratings table on the data sheet. Substituting these values into the equation for an ambient temperature T_A of 25°C, one can calculate the power dissipation of the device. For example, for a SOT–223 device, P_D is calculated as follows.

$$P_D = \frac{150°C - 25°C}{156°C/W} = 800 \text{ milliwatts}$$

The 156°C/W for the SOT–223 package assumes the use of the recommended footprint on a glass epoxy printed circuit board to achieve a power dissipation of 800 milliwatts. There are other alternatives to achieving higher power dissipation from the surface mount packages. One is to increase the area of the drain/collector pad. By increasing the area of the drain/collector pad, the power dissipation can be increased. Although the power dissipation can almost be doubled with this method, area is taken up on the printed circuit board which can defeat the purpose of using surface mount technology. For example, a graph of $R_{\theta JA}$ versus drain pad area is shown in Figures 1, 2 and 3.

Another alternative would be to use a ceramic substrate or an aluminum core board such as Thermal Clad™. Using a board material such as Thermal Clad, an aluminum core board, the power dissipation can be doubled using the same footprint.

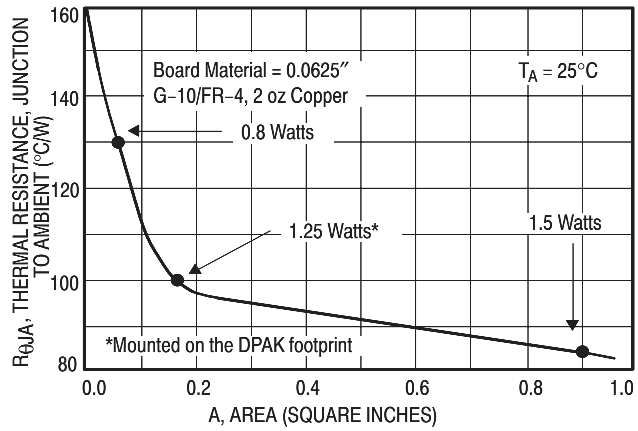


Figure 1. Thermal Resistance versus Drain Pad Area for the SOT–223 Package (Typical)

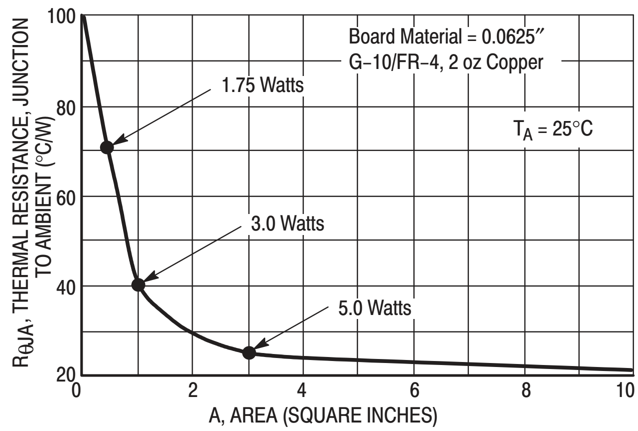


Figure 2. Thermal Resistance versus Drain Pad Area for the DPAK Package (Typical)

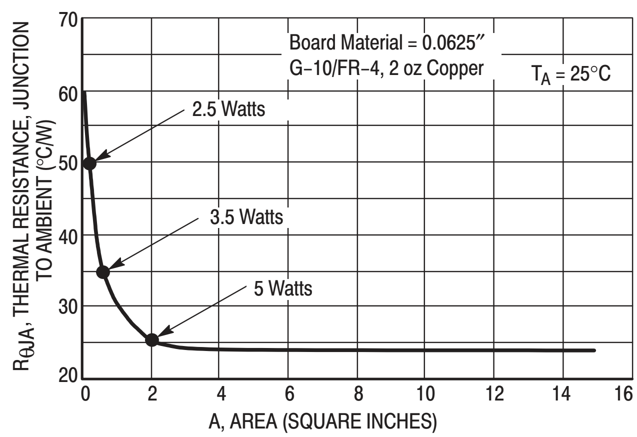


Figure 3. Thermal Resistance versus Drain Pad Area for the D²PAK Package (Typical)

SOLDER STENCIL GUIDELINES

Prior to placing surface mount components onto a printed circuit board, solder paste must be applied to the pads. Solder stencils are used to screen the optimum amount. These stencils are typically 0.008 inches thick and may be made of brass or stainless steel. For packages such as the SC–59, SC–70/SOT–323, SOD–123, SOT–23, SOT–143, SOT–223, SO–8, SO–14, SO–16, and SMB/SMC diode packages, the stencil opening should be the same as the pad size or a 1:1 registration. This is not the case with the DPAK and D^2PAK packages. If a 1:1 opening is used to screen solder onto the drain pad, misalignment and/or "tombstoning" may occur due to an excess of solder. For these two packages, the opening in the stencil for the paste should be approximately 50% of the tab area. The opening for the leads is still a 1:1 registration. Figure 4 shows a typical stencil for the DPAK and D^2PAK packages. The pattern of the opening in the stencil for the drain pad is not critical as long as it allows approximately 50% of the pad to be covered with paste.

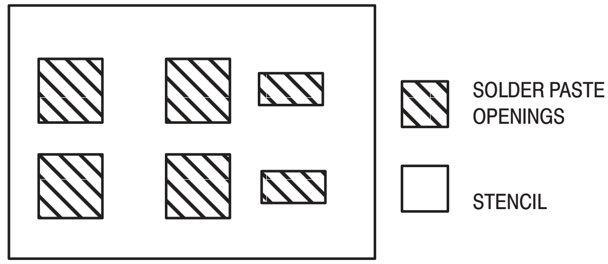


Figure 4. Typical Stencil for DPAK and D^2PAK Packages

SOLDERING PRECAUTIONS

The melting temperature of solder is higher than the rated temperature of the device. When the entire device is heated to a high temperature, failure to complete soldering within a short time could result in device failure. Therefore, the following items should always be observed in order to minimize the thermal stress to which the devices are subjected.

- Always preheat the device.
- The delta temperature between the preheat and soldering should be 100°C or less.*
- When preheating and soldering, the temperature of the leads and the case must not exceed the maximum temperature ratings as shown on the data sheet. When using infrared heating with the reflow soldering method, the difference should be a maximum of 10°C.
- The soldering temperature and time should not exceed 260°C for more than 10 seconds.
- When shifting from preheating to soldering, the maximum temperature gradient shall be 5°C or less.
- After soldering has been completed, the device should be allowed to cool naturally for at least three minutes. Gradual cooling should be used since the use of forced cooling will increase the temperature gradient and will result in latent failure due to mechanical stress.
- Mechanical stress or shock should not be applied during cooling.

* Soldering a device without preheating can cause excessive thermal shock and stress which can result in damage to the device.

* Due to shadowing and the inability to set the wave height to incorporate other surface mount components, the D^2PAK is not recommended for wave soldering.

TYPICAL SOLDER HEATING PROFILE

For any given circuit board, there will be a group of control settings that will give the desired heat pattern. The operator must set temperatures for several heating zones and a figure for belt speed. Taken together, these control settings make up a heating "profile" for that particular circuit board. On machines controlled by a computer, the computer remembers these profiles from one operating session to the next. Figure 5 shows a typical heating profile for use when soldering a surface mount device to a printed circuit board. This profile will vary among soldering systems, but it is a good starting point. Factors that can affect the profile include the type of soldering system in use, density and types of components on the board, type of solder used, and the type of board or substrate material being used. This profile shows temperature versus time. The line on the graph shows the actual temperature that might be experienced on the surface of a test board at or near a central solder joint. The two profiles are based on a high density and a low density board. The Vitronics SMD310 convection/infrared reflow soldering system was used to generate this profile. The type of solder used was 62/36/2 Tin Lead Silver with a melting point between 177–189°C. When this type of furnace is used for solder reflow work, the circuit boards and solder joints tend to heat first. The components on the board are then heated by conduction. The circuit board, because it has a large surface area, absorbs the thermal energy more efficiently, then distributes this energy to the components. Because of this effect, the main body of a component may be up to 30 degrees cooler than the adjacent solder joints.

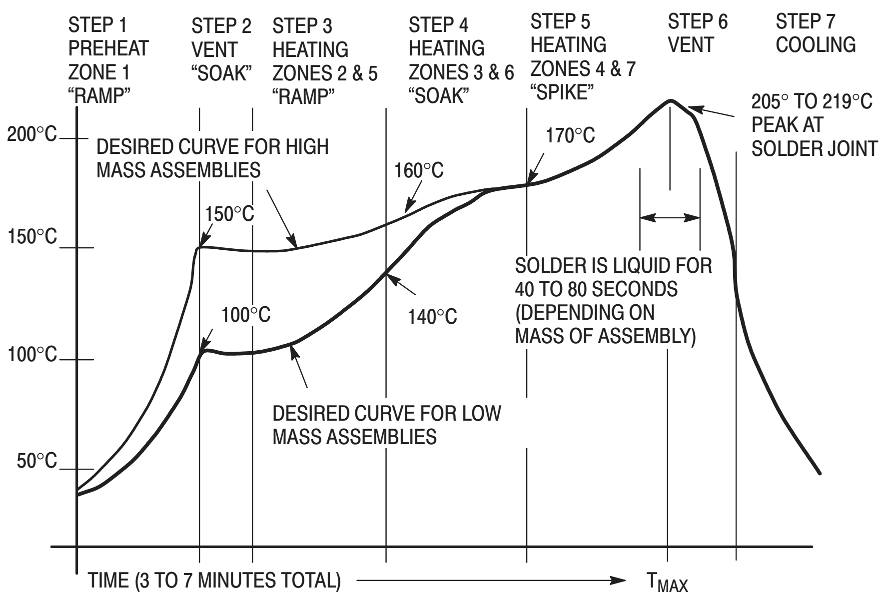
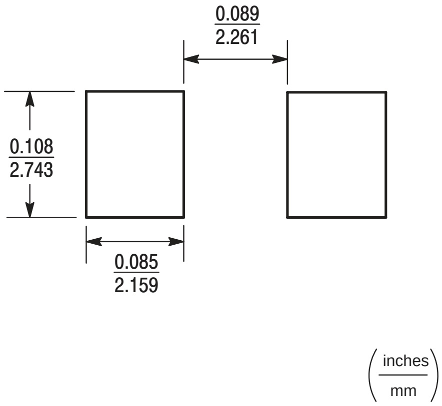
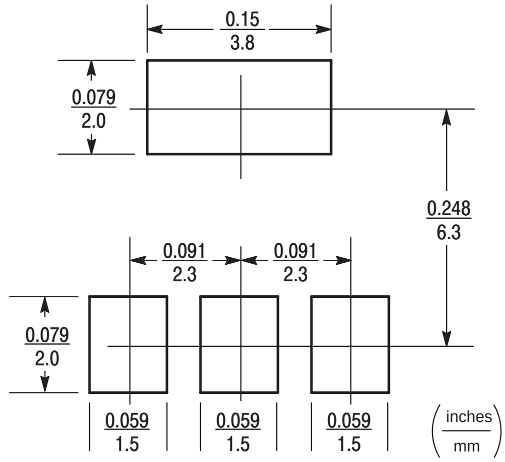


Figure 5. Typical Solder Heating Profile

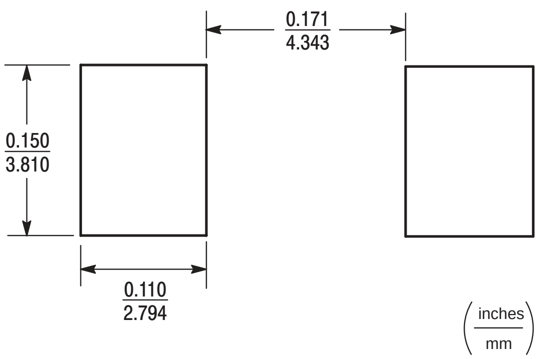
Footprints for Soldering



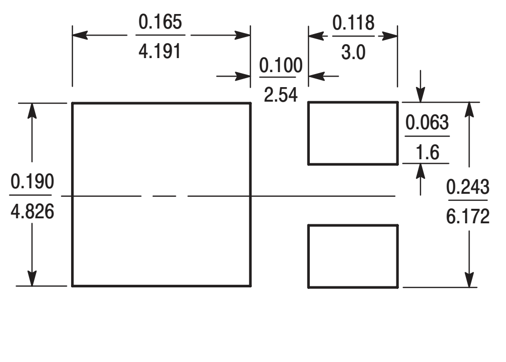
SMB



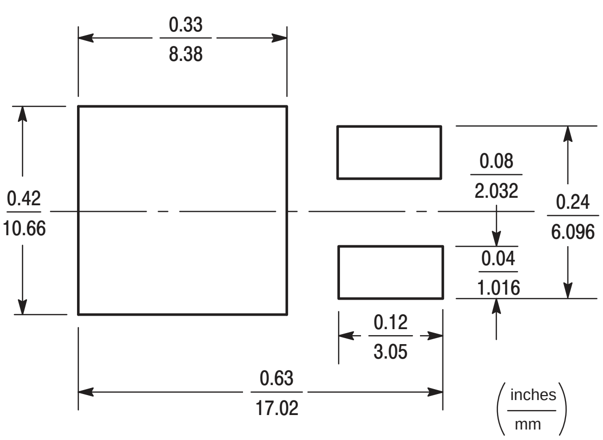
SOT–223



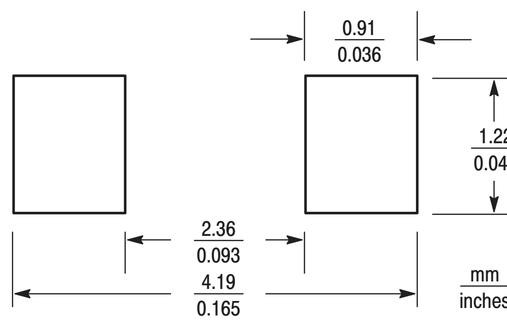
SMC



DPAK

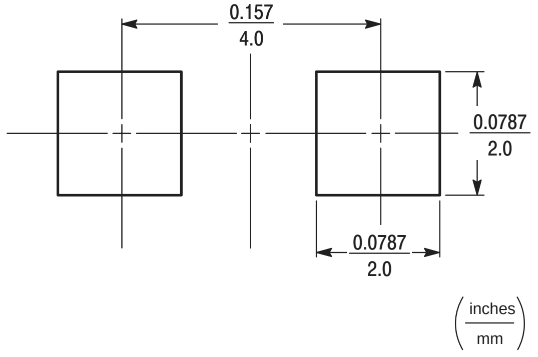


D^2PAK

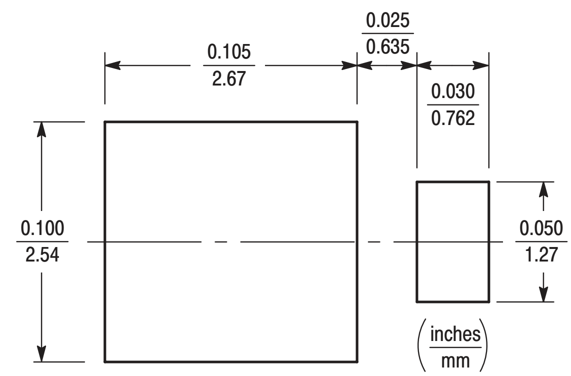


SOD–123

Footprints for Soldering



SMA



POWERMITE

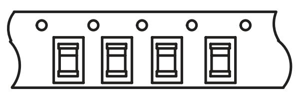
Tape and Reel Specifications and Packaging Specifications

Embossed Tape and Reel is used to facilitate automatic pick and place equipment feed requirements. The tape is used as the shipping container for various products and requires a minimum of handling. The antistatic/conductive tape provides a secure cavity for the product when sealed with the “peel–back” cover tape.

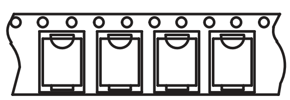
- Two Reel Sizes Available (7″ and 13″)
- Used for Automatic Pick and Place Feed Systems
- Minimizes Product Handling
- EIA 481, –1, –2
- SOD–123 in 8 mm Tape
- SMB in 12 mm Tape
- DPAK, SMC in 16 mm Tape
- D^2PAK in 24 mm Tape

Use the standard device title and add the required suffix as listed in the option table on the following page. Note that the individual reels have a finite number of devices depending on the type of product contained in the tape. Also note the minimum lot size is one full reel for each line item, and orders are required to be in increments of the single reel quantity.

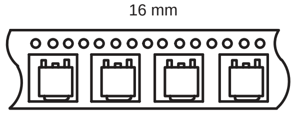
SOD–123
8 mm



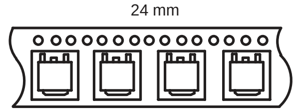
SMB 12 mm **SMC** 16 mm



DPAK
16 mm



D^2PAK
24 mm



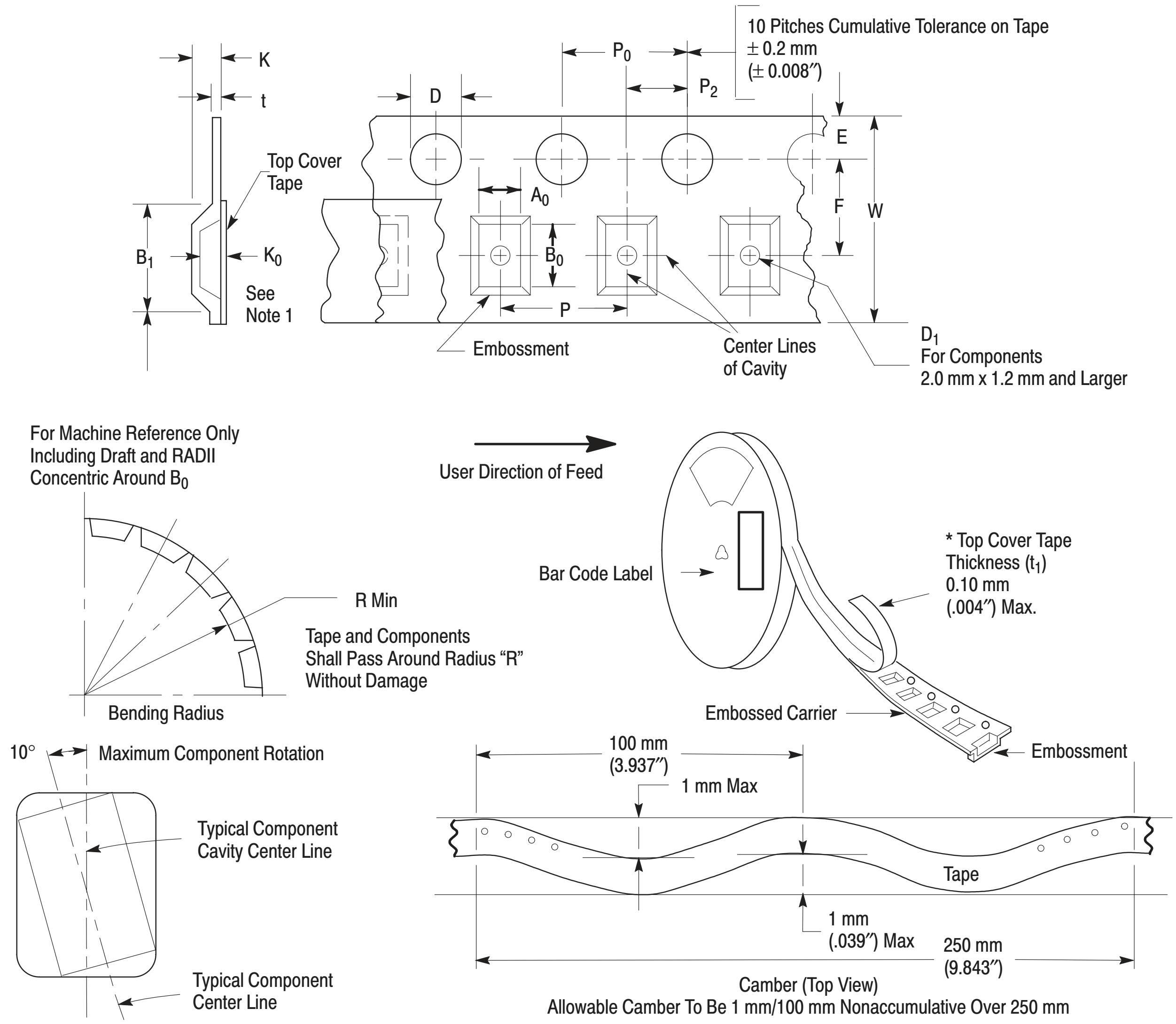
DIRECTION
OF FEED

EMBOSSED TAPE AND REEL ORDERING INFORMATION

Package	Tape Width (mm)	Pitch mm (inch)	Reel Size mm (inch)	Devices Per Reel and Minimum Order Quantity	Device Suffix
DPAK	16	8.0 ± 0.1 (.315 ± .004)	330 (13)	2,500	T4
D^2PAK	24	16.0 ± 0.1 (.630 ± .004)	330 (13)	800	T4
SMB	12	8.0 ± 0.1 (.315 ± .004)	330 (13)	2,500	T3
SMC	16	8.0 ± 0.1 (.315 ± .004)	330 (13)	2,500	T3
SOD–123	8 8	4.0 ± 0.1 (.157 ± .004)	178 (7) 330 (13)	3,000 10,000	T1 T3

EMBOSSED TAPE AND REEL DATA FOR DISCRETES

CARRIER TAPE SPECIFICATIONS



DIMENSIONS

Tape Size	B_1 Max	D	D_1	E	F	K	P_0	P_2	R Min	T Max	W Max
8 mm	4.55 mm (.179″)	1.5+0.1 mm −0.0 (.059+.004″ −0.0)	1.0 Min (.039″)	1.75±0.1 mm (.069±.004″)	3.5±0.05 mm (.138±.002″)	2.4 mm Max (.094″)	4.0±0.1 mm (.157±.004″)	2.0±0.1 mm (.079±.002″)	25 mm (.98″)	0.6 mm (.024″)	8.3 mm (.327″)
12 mm	8.2 mm (.323″)		1.5 mm Min (.060″)		5.5±0.05 mm (.217±.002″)	6.4 mm Max (.252″)			30 mm (1.18″)		12±.30 mm (.470±.012″)
16 mm	12.1 mm (.476″)				7.5±0.10 mm (.295±.004″)	7.9 mm Max (.311″)					16.3 mm (.642″)
24 mm	20.1 mm (.791″)				11.5±0.1 mm (.453±.004″)	11.9 mm Max (.468″)					24.3 mm (.957″)

Metric dimensions govern — English are in parentheses for reference only.

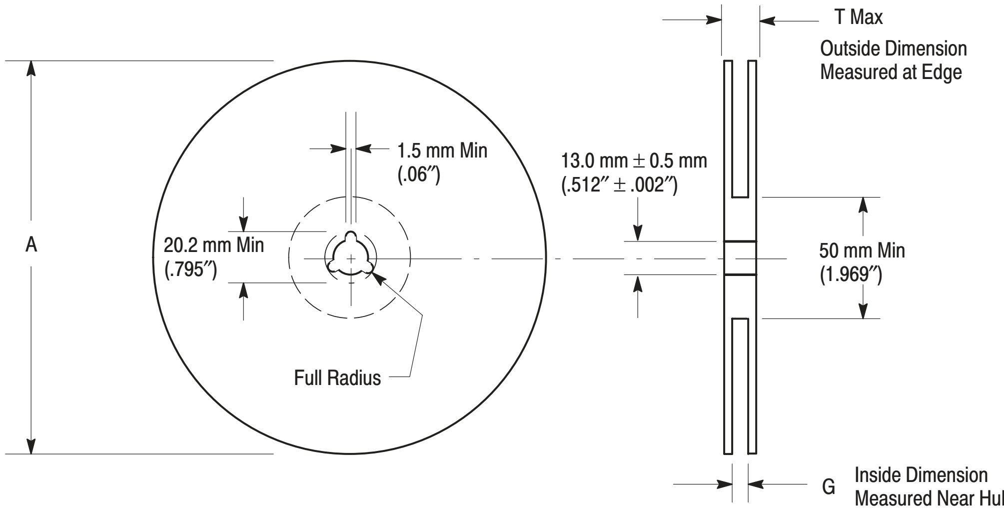
NOTE 1: A_0, B_0, and K_0 are determined by component size. The clearance between the components and the cavity must be within .05 mm min. to .50 mm max.,

the component cannot rotate more than 10° within the determined cavity.

NOTE 2: If B_1 exceeds 4.2 mm (.165) for 8 mm embossed tape, the tape may not feed through all tape feeders.

NOTE 3: Pitch information is contained in the Embossed Tape and Reel Ordering Information on pg. 6–3.

EMBOSSED TAPE AND REEL DATA FOR DISCRETES



Size	A Max	G	T Max
8 mm	330 mm (12.992″)	8.4 mm + 1.5 mm, –0.0 (.33″ + .059″, –0.00)	14.4 mm (.56″)
12 mm	330 mm (12.992″)	12.4 mm + 2.0 mm, –0.0 (.49″ + .079″, –0.00)	18.4 mm (.72″)
16 mm	360 mm (14.173″)	16.4 mm + 2.0 mm, –0.0 (.646″ + .078″, –0.00)	22.4 mm (.882″)
24 mm	360 mm (14.173″)	24.4 mm + 2.0 mm, –0.0 (.961″ + .070″, –0.00)	30.4 mm (1.197″)

Reel Dimensions

Metric Dimensions Govern — English are in parentheses for reference only

LEAD TAPE PACKAGING STANDARDS FOR AXIAL–LEAD COMPONENTS

Case Type	Product Category	Device Title Suffix	MPQ Quantity Per Reel (Item 3.3.7)	Component Spacing A Dimension	Tape Spacing B Dimension	Reel Dimension C	Reel Dimension D (Max)	Max Off Alignment E
Case 17–02	Surmetic 40 & 600 Watt TVS	RL	4000	0.2 +/– 0.015	2.062 +/– 0.059	3	14	0.047
Case 41A–02	1500 Watt TVS	RL4	1500	0.4 +/– 0.02	2.062 +/– 0.059	3	14	0.047
Case 51–02	DO–7 Glass (For Reference only)	RL	3000	0.2 +/– 0.02	2.062 +/– 0.059	3	14	0.047
Case 59–03	DO–41 Glass & DO–41 Surmetic 30	RL	6000	0.2 +/– 0.015	2.062 +/– 0.059	3	14	0.047
	Rectifier							
Case 59–04	500 Watt TVS	RL	5000	0.2 +/– 0.02	2.062 +/– 0.059	3	14	0.047
	Rectifier							
Case 194–04	110 Amp TVS (Automotive)	RL	800	0.4 +/– 0.02	1.875 +/– 0.059	3	14	0.047
	Rectifier							
Case 267–02	Rectifier	RL	1500	0.4 +/– 0.02	2.062 +/– 0.059	3	14	0.047
Case 299–02	DO–35 Glass	RL	5000	0.2 +/– 0.02	2.062 +/– 0.059	3	14	0.047

Table 1. Packaging Details (all dimensions in inches)

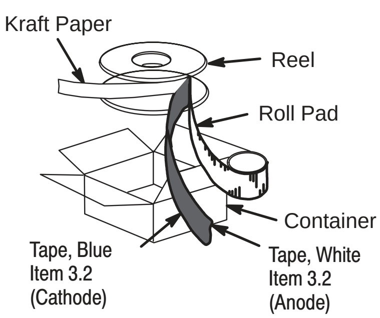


Figure 1. Reel Packing

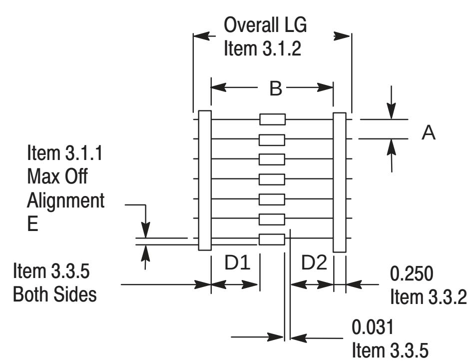


Figure 2. Component Spacing

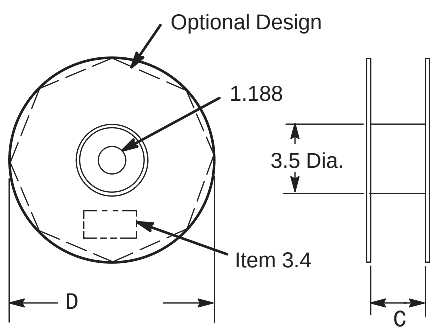


Figure 3. Reel Dimensions

Index and Cross Reference

The following table represents an index and cross reference guide for all rectifier devices which are either manufactured directly by ON Semiconductor or for which ON Semiconductor manufactures a suitable equivalent. Where the ON Semiconductor part number differs from the industry part number, the ON Semiconductor device is a form, fit and function replacement for the industry type number – however, subtle differences in characteristics and/or specifications may exist. The part numbers listed in this Cross Reference are in computer sort.

Industry Part Number	ON Semiconductor Nearest Replacement	ON Semiconductor Similar Replacement	Page
10BF10	MURS110T3		286
10BF20	MURS120T3		286
10BF40	MURS140T3		286
10BF60	MURS160T3		286
10BF80		MURS160T3	286
10BQ015		MBRS120T3	64
10BQ030	MBRS130T3		70
10BQ040	MBRS140T3		73
10BQ060		MBRS1100T3	80
10BQ100	MBRS1100T3		80
10CTF10		MUR840	370
10CTF20		MUR840	370
10CTF30		MUR840	370
10CTF40		MUR840	370
10DL1		1N4934	452
10DL2		1N4935	452
10MQ040N	MBRA140T3		61
10TQ030		MBR1035	207
10TQ035	MBR1035		207
10TQ040		MBR1045	207
10TQ045	MBR1045		207
11DQ03		1N5818	146
11DQ04		1N5819	146
11DQ05		MBR150	152
11DQ06		MBR160	152
11DQ09		MBR1100	156
11DQ10		MBR1100	156
12CTQ030		MBR1535CT	174
12CTQ035		MBR1535CT	174
12CTQ035S		MBRB1545CT	116
12CTQ040		MBR1545CT	174
12CTQ040S		MBRB1545CT	116
12CTQ045		MBR1545CT	174
12CTQ045S		MBRB1545CT	116
12CWQ03FN		MBRD1035CTL	108
12TQ035		MBR1635	215
12TQ035S		MBRB1545CT	116
12TQ040		MBR1645	215
12TQ040S		MBRB1545CT	116
12TQ045		MBR1645	215
12TQ045S		MBRB1545CT	116
15CTQ035	MBR1535CT		174
15CTQ035S		MBRB1545CT	116
15CTQ040		MBR1545CT	174
15CTQ040S		MBRB1545CT	116
15CTQ045	MBR1545CT		174
15CTQ045S	MBRB1545CT		116
180NQ035		MBRP20035L	280
181NQ035		MBRP20035L	280
182NQ030		MBRP20035L	280
182NQ030R		MBRP20035L	280
1N2069,A	1N4003		447
1N2070,A	1N4004		447
1N2071,A	1N4005		447
1N3611		1N4003	447
1N3611GP		1N4003	447
1N3612		1N4004	447
1N3612GP		1N4004	447
1N3613		1N4005	447
1N3613GP		1N4005	447
1N3614		1N4006	447
1N3614GP		1N4006	447
1N3957		1N4007	447
1N3957GP		1N4007	447
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1N4004GP		1N4004	447
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1N4006GP		1N4006	447
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1N4245GP		1N4003	447
1N4246		1N4004	447
1N4246GP		1N4004	447
1N4247		1N4005	447
1N4247GP		1N4005	447
1N4248		1N4006	447
1N4248GP		1N4006	447
1N4249		1N4007	447
1N4249GP		1N4007	447
1N4383GP		1N4003RL	447
1N4384GP		1N4004RL	447
1N4385GP		1N4005RL	447
1N4585GP		1N4006RL	447
1N4586GP		1N4007RL	447
1N4934	1N4934		452
1N4934GP		1N4934	452
1N4935	1N4935		452
1N4935GP		1N4935	452
1N4936	1N4936		452

Industry Part Number	ON Semiconductor Nearest Replacement	ON Semiconductor Similar Replacement	Page
1N4936GP		1N4936	452
1N4937	1N4937		452
1N4937GP		1N4937	452
1N4942		1N4935	452
1N4942GP		1N4935	452
1N4943		1N4936	452
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GER4002		1N4002	447
GER4003		1N4003	447
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GER4006		1N4006	447
GER4007		1N4007	447
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GI1002		MUR120	324
GI1003		MUR120	324
GI1004		MUR120	324
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GI1102		MUR420	350
GI1103		MUR420	350
GI1104		MUR420	350
GI1301		MUR420	350
GI1302		MUR420	350
GI1303		MUR420	350
GI1304		MUR420	350
GI1401	MUR820		370
GI1402	MUR820		370
GI1403	MUR820		370
GI1404	MUR820		370
GI2401	MUR1620CT		402
GI2402	MUR1620CT		402
GI2403	MUR1620CT		402
GI2404	MUR1620CT		402
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GI2501	MR2504		463
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GI501	1N5401RL		449
GI502	1N5402RL		449
GI504	1N5404RL		449
GI506	1N5406RL		449
GI508	1N5407RL		449
GI510	1N5408RL		449
GI750		MR754	484
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GI752		MR754	484
GI754		MR754	484
GI756		MR760	484
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GI810		1N4933RL	452
GI811		1N4934RL	452
GI812		1N4935RL	452
GI814		1N4936RL	452
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GI851	MR852		454
GI852	MR852		454
GI854	MR856		454
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GP15G		1N4004RL	447
GP15J		1N4005RL	447
GP15K		1N4006RL	447
GP15M		1N4007RL	447
GP30A	1N5400RL		449
GP30B	1N5401RL		449
GP30D	1N5402RL		449
GP30G	1N5404RL		449
GP30J	1N5406RL		449
GP30K	1N5407RL		449
GP30M	1N5408RL		449
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HER105	MUR140		324
HER151		MUR120	324
HER152		MUR120	324
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HER803	MUR820		370
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HER805	MUR840		370
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LT2A02		1N5401RL	449
LT2A03		1N5402RL	449
LT2A04		1N5404RL	449
LT2A05		1N5406RL	449
LT2A06		1N5407RL	449
LT2A07		1N5408RL	449
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MBR1545CT	MBR1545CT		174
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MBR20030CTL	MBRP20030CTL		252
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MBR4045PT	MBR4045PT		235
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MBRB1530CT		MBRB1545CT	116
MBRB1535CT		MBRB1545CT	116
MBRB1540CT		MBRB1545CT	116
MBRB1545CT	MBRB1545CT		116
MBRB1550CT		MBRB1545CT	116
MBRB1635		MBRB1545CT	116
MBRB1645		MBRB1545CT	116
MBRB1650		MBRB1545CT	116
MBRB20100CT	MBRB20100CT		120
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MBRB2050CT		MBRB2545CT	130
MBRB2060CT	MBRB2060CT		118
MBRB2080CT		MBRB20100CT	120
MBRB2090CT		MBRB20100CT	120
MBRB2515L	MBRB2515L		125
MBRB2535CTL	MBRB2535CTL		127
MBRB2545CT	MBRB2545CT		130
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MBRD650CT	MBRD660CT		101
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MUR1640CT	MUR1640CT		402
MUR1650CT	MUR1660CT		402
MUR1660CT	MUR1660CT		402
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MUR180E	MUR1100E		329
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MUR20015CT	MURP20020CT		436
MUR20020CT	MURP20020CT		436
MUR20030CT	MURP20040CT		436
MUR20040CT	MURP20040CT		436
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MUR3015PT	MUR3020PT		425
MUR3020PT	MUR3020PT		425
MUR3020WT	MUR3020WT		431
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MUR3040PT	MUR3040PT		425
MUR3050PT	MUR3060PT		425
MUR3060PT	MUR3060PT		425
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P300J	1N5406RL		449
P300K	1N5407RL		449
P300M	1N5408RL		449
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P600D		MR754	484
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RGP20B		MR852	454
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UTR4320		MR852	454
UTR4340		MR852	454
UTR4350		MR856	454
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UTR50		1N4937	452
UTR51		1N4937	452
UTR52		1N4937	452
UTR60		1N4937	452
UTR61		1N4937	452
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UTX105		1N4933	452
UTX110		1N4934	452
UTX120		1N4935	452
UTX125		1N4935	452
UTX205		1N4933	452
UTX210		1N4934	452
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UTX220		1N4935	452
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UTX3105		MR852	454
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UTX3115		MR852	454
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UTX4110		MR852	454
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V342	1N5402		449
V344	1N5404		449
V346	1N5406		449
V350X	MR852		454
V351X	MR852		454
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VHE1401		MUR820	370
VHE1402		MUR820	370
VHE1403		MUR820	370
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VHE205	MUR120		324
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VHE2402		MUR1620CT	402
VHE2403		MUR1620CT	402
VHE2404		MUR1620CT	402
VHE605	MUR420		350
VHE610	MUR420		350
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VSK12	MBR1545CT		174
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VSK2035	MBR2045CT		184
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VSK2420	MBR2545CT		198
VSK2435	MBR2545CT		198
VSK2445	MBR2545CT		198
VSK320	MBR340		165
VSK330	MBR340		165
VSK340	MBR340		165
VSK62	MBR745		204
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