ON Semiconductor

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NTD32N06

Power MOSFET

32 Amps, 60 Volts, N−Channel DPAK

Designed for low voltage, high speed switching applications in power supplies, converters and power motor controls and bridge circuits.

Features

- Pb−Free Packages are Available
- Smaller Package than MTB36N06V
- Lower $R_{DS(on)}$
- Lower $V_{DS(on)}$
- Lower Total Gate Charge
- Lower and Tighter V_{SD}
- Lower Diode Reverse Recovery Time
- Lower Reverse Recovery Stored Charge

Typical Applications

- Power Supplies
- Converters
- Power Motor Controls
- Bridge Circuits

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain−to−Source Voltage	V_{DSS}	60	Vdc
Drain−to−Gate Voltage (R_{GS} = 10 MΩ)	V_{DGR}	60	Vdc
Gate−to−Source Voltage, Continuous − Non−Repetitive ($t_p \le 10$ ms)	V_{GS} V_{GS}	±20 ±30	Vdc
Drain Current − Continuous @ T_A = 25°C − Continuous @ T_A = 100°C − Single Pulse ($t_p \le 10$ μs)	 I_D I_D I_{DM}	 32 22 90	 Adc Apk
Total Power Dissipation @ T_A = 25°C Derate above 25°C Total Power Dissipation @ T_A = 25°C (Note 1) Total Power Dissipation @ T_A = 25°C (Note 2)	P_D	93.75 0.625 2.88 1.5	W W/°C W W
Operating and Storage Temperature Range	T_J, T_{stg}	−55 to +175	°C
Single Pulse Drain−to−Source Avalanche Energy − Starting T_J = 25°C (Note 3) (V_{DD} = 50 Vdc, V_{GS} = 10 Vdc, L = 1.0 mH, $I_{L(pk)}$ = 25 A, V_{DS} = 60 Vdc, R_G = 25 Ω)	E_{AS}	313	mJ
Thermal Resistance − Junction−to−Case − Junction−to−Ambient (Note 1) − Junction−to−Ambient (Note 2)	$R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	1.6 52 100	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8″ from case for 10 seconds	T_L	260	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. When surface mounted to an FR4 board using 1″ pad size, (Cu Area 1.127 in^2).
2. When surface mounted to an FR4 board using minimum recommended pad size, (Cu Area 0.412 in^2).
3. Repetitive rating; pulse width limited by maximum junction temperature.

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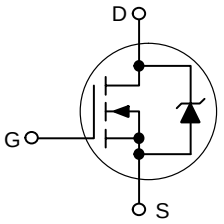
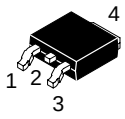
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
60 V	26 mΩ	32 A

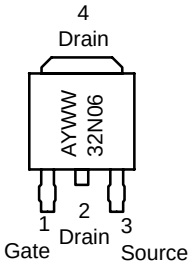
N−Channel

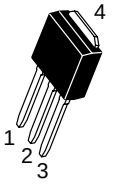


MARKING DIAGRAMS

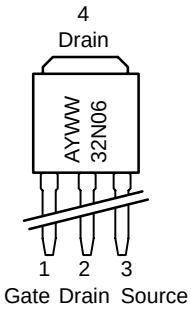


DPAK
CASE 369C
STYLE 2





DPAK−3
CASE 369D
STYLE 2



32N06	= Device Code
A	= Assembly Location
Y	= Year
WW	= Work Week

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain−to−Source Breakdown Voltage (Note 4) (V_{GS} = 0 Vdc, I_D = 250 μAdc) Temperature Coefficient (Positive)		$V_{(BR)DSS}$	 60 −	 70 41.6	 − −	Vdc mV/°C
Zero Gate Voltage Drain Current (V_{DS} = 60 Vdc, V_{GS} = 0 Vdc) (V_{DS} = 60 Vdc, V_{GS} = 0 Vdc, T_J = 150°C)		I_{DSS}	 − −	 − −	 1.0 10	μAdc
Gate−Body Leakage Current (V_{GS} = ±20 Vdc, V_{DS} = 0 Vdc)		I_{GSS}	−	−	±100	nAdc
ON CHARACTERISTICS (Note 4)						
Gate Threshold Voltage (Note 4) (V_{DS} = V_{GS}, I_D = 250 μAdc) Threshold Temperature Coefficient (Negative)		$V_{GS(th)}$	 2.0 −	 2.8 7.0	 4.0 −	Vdc mV/°C
Static Drain−to−Source On−Resistance (Note 4) (V_{GS} = 10 Vdc, I_D = 16 Adc)		$R_{DS(on)}$	 −	 21	 26	mΩ
Static Drain−to−Source On−Voltage (Note 4) (V_{GS} = 10 Vdc, I_D = 20 Adc) (V_{GS} = 10 Vdc, I_D = 32 Adc) (V_{GS} = 10 Vdc, I_D = 16 Adc, T_J = 150°C)		$V_{DS(on)}$	 − − −	 0.417 0.680 0.633	 0.62 − −	Vdc
Forward Transconductance (Note 4) (V_{DS} = 6 Vdc, I_D = 16 Adc)		g_{FS}	−	21.1	−	mhos
DYNAMIC CHARACTERISTICS						
Input Capacitance	(V_{DS} = 25 Vdc, V_{GS} = 0 Vdc, f = 1.0 MHz)	C_{iss}	−	1231	1725	pF
Output Capacitance		C_{oss}	−	346	485	
Transfer Capacitance		C_{rss}	−	77	160	
SWITCHING CHARACTERISTICS (Note 5)						
Turn−On Delay Time	(V_{DD} = 30 Vdc, I_D = 32 Adc, V_{GS} = 10 Vdc, R_G = 9.1 Ω) (Note 4)	$t_{d(on)}$	−	10	25	ns
Rise Time		t_r	−	84	180	
Turn−Off Delay Time		$t_{d(off)}$	−	31	70	
Fall Time		t_f	−	93	200	
Gate Charge	(V_{DS} = 48 Vdc, I_D = 32 Adc, V_{GS} = 10 Vdc) (Note 4)	Q_T	−	33	60	nC
		Q_1	−	6.0	−	
		Q_2	−	15	−	
SOURCE−DRAIN DIODE CHARACTERISTICS						
Forward On−Voltage	(I_S = 20 Adc, V_{GS} = 0 Vdc) (Note 4) (I_S = 32 Adc, V_{GS} = 0 Vdc) (Note 4) (I_S = 20 Adc, V_{GS} = 0 Vdc, T_J = 150°C)	V_{SD}	 − − −	 0.89 0.96 0.75	 1.0 − −	Vdc
Reverse Recovery Time	(I_S = 32 Adc, V_{GS} = 0 Vdc, dI_S/dt = 100 A/μs) (Note 4)	t_{rr}	−	52	−	ns
		t_a	−	37	−	
		t_b	−	14.3	−	
Reverse Recovery Stored Charge		Q_{RR}	−	0.095	−	μC

4. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
5. Switching characteristics are independent of operating junction temperatures.

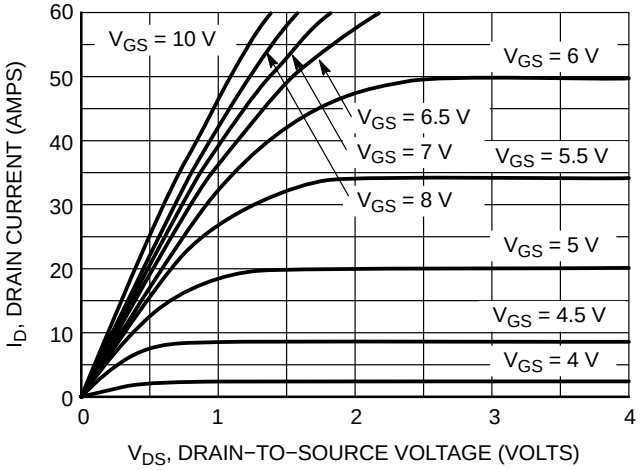


Figure 1. On−Region Characteristics

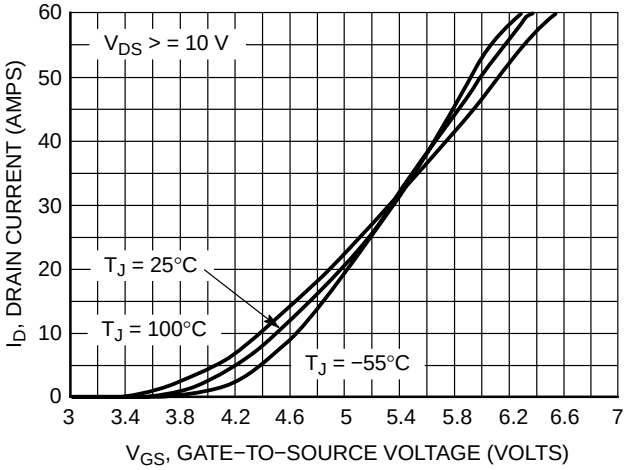


Figure 2. Transfer Characteristics

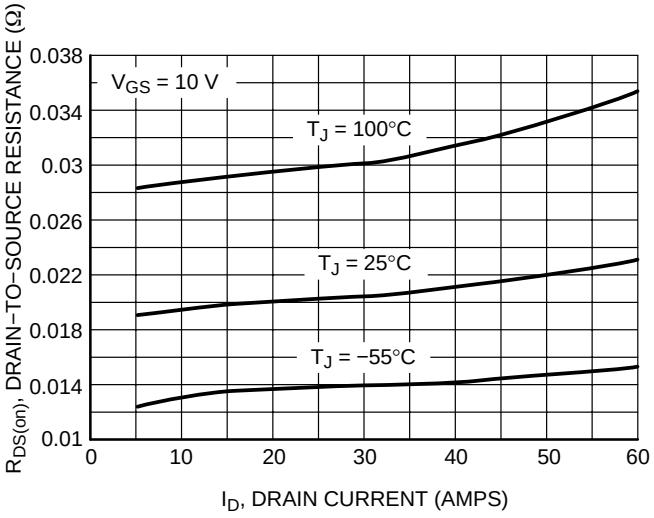


Figure 3. On−Resistance vs. Gate−to−Source Voltage

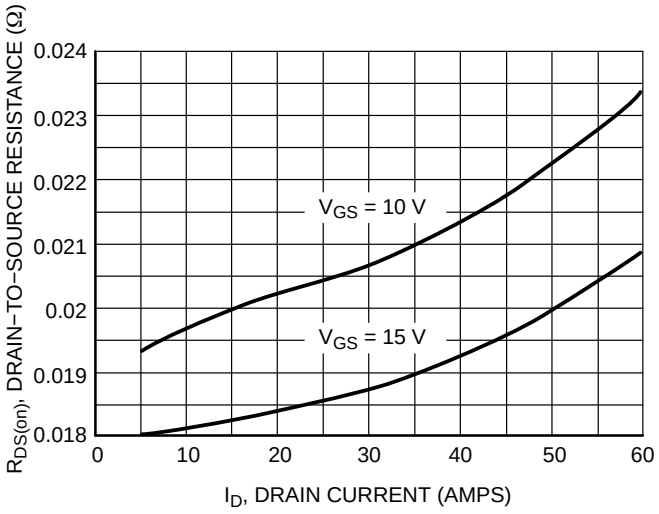


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

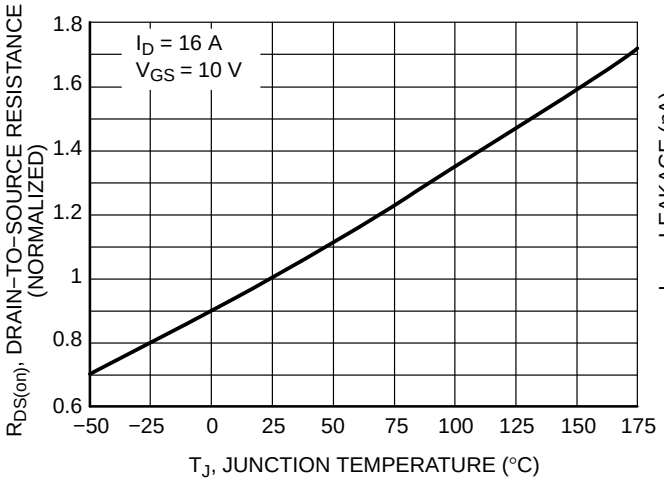


Figure 5. On−Resistance Variation with Temperature

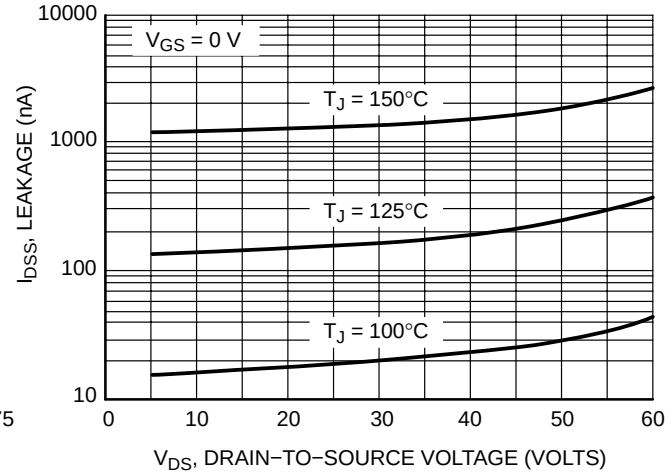


Figure 6. Drain−to−Source Leakage Current vs. Voltage

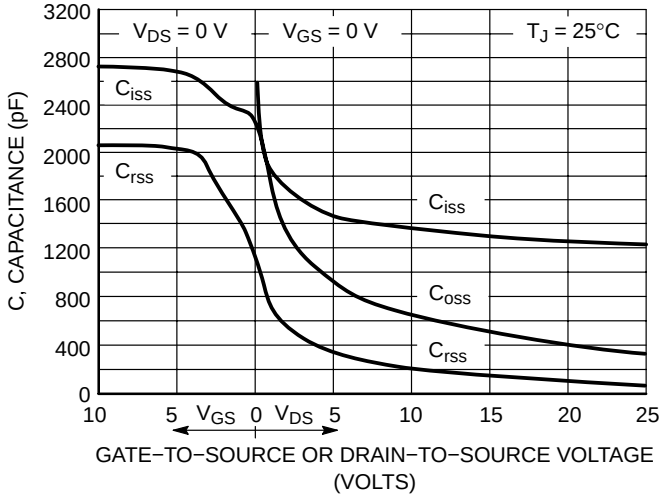


Figure 7. Capacitance Variation

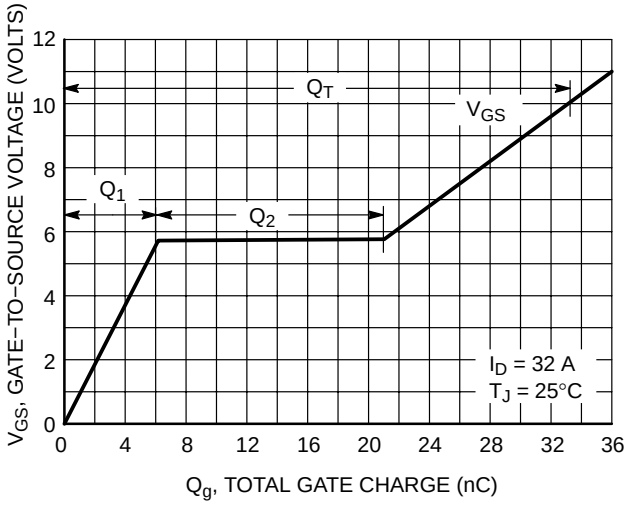


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

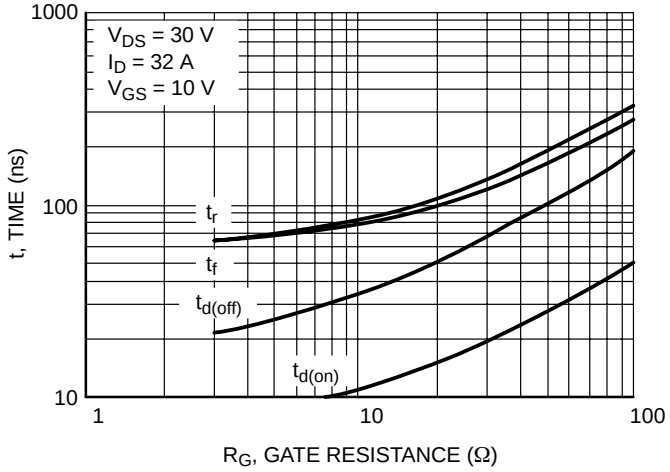


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

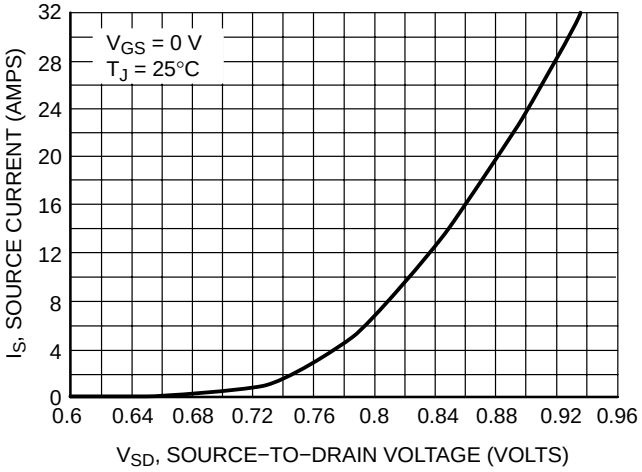


Figure 10. Diode Forward Voltage vs. Current

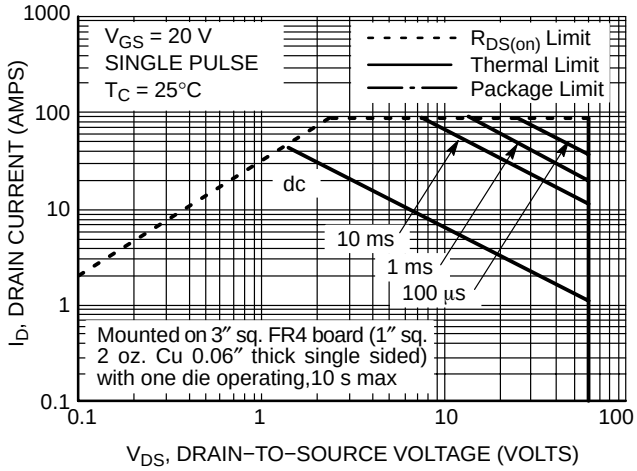


Figure 11. Maximum Rated Forward Biased Safe Operating Area

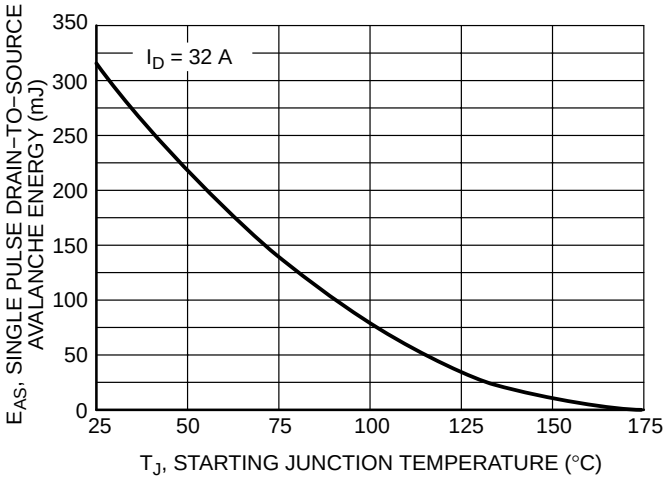


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

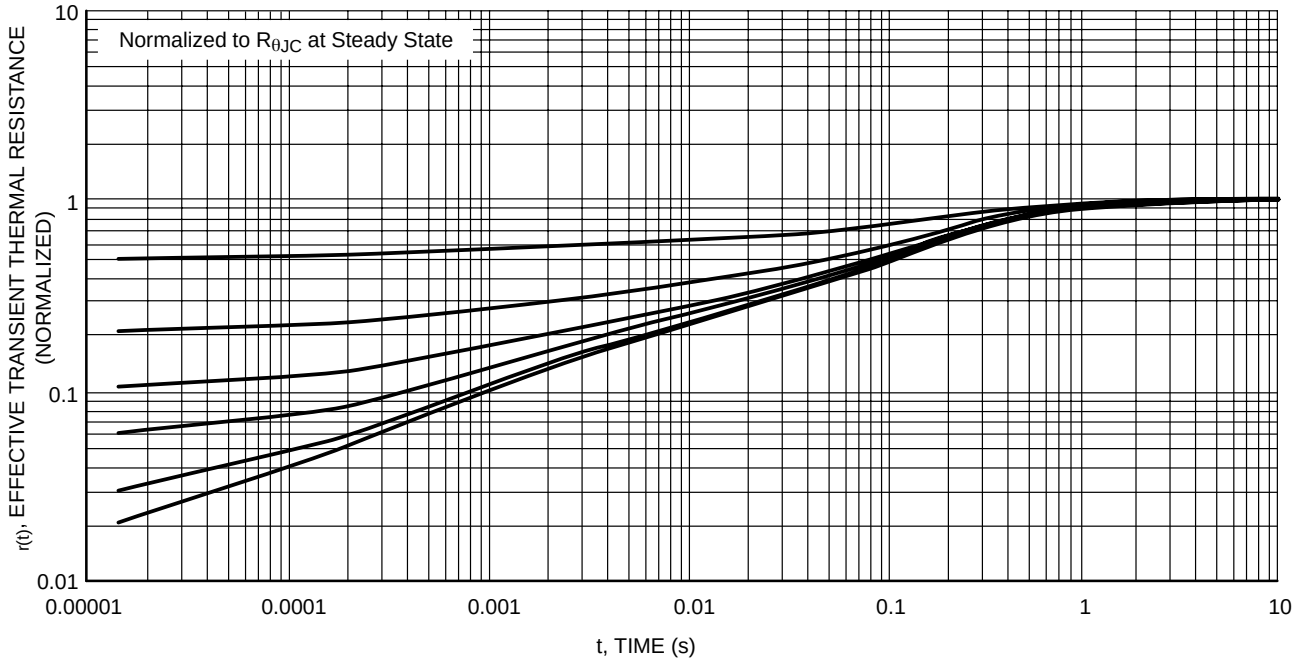


Figure 13. Thermal Response

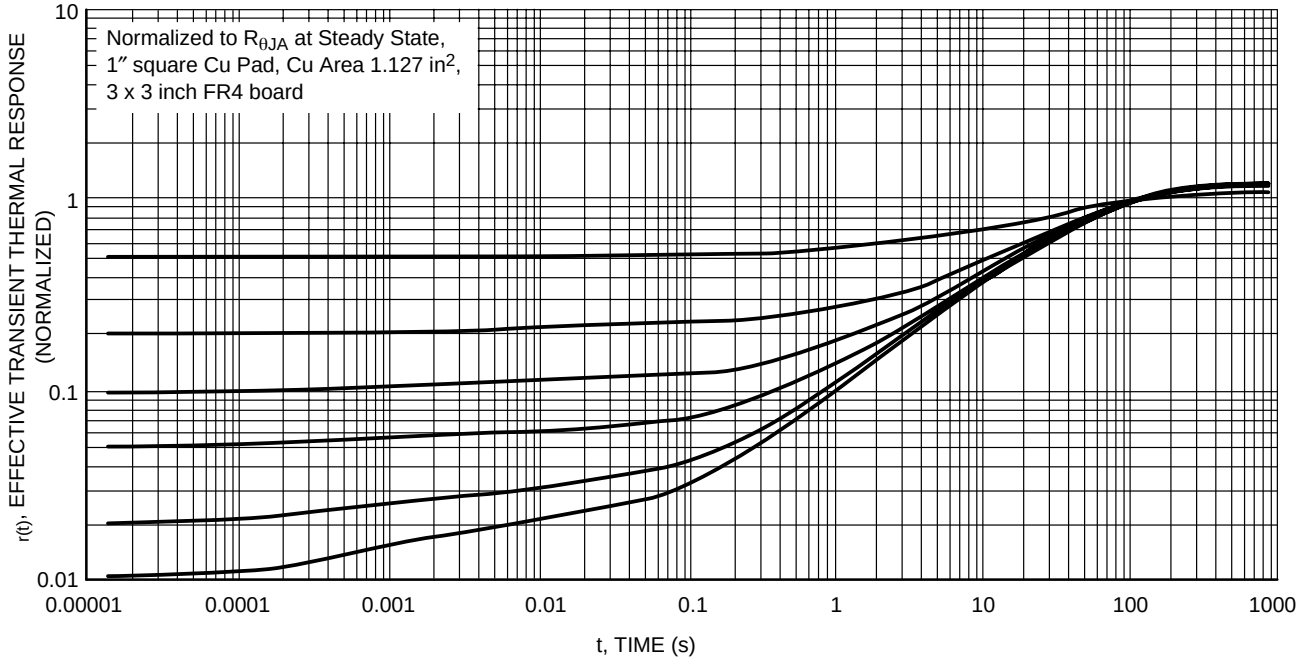


Figure 14. Thermal Response

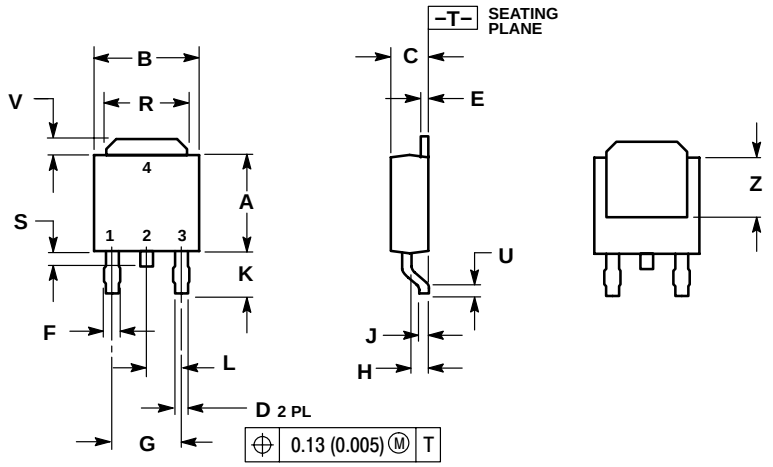
ORDERING INFORMATION

Device	Package	Shipping†
NTD32N06	DPAK	75 Units/Rail
NTD32N06G	DPAK (Pb−Free)	75 Units/Rail
NTD32N06−1	DPAK−3	75 Units/Rail
NTD32N06−1G	DPAK−3 (Pb−Free)	75 Units/Rail
NTD32N06T4	DPAK	2500 Tape & Reel
NTD32N06T4G	DPAK (Pb−Free)	2500 Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

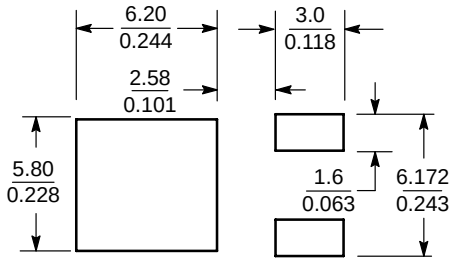
DPAK
CASE 369C−01
ISSUE O



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.22
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	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
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	0.180	0.215	4.57	5.45
S	0.025	0.040	0.63	1.01
U	0.020	−−−	0.51	−−−
V	0.035	0.050	0.89	1.27
Z	0.155	−−−	3.93	−−−

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

SOLDERING FOOTPRINT*

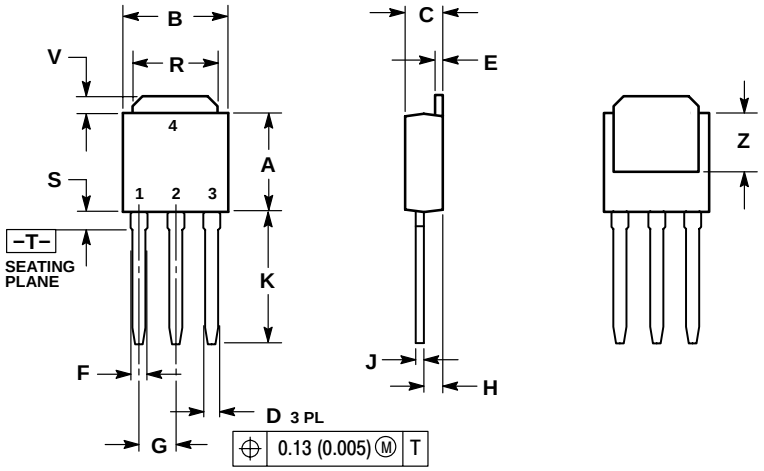


SCALE 3:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

DPAK−3
CASE 369D−01
ISSUE B



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

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.235	0.245	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	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.090 BSC		2.29 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.350	0.380	8.89	9.65
R	0.180	0.215	4.45	5.45
S	0.025	0.040	0.63	1.01
V	0.035	0.050	0.89	1.27
Z	0.155	−−−	3.93	−−−

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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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2−9−1 Kamimeguro, Meguro−ku, Tokyo, Japan 153−0051
Phone: 81−3−5773−3850

ON Semiconductor Website: http://onsemi.com

Order Literature: http://www.onsemi.com/litorder

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NTD32N06/D