

Description

This Bipolar Junction Transistor (BJT) is designed to meet the stringent requirements of automotive applications.

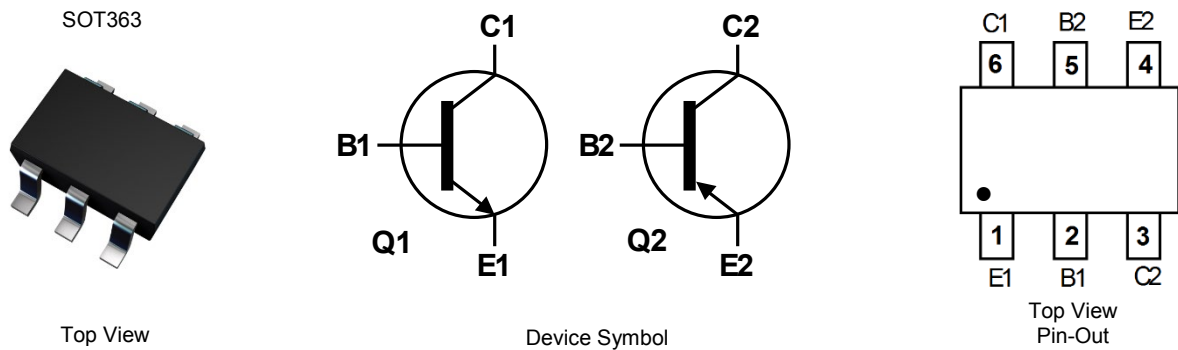
Features

- Epitaxial Planar Die Construction
- Complementary Pair
- Ideal for Medium Power Amplification and Switching
- Ultra-Small Surface Mount Package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The MMDT5451Q is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF16949 certified facilities.**

<https://www.diodes.com/quality/product-definitions/>

Mechanical Data

- Case: SOT363
- Case Material: Molded Plastic, "Green" Molding Compound, UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish—Matte Tin Finish. Solderable per MIL-STD-202, Method 208
- Weight: 0.006 grams (Approximate)

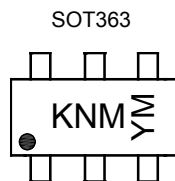


Ordering Information (Note 4)

Part Number	Compliance	Marking	Reel Size (inches)	Tape Width (mm)	Quantity Per Reel
MMDT5451Q-7	AEC-Q101	KNM	7	8	3,000

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information



KNM = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: H = 2020)
 M = Month (ex: 9 = September)

Date Code Key

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Code	I	J	K	L	M	N	O	P	R	S	T	U

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

Absolute Maximum Ratings – NPN (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	180	V
Collector-Emitter Voltage	V_{CEO}	160	V
Emitter-Base Voltage	V_{EBO}	6	V
Continuous Collector Current	I_C	200	mA

Absolute Maximum Ratings – PNP (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

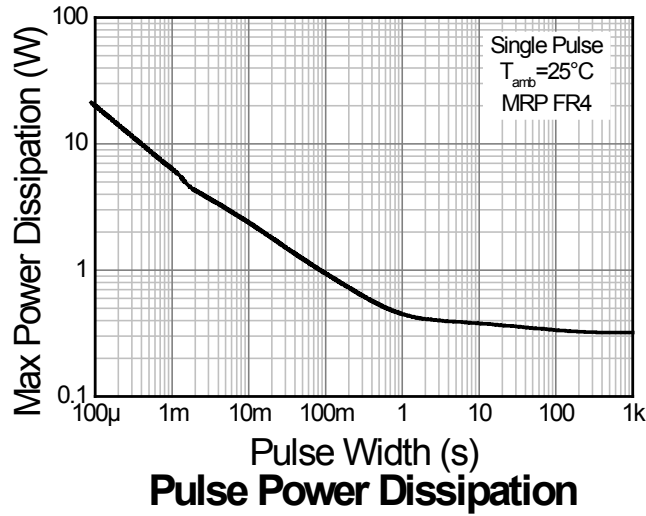
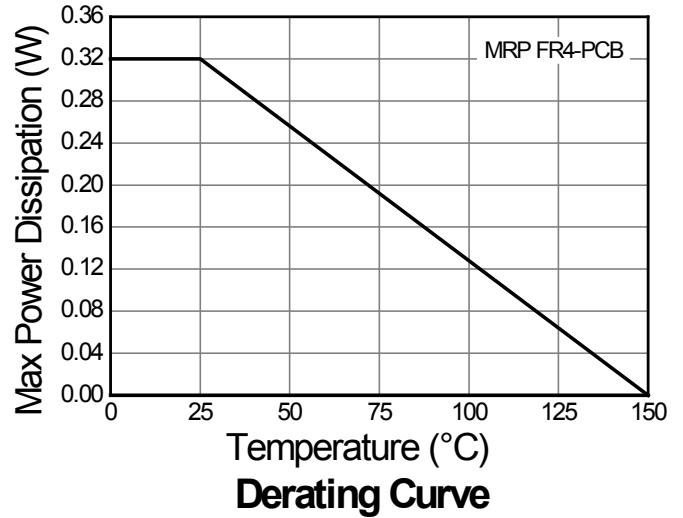
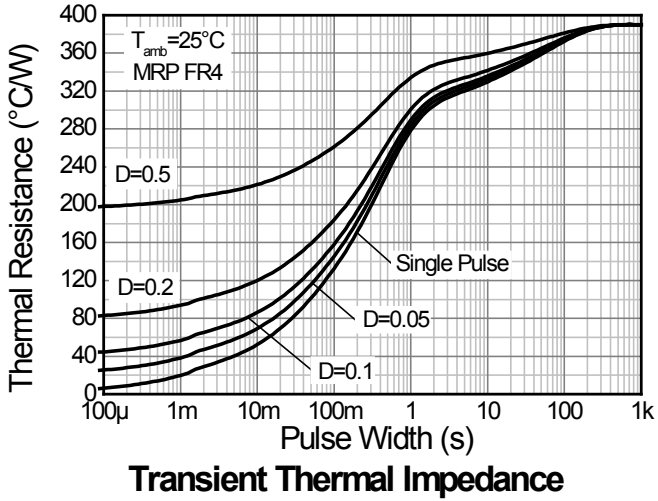
Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	-160	V
Collector-Emitter Voltage	V_{CEO}	-150	V
Emitter-Base Voltage	V_{EBO}	-6	V
Continuous Collector Current	I_C	-200	mA

Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation	P_D	(Note 5)	200
		(Note 6, 7)	320
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	(Note 5)	625
		(Note 6, 7)	390
Thermal Resistance, Junction to Case	$R_{\theta JC}$	140	$^\circ\text{C/W}$
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	

- Notes:
5. For a device mounted on minimum recommended pad layout 1oz weight copper that is on a single-sided FR-4 PCB; device is measured under still air conditions whilst operating in a steady-state.
 6. Same as Note 5, except the device uses 2oz copper.
 7. Maximum combined dissipation.
 8. Thermal resistance from junction to the top of package.

Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



Electrical Characteristics – NPN (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

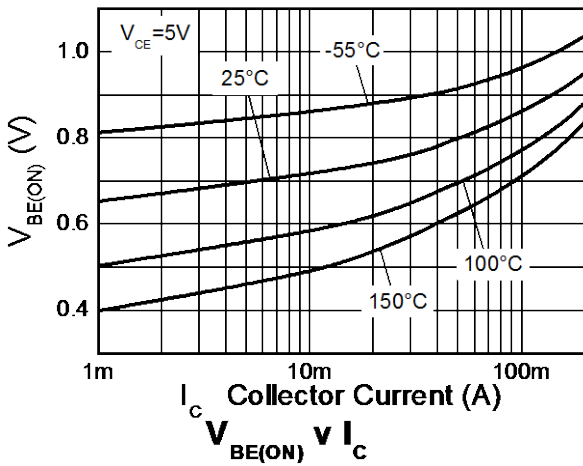
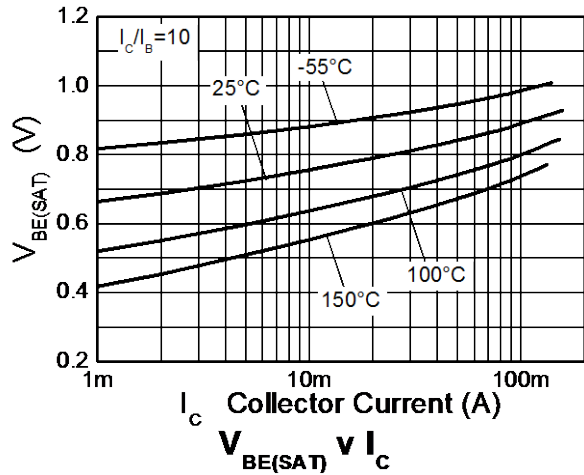
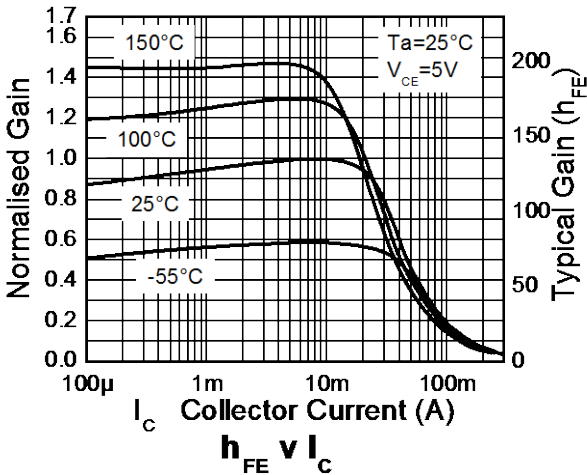
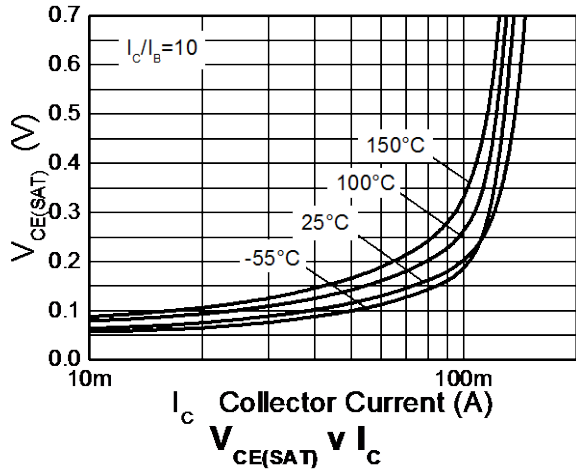
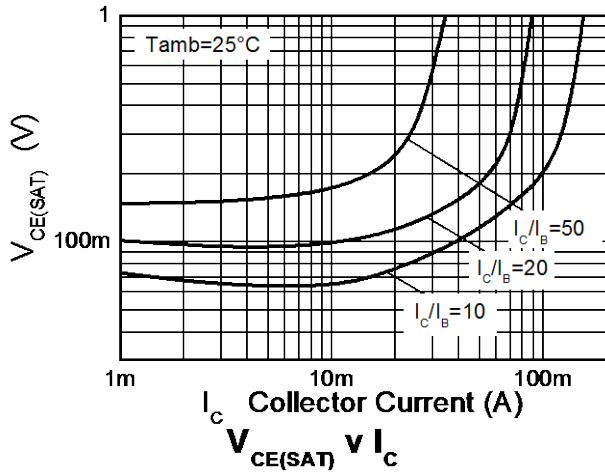
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Collector-Base Breakdown Voltage	BV_{CBO}	180	—	—	V	$I_C = 100\mu\text{A}$, $I_E = 0$
Collector-Emitter Breakdown Voltage (Note 9)	BV_{CEO}	160	—	—	V	$I_C = 1\text{mA}$, $I_B = 0$
Emitter-Base Breakdown Voltage	BV_{EBO}	6	—	—	V	$I_E = 10\mu\text{A}$, $I_C = 0$
Collector-Base Cutoff Current	I_{CBO}	—	—	50	nA	$V_{CB} = 120\text{V}$, $I_E = 0$
		—	—	50	μA	$V_{CB} = 120\text{V}$, $I_E = 0$, $T_A = +100^\circ\text{C}$
Base-Emitter Cutoff Current	I_{EBO}	—	—	50	nA	$V_{EB} = 4\text{V}$, $I_C = 0$
ON CHARACTERISTICS (Note 9)						
DC Current Gain	h_{FE}	80	—	—	—	$I_C = 1.0\text{mA}$, $V_{CE} = 5.0\text{V}$
		80	—	250	—	$I_C = 10\text{mA}$, $V_{CE} = 5.0\text{V}$
		30	—	—	—	$I_C = 50\text{mA}$, $V_{CE} = 5.0\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	—	0.15	V	$I_C = 10\text{mA}$, $I_B = 1.0\text{mA}$
		—	—	0.20		$I_C = 50\text{mA}$, $I_B = 5.0\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	—	—	1.0	V	$I_C = 10\text{mA}$, $I_B = 1.0\text{mA}$
		—	—	—		$I_C = 50\text{mA}$, $I_B = 5.0\text{mA}$
SMALL SIGNAL CHARACTERISTICS						
Output Capacitance	C_{obo}	—	—	6.0	pF	$V_{CB} = 10\text{V}$, $f = 1.0\text{MHz}$, $I_E = 0$
Small Signal Current Gain	h_{fe}	50	—	250	—	$I_C = 1\text{mA}$, $V_{CE} = 10\text{V}$, $f = 1.0\text{MHz}$
Current Gain-Bandwidth Product	f_T	100	—	300	MHz	$I_C = 10\text{mA}$, $V_{CE} = 10\text{V}$, $f = 100\text{MHz}$

Electrical Characteristics – PNP (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

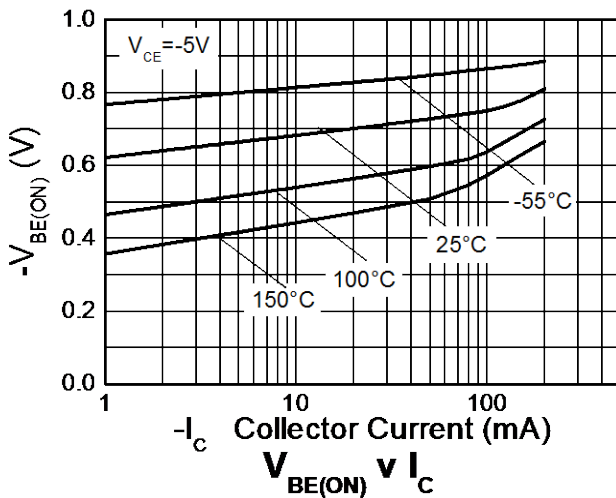
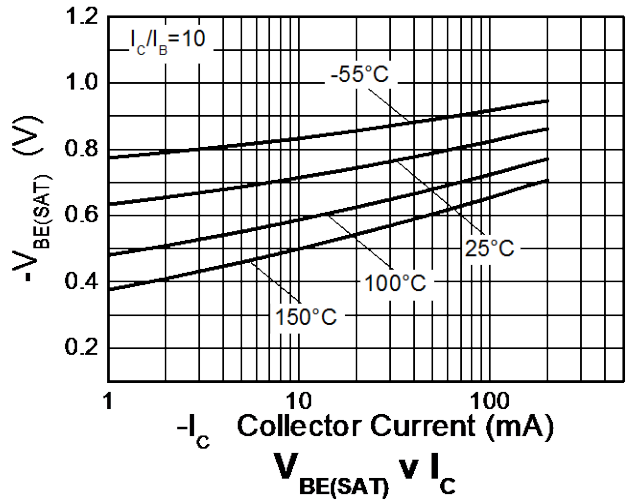
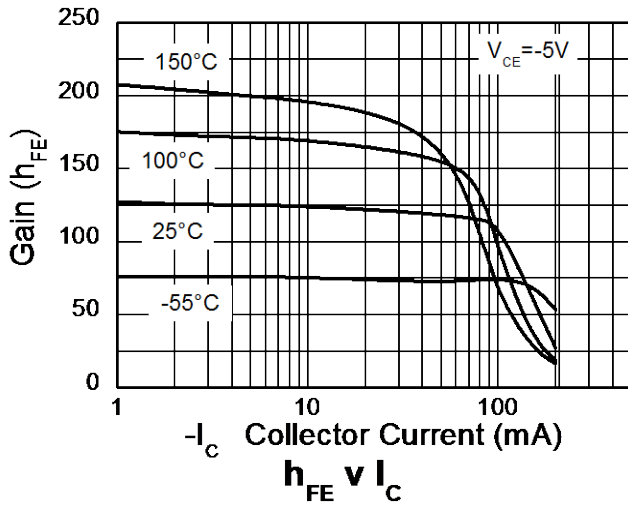
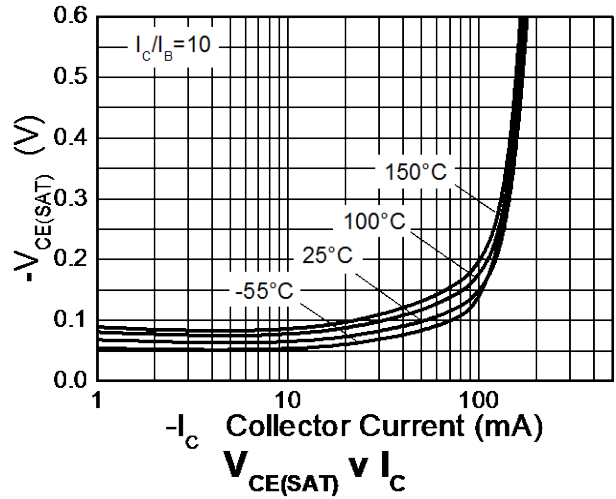
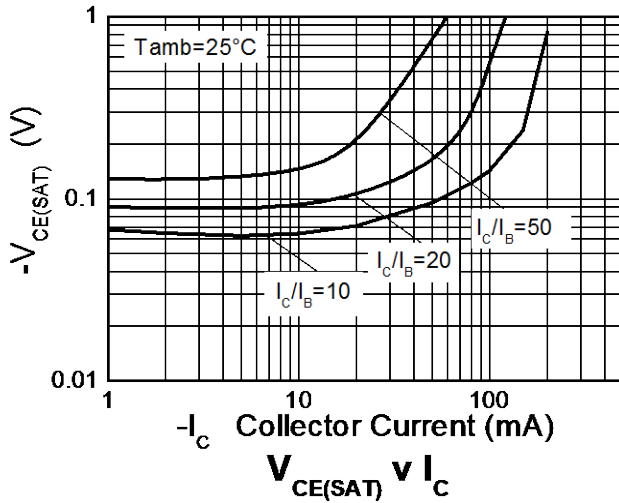
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Collector-Base Breakdown Voltage	BV_{CBO}	-160	—	—	V	$I_C = -100\mu\text{A}$, $I_E = 0$
Collector-Emitter Breakdown Voltage (Note 9)	BV_{CEO}	-150	—	—	V	$I_C = -1\text{mA}$, $I_B = 0$
Emitter-Base Breakdown Voltage	BV_{EBO}	-6	—	—	V	$I_E = -10\mu\text{A}$, $I_C = 0$
Collector-Base Cutoff Current	I_{CBO}	—	—	-50	nA	$V_{CB} = -120\text{V}$, $I_E = 0$
		—	—	-50	μA	$V_{CB} = -120\text{V}$, $I_E = 0$, $T_A = +100^\circ\text{C}$
Base-Emitter Cutoff Current	I_{EBO}	—	—	-50	nA	$V_{EB} = -4\text{V}$, $I_C = 0$
ON CHARACTERISTICS (Note 9)						
DC Current Gain	h_{FE}	50	—	—	—	$I_C = -1.0\text{mA}$, $V_{CE} = -5.0\text{V}$
		60	—	240	—	$I_C = -10\text{mA}$, $V_{CE} = -5.0\text{V}$
		50	—	—	—	$I_C = -50\text{mA}$, $V_{CE} = -5.0\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	—	-0.20	V	$I_C = -10\text{mA}$, $I_B = -1.0\text{mA}$
		—	—	-0.50		$I_C = -50\text{mA}$, $I_B = -5.0\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	—	—	-1.0	V	$I_C = -10\text{mA}$, $I_B = -1.0\text{mA}$
		—	—	—		$I_C = -50\text{mA}$, $I_B = -5.0\text{mA}$
SMALL SIGNAL CHARACTERISTICS						
Output Capacitance	C_{obo}	—	—	6.0	pF	$V_{CB} = -10\text{V}$, $f = 1.0\text{MHz}$, $I_E = 0$
Small Signal Current Gain	h_{fe}	40	—	260	—	$I_C = -1\text{mA}$, $V_{CE} = -10\text{V}$, $f = 1.0\text{MHz}$
Current Gain-Bandwidth Product	f_T	100	—	300	MHz	$I_C = -10\text{mA}$, $V_{CE} = -10\text{V}$, $f = 100\text{MHz}$

 Note: 9. Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$. Duty cycle $\leq 2\%$.

Typical Electrical Characteristics – NPN (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



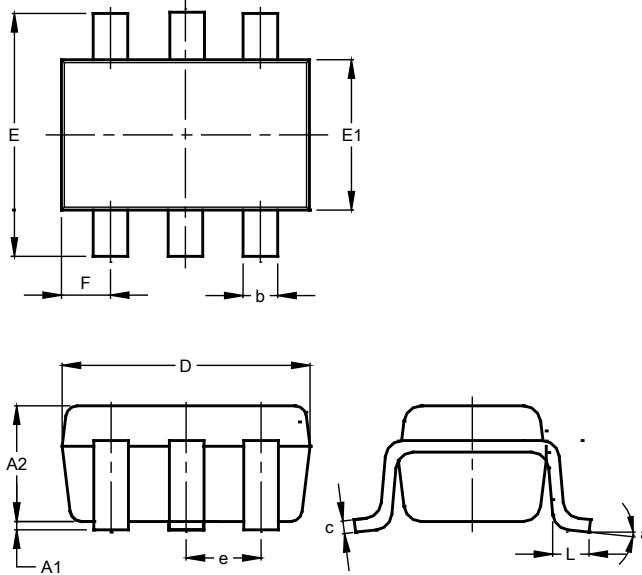
Typical Electrical Characteristics – PNP 5401 Section (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT363

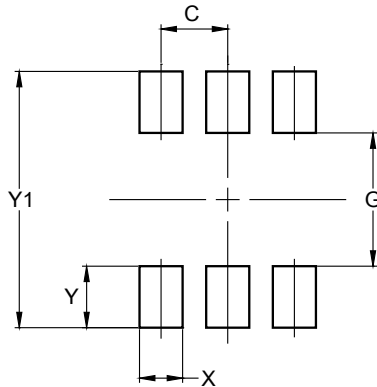


SOT363			
Dim	Min	Max	Typ
A1	0.00	0.10	0.05
A2	0.90	1.00	1.00
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT363



Dimensions	Value (in mm)
C	0.650
G	1.300
X	0.420
Y	0.600
Y1	2.500

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