

12V COMPLEMENTARY MEDIUM POWER TRANSISTOR IN SOT26

Features

- NPN + PNP Combination
- $BV_{CEO} > 12$ (-12)V
- $BV_{EBO} > 7$ (-7)V
- Continuous Collector Current $I_C = 5$ (-3.5)A
- $V_{CE(sat)} < 32$ (-70)mV @ 1A
- $R_{CE(sat)} = 25$ (45)m Ω
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Description

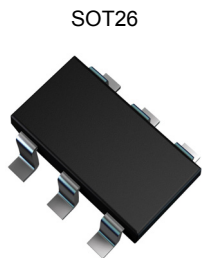
Advanced process capability has been used to achieve this high performance device. Combining NPN and PNP transistors in the SOT26 package provides a compact solution for the intended applications.

Mechanical Data

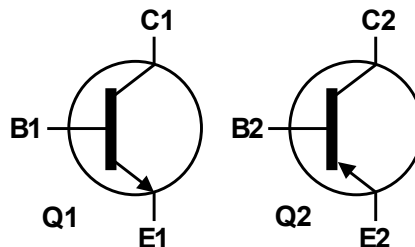
- Case: SOT26
- Case Material: Molded Plastic, "Green" Molding Compound
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 [Ⓔ]
- Weight: 0.015 grams (approximate)

Applications

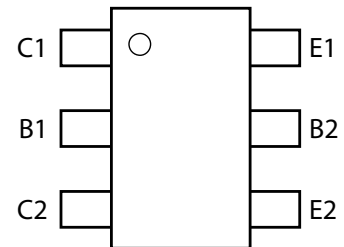
- MOSFET and IGBT Gate Driving
- Motor Drive



Top View



Device Symbol



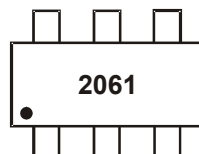
Top View Pin-Out

Ordering Information (Note 4)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXTC2061E6TA	2061	7	8	3,000

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See <http://www.diodes.com/> 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 <http://www.diodes.com>

Marking Information



2061 = Product Type Marking Code

Maximum Ratings – Q1 (NPN Transistor) (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V _{CBO}	20	V
Collector-Emitter Voltage	V _{CEO}	12	V
Emitter-Base Voltage	V _{EBO}	7	V
Continuous Collector Current	I _C	5	A
Peak Pulsed Collector Current	I _{CM}	12	A
Base Current	I _B	1	A

Maximum Ratings – Q2 (PNP Transistor) (@T_A = +25°C, unless otherwise specified.)

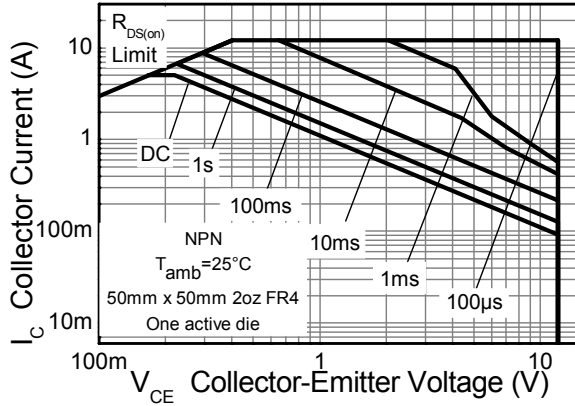
Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V _{CBO}	-12	V
Collector-Emitter Voltage	V _{CEO}	-12	V
Emitter-Base Voltage	V _{EBO}	-7	V
Continuous Collector Current	I _C	-3.5	A
Peak Pulsed Collector Current	I _{CM}	-10	A
Base Current	I _B	-1	A

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

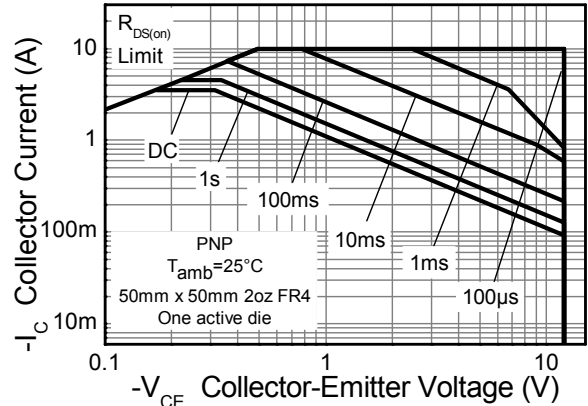
Characteristic	Symbol	Value	Unit	
Power Dissipation Linear Derating Factor	P _D	0.7	W mW/°C	
		(Notes 5 & 9)		5.6
		(Notes 6 & 9)		0.9
		(Notes 6 & 10)		7.2
		(Notes 7 & 9)		1.1
		(Notes 8 & 9)		8.8
Thermal Resistance, Junction to Ambient	R _{θJA}	1.1	°C/W	
		(Notes 5 & 9)		8.8
		(Notes 6 & 9)		1.7
		(Notes 6 & 10)		13.6
		(Notes 7 & 9)		179
Thermal Resistance, Junction to Lead	R _{θJL}	139	°C/W	
		(Notes 8 & 9)		113
Operating and Storage Temperature Range	T _J , T _{STG}	87.58	°C	
		-55 to +150		

- Notes:
- For a device surface mounted on 15mm x 15mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
 - Same as note (5), except the device is surface mounted on 25mm x 25mm 1oz copper.
 - Same as note (5), except the device is surface mounted on 50mm x 50mm 2oz copper.
 - Same as note (7), except the device is measured at t < 5 seconds.
 - For device with one active die, both collectors attached to a common heatsink.
 - For device with two active dice running at equal power, split heatsink 50% to each collector.
 - Thermal resistance from junction to solder-point (at the end of the collector lead).

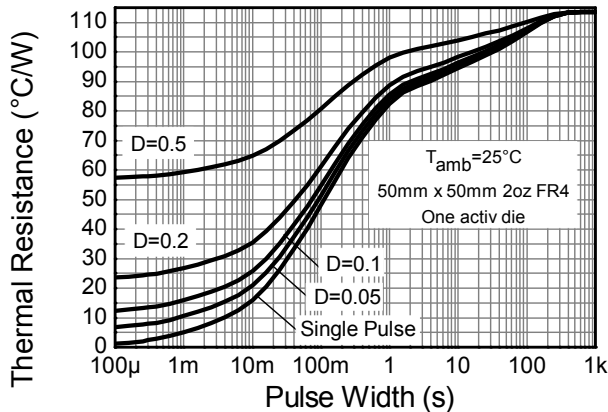
Thermal Characteristics and Derating Information



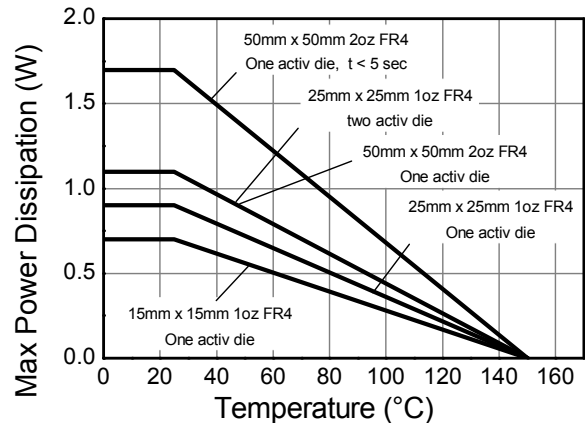
Safe Operating Area



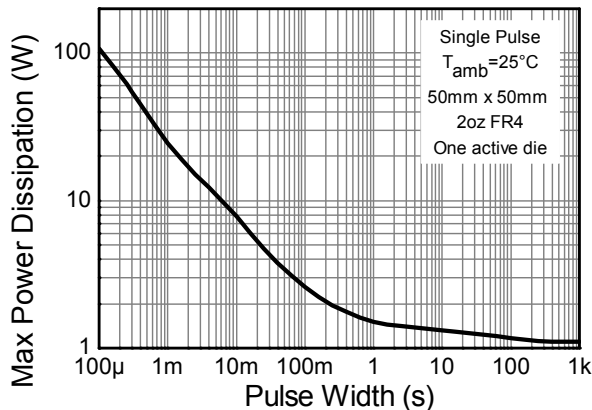
Safe Operating Area



Transient Thermal Impedance



Derating Curve



Pulse Power Dissipation

Electrical Characteristics – Q1 (NPN Transistor) (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Collector-Base Breakdown Voltage	BV_{CBO}	20	40	—	V	$I_C = 100\mu\text{A}$, $I_E = 0$
Collector-Emitter Breakdown Voltage (Note 12)	BV_{CEO}	12	17	—	V	$I_C = 10\text{mA}$, $I_B = 0$
Emitter-Base Breakdown Voltage	BV_{EBO}	7	8.4	—	V	$I_E = 100\mu\text{A}$, $I_C = 0$
Collector Cutoff Current	I_{CBO}	—	<1	50	nA	$V_{CB} = 20\text{V}$
Collector Cutoff Current	I_{EBO}	—	<1	50	nA	$V_{CB} = 20\text{V}$, $T_A = +100^\circ\text{C}$
ON CHARACTERISTICS (Note 12)						
DC Current Gain	h_{FE}	500 480 260	800 750 390	1500	—	$I_C = 10\text{mA}$, $V_{CE} = 2\text{V}$ $I_C = 1.0\text{A}$, $V_{CE} = 2\text{V}$ $I_C = 5\text{A}$, $V_{CE} = 2\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	32 50 65 145	40 60 80 180	mV	$I_C = 1.0\text{A}$, $I_B = 100\text{mA}$ $I_C = 1.0\text{A}$, $I_B = 10\text{mA}$ $I_C = 2.0\text{A}$, $I_B = 40\text{mA}$ $I_C = 5\text{A}$, $I_B = 100\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	—	920	1000	mV	$I_C = 5\text{A}$, $I_B = 100\text{mA}$
Base-Emitter Turn-On Voltage	$V_{BE(on)}$	—	810	900	mV	$I_C = 5\text{A}$, $V_{CE} = 2\text{V}$
SMALL SIGNAL CHARACTERISTICS						
Output Capacitance	C_{obo}	—	26	35	pF	$V_{CB} = 10\text{V}$, $f = 1.0\text{MHz}$
Current Gain-Bandwidth Product	f_T	—	260	—	MHz	$V_{CE} = 10\text{V}$, $I_C = 50\text{mA}$, $f = 100\text{MHz}$
Delay Time	t_d	—	71	—	ns	$V_{CC} = 10\text{V}$, $I_C = 1\text{A}$, $I_{B1} = -I_{B2} = 10\text{mA}$
Rise Time	t_r	—	70	—	ns	
Storage Time	t_s	—	233	—	ns	
Fall Time	t_f	—	72	—	ns	

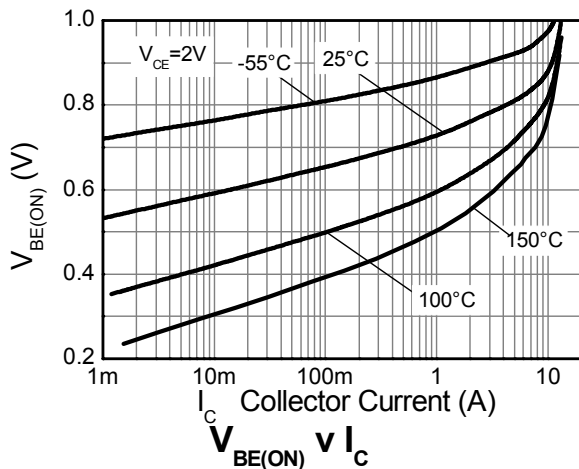
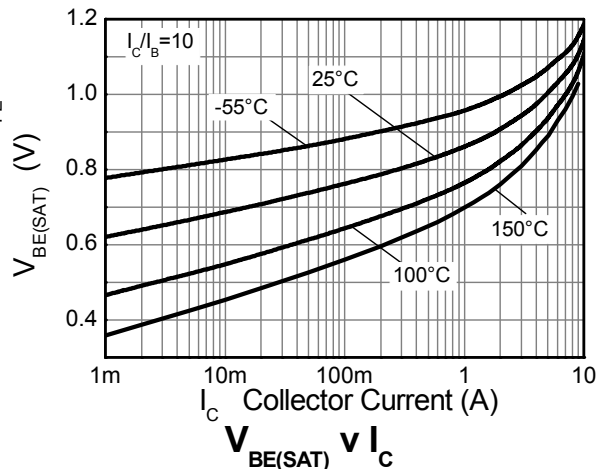
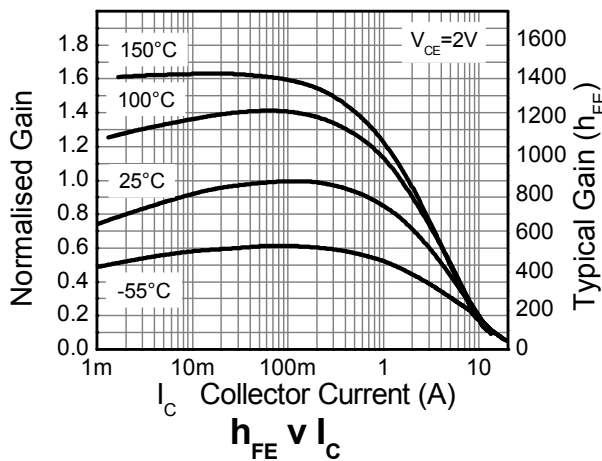
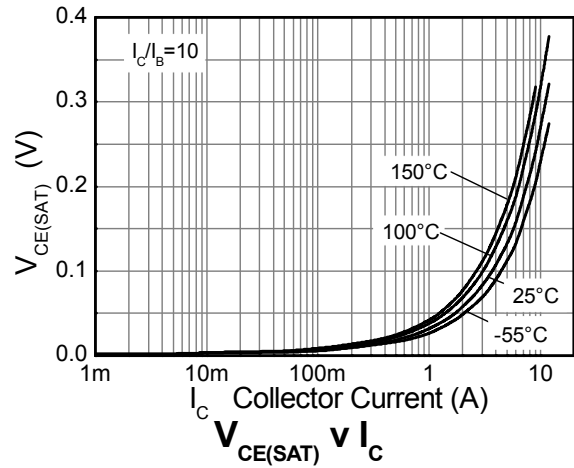
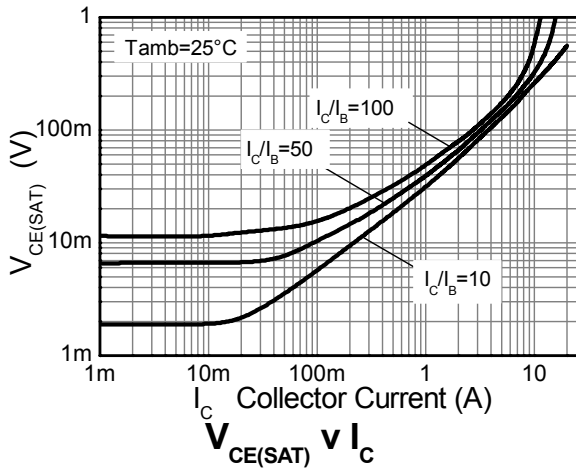
Notes: 12. Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$. Duty cycle $\leq 2\%$.

Electrical Characteristics – Q2 (PNP Transistor) (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

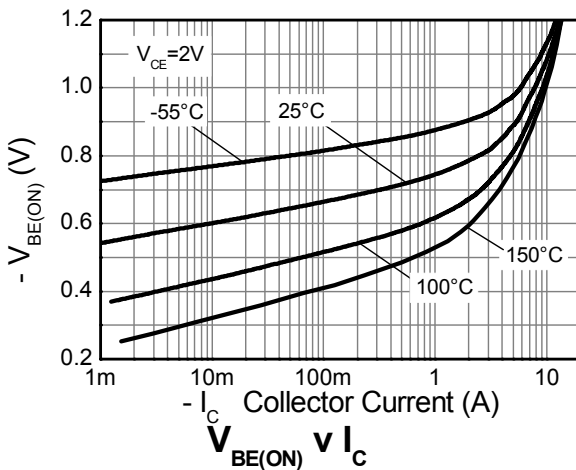
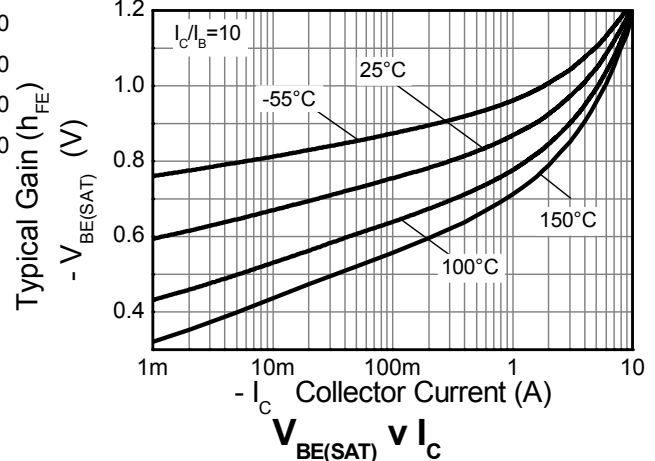
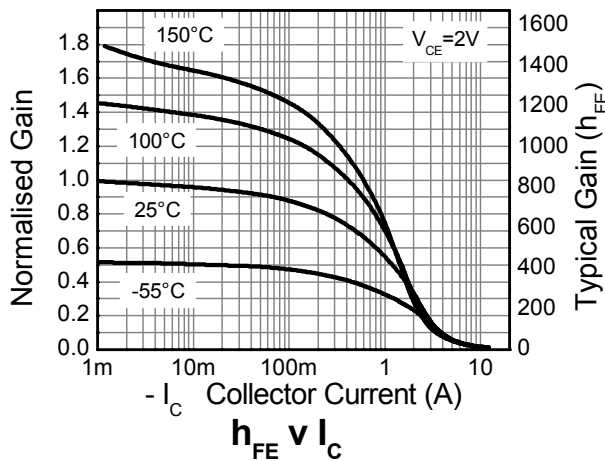
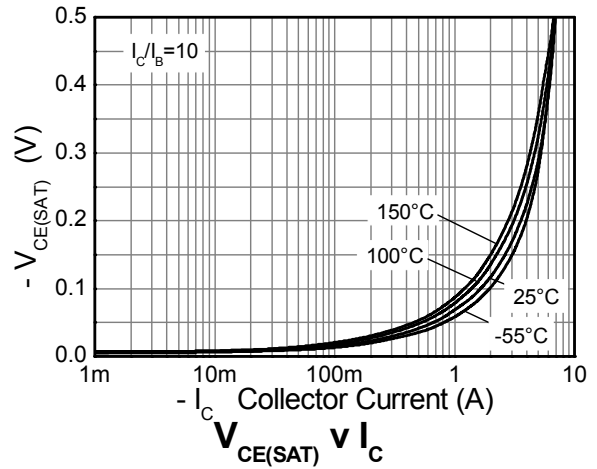
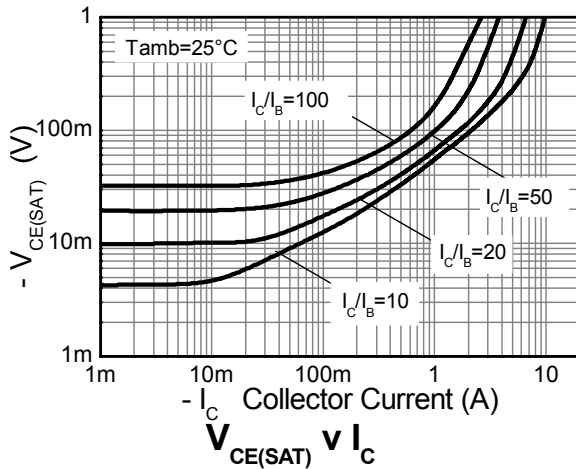
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Collector-Base Breakdown Voltage	BV_{CBO}	-12	-35	—	V	$I_C = -100\mu\text{A}, I_E = 0$
Collector-Emitter Breakdown Voltage (Note 12)	BV_{CEO}	-12	-25	—	V	$I_C = -10\text{mA}, I_B = 0$
Emitter-Base Breakdown Voltage	BV_{EBO}	-7	-8.4	—	V	$I_E = -100\mu\text{A}, I_C = 0$
Collector Cutoff Current	I_{CBO}	—	< -1	-50	nA	$V_{CB} = -12\text{V}$
Collector Cutoff Current	I_{EBO}	—	< -1	-50	nA	$V_{CB} = -12\text{V}, T_A = +100^\circ\text{C}$
Collector Cutoff Current		—	< -1	-50	nA	$V_{EB} = -5.6\text{V}$
ON CHARACTERISTICS (Note 12)						
DC Current Gain	h_{FE}	500 290 75	800 450 100	1500 — —	—	$I_C = -10\text{mA}, V_{CE} = -2\text{V}$ $I_C = -1.0\text{A}, V_{CE} = -2\text{V}$ $I_C = -3.5\text{A}, V_{CE} = -2\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	-55 -170 -220 -150	-70 -265 -360 -200	mV	$I_C = -1.0\text{A}, I_B = -100\text{mA}$ $I_C = -1.0\text{A}, I_B = -10\text{mA}$ $I_C = -2.0\text{A}, I_B = -40\text{mA}$ $I_C = -3.5\text{A}, I_B = -350\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	—	-955	-1050	mV	$I_C = -3.5\text{A}, I_B = -350\text{mA}$
Base-Emitter Turn-On Voltage	$V_{BE(on)}$	—	-830	-900	mV	$I_C = -3.5\text{A}, V_{CE} = -2\text{V}$
SMALL SIGNAL CHARACTERISTICS						
Output Capacitance	C_{obo}	—	17	25	pF	$V_{CB} = -10\text{V}, f = 1.0\text{MHz}$
Current Gain-Bandwidth Product	f_T	—	310	—	MHz	$V_{CE} = -10\text{V}, I_C = -50\text{mA}, f = 100\text{MHz}$
Delay Time	t_d	—	41	—	ns	$V_{CC} = -10\text{V}, I_C = -1\text{A},$ $I_{B1} = -I_{B2} = -10\text{mA}$
Rise Time	t_r	—	62	—	ns	
Storage Time	t_s	—	179	—	ns	
Fall Time	t_f	—	65	—	ns	

Notes: 12. Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$. Duty cycle $\leq 2\%$.

Typical Electrical Characteristics – Q1 (NPN Transistor) (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

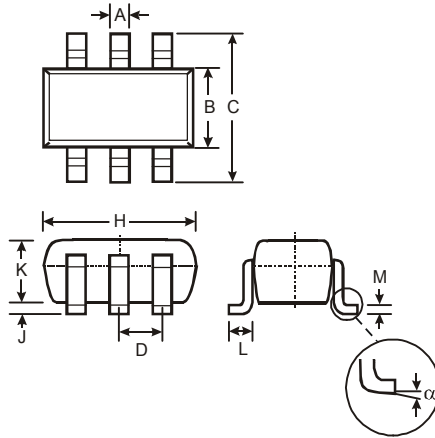


Typical Electrical Characteristics – Q2 (PNP Transistor) (@T_A = +25°C, unless otherwise specified.)



Package Outline Dimensions

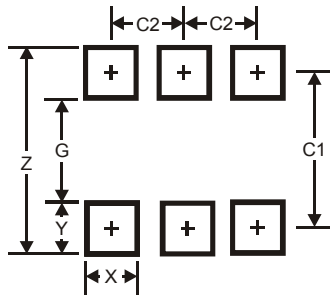
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



SOT26			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	—	—	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
α	0°	8°	—
All Dimensions in mm			

Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



Dimensions	Value (in mm)
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

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