

**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 $\Omega$
- **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**

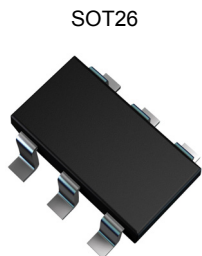
Advanced process capability has been used to achieve this high performance device. Combining NPN and PNP transistors in the SOT26 package provides a compact solution for the intended applications.

**Mechanical Data**

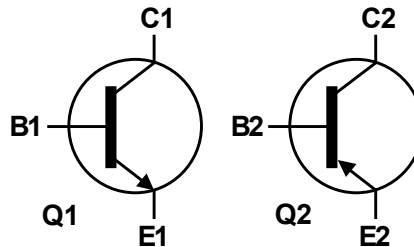
- Case: SOT26
- Case Material: Molded Plastic, "Green" Molding Compound
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 
- Weight: 0.015 grams (approximate)

**Applications**

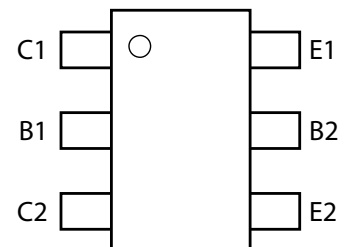
- MOSFET and IGBT Gate Driving
- Motor Drive



Top View



Device Symbol



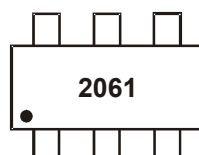
Top View  
Pin-Out

**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<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	20	V
Collector-Emitter Voltage	V <sub>CEO</sub>	12	V
Emitter-Base Voltage	V <sub>EBO</sub>	7	V
Continuous Collector Current	I <sub>C</sub>	5	A
Peak Pulsed Collector Current	I <sub>CM</sub>	12	A
Base Current	I <sub>B</sub>	1	A

**Maximum Ratings – Q2 (PNP Transistor)** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

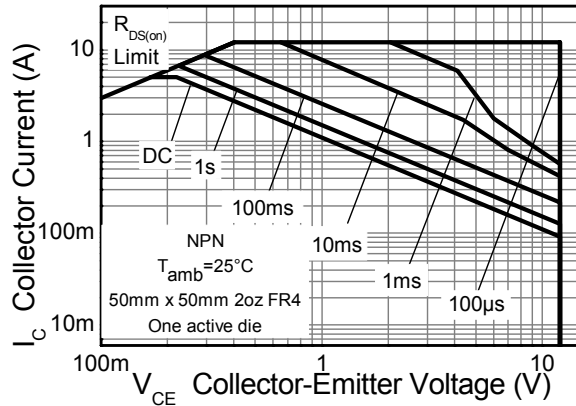
Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	-12	V
Collector-Emitter Voltage	V <sub>CEO</sub>	-12	V
Emitter-Base Voltage	V <sub>EBO</sub>	-7	V
Continuous Collector Current	I <sub>C</sub>	-3.5	A
Peak Pulsed Collector Current	I <sub>CM</sub>	-10	A
Base Current	I <sub>B</sub>	-1	A

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

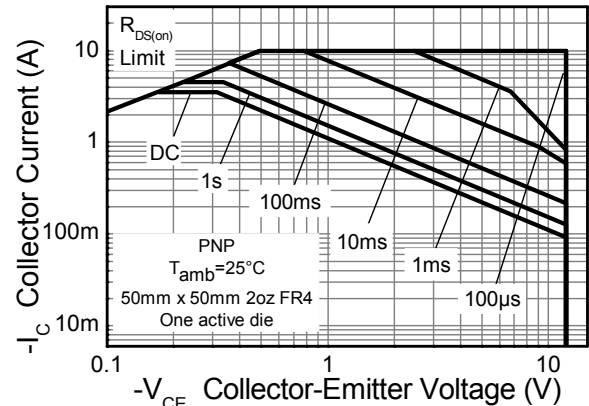
Characteristic		Symbol	Value	Unit
Power Dissipation Linear Derating Factor	(Notes 5 & 9)	P <sub>D</sub>	0.7	W mW/°C
	(Notes 6 & 9)		5.6	
	(Notes 6 & 10)		0.9	
	(Notes 7 & 9)		7.2	
	(Notes 8 & 9)		1.1	
	(Notes 8 & 9)		8.8	
Thermal Resistance, Junction to Ambient	(Notes 5 & 9)	R <sub>θJA</sub>	1.1	°C/W
	(Notes 6 & 9)		8.8	
	(Notes 6 & 10)		1.7	
	(Notes 7 & 9)		13.6	
	(Notes 8 & 9)		179	
Thermal Resistance, Junction to Lead	(Note 11)	R <sub>θJL</sub>	139	°C
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	113	
			73	
			87.58	
			-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).

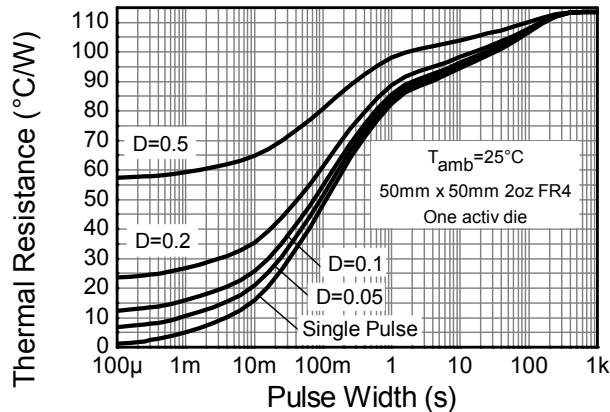
## Thermal Characteristics and Derating Information



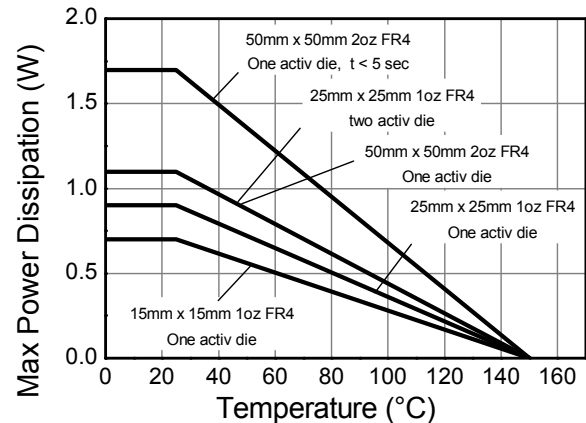
**Safe Operating Area**



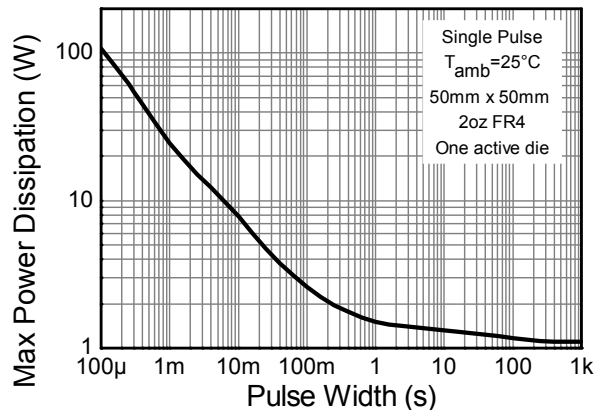
**Safe Operating Area**



**Transient Thermal Impedance**



**Derating Curve**



**Pulse Power Dissipation**

**Electrical Characteristics – Q1 (NPN Transistor)** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	20	40	—	V	I <sub>C</sub> = 100μA, I <sub>E</sub> = 0
Collector-Emitter Breakdown Voltage (Note 12)	BV <sub>CEO</sub>	12	17	—	V	I <sub>C</sub> = 10mA, I <sub>B</sub> = 0
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	7	8.4	—	V	I <sub>E</sub> = 100μA, I <sub>C</sub> = 0
Collector Cutoff Current	I <sub>CBO</sub>	—	<1	50 0.5	nA μA	V <sub>CB</sub> = 20V V <sub>CB</sub> = 20V, T <sub>A</sub> = +100°C
Collector Cutoff Current	I <sub>EBO</sub>	—	<1	50	nA	V <sub>EB</sub> = 5.6V
<b>ON CHARACTERISTICS (Note 12)</b>						
DC Current Gain	h <sub>FE</sub>	500 480 260	800 750 390	1500	—	I <sub>C</sub> = 10mA, V <sub>CE</sub> = 2V I <sub>C</sub> = 1.0A, V <sub>CE</sub> = 2V I <sub>C</sub> = 5A, V <sub>CE</sub> = 2V
Collector-Emitter Saturation Voltage	V <sub>CE(sat)</sub>	—	32 50 65 145	40 60 80 180	mV	I <sub>C</sub> = 1.0A, I <sub>B</sub> = 100mA I <sub>C</sub> = 1.0A, I <sub>B</sub> = 10mA I <sub>C</sub> = 2.0A, I <sub>B</sub> = 40mA I <sub>C</sub> = 5A, I <sub>B</sub> = 100mA
Base-Emitter Saturation Voltage	V <sub>BE(sat)</sub>	—	920	1000	mV	I <sub>C</sub> = 5A, I <sub>B</sub> = 100mA
Base-Emitter Turn-On Voltage	V <sub>BE(on)</sub>	—	810	900	mV	I <sub>C</sub> = 5A, V <sub>CE</sub> = 2V
<b>SMALL SIGNAL CHARACTERISTICS</b>						
Output Capacitance	C <sub>obo</sub>	—	26	35	pF	V <sub>CB</sub> = 10V, f = 1.0MHz
Current Gain-Bandwidth Product	f <sub>T</sub>	—	260	—	MHz	V <sub>CE</sub> = 10V, I <sub>C</sub> = 50mA, f = 100MHz
Delay Time	t <sub>d</sub>	—	71	—	ns	V <sub>CC</sub> = 10V, I <sub>C</sub> = 1A, I <sub>B1</sub> = -I <sub>B2</sub> = 10mA
Rise Time	t <sub>r</sub>	—	70	—	ns	
Storage Time	t <sub>s</sub>	—	233	—	ns	
Fall Time	t <sub>f</sub>	—	72	—	ns	

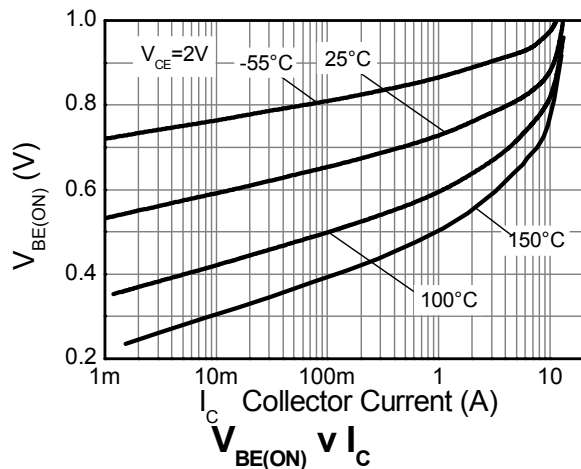
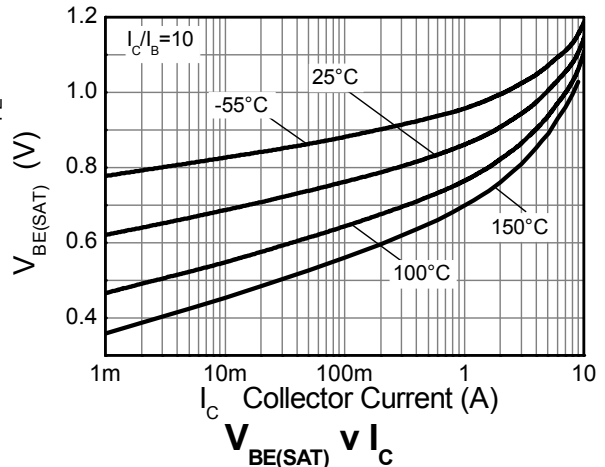
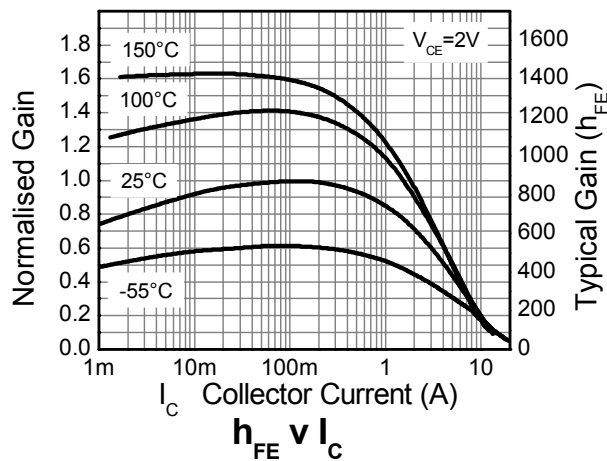
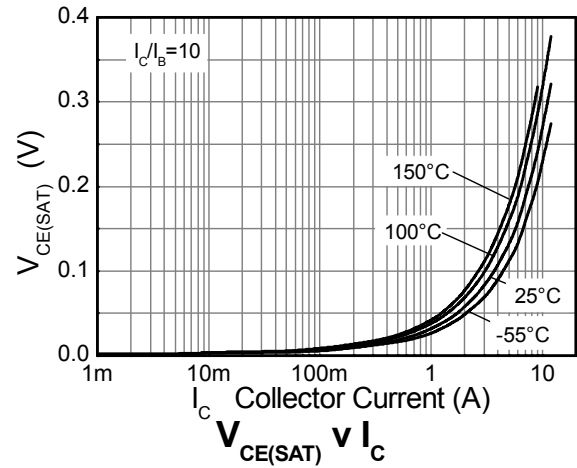
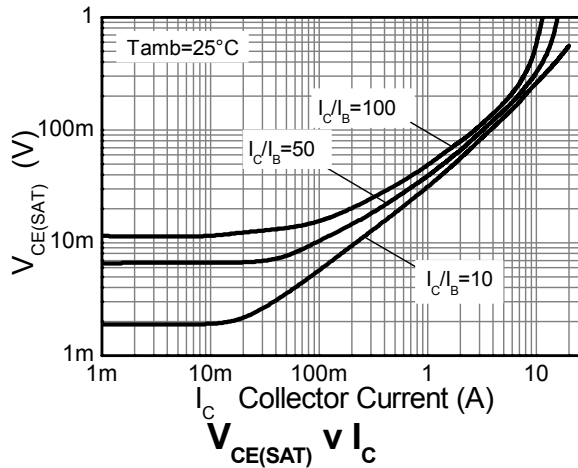
Notes: 12. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

**Electrical Characteristics – Q2 (PNP Transistor)** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

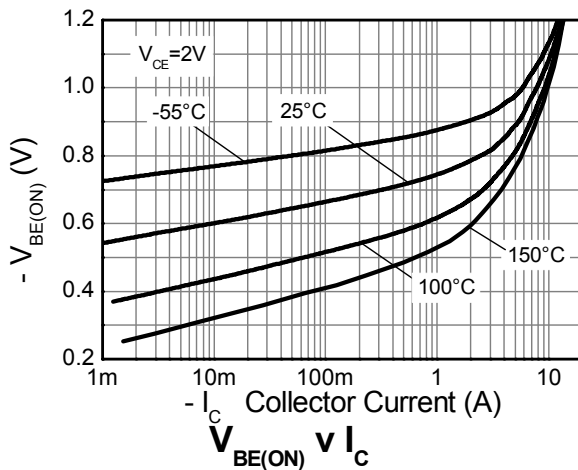
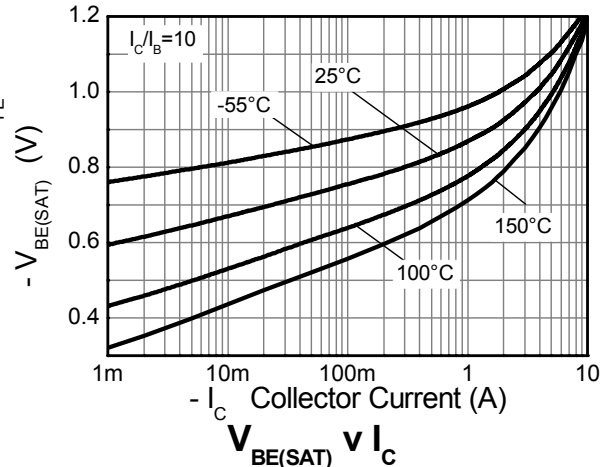
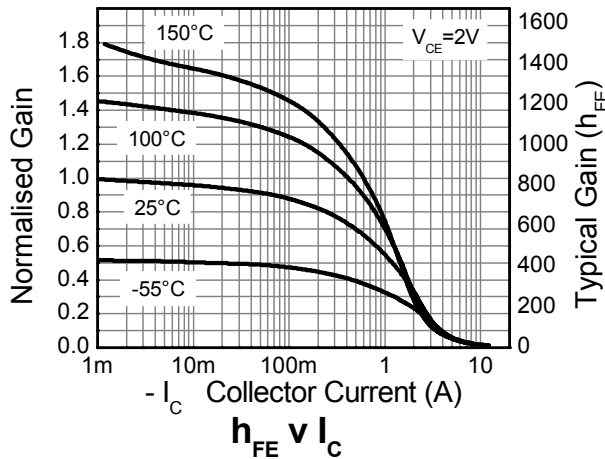
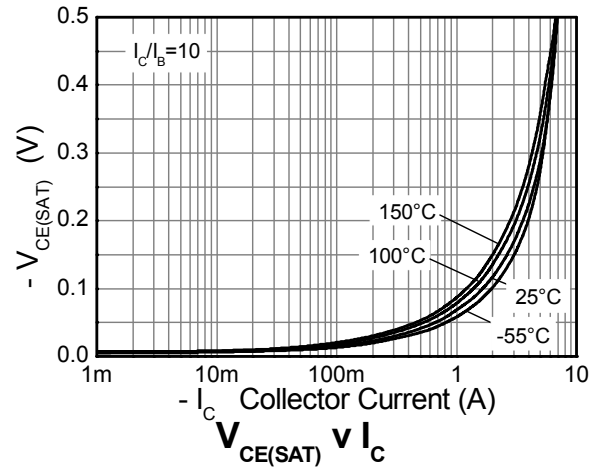
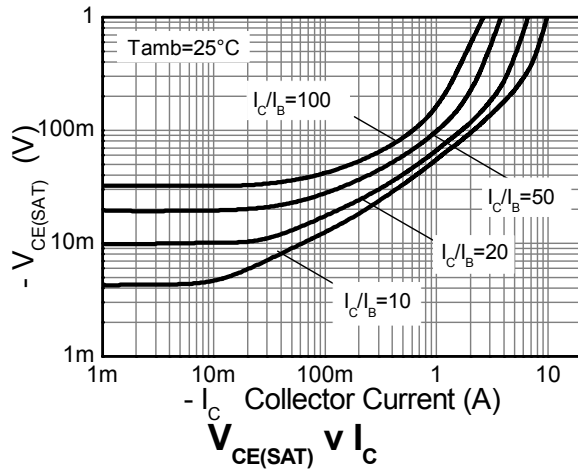
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	-12	-35	—	V	I <sub>C</sub> = -100μA, I <sub>E</sub> = 0
Collector-Emitter Breakdown Voltage (Note 12)	BV <sub>CEO</sub>	-12	-25	—	V	I <sub>C</sub> = -10mA, I <sub>B</sub> = 0
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	-7	-8.4	—	V	I <sub>E</sub> = -100μA, I <sub>C</sub> = 0
Collector Cutoff Current	I <sub>CBO</sub>	—	< -1	-50	nA	V <sub>CB</sub> = -12V
Collector Cutoff Current	I <sub>EBO</sub>	—	< -1	-50	nA	V <sub>CB</sub> = -12V, T <sub>A</sub> = +100°C
Collector Cutoff Current	I <sub>EBO</sub>	—	< -1	-50	nA	V <sub>EB</sub> = -5.6V
<b>ON CHARACTERISTICS (Note 12)</b>						
DC Current Gain	h <sub>FE</sub>	500 290 75	800 450 100	1500 — —	—	I <sub>C</sub> = -10mA, V <sub>CE</sub> = -2V I <sub>C</sub> = -1.0A, V <sub>CE</sub> = -2V I <sub>C</sub> = -3.5A, V <sub>CE</sub> = -2V
Collector-Emitter Saturation Voltage	V <sub>CE(sat)</sub>	— — — —	-55 -170 -220 -150	-70 -265 -360 -200	mV	I <sub>C</sub> = -1.0A, I <sub>B</sub> = -100mA I <sub>C</sub> = -1.0A, I <sub>B</sub> = -10mA I <sub>C</sub> = -2.0A, I <sub>B</sub> = -40mA I <sub>C</sub> = -3.5A, I <sub>B</sub> = -350mA
Base-Emitter Saturation Voltage	V <sub>BE(sat)</sub>	—	-955	-1050	mV	I <sub>C</sub> = -3.5A, I <sub>B</sub> = -350mA
Base-Emitter Turn-On Voltage	V <sub>BE(on)</sub>	—	-830	-900	mV	I <sub>C</sub> = -3.5A, V <sub>CE</sub> = -2V
<b>SMALL SIGNAL CHARACTERISTICS</b>						
Output Capacitance	C <sub>obo</sub>	—	17	25	pF	V <sub>CB</sub> = -10V, f = 1.0MHz
Current Gain-Bandwidth Product	f <sub>T</sub>	—	310	—	MHz	V <sub>CE</sub> = -10V, I <sub>C</sub> = -50mA, f = 100MHz
Delay Time	t <sub>d</sub>	—	41	—	ns	V <sub>CC</sub> = -10V, I <sub>C</sub> = -1A, I <sub>B1</sub> = -I <sub>B2</sub> = -10mA
Rise Time	t <sub>r</sub>	—	62	—	ns	
Storage Time	t <sub>s</sub>	—	179	—	ns	
Fall Time	t <sub>f</sub>	—	65	—	ns	

Notes: 12. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

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

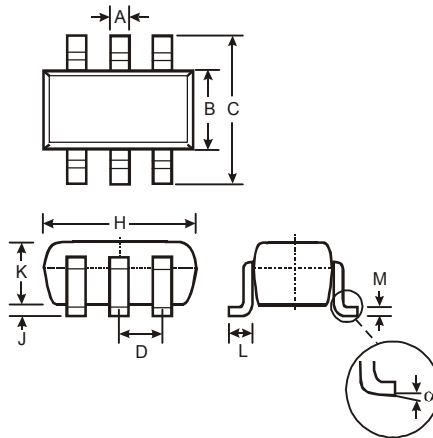


**Typical Electrical Characteristics – Q2 (PNP Transistor)** (@T<sub>A</sub> = +25°C, unless otherwise specified.)



## Package Outline Dimensions

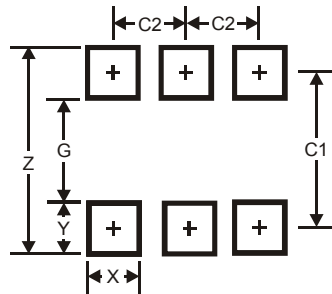
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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
$\alpha$	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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