



YOUSHANG SEMICONDUCTOR

设计研发新型功率器件

各类小信号开关

中低压及高压大电流等场效应管

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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

Description

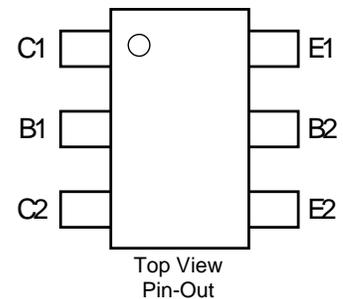
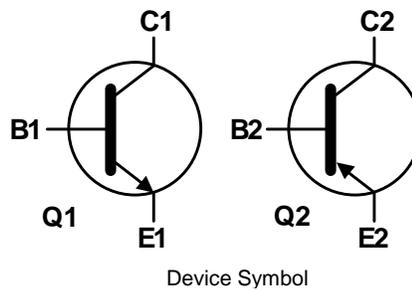
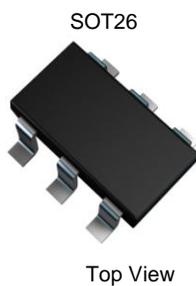
Advanced process capability has been used to achieve this high performance device. Combining NPN and PNP transistors in the SOT26 package provides a compact solution for the intended applications.

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 ^(e3)
- Weight: 0.015 grams (Approximate)

Applications

- MOSFET and IGBT Gate Driving
- Motor Drive



Absolute Maximum Ratings – Q1 (NPN Transistor) (@ $T_A = +25^\circ\text{C}$, 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

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

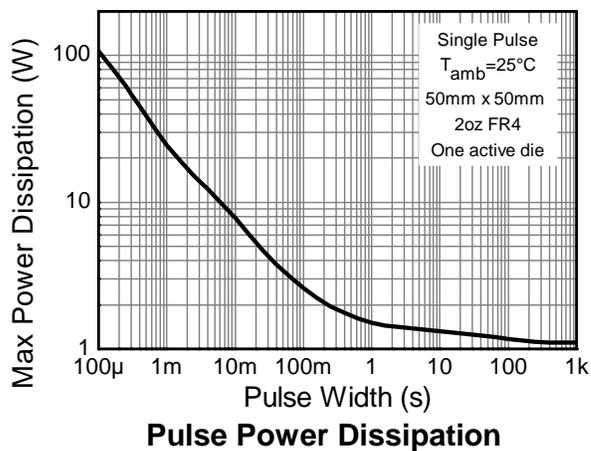
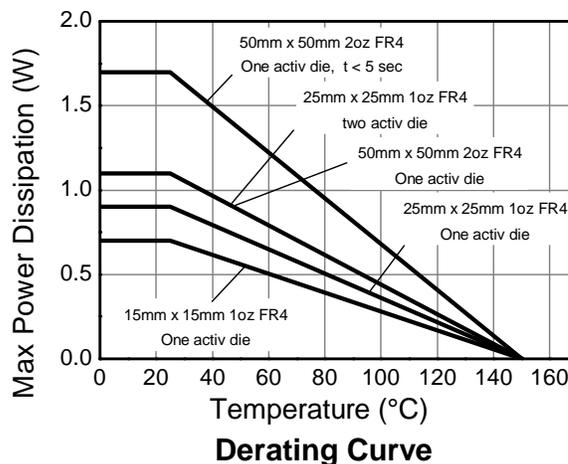
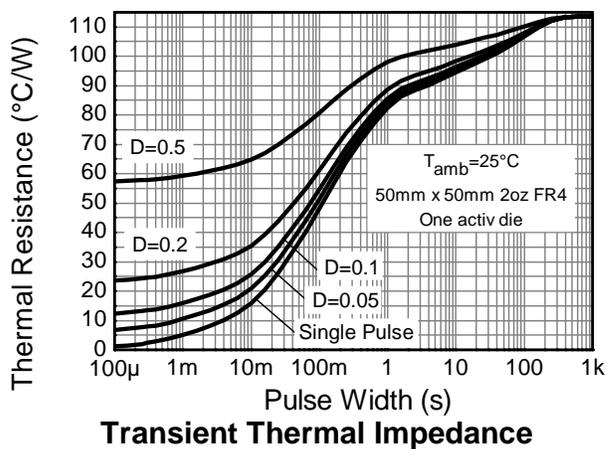
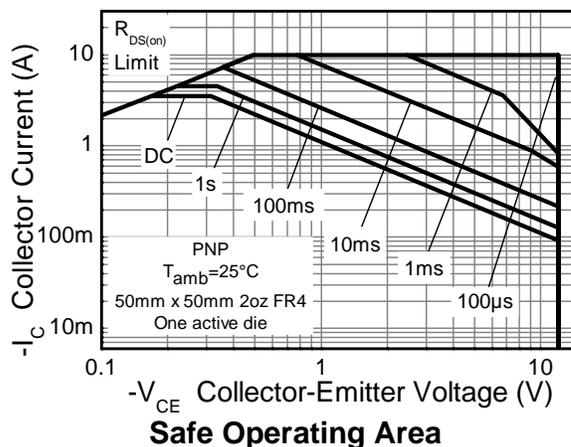
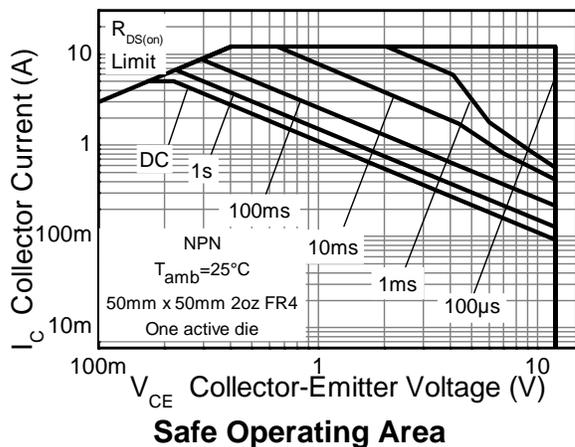
Characteristic	Symbol	Value	Unit	
Power Dissipation Linear Derating Factor	P_D	0.7	W mW/°C	
		5.6		
		(Notes 6 & 9)		0.9
		(Notes 6 & 10)		7.2
		(Notes 7 & 9)		1.1
		(Notes 8 & 9)		8.8
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	1.1	°C/W	
		8.8		
		(Notes 5 & 9)		179
		(Notes 6 & 9)		139
		(Notes 6 & 10)		113
Thermal Resistance, Junction to Lead	$R_{\theta JL}$	(Notes 7 & 9)	113	
		(Notes 8 & 9)	73	
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C	

ESD Ratings (Note 12)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- 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).
 - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristics and Derating Information



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

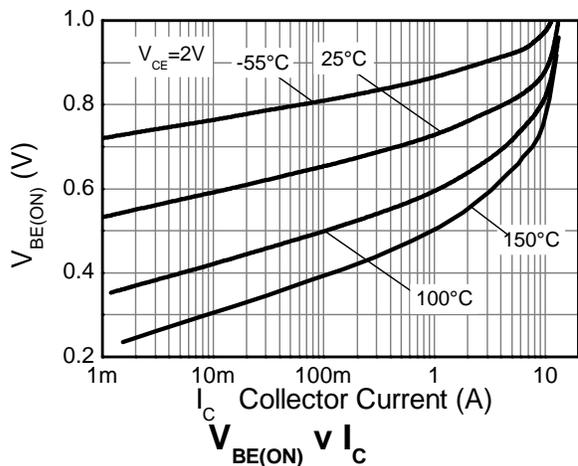
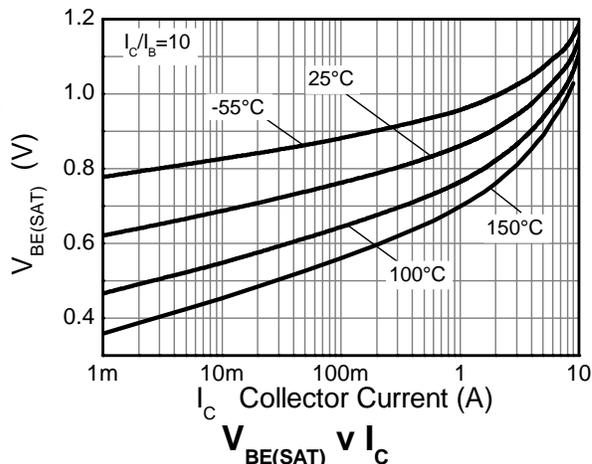
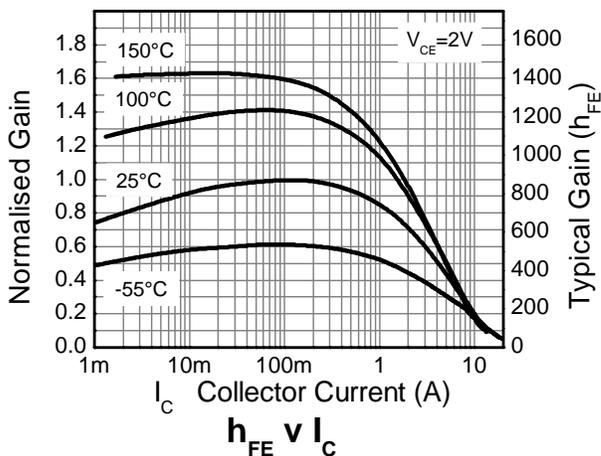
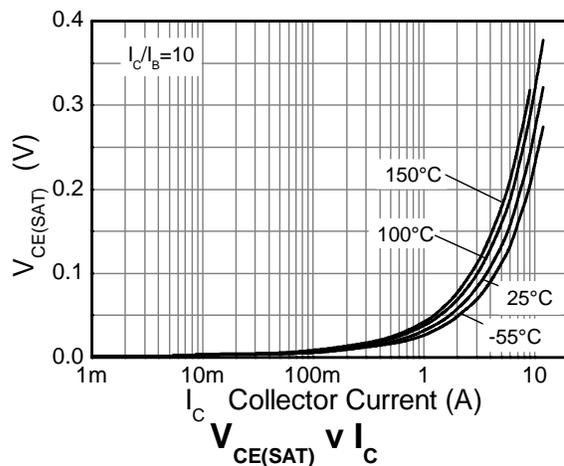
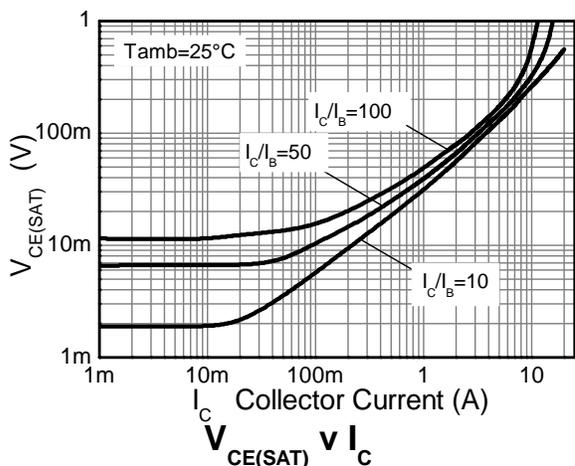
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Collector-Base Breakdown Voltage	BV_{CBO}	20	40	—	V	$I_C = 100\mu\text{A}, I_E = 0$
Collector-Emitter Breakdown Voltage (Note 13)	BV_{CEO}	12	17	—	V	$I_C = 10\text{mA}, I_B = 0$
Emitter-Base Breakdown Voltage	BV_{EBO}	7	8.4	—	V	$I_E = 100\mu\text{A}, I_C = 0$
Collector Cut-Off Current	I_{CBO}	—	<1	50	nA	$V_{CB} = 20\text{V}$
Collector Cut-Off Current	I_{EBO}	—	<1	50	nA	$V_{CB} = 20\text{V}, T_A = +100^\circ\text{C}$
Collector Cut-Off Current						$V_{EB} = 5.6\text{V}$
ON CHARACTERISTICS (Note 13)						
DC Current Gain	h_{FE}	500 480 260	800 750 390	1,500	—	$I_C = 10\text{mA}, V_{CE} = 2\text{V}$ $I_C = 1.0\text{A}, V_{CE} = 2\text{V}$ $I_C = 5\text{A}, V_{CE} = 2\text{V}$
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	1,000	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	

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

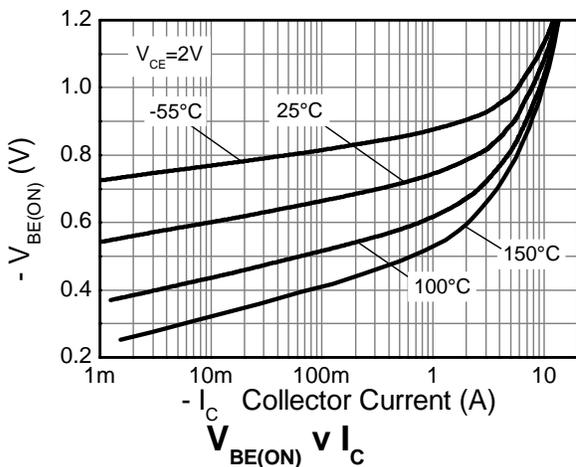
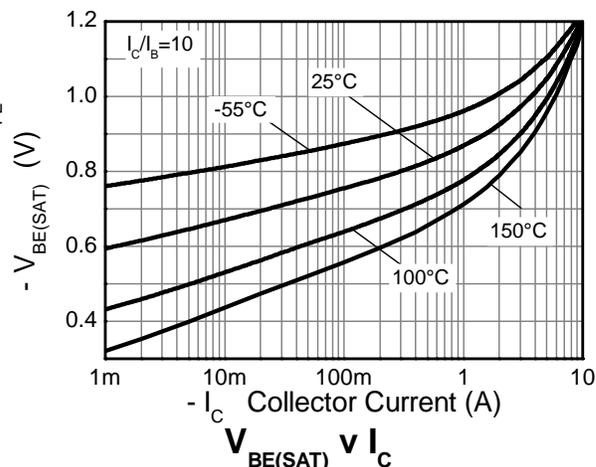
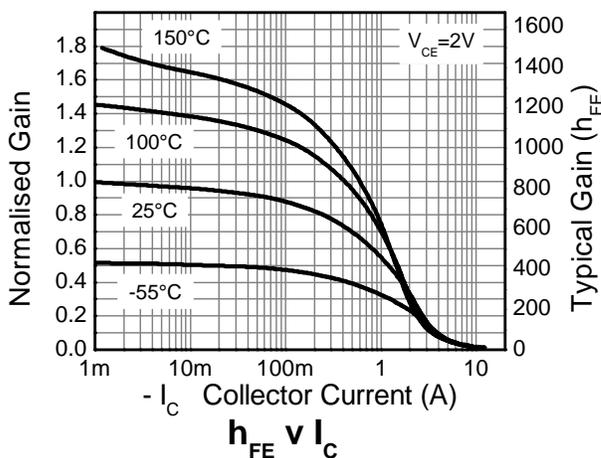
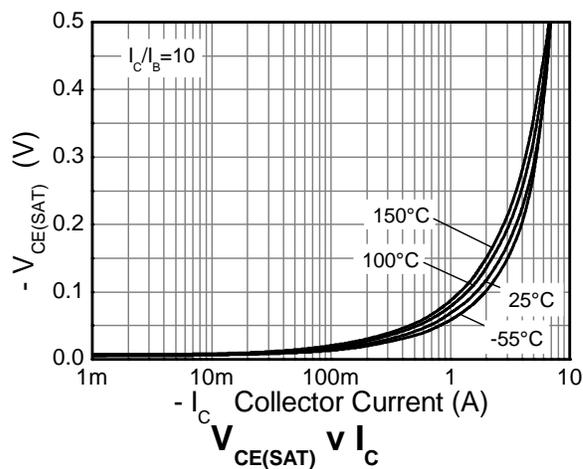
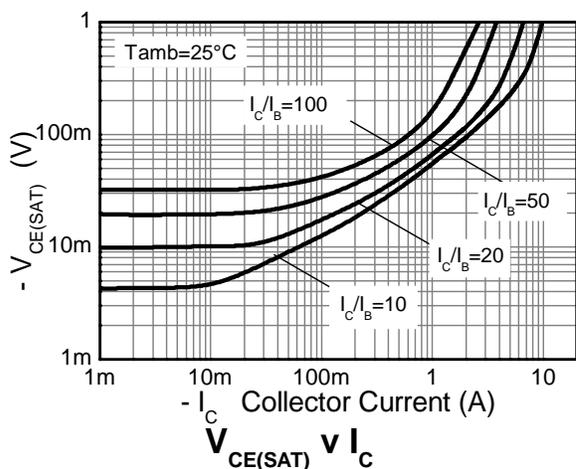
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Collector-Base Breakdown Voltage	BV_{CBO}	-12	-35	—	V	$I_C = -100\mu\text{A}, I_E = 0$
Collector-Emitter Breakdown Voltage (Note 13)	BV_{CEO}	-12	-25	—	V	$I_C = -10\text{mA}, I_B = 0$
Emitter-Base Breakdown Voltage	BV_{EBO}	-7	-8.4	—	V	$I_E = -100\mu\text{A}, I_C = 0$
Collector Cut-Off Current	I_{CBO}	—	< -1	-50	nA	$V_{CB} = -12\text{V}$
Collector Cut-Off Current				-0.5	μA	$V_{CB} = -12\text{V}, T_A = +100^\circ\text{C}$
Collector Cut-Off Current	I_{EBO}	—	< -1	-50	nA	$V_{EB} = -5.6\text{V}$
ON CHARACTERISTICS (Note 13)						
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	-1,050	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	

 Note: 13. Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$. Duty cycle $\leq 2\%$.

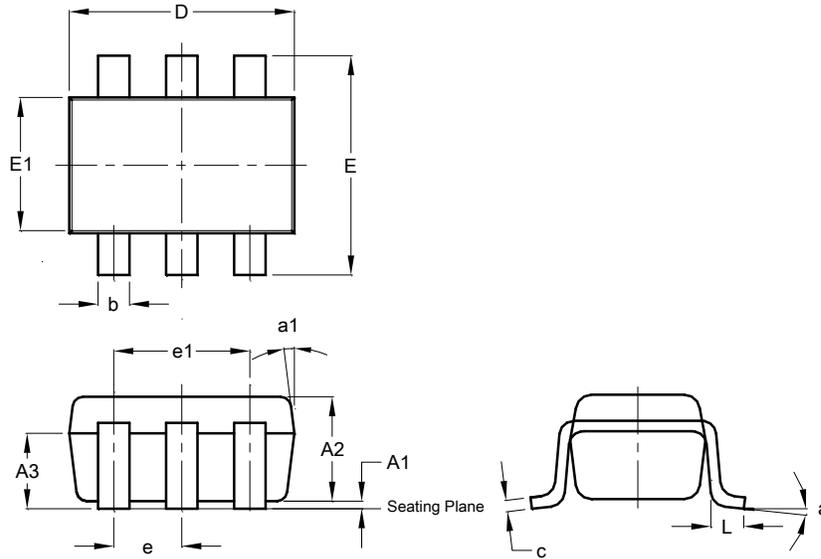
Typical Electrical Characteristics – Q1 (NPN Transistor) (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



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

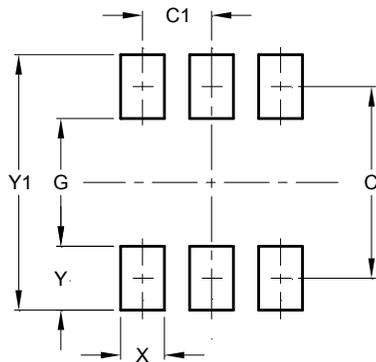


Package Outline Dimensions



SOT26			
Dim	Min	Max	Typ
A1	0.013	0.10	0.05
A2	1.00	1.30	1.10
A3	0.70	0.80	0.75
b	0.35	0.50	0.38
c	0.10	0.20	0.15
D	2.90	3.10	3.00
e	-	-	0.95
e1	-	-	1.90
E	2.70	3.00	2.80
E1	1.50	1.70	1.60
L	0.35	0.55	0.40
a	-	-	8°
a1	-	-	7°
All Dimensions in mm			

Suggested Pad Layout



Dimensions	Value (in mm)
C	2.40
C1	0.95
G	1.60
X	0.55
Y	0.80
Y1	3.20