20V BIPOLAR TRANSISTOR H-BRIDGE

Features

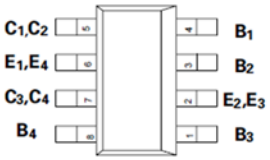
- Compact design
- Operates up to 20V supply
- 2.5A continuous rating
- NPN Transistor
  - BV_{CEO} > 20
  - Low Saturation Voltage $V_{CE(sat)}$ < 150mV @ 1A
- PNP Transistor
  - BV_{CEO} > -20V
  - Low Saturation Voltage $V_{CE(sat)}$ < -200mV @ -1A
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Mechanical Data

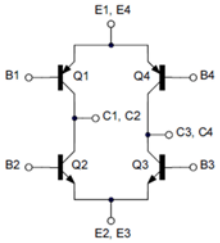
- Case: SM-8 (8 LEAD SOT223)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.117 grams (approximate)

SM-8

Top View



Top View
Pinout



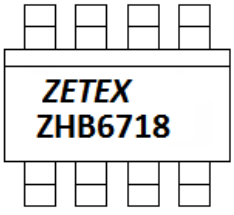
Equivalent Circuit

Ordering Information (Note 4)

Part Number	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZHB6718TA	ZHB6718	7	12	1,000
ZHB6718TC	ZHB6718	13	12	4,000

Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
2. See http://www.diodes.com/quality/lead_free.html 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/products/packages.html.

Marking Information



Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	NPN	PNP	Unit
Collector-Base Voltage	V_{CBO}	20	-20	V
Collector-Emitter Voltage	V_{CEO}	20	-20	V
Emitter-Base Voltage	V_{EBO}	7	-7	V
Continuous Collector Current	I_C	2.5	-2.5	A
Peak Pulse Current (Note 5)	I_{CM}	6	-6	A

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

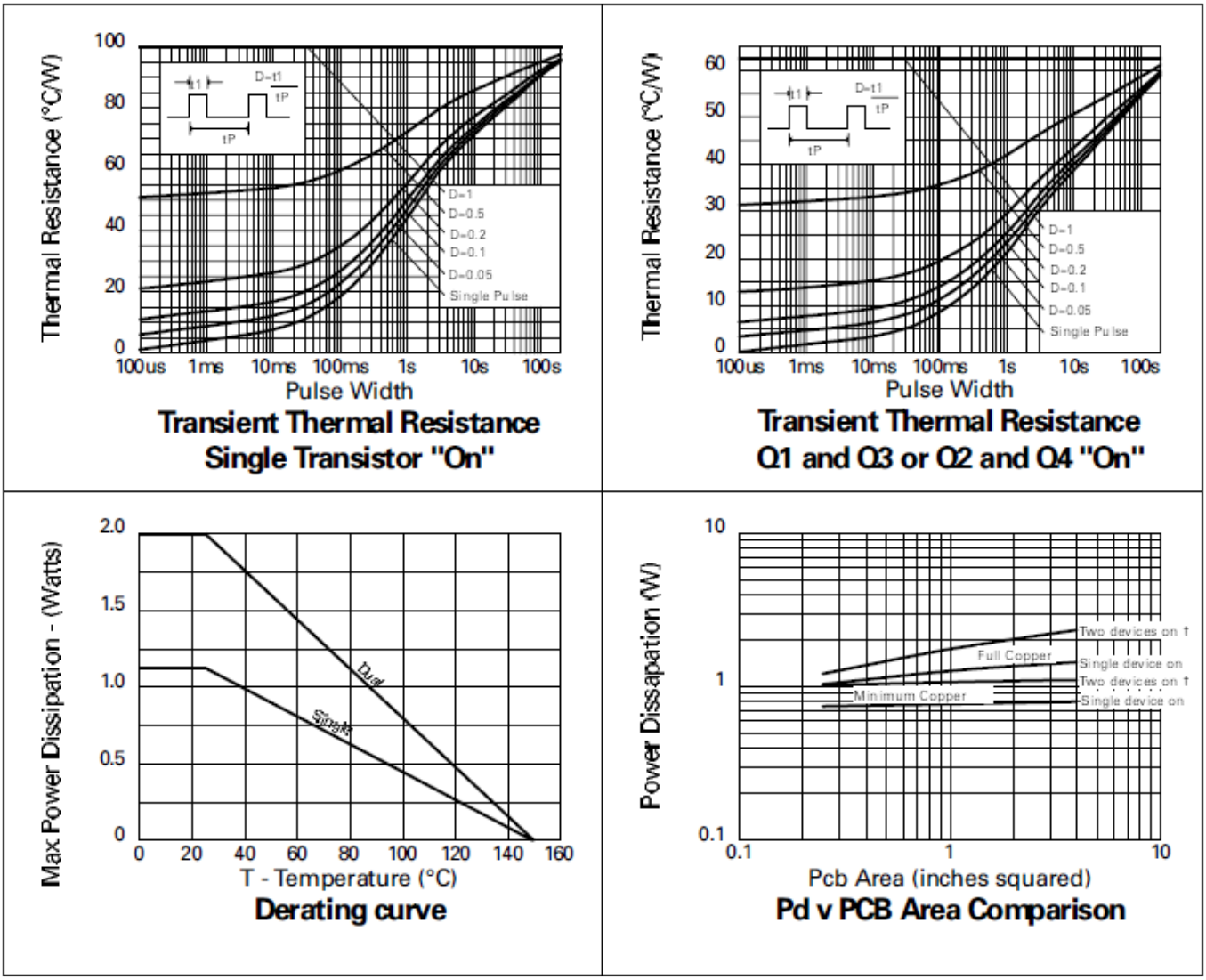
Characteristic		Symbol	Value	Unit
Collector Power Dissipation	(Note 5)	P_D	1.25	W
	(Note 6)		2	
Thermal Resistance, Junction to Ambient	(Note 5)	$R_{\theta JA}$	100	°C/W
	(Note 6)		62.5	
Operating and Storage Temperature Range		T_J,T_{STG}	-55 to +150	°C

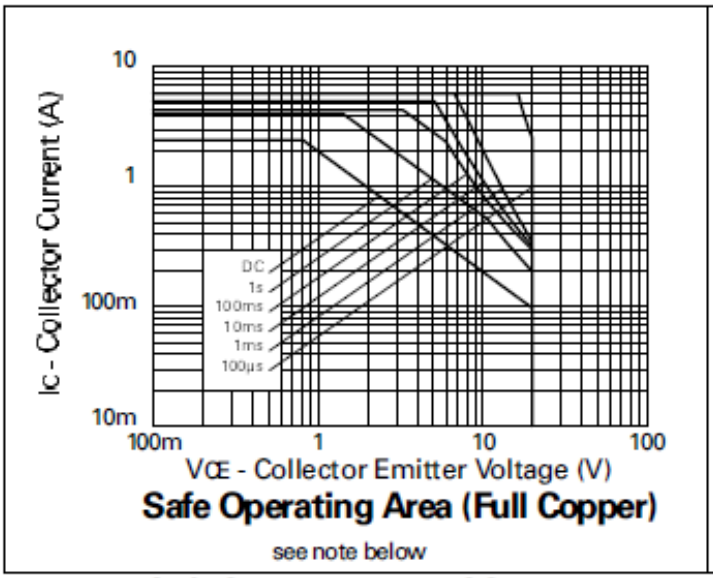
ESD Ratings (Note 7)

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:
5. For a device with any single die active and mounted with the collector lead on 25mm x 25mm 2oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in steady-state.
6. Same as note (5), except both Q1/Q3 active or Q2/Q4 active and equally sharing power.
7. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

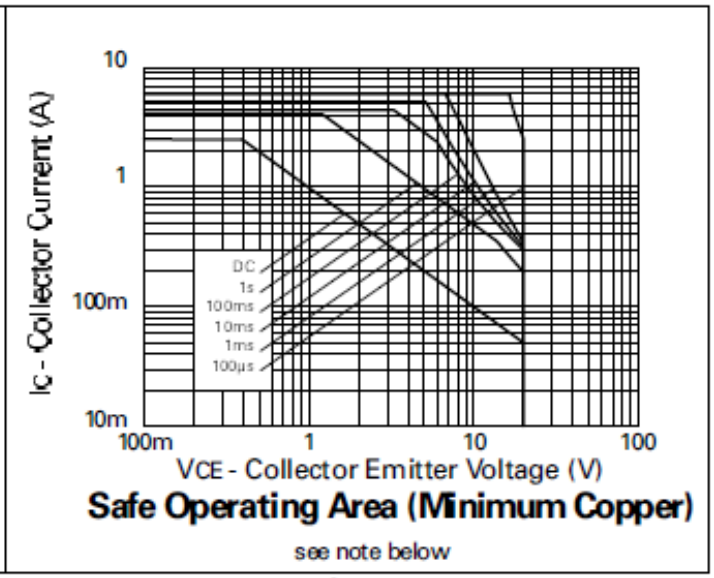
Thermal Characteristics and Derating Information





Safe Operating Area (Full Copper)

see note below



Safe Operating Area (Minimum Copper)

see note below

Note: The Safe Operating Area (SOA) charts shown are a combination of the worst case secondary breakdown characteristics for the NPN/PNP pair, and the thermal curves demonstrating the power dissipation capability of the energised ZHB part (opposing NPN-PNP switched on) when mounted on a 50mm x 50mm FR4 PCB. The two cases show:
i) full copper present and
ii) with minimal copper present - this being defined as an SM-8 footprint with 1.5mm tracks to the edge of the PCB.

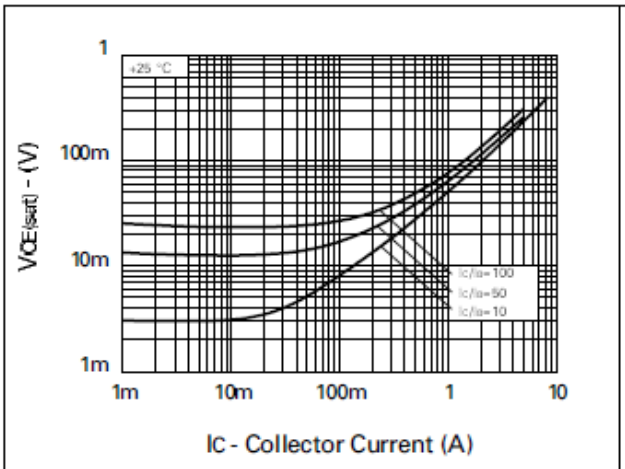
For example, on a 50mm x 50mm full copper PCB, the ZHB6718 will safely dissipate 2W under DC conditions, taking note of continuous current ratings and voltage limits. Higher powers can be tolerated for pulsed operation, while the shorter pulse widths (100µs and 1ms) being relevant for assessment of switching conditions.

NPN - Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

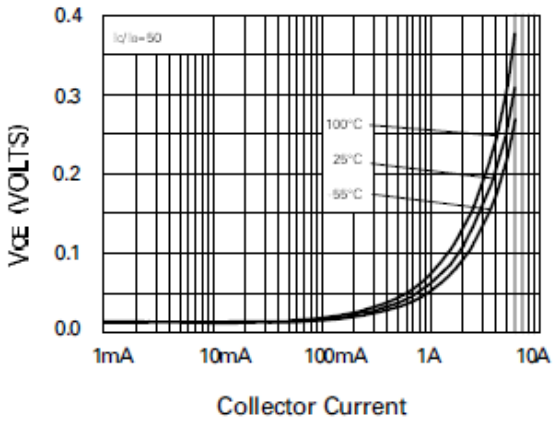
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV_{CBO}	20	100	—	V	I_C = 100μA
Collector-Emitter Breakdown Voltage (Note 8)	BV_{CEO}	20	27	—	V	I_C = 10mA
Emitter-Base Breakdown Voltage	BV_{EBO}	5	8.3	—	V	I_E = 100μA
Collector Cutoff Current	I_{CBO}	—	—	0.1	μA	V_{CB} = 16V
Emitter Cutoff Current	I_{EBO}	—	—	0.1	μA	V_{EB} = 4V
DC current transfer Static ratio (Note 8)	h_{FE}	200	400	—	—	I_C = 10mA, V_{CE} = 2V
		300	450	300		I_C = 100mA, V_{CE} = 2V
		200	360	—		I_C = 2A, V_{CE} = 2V
			180	—		I_C = 6A, V_{CE} = 2V
Collector-Emitter Saturation Voltage (Note 8)	$V_{CE(sat)}$	—	8	15	mV	I_C = 0.1A, I_B = 10mA
		—	70	150		I_C = 1A, I_B = 10mA
		—	130	200		I_C = 2.5A, I_B = 50mA
Base-Emitter Saturation Voltage (Note 8)	$V_{BE(sat)}$	—	0.89	1.0	V	I_C = 2.5A, I_B = 50mA
Base-Emitter Turn-on Voltage (Note 8)	$V_{BE(on)}$	—	079	—	V	I_C = 2.5A, V_{CE} = 2V
Transitional Frequency	f_T	100	140	—	MHz	I_C = 50mA, V_{CE} = 10V, f = 100MHz
Output capacitance	C_{obo}	—	23	30	pF	V_{CB} = 10V, f = 1MHz
Switching Time	t_{on}	—	170	—	ns	V_{CC} = 10V, I_C = 1A, I_{B1} = -I_{B2} = 10mA
	t_{off}	—	400	—	ns	

Note: 8. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

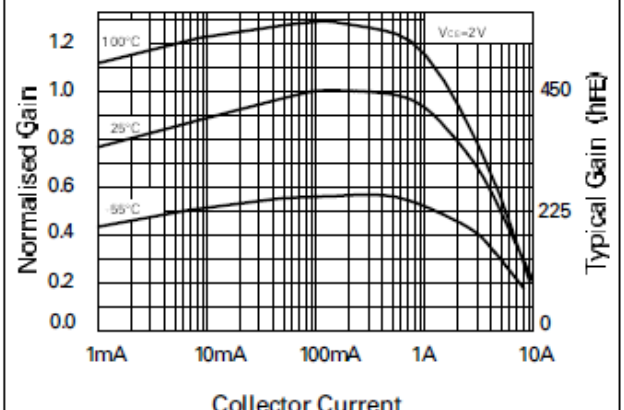
NPN – Typical Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)



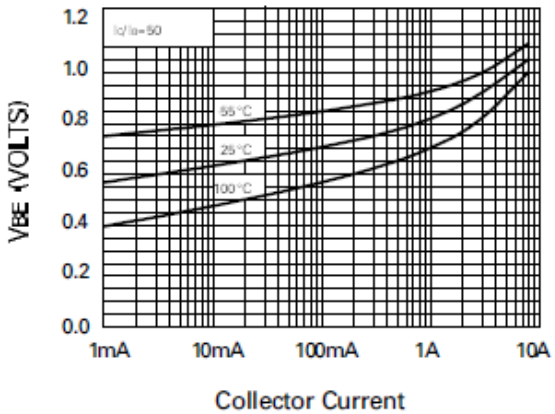
VCE(sat) v IC



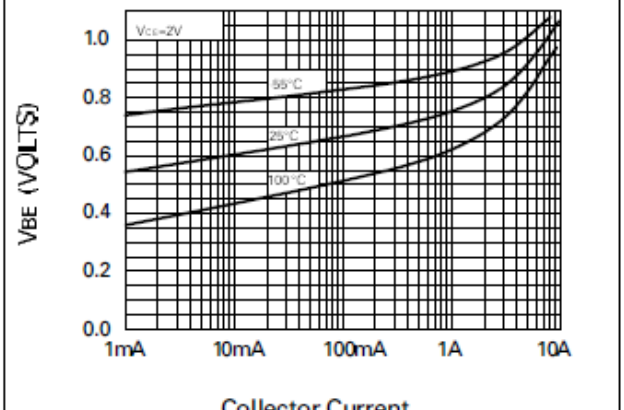
VCE(sat) vs IC



hFE vs IC



VBE(sat) vs IC



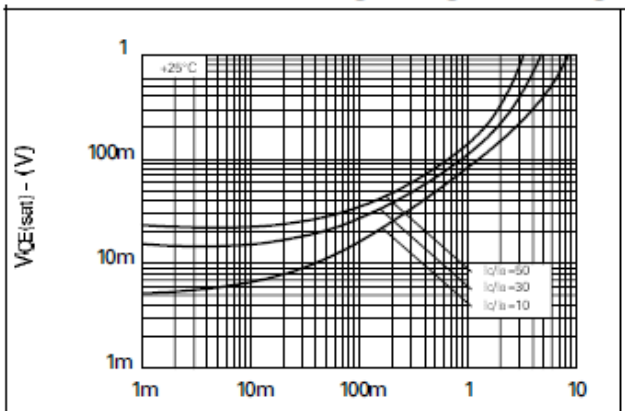
VBE(on) vs IC

PNP - Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

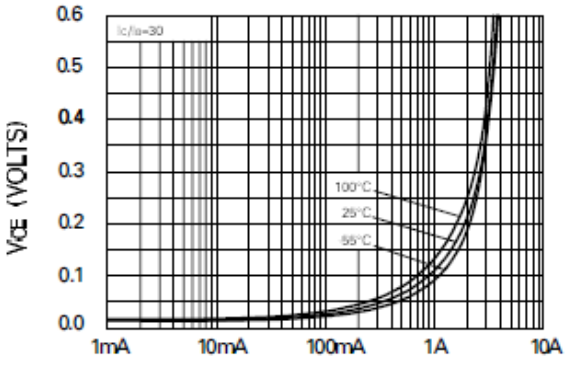
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV_{CBO}	-20	-65	—	V	I_C = -100μA
Collector-Emitter Breakdown Voltage (Note 8)	BV_{CEO}	-20	-55	—	V	I_C = -10mA
Emitter-Base Breakdown Voltage	BV_{EBO}	-5	-8.8	—	V	I_E = -100μA
Collector Cutoff Current	I_{CBO}	—	—	-0.1	μA	V_{CB} = -15V
Emitter Cutoff Current	I_{EBO}	—		-0.1	μA	V_{EB} = -4V
DC current transfer Static ratio (Note 8)	h_{FE}	300	475	—	—	I_C = -10mA, V_{CE} = -2V
		300	450	—		I_C = -100mA, V_{CE} = -2V
		150	230	—		I_C = -2A, V_{CE} = -2V
		35	70	—		I_C = -4A, V_{CE} = -2V
		—	30	—		I_C = -6A, V_{CE} = -2V
Collector-Emitter Saturation Voltage (Note 8)	$V_{CE(sat)}$	—	-16	-40	mV	I_C = -100mA, I_B = -10mA
		—	-130	-200		I_C = -1A, I_B = -20mA
			-190	-260		I_C = -2.5A, I_B = -200mA
Base-Emitter Saturation Voltage (Note 8)	$V_{BE(sat)}$	—	-0.98	-1.1	V	I_C = -2.5A, I_B = -200mA
Base-Emitter Turn-on Voltage (Note 8)	$V_{BE(on)}$	—	-0.85		V	I_C = -2.5A, V_{CE} = -2V
Transitional Frequency	f_T	150	180	—	MHz	I_C = -50mA, V_{CE} = -10V, f = 100MHz
Output capacitance	C_{obo}	—	21	30	pF	V_{CB} = -10V, f = 1MHz,
Switching Time	t_{on}	—	40	—	ns	V_{CC} = -10V, I_C = -1A,
	t_{off}		670		ns	I_{B1} = -I_{B2} = -20mA

Note: 8. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

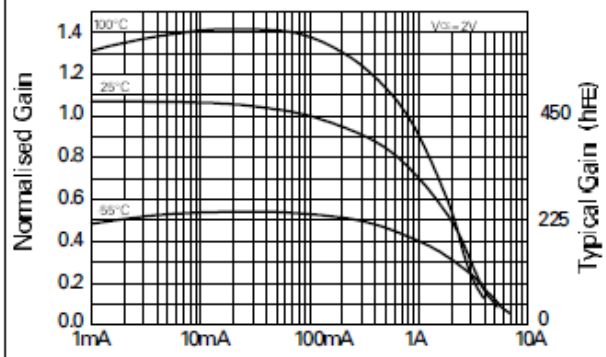
PNP – Typical Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)



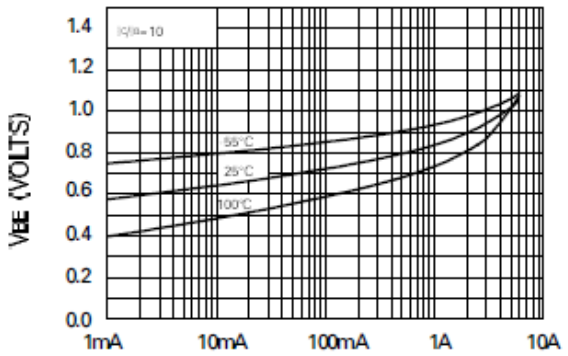
VCE(sat) v IC



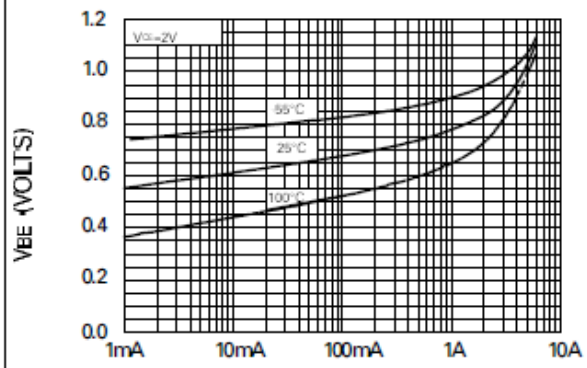
VCE(sat) vs IC



hFE vs IC



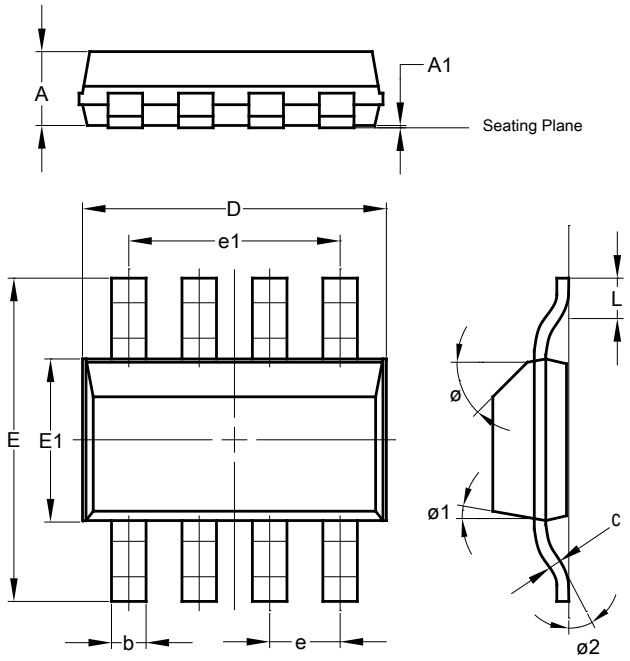
VBE(sat) vs IC



VBE(on) vs IC

Package Outline Dimensions

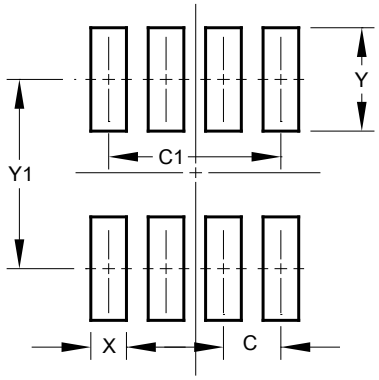
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



SM-8			
Dim	**Min**	**Max**	**Typ**
A	--	1.70	1.60
A1	0.02	0.10	0.04
b	0.70	0.90	0.80
c	0.24	0.32	0.28
D	6.30	6.70	6.60
e	1.53 REF		
e1	4.59 REF		
E	6.70	7.30	7.00
E1	3.30	3.70	3.50
L	0.75	1.00	0.90
Ø	--	--	45°
Ø1	--	15°	--
Ø2	--	--	10°
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)
C	1.52
C1	4.6
X	0.95
Y	2.80
Y1	6.80

Note: For high voltage applications, the appropriate industry sector guidelines should be considered with regards to creepage and clearance distances between device Terminals and PCB tracking.

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