

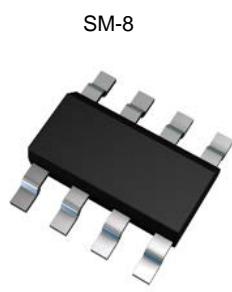


ZHB6718

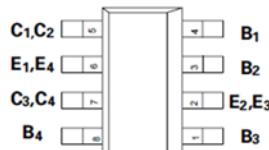
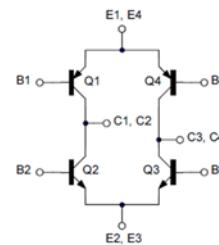
## 20V BIPOLAR TRANSISTOR H-BRIDGE

## 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)



Top View


Top View  
Pinout


Equivalent Circuit

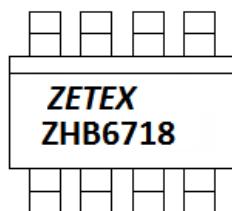
## Ordering Information (Note 4)

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

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

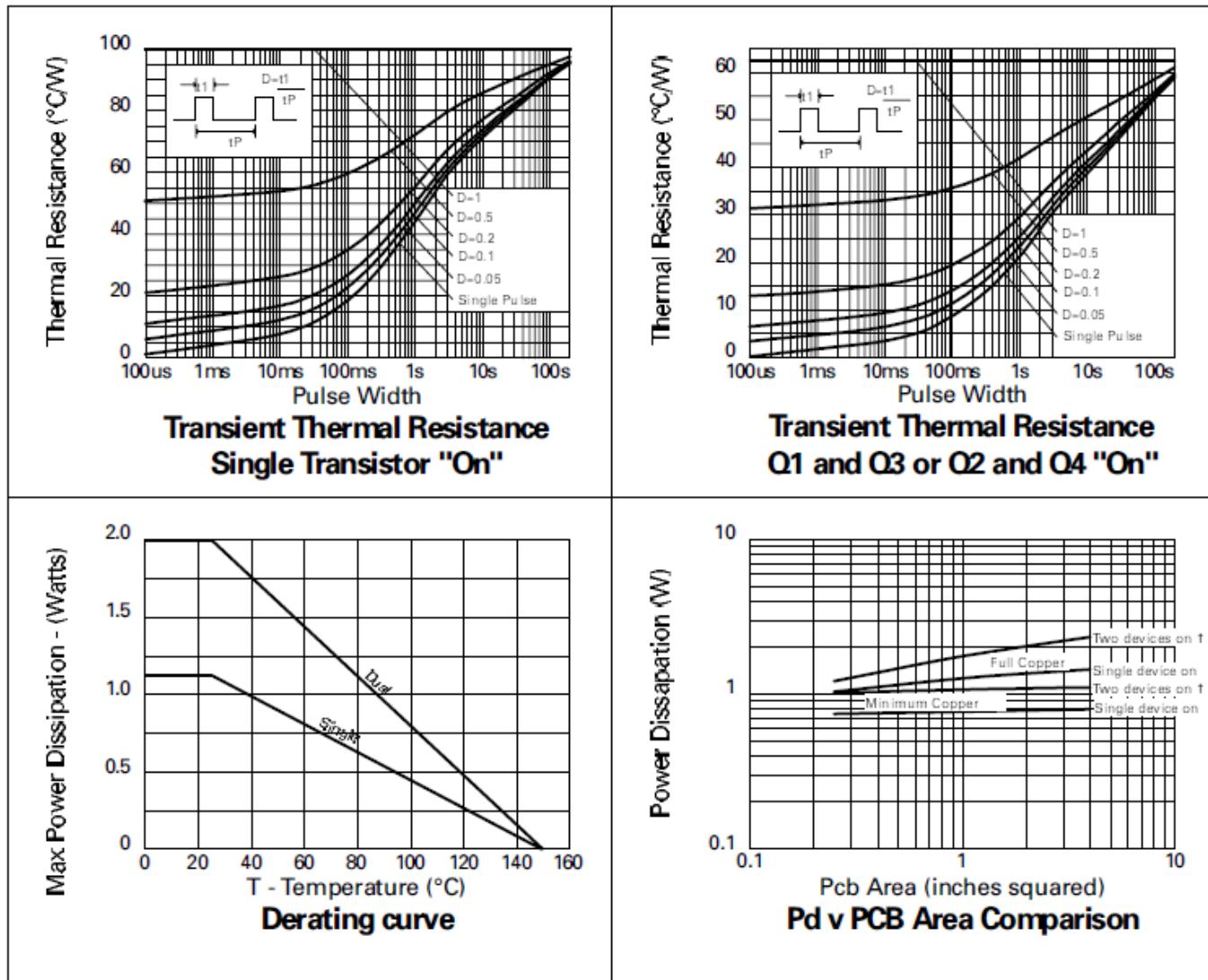
**ESD Ratings** (Note 7)

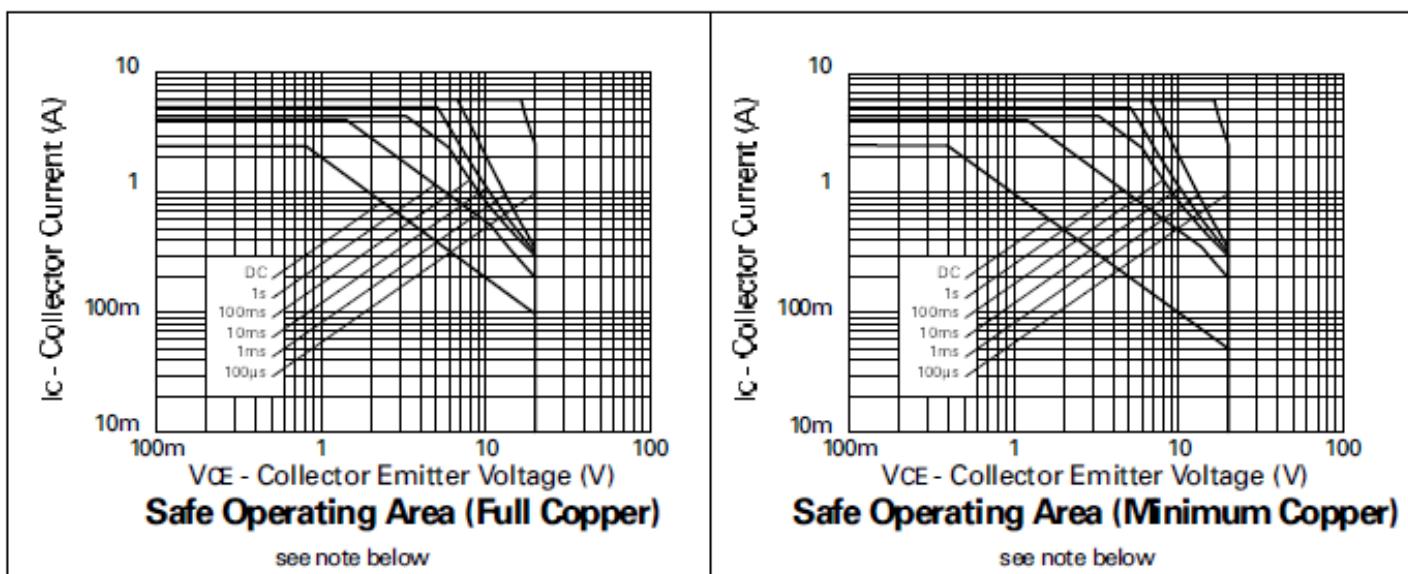
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

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





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:

- full copper present and
- with minimal copper present - this being defined as an SM-8 footprint with 1.5mm tracks to the edge of the PCB.

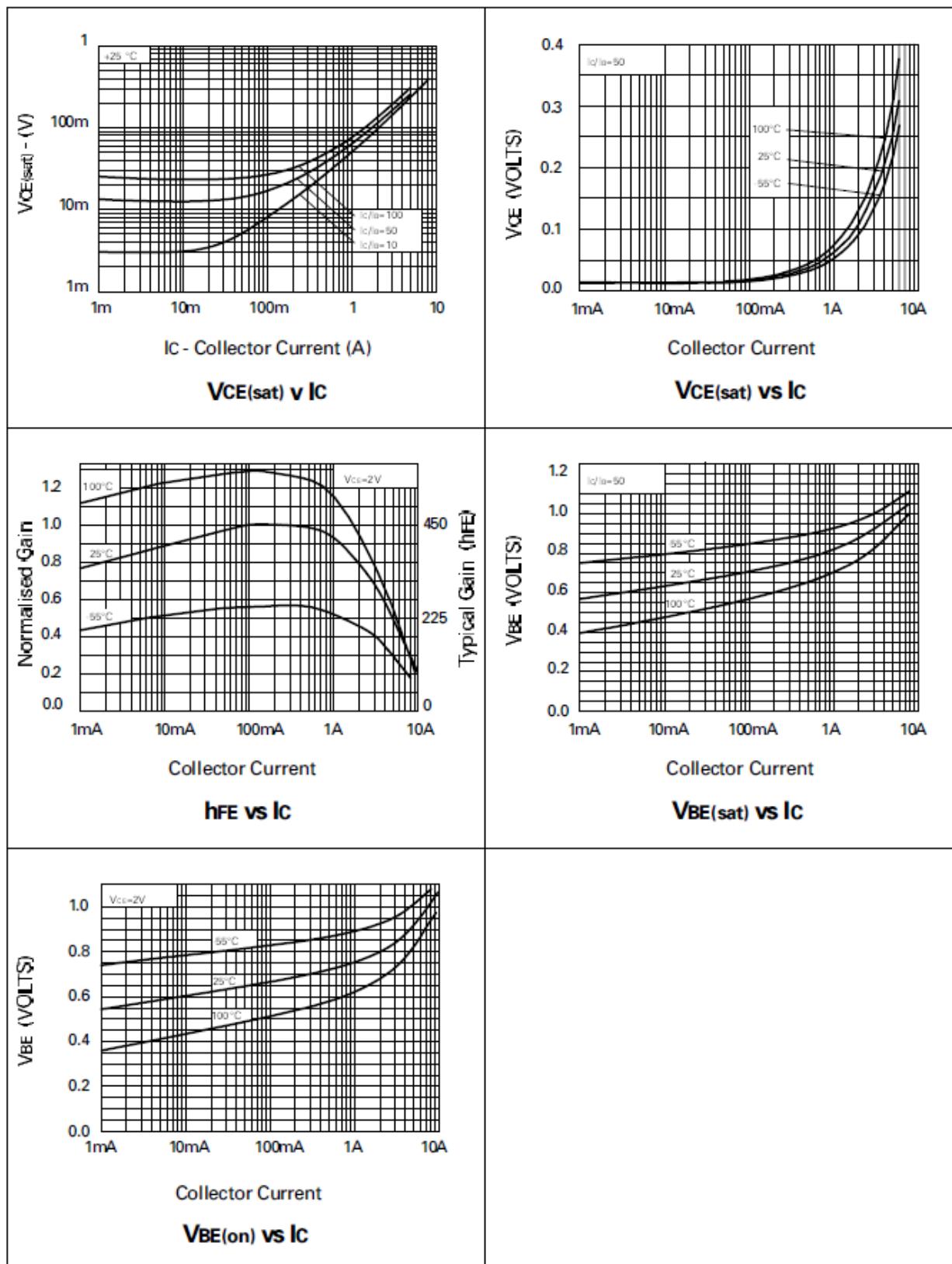
For example, on a 50mm x 50mm full copper PCB, the ZHB6718 will safely dissipate 2W under DC conditions, taking note of continuous current ratings and voltage limits. Higher powers can be tolerated for pulsed operation, while the shorter pulse widths (100μs and 1ms) being relevant for assessment of switching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

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

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

Note: 8. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

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

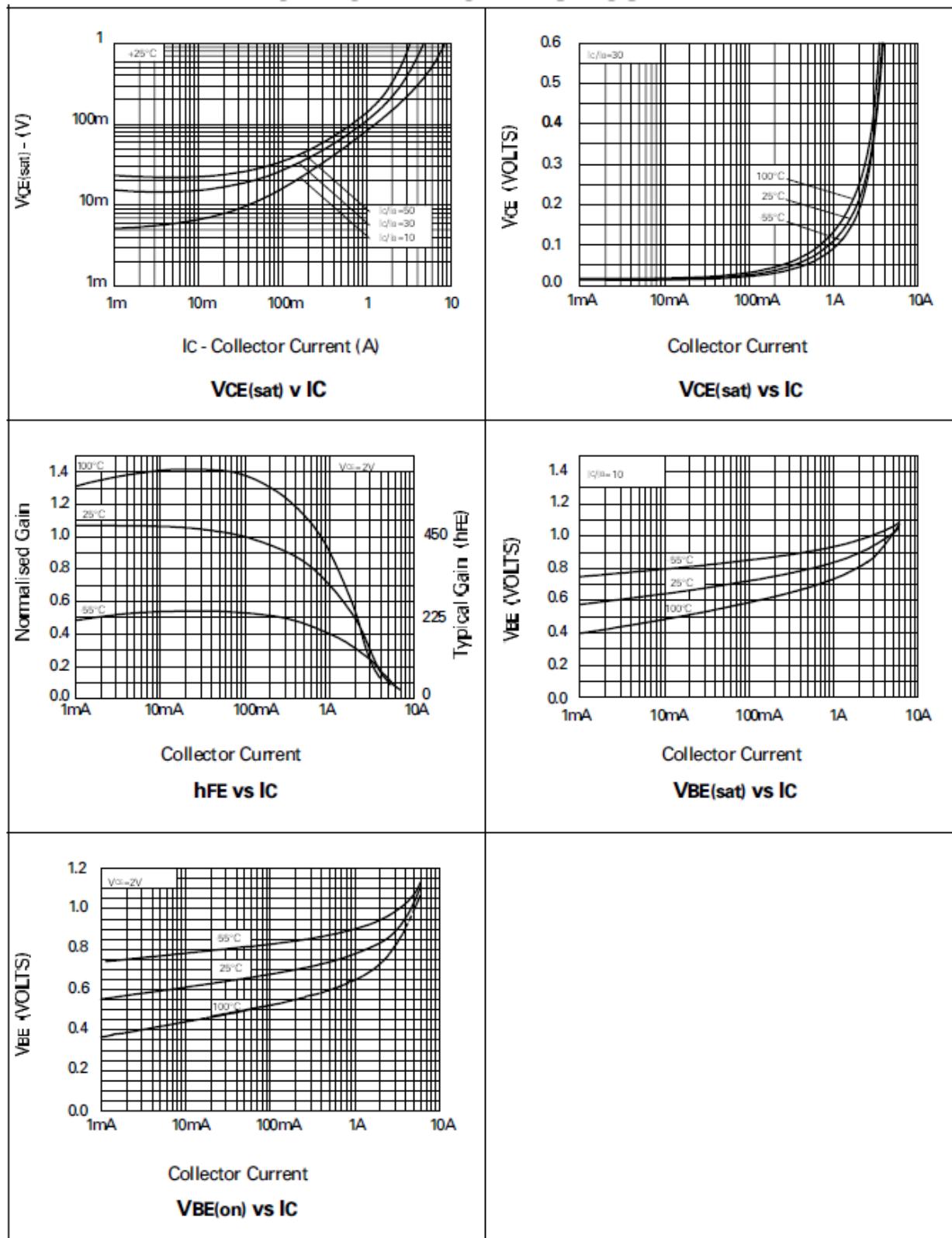


**PNP - Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

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

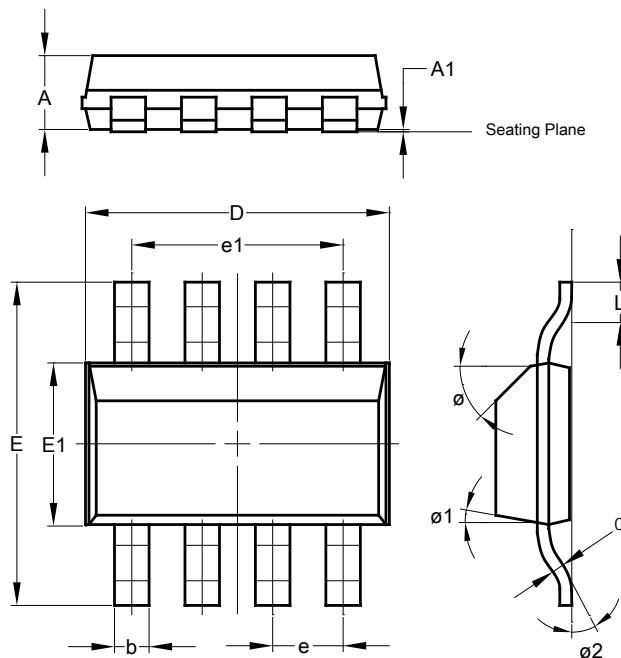
Note: 8. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

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



## Package Outline Dimensions

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

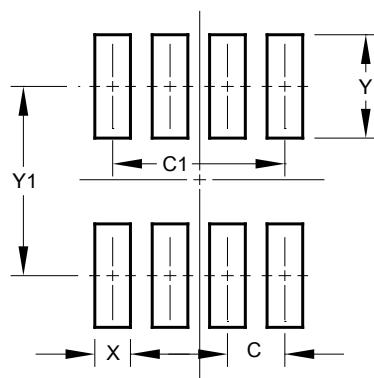


SM-8			
Dim	Min	Max	Typ
A	--	1.70	1.60
A1	0.02	0.10	0.04
b	0.70	0.90	0.80
c	0.24	0.32	0.28
D	6.30	6.70	6.60
e	1.53 REF		
e1	4.59 REF		
E	6.70	7.30	7.00
E1	3.30	3.70	3.50
L	0.75	1.00	0.90
Ø	--	--	45°
Ø1	--	15°	--
Ø2	--	--	10°

All Dimensions in mm

## Suggested Pad Layout

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