

Features

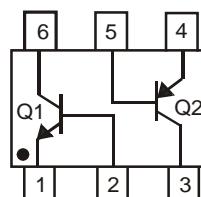
- Ultra Small Package
- Epitaxial Planar Die Construction
- Ideally Suited for Automated Assembly Processes
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Mechanical Data

- Case: SOT963
- 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 annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.0027 grams (approximate)



Top View



Device Schematic

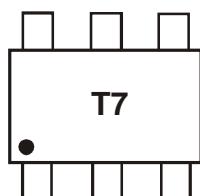
Ordering Information (Note 4)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
DST3946DPJ-7	T7	7	8	10,000

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



T7 = Product Type Marking Code

Maximum Ratings - NPN (Q1) (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CEO}	40	V
Emitter-Base Voltage	V_{EBO}	6.0	V
Collector Current	I_C	200	mA

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	-40	V
Collector-Emitter Voltage	V_{CEO}	-40	V
Emitter-Base Voltage	V_{EBO}	-5.0	V
Collector Current	I_C	-200	mA

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P_D	300	mW
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	417	°C/W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

Notes: 5. Device mounted on FR-4 PCB with minimum recommended pad layout.

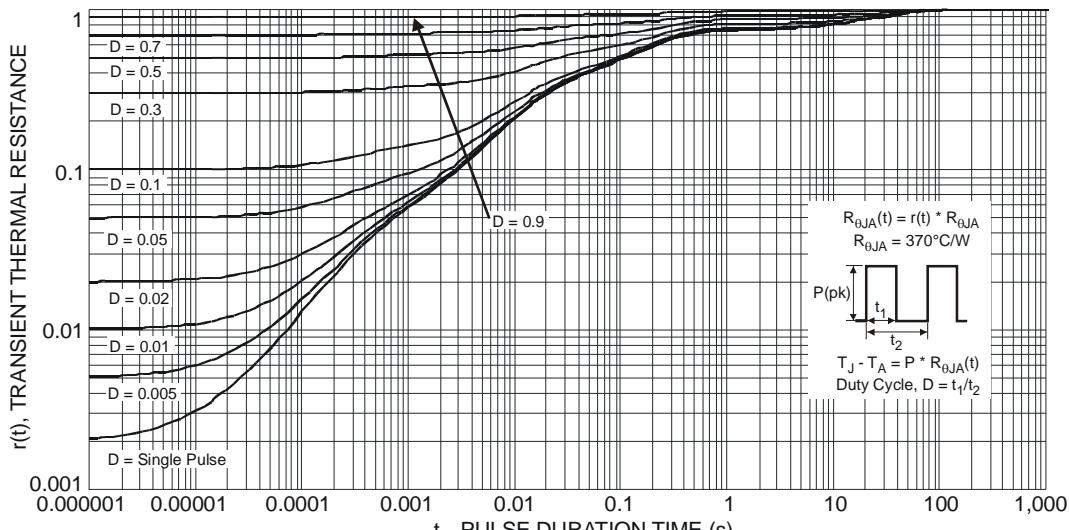


Fig. 1 Transient Thermal Response

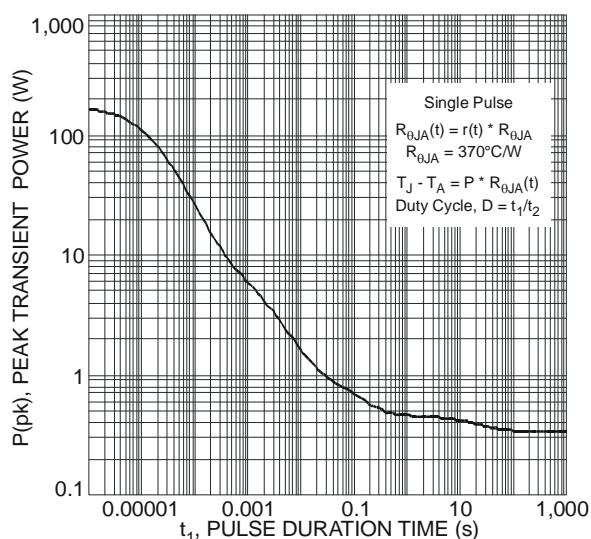


Fig. 2 Single Pulse Maximum Power Dissipation

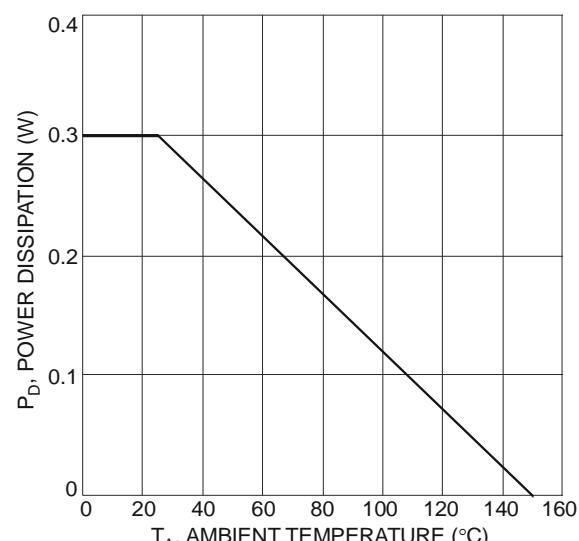


Fig. 3 Power Dissipation vs. Ambient Temperature

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

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)					
Collector-Base Breakdown Voltage	BV_{CBO}	60	—	V	$I_C = 10\mu\text{A}, I_E = 0$
Collector-Emitter Breakdown Voltage (Note 6)	BV_{CEO}	40	—	V	$I_C = 1.0\text{mA}, I_B = 0$
Emitter-Base Breakdown Voltage	BV_{EBO}	6.0	—	V	$I_E = 10\mu\text{A}, I_C = 0$
Collector Cutoff Current	I_{CEX}	—	50	nA	$V_{\text{CE}} = 30\text{V}, V_{\text{EB}(\text{OFF})} = 3.0\text{V}$
Base Cutoff Current	I_{BL}	—	50	nA	$V_{\text{CE}} = 30\text{V}, V_{\text{EB}(\text{OFF})} = 3.0\text{V}$
ON CHARACTERISTICS (Note 6)					
DC Current Gain	h_{FE}	40 70 100 60 30	300	—	$I_C = 100\mu\text{A}, V_{\text{CE}} = 1.0\text{V}$ $I_C = 1.0\text{mA}, V_{\text{CE}} = 1.0\text{V}$ $I_C = 10\text{mA}, V_{\text{CE}} = 1.0\text{V}$ $I_C = 50\text{mA}, V_{\text{CE}} = 1.0\text{V}$ $I_C = 100\text{mA}, V_{\text{CE}} = 1.0\text{V}$
Collector-Emitter Saturation Voltage	$V_{\text{CE}(\text{sat})}$	—	0.20 0.30	V	$I_C = 10\text{mA}, I_B = 1.0\text{mA}$ $I_C = 50\text{mA}, I_B = 5.0\text{mA}$
Base-Emitter Saturation Voltage	$V_{\text{BE}(\text{sat})}$	0.65	0.85 0.95	V	$I_C = 10\text{mA}, I_B = 1.0\text{mA}$ $I_C = 50\text{mA}, I_B = 5.0\text{mA}$
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{obo}	—	4.0	pF	$V_{\text{CB}} = 5.0\text{V}, f = 1.0\text{MHz}, I_E = 0$
Input Capacitance	C_{ibo}	—	8.5	pF	$V_{\text{EB}} = 0.5\text{V}, f = 1.0\text{MHz}, I_C = 0$
Input Impedance	h_{ie}	1.0	10	k Ω	
Voltage Feedback Ratio	h_{re}	0.5	8.0	$\times 10^{-4}$	
Small Signal Current Gain	h_{fe}	100	400	—	
Output Admittance	h_{oe}	1.0	40	μS	
Current Gain-Bandwidth Product	f_T	300	—	MHz	$V_{\text{CE}} = 20\text{V}, I_C = 10\text{mA}, f = 100\text{MHz}$
SWITCHING CHARACTERISTICS					
Delay Time	t_d	—	35	ns	$V_{\text{CC}} = 3.0\text{V}, I_C = 10\text{mA},$
Rise Time	t_r	—	35	ns	$V_{\text{BE}(\text{off})} = -0.5\text{V}, I_{B1} = 1.0\text{mA}$
Storage Time	t_s	—	200	ns	$V_{\text{CC}} = 3.0\text{V}, I_C = 10\text{mA},$
Fall Time	t_f	—	50	ns	$I_{B1} = I_{B2} = 1.0\text{mA}$

Notes: 6. Short duration pulse test used to minimize self-heating effect.

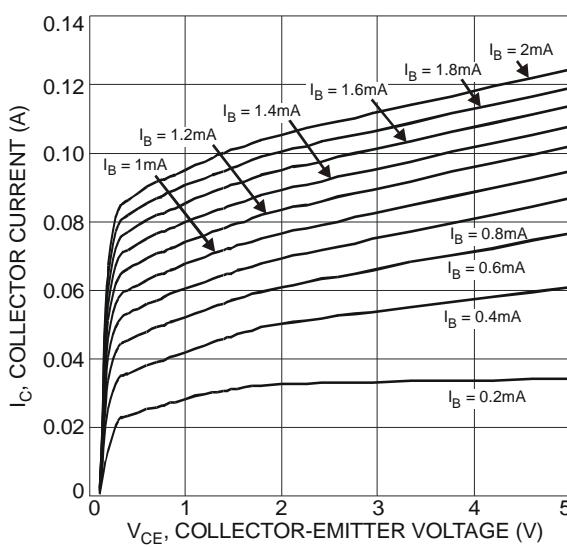


Fig. 4 Typical Collector Current vs. Collector-Emitter Voltage

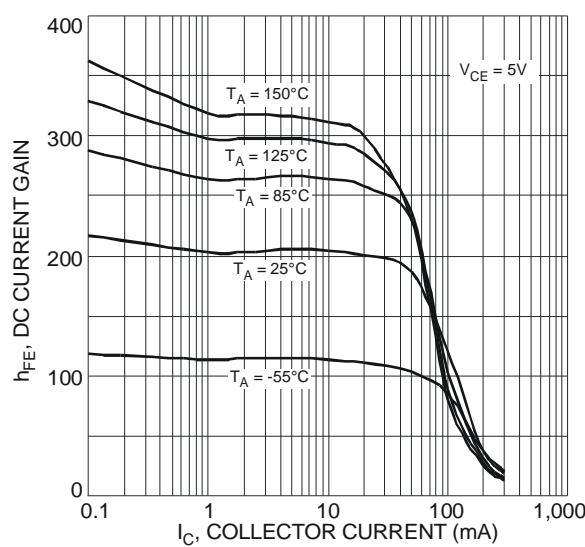


Fig. 5 Typical DC Current Gain vs. Collector Current

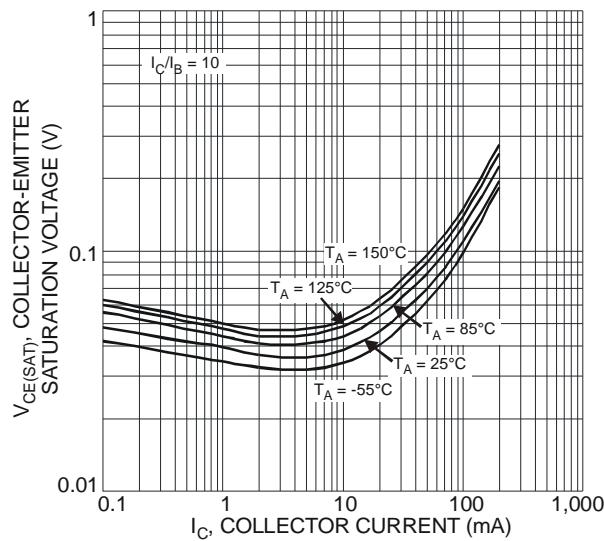


Fig. 6 Typical Collector-Emitter Saturation Voltage vs. Collector Current

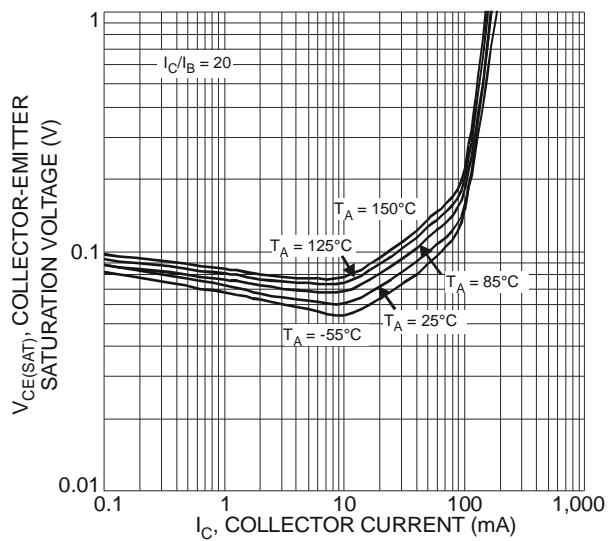


Fig. 7 Typical Collector-Emitter Saturation Voltage vs. Collector Current

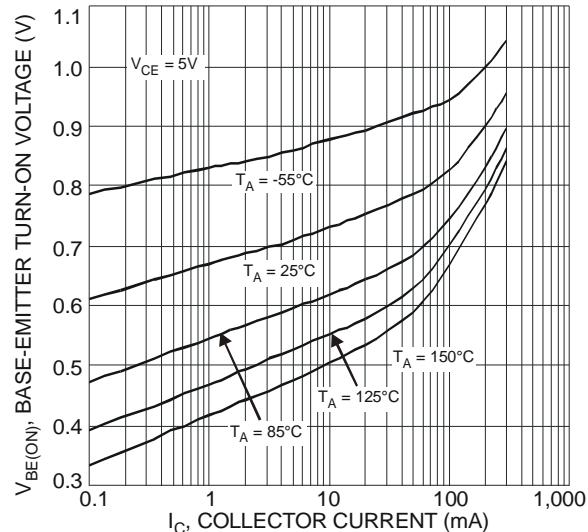


Fig. 8 Typical Base-Emitter Turn-On Voltage vs. Collector Current

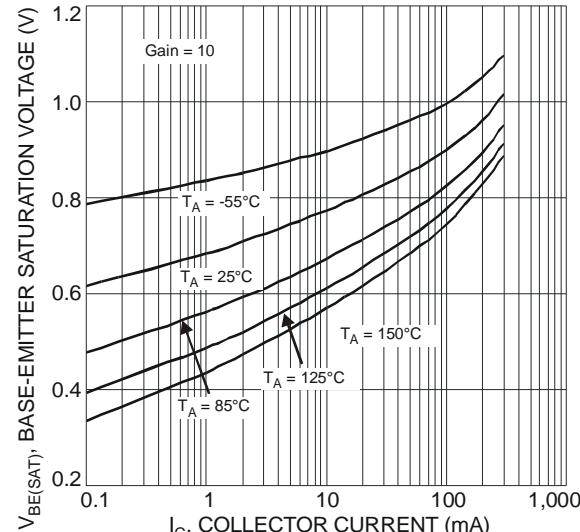


Fig. 9 Typical Base-Emitter Saturation Voltage vs. Collector Current

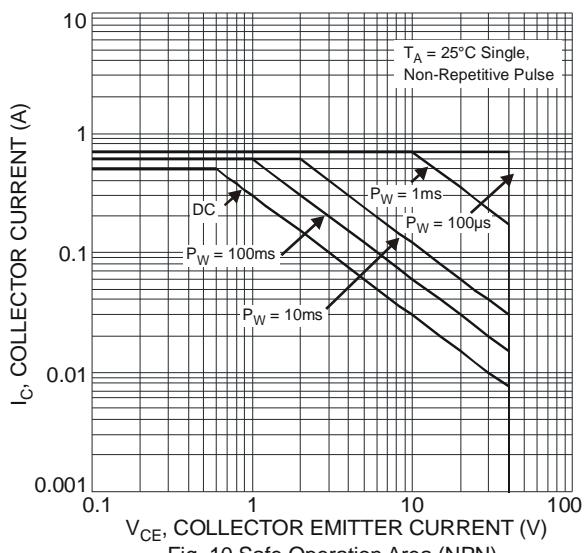
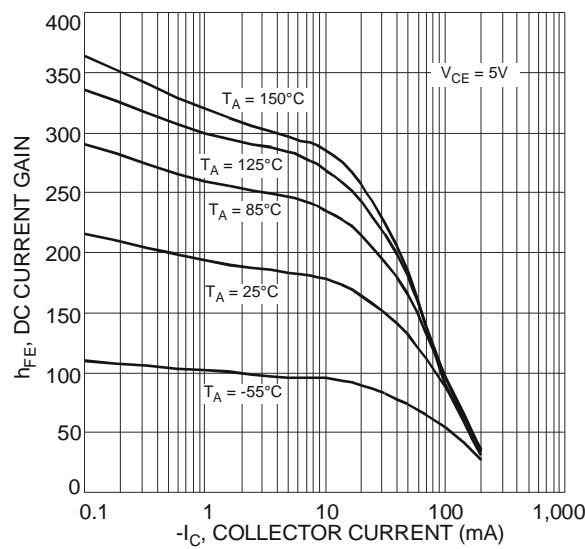
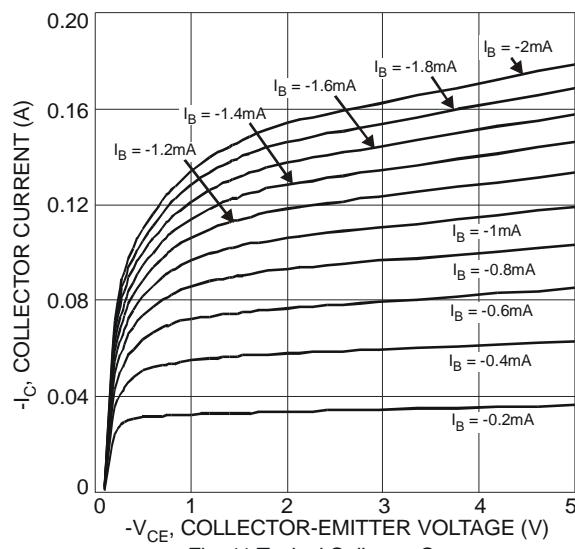


Fig. 10 Safe Operation Area (NPN)

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

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS					
Collector-Base Breakdown Voltage	BV_{CBO}	-40	—	V	$I_C = -10\mu\text{A}, I_E = 0$
Collector-Emitter Breakdown Voltage (Note 7)	BV_{CEO}	-40	—	V	$I_C = -1.0\text{mA}, I_B = 0$
Emitter-Base Breakdown Voltage	BV_{EBO}	-5.0	—	V	$I_E = -10\mu\text{A}, I_C = 0$
Collector Cutoff Current	I_{CEX}	—	-50	nA	$V_{\text{CE}} = -30\text{V}, V_{\text{EB(OFF)}} = -3.0\text{V}$
	I_{CBO}	—	-50	nA	$V_{\text{CE}} = -30\text{V}, I_E = 0$
Base Cutoff Current	I_{BL}	—	-50	nA	$V_{\text{CE}} = -30\text{V}, V_{\text{EB(OFF)}} = -3.0\text{V}$
ON CHARACTERISTICS (Note 7)					
DC Current Gain	h_{FE}	60 80 100 60 30	— — 300 — —	—	$I_C = -100\mu\text{A}, V_{\text{CE}} = -1.0\text{V}$ $I_C = -1.0\text{mA}, V_{\text{CE}} = -1.0\text{V}$ $I_C = -10\text{mA}, V_{\text{CE}} = -1.0\text{V}$ $I_C = -50\text{mA}, V_{\text{CE}} = -1.0\text{V}$ $I_C = -100\text{mA}, V_{\text{CE}} = -1.0\text{V}$
Collector-Emitter Saturation Voltage	$V_{\text{CE(sat)}}$	—	-0.25 -0.40	V	$I_C = -10\text{mA}, I_B = -1.0\text{mA}$ $I_C = -50\text{mA}, I_B = -5.0\text{mA}$
Base-Emitter Saturation Voltage	$V_{\text{BE(sat)}}$	-0.65 —	-0.85 -0.95	V	$I_C = -10\text{mA}, I_B = -1.0\text{mA}$ $I_C = -50\text{mA}, I_B = -5.0\text{mA}$
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{obo}	—	4.5	pF	$V_{\text{CB}} = -5.0\text{V}, f = 1.0\text{MHz}, I_E = 0$
Input Capacitance	C_{ibo}	—	10	pF	$V_{\text{EB}} = -0.5\text{V}, f = 1.0\text{MHz}, I_C = 0$
Input Impedance	h_{ie}	2.0	12	k Ω	
Voltage Feedback Ratio	h_{re}	0.1	10	$\times 10^{-4}$	
Small Signal Current Gain	h_{fe}	100	400	—	$V_{\text{CE}} = 10\text{V}, I_C = 1.0\text{mA}, f = 1.0\text{kHz}$
Output Admittance	h_{oe}	3.0	60	μS	
Current Gain-Bandwidth Product	f_T	300	—	MHz	$V_{\text{CE}} = -20\text{V}, I_C = -10\text{mA}, f = 100\text{MHz}$
SWITCHING CHARACTERISTICS					
Delay Time	t_d	—	35	ns	$V_{\text{CC}} = -3.0\text{V}, I_C = -10\text{mA},$
Rise Time	t_r	—	35	ns	$V_{\text{BE(off)}} = 0.5\text{V}, I_{\text{B1}} = -1.0\text{mA}$
Storage Time	t_s	—	225	ns	$V_{\text{CC}} = -3.0\text{V}, I_C = -10\text{mA},$
Fall Time	t_f	—	75	ns	$I_{\text{B1}} = I_{\text{B2}} = -1.0\text{mA}$

Notes: 7. Short duration pulse test used to minimize self-heating effect.



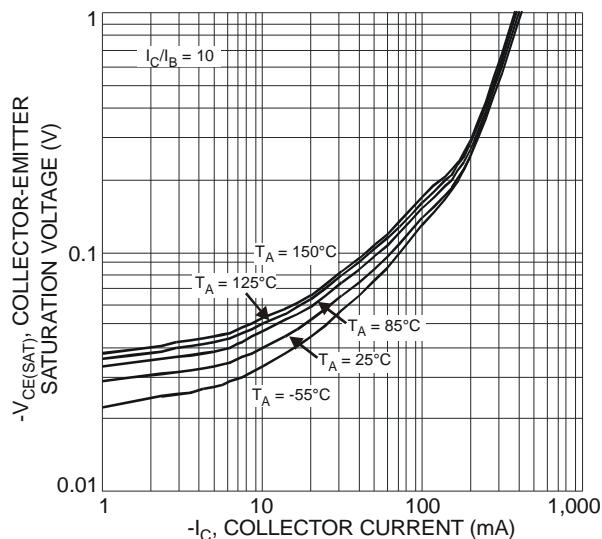


Fig. 13 Typical Collector-Emitter Saturation Voltage vs. Collector Current

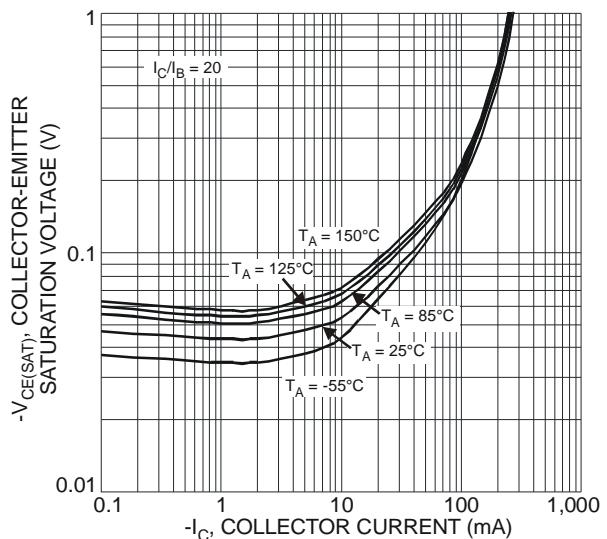


Fig. 14 Typical Collector-Emitter Saturation Voltage vs. Collector Current

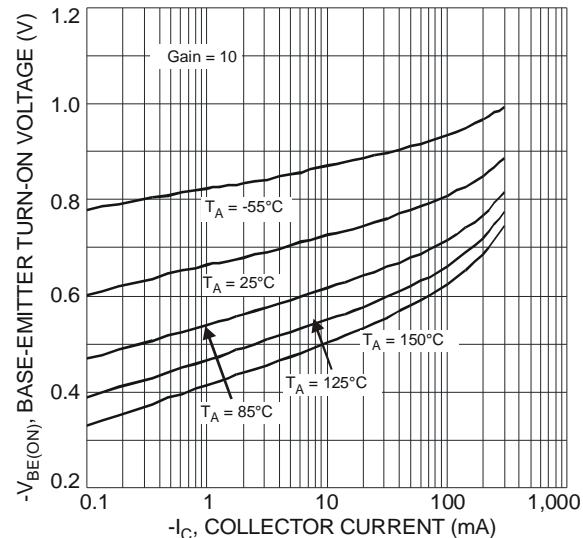


Fig. 15 Typical Base-Emitter Saturation Voltage vs. Collector Current

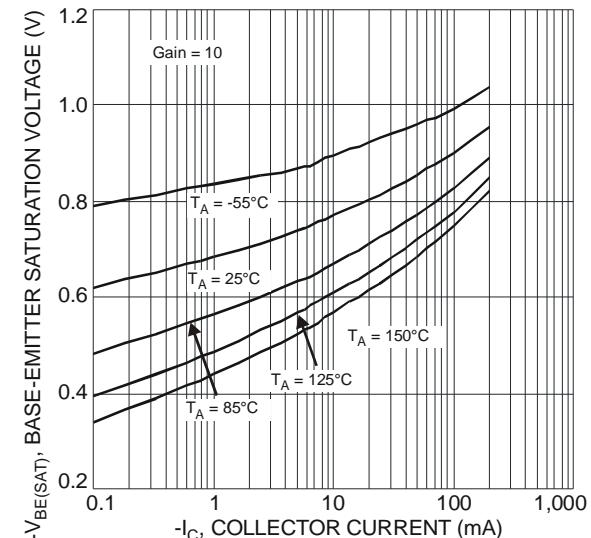


Fig. 16 Typical Base-Emitter Saturation Voltage vs. Collector Current

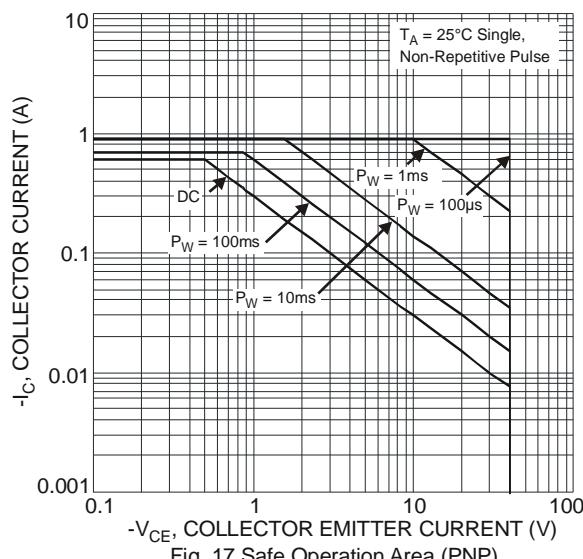
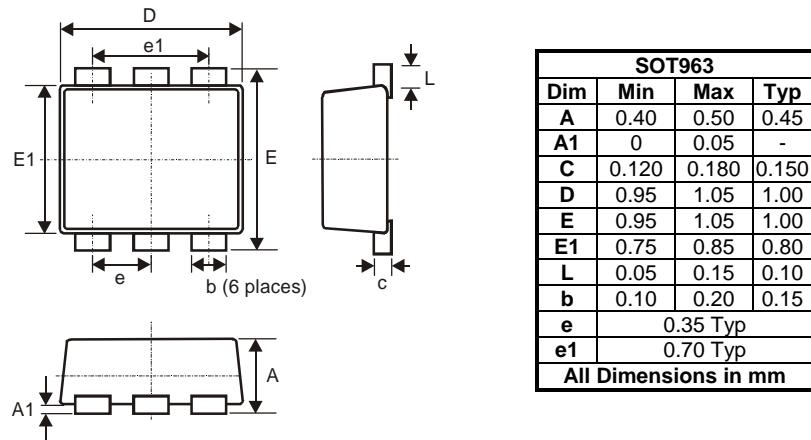


Fig. 17 Safe Operation Area (PNP)

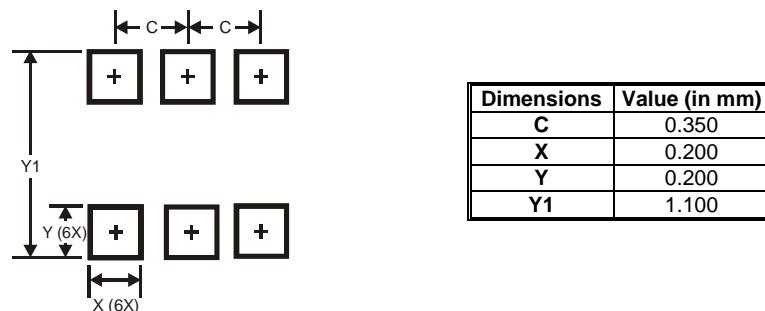
Package Outline Dimensions

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



Suggested Pad Layout

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



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