450V NPN HIGH-VOLTAGE POWER TRANSISTOR IN TO252

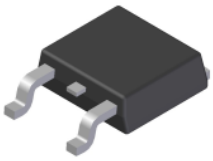
Features

- BV_{CEO} > 450V
- BV_{CES} > 700V
- BV_{EBO} > 9V
- I_C = 1.5A High Continuous Collector Current
- Integrated Anti-Parallel Diode to Act as Free-Wheeling Diode
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

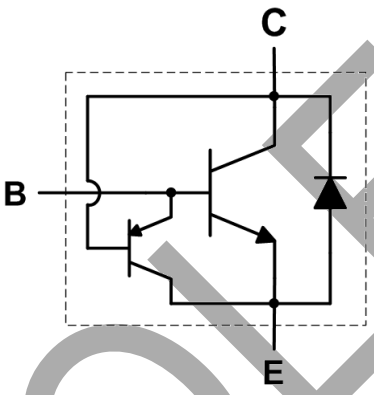
Mechanical Data

- Package: TO252
- Package 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: 0.34 grams (Approximate)

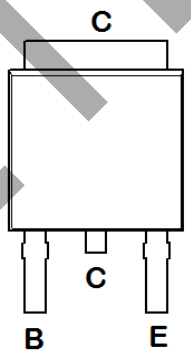
TO252 (DPAK)



Top View



Device Schematic



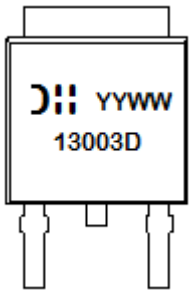
Top View
Pin-Out

Ordering Information (Note 4)

Part Number	Package	Marking	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty.	Carrier
DXT13003DK-13	TO252 (DPAK)	13003D	13	16	2,500	Reel

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ 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 https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information



13003D = Product Type Marking Code
= Manufacturer's Code Marking
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 23 = 2023)
WW = Week Code (01 to 53)

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

Characteristic	Symbol	Value	Unit
Collector-Emitter Voltage (V_{BE} = 0V)	V_{CES}	700	V
Collector-Emitter Voltage	V_{CEO}	450	V
Emitter-Base Voltage	V_{EBO}	9	V
Continuous Collector Current	I_C	1.5	A
Peak Pulse Collector Current (Note 5)	I_{CM}	3	A
Continuous Base Current	I_B	0.75	A
Peak Pulse Base Current (Note 5)	I_{BM}	1.5	A

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

Characteristic		Symbol	Value	Unit
Power Dissipation	(Note 6)	P_D	3.9	W
	(Note 7)		2.5	
	(Note 8)		2.1	
	(Note 9)		1.6	
Thermal Resistance, Junction to Ambient Air	(Note 6)	$R_{\theta JA}$	32	°C/W
	(Note 7)		51	
	(Note 8)		59	
	(Note 9)		80	
Thermal Resistance, Junction to Leads	(Note 10)	$R_{\theta JL}$	3	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

ESD Ratings (Note 11)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	8,000	V	3B
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

Notes:
5. Pulse test for pulse width < 5ms, duty cycle ≤ 10%.
6. For a device mounted with the exposed collector pad on 50mm x 50mm 2oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in a steady state.
7. Same as Note 6, except the device is surface mounted on 25mm x 25mm 2oz copper.
8. Same as Note 6, except the device is surface mounted on 25mm x 25mm 1oz copper.
9. Same as Note 6, except mounted on minimum recommended pad (MRP) layout.
10. Thermal resistance from junction to solder-point (on the exposed collector pad).
11. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristics and Derating Information

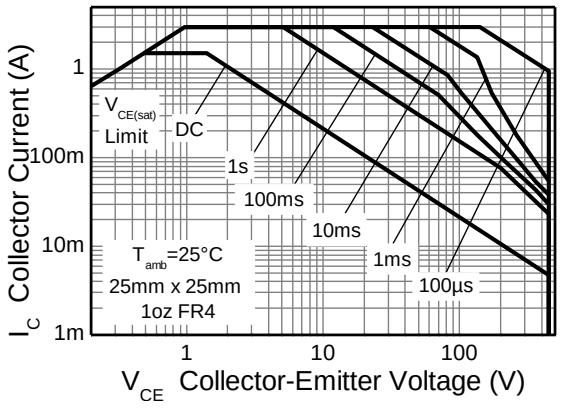


Figure 1. Safe Operating Area

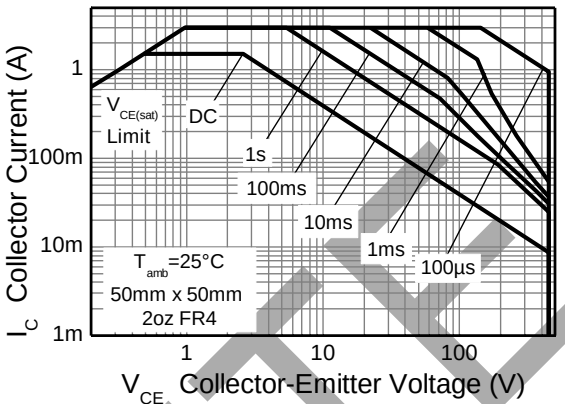


Figure 2. Safe Operating Area

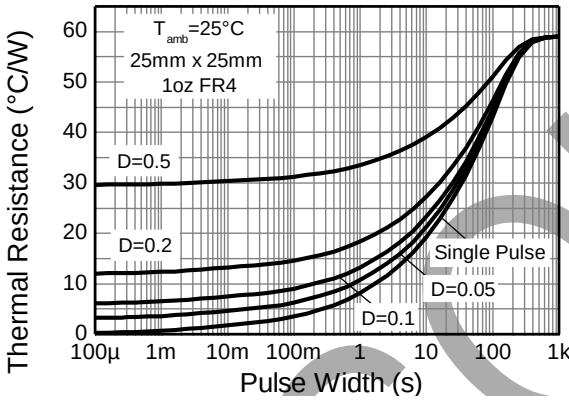


Figure 3. Transient Thermal Impedance

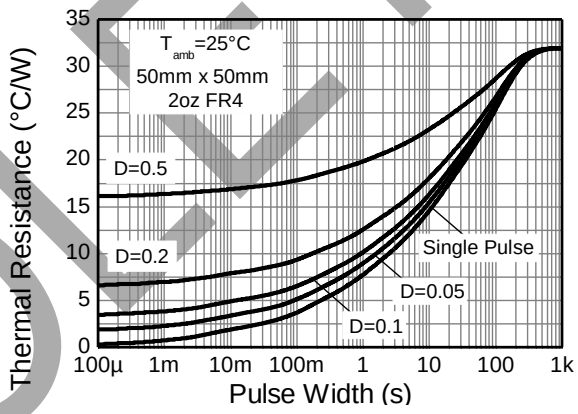


Figure 4. Transient Thermal Impedance

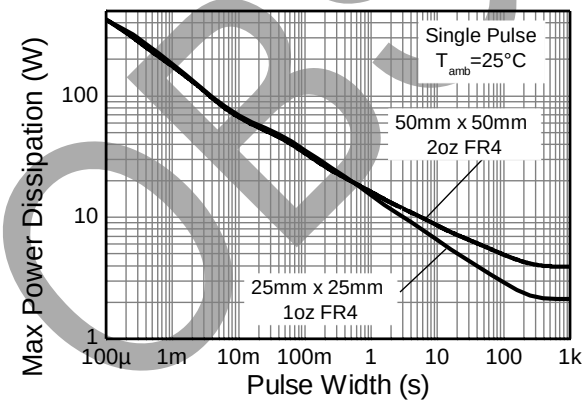


Figure 5. Pulse Power Dissipation

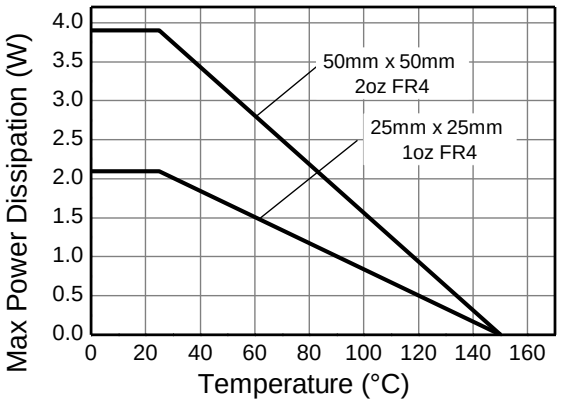


Figure 6. Derating Curve

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Emitter Breakdown Voltage	BV_{CES}	700	—	—	V	I_C = 100μA, V_{BE} = 0V
Collector-Emitter Breakdown Voltage	BV_{CEO}	450	—	—	V	I_C = 100μA
Emitter-Base Breakdown Voltage	BV_{EBO}	9	—	—	V	I_E = 100μA
Collector Cutoff Current	I_{CEV}	—	—	10	μA	V_{CE} = 700V, V_{BE} = -1.5V
DC Current Transfer Static Ratio (Note 12)	h_{FE}	20 16 5	— — —	40 30 25	—	I_C = 20mA, V_{CE} = 10V I_C = 0.5A, V_{CE} = 2V I_C = 1.0A, V_{CE} = 2V
Collector-Emitter Saturation Voltage (Note 12)	$V_{CE(sat)}$	— —	— —	0.3 0.4	V	I_C = 0.5A, I_B = 0.1A I_C = 1A, I_B = 0.25A
Base-Emitter Saturation Voltage (Note 12)	$V_{BE(sat)}$	— —	— —	1.0 1.2	V	I_C = 0.5A, I_B = 0.1A I_C = 1A, I_B = 0.25A
Output Capacitance	C_{ob}	—	18	—	pF	V_{CB} = 10V, f = 0.1MHz
Transition Frequency	f_T	4	—	—	MHz	I_C = 0.1A, V_{CE} = 10V
Turn-on Time with Resistive Load	t_{on}	—	0.35	—	μs	I_C = 1A, V_{CC} = 125V, I_{B1} = 0.2A I_{B2} = -0.2A
Storage Time with Resistive Load	t_s	—	2.31	—		
Fall Time with Resistive Load	t_f	—	0.21	—		

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

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

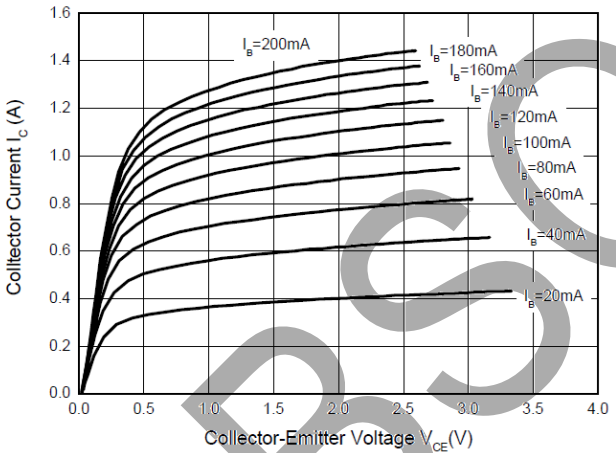


Figure 7. Static Characteristics

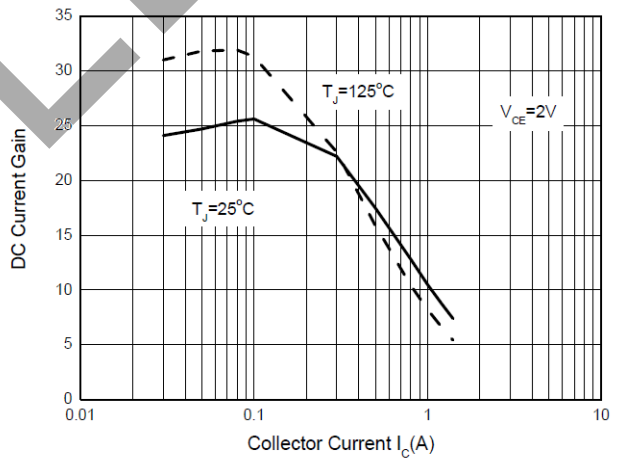


Figure 8. DC Current Gain

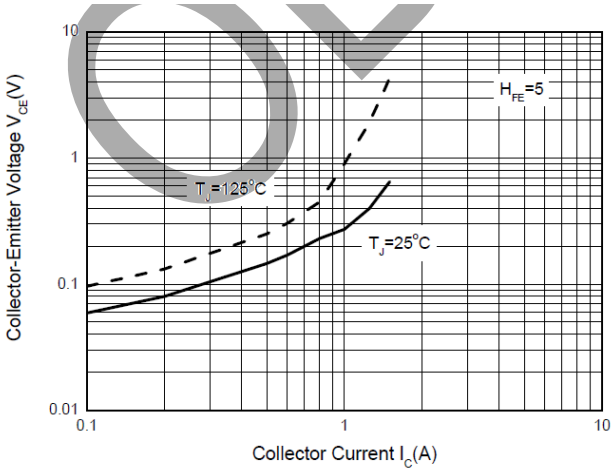


Figure 9. Collector-Emitter Saturation Region

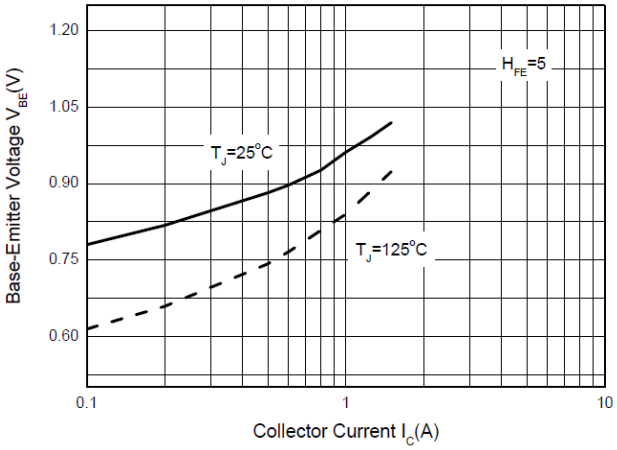
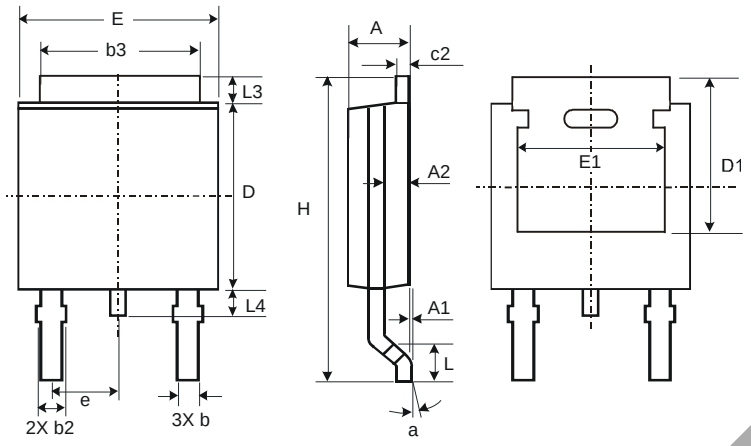


Figure 10. Base-Emitter Saturation Voltage

Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

TO252

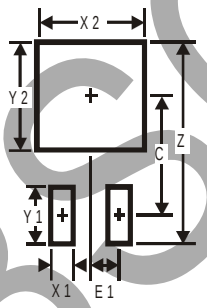


TO252			
Dim	**Min**	**Max**	**Typ**
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c2	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	–	–
e	–	–	2.286
E	6.45	6.70	6.58
E1	4.32	–	–
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°	10°	–
All Dimensions in mm			

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

TO252



Dimensions	Value (in mm)
Z	11.6
X1	1.5
X2	7.0
Y1	2.5
Y2	7.0
C	6.9
E1	2.3

Note: 13. 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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