

## Product Summary

$BV_{DSS}$	$R_{DS(ON)}$ Max	$Q_g$ Typ	$I_D$ $T_C = +25^\circ C$ (Note 10)
40V	3m $\Omega$ @ $V_{GS} = 10V$	68.6nC	100A

## Features

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped inductive switching ensures more reliable and robust end application
- Low  $R_{DS(ON)}$  – Minimizes Power Losses
- Low  $Q_g$  – Minimizes Switching Losses
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

## Description and Applications

This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

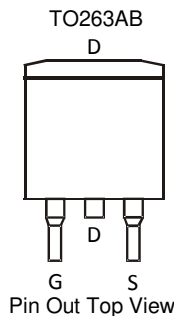
- Engine Management Systems
- Body Control Electronics
- DC-DC Converters

## Mechanical Data

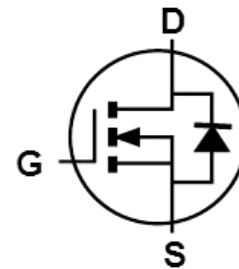
- Case: TO263AB
- Case Material: Molded Plastic, “Green” Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208  $\text{e3}$
- Weight: 1.7 grams (Approximate)



Top View



Pin Out Top View



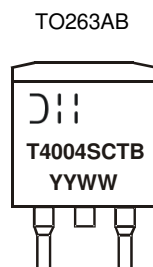
Internal Schematic

## Ordering Information (Note 5)

Part Number	Case	Packaging
DMTH4004SCTBQ-13	TO263AB	800/Tape & Reel

- 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. Automotive products are AEC-Q101 qualified and are PPAP capable. For more information, please refer to [http://www.diodes.com/product\\_compliance\\_definitions.html](http://www.diodes.com/product_compliance_definitions.html).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



T4004SCTB = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last Two Digits of Year (ex: 14 = 2014)  
 WW = Week (01 to 53)

**Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Units
Drain-Source Voltage	V <sub>DSS</sub>	40	V
Gate-Source Voltage	V <sub>GSS</sub>	±20	V
Continuous Drain Current (Note 7)	I <sub>D</sub>	T <sub>C</sub> = +25°C (Note 10)	100
		T <sub>C</sub> = +100°C	100
Maximum Continuous Body Diode Forward Current	I <sub>S</sub>	100	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)	I <sub>DM</sub>	200	A
Avalanche Current, L=0.2mH	I <sub>AS</sub>	45	A
Avalanche Energy, L=0.2mH	E <sub>AS</sub>	200	mJ

**Thermal Characteristics**

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 6)	P <sub>D</sub>	4.7	W
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	32	°C/W
Total Power Dissipation (Note 7)	P <sub>D</sub>	136	W
Thermal Resistance, Junction to Case (Note 7)	R <sub>θJC</sub>	1.1	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +175	°C

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	40	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 1mA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	1	µA	V <sub>DS</sub> = 32V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	2	—	4	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	2.5	3	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 100A
Diode Forward Voltage	V <sub>SD</sub>	—	—	1.3	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 100A
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iss</sub>	—	4,305	—	pF	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V f = 1MHz
Output Capacitance	C <sub>oss</sub>	—	1,441	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	102	—		
Gate Resistance	R <sub>G</sub>	—	0.77	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge	Q <sub>g</sub>	—	68.6	—	nC	V <sub>DD</sub> = 20V, I <sub>D</sub> = 90A, V <sub>GS</sub> = 10V
Gate-Source Charge	Q <sub>gs</sub>	—	16.8	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	14.2	—		
Turn-On Delay Time	t <sub>D(ON)</sub>	—	9.5	—	ns	V <sub>DD</sub> = 20V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 90A, R <sub>G</sub> = 3.5Ω
Turn-On Rise Time	t <sub>R</sub>	—	6.7	—		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	26.4	—		
Turn-Off Fall Time	t <sub>F</sub>	—	8.1	—		
Reverse Recovery Time	t <sub>RR</sub>	—	52.4	—	ns	I <sub>F</sub> = 50A, di/dt = 100A/µs
Reverse Recovery Charge	Q <sub>RR</sub>	—	78.2	—	nC	

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.
  - Thermal resistance from junction to soldering point (on the exposed drain pad).
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.
  - Package limited.

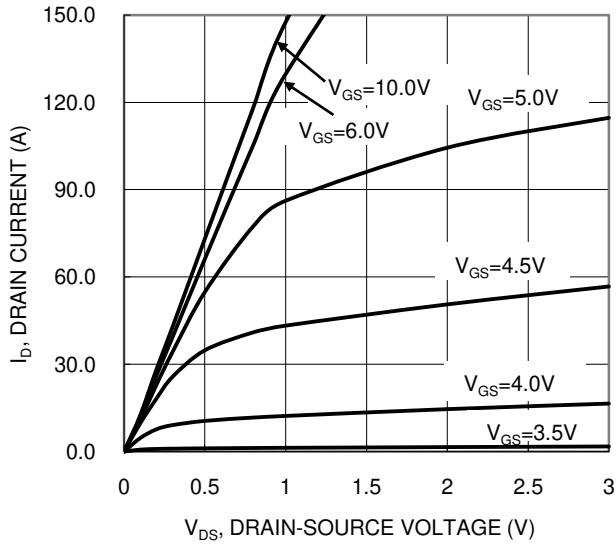


Figure 1 Typical Output Characteristic

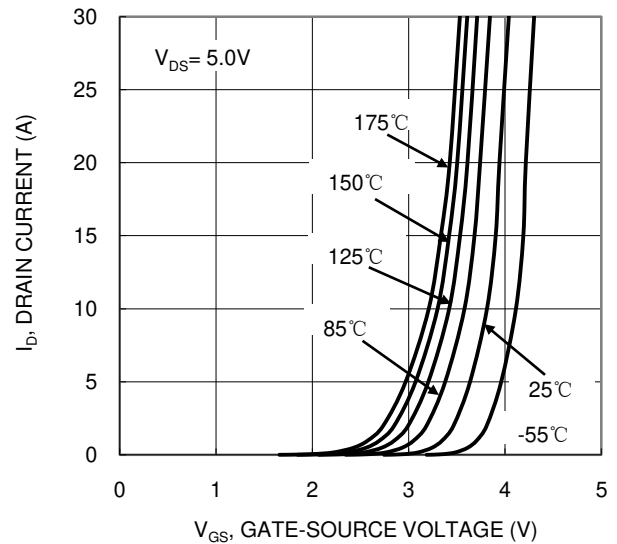


Figure 2 Typical Transfer Characteristic

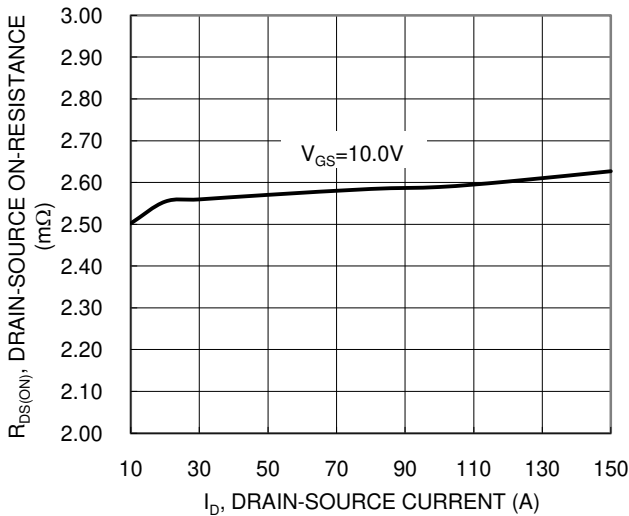


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

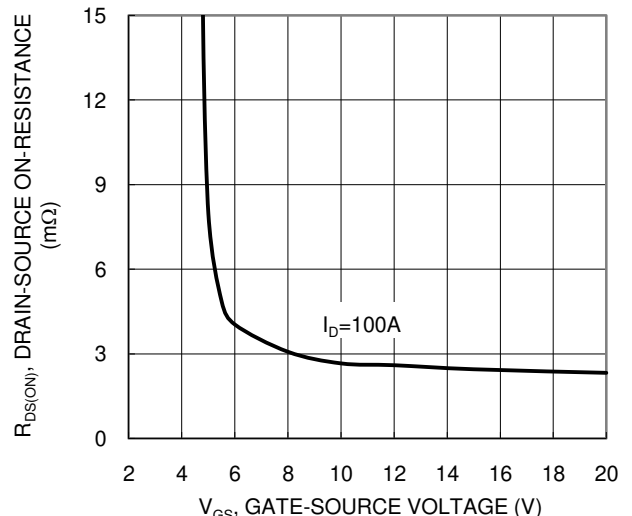


Figure 4 Typical Transfer Characteristic

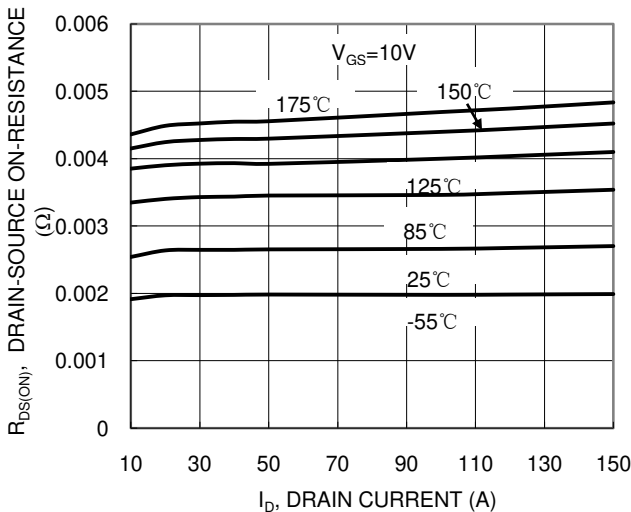


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

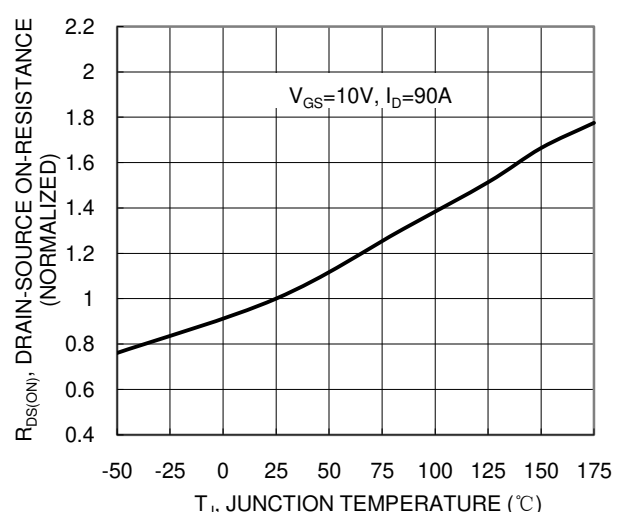


Figure 6 On-Resistance Variation with Temperature

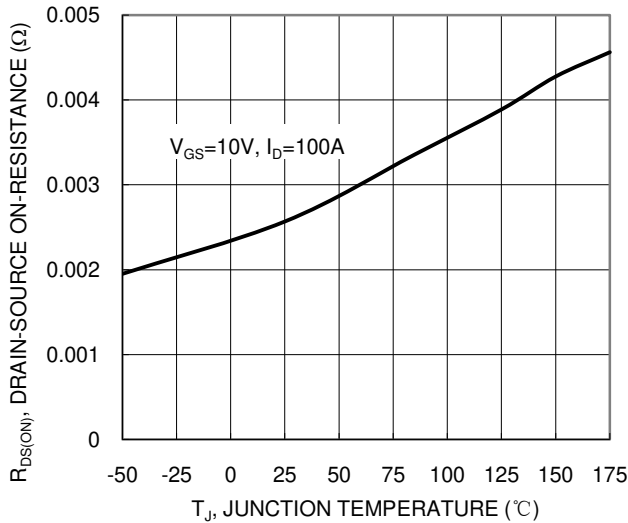


Figure 7 On-Resistance Variation with Temperature

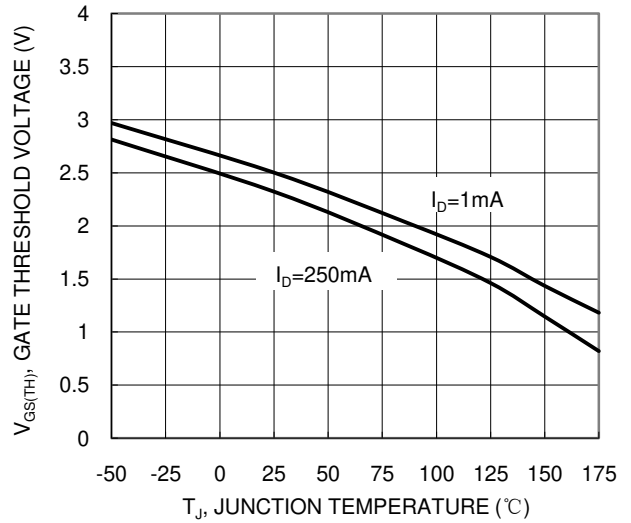


Figure 8 Gate Threshold Variation vs. Temperature

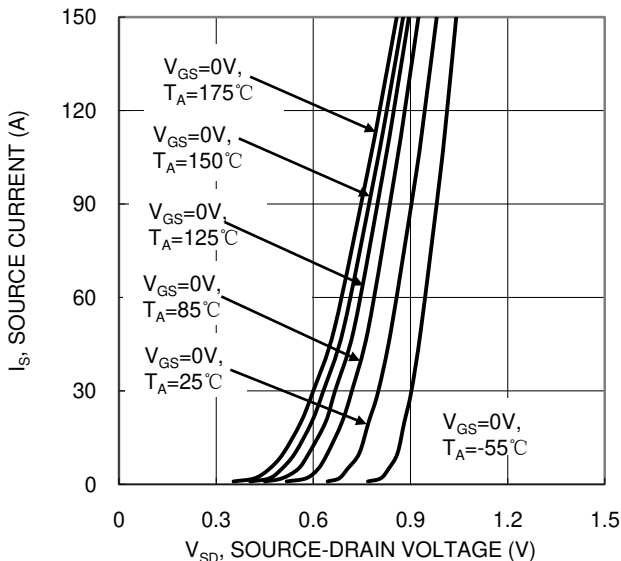


Figure 9 Diode Forward Voltage vs. Current

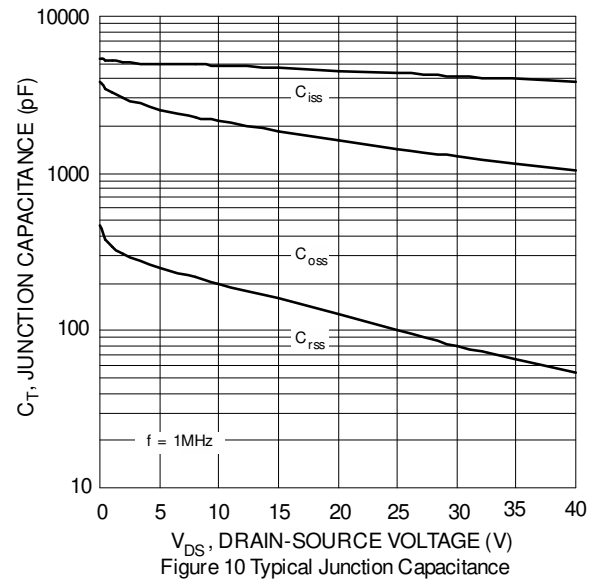


Figure 10 Typical Junction Capacitance

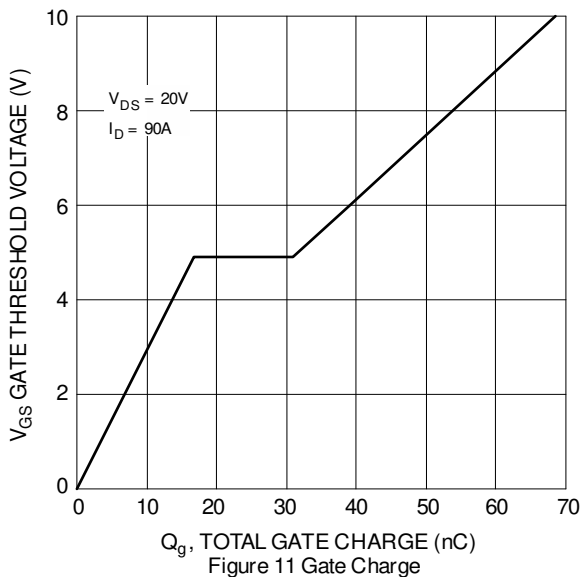


Figure 11 Gate Charge

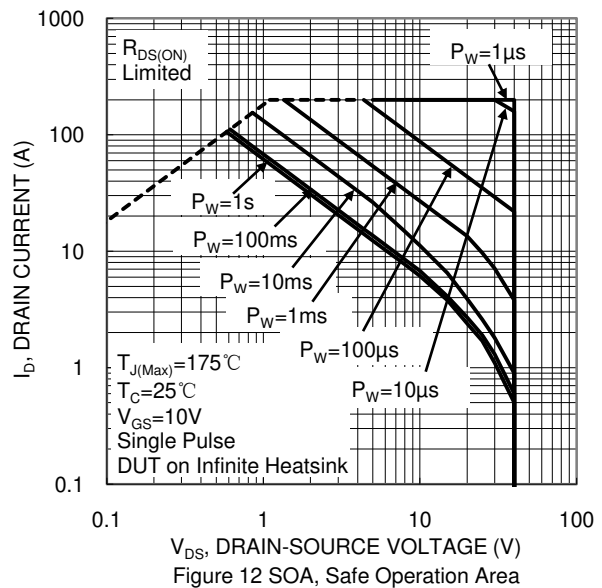
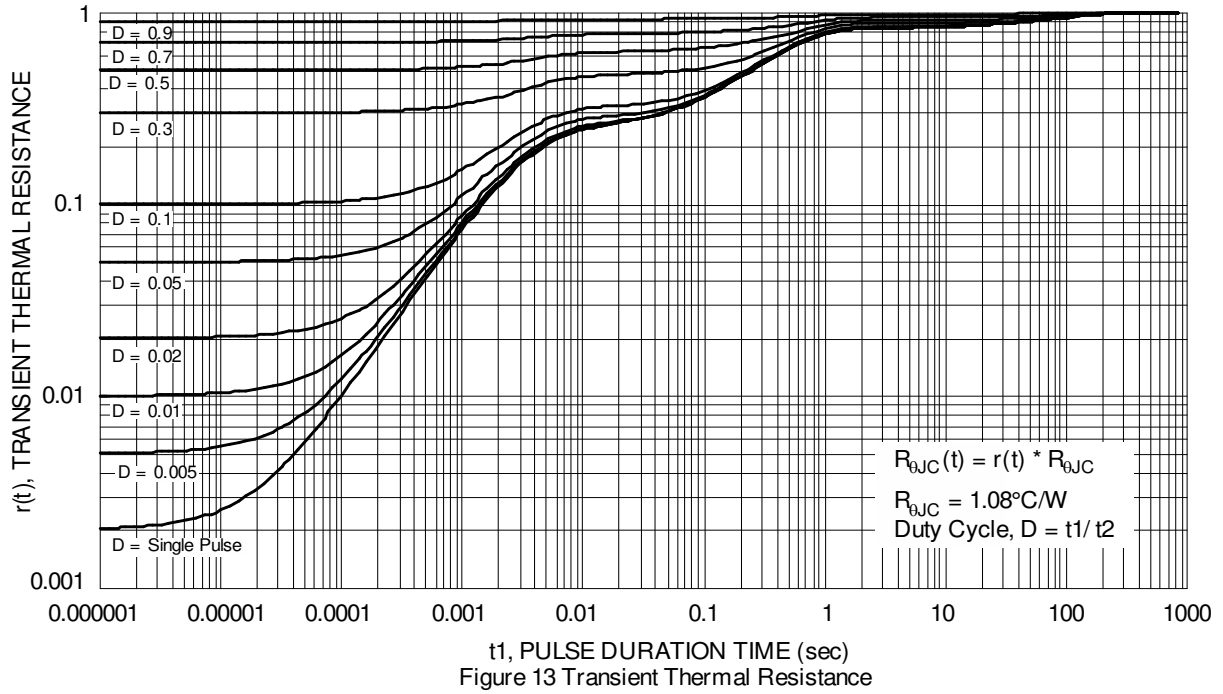


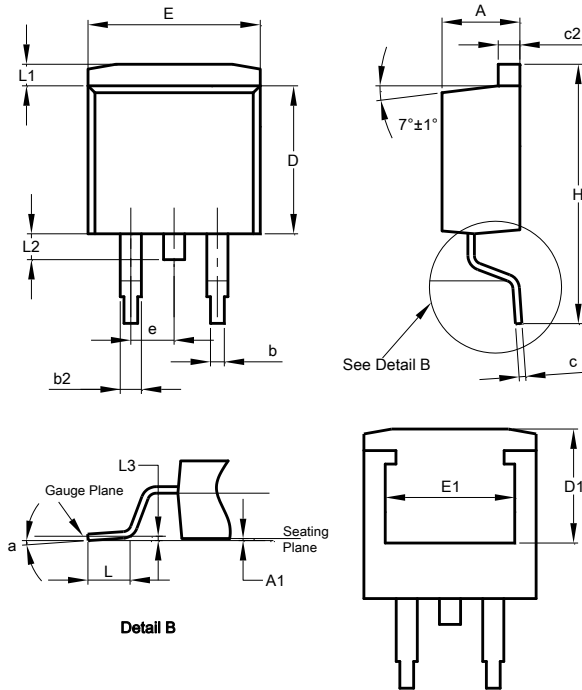
Figure 12 SOA, Safe Operation Area



**Package Outline Dimensions**

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

**TO263AB (D2PAK)**

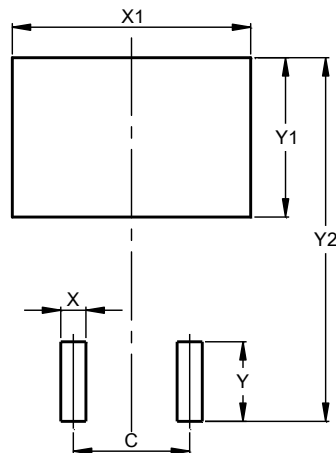


TO263AB (D2PAK)			
Dim	Min	Max	Typ
A	4.07	4.82	-
A1	0.00	0.25	-
b	0.51	0.99	-
b2	1.15	1.77	-
c	0.356	0.73	-
c2	1.143	1.65	-
D	8.39	9.65	-
D1	6.55	6.95	-
e	2.54 TYP		
E	9.66	10.66	-
E1	6.23	8.23	-
H	14.61	15.87	-
L	1.78	2.79	-
L1	-	1.67	-
L2	-	1.77	-
L3	-	-	0.254
a	0°	8°	-
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

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

**TO263AB (D2PAK)**



Dimensions	Value (in mm)
C	5.08
X	1.10
X1	10.41
Y	3.50
Y1	7.01
Y2	15.99

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