

## Product Summary

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> Max T <sub>C</sub> = +25°C (Note 9)
40V	3mΩ @ V <sub>GS</sub> = 10V	100A
	5mΩ @ V <sub>GS</sub> = 4.5V	100A

## Description

This MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.


## Applications

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

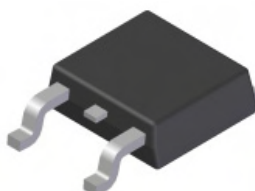
## Features

- Rated to 175° C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low R<sub>dson</sub> – Minimizes Power Losses
- Low Q<sub>g</sub> – 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**
- An Automotive-Compliant Part is Available Under Separate Datasheet ([DMTH4004LK3Q](#))**

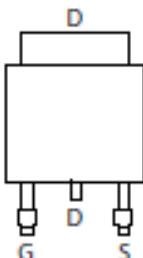
## Mechanical Data

- Case: TO252
- 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: 0.33 grams (Approximate)

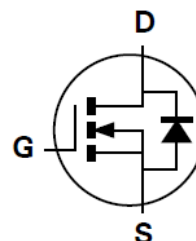
TO252 (DPAK)



Top View



Pin Out Top View



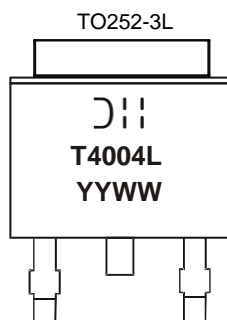
Equivalent Circuit


## Ordering Information (Notes 4)

Part Number	Case	Packaging
DMTH4004LK3-13	TO252	2,500/Tape & Reel

- Notes:
- EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
  - 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.
  - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  - For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



 = Manufacturer's Marking  
 T4004L = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last Two Digits of Year  
 (ex: 15 = 2015)  
 WW = Week Code (01 to 53)

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

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DSS</sub>	40	V
Gate-Source Voltage	V <sub>GSS</sub>	±20	V
Continuous Drain Current (Note 6), V <sub>GS</sub> = 10V	I <sub>D</sub>	100	A
		100	A
Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)	I <sub>DM</sub>	200	A
Maximum Continuous Body Diode Forward Current (Note 6)	I <sub>S</sub>	100	A
Avalanche Current, L = 0.2mH	I <sub>AS</sub>	30	A
Avalanche Energy, L = 0.2mH	E <sub>AS</sub>	90	mJ

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

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P <sub>D</sub>	3.9	W
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	38	°C/W
Total Power Dissipation (Note 6)	P <sub>D</sub>	180	W
Thermal Resistance, Junction to Case (Note 6)	R <sub>θJC</sub>	0.8	°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 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	40	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
Zero Gate Voltage Drain Current, T <sub>J</sub> = +25°C	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 7)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	1	—	3	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	2.4	3	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 50A
		—	4	5	mΩ	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 50A
Diode Forward Voltage	V <sub>SD</sub>	—	0.7	1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 50A
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	—	4,450	—	pF	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1MHz
Output Capacitance	C <sub>oss</sub>	—	1,407	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	74	—	pF	
Gate Resistance	R <sub>g</sub>	—	0.7	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>g</sub>	—	35	—	nC	V <sub>DS</sub> = 20V, I <sub>D</sub> = 30A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	—	83	—	nC	
Gate-Source Charge	Q <sub>gs</sub>	—	10	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	11.2	—	nC	
Turn-On Delay Time	t <sub>D(ON)</sub>	—	5.9	—	ns	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 20V, R <sub>g</sub> = 1.6Ω, I <sub>D</sub> = 30A
Turn-On Rise Time	t <sub>r</sub>	—	13.2	—	ns	
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	25.8	—	ns	
Turn-Off Fall Time	t <sub>f</sub>	—	7.9	—	ns	
Body Diode Reverse Recovery Time	t <sub>RR</sub>	—	48	—	ns	I <sub>F</sub> = 50A, di/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>	—	72	—	nC	I <sub>F</sub> = 50A, di/dt = 100A/μs

- Notes:
- Device mounted with exposed drain pad on 25mm by 25mm 2oz copper on a single-sided 1.6mm FR-4 PCB; device is measured under still air conditions whilst operating in a steady state.
  - Thermal resistance from junction to solder point (on the exposed drain pin).
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.
  - Package Limited.

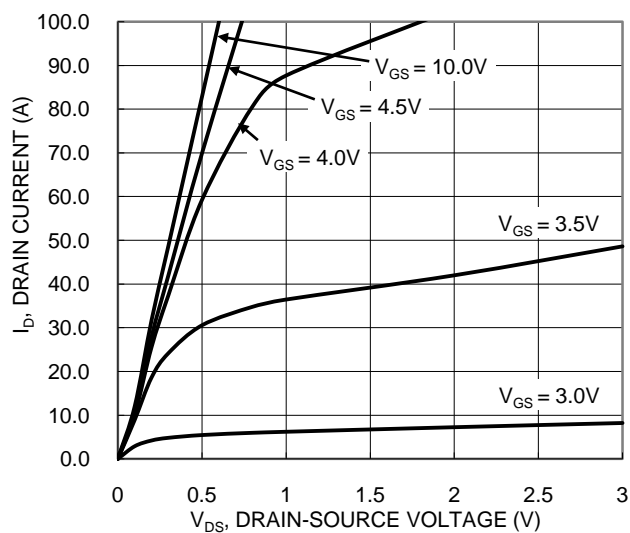


Figure 1. Typical Output Characteristic

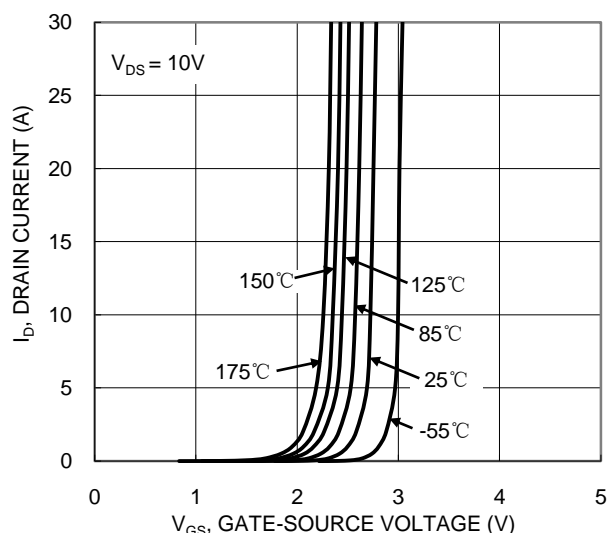


Figure 2. Typical Transfer Characteristic

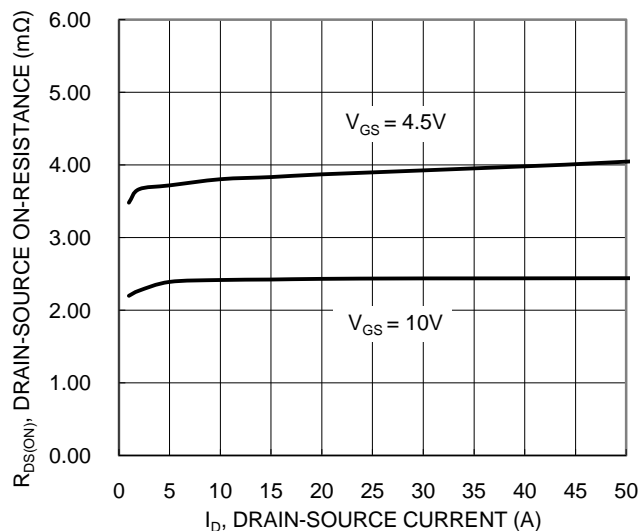


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

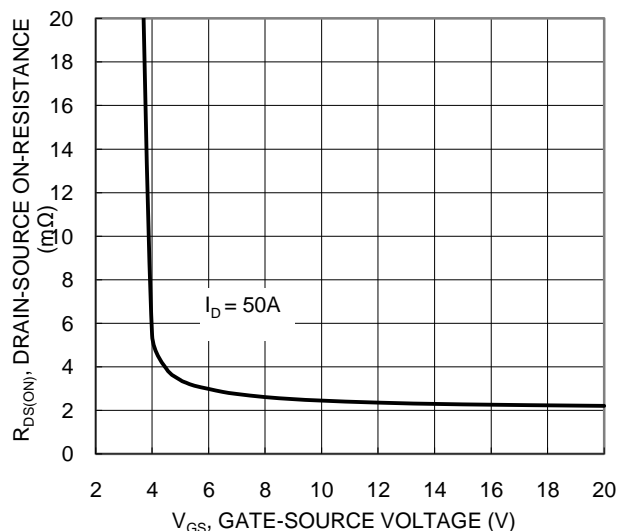


Figure 4. Typical Transfer Characteristic

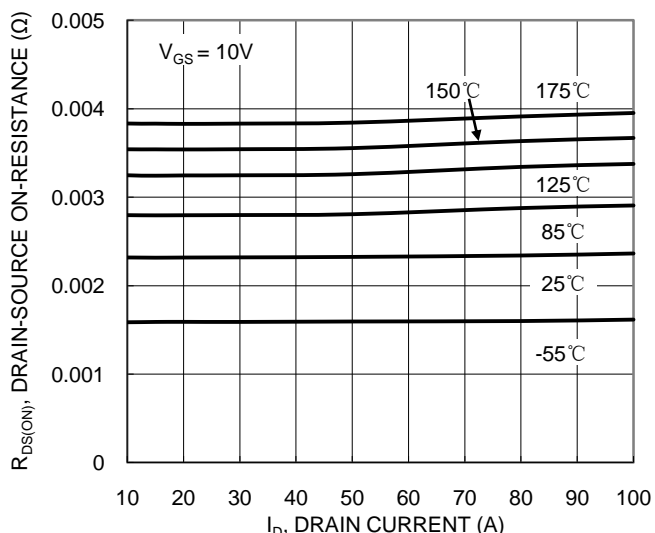


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

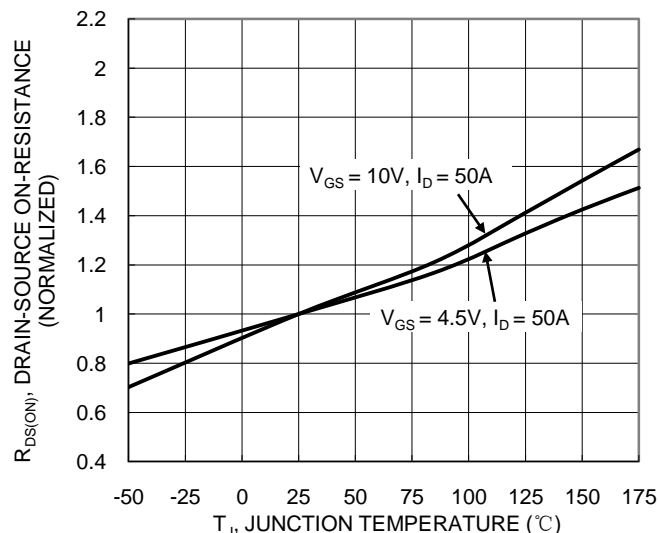
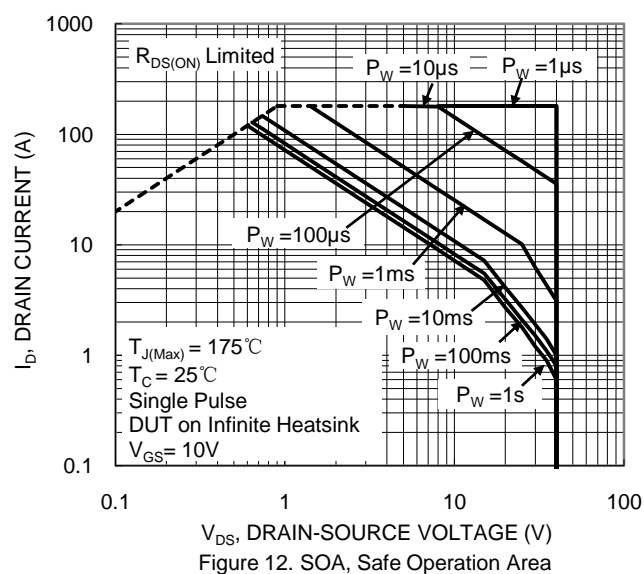
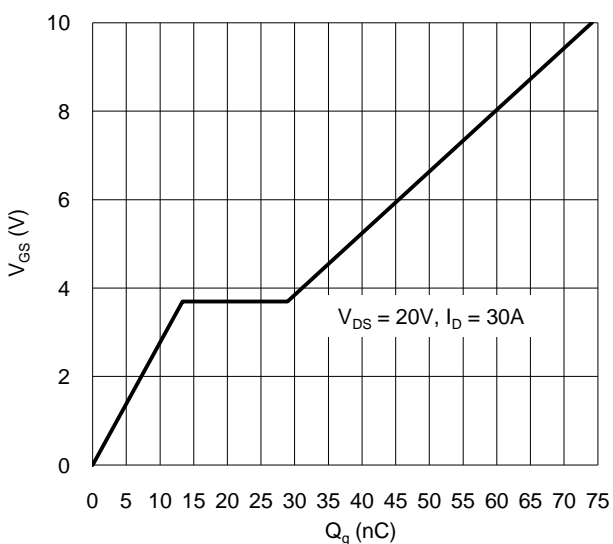
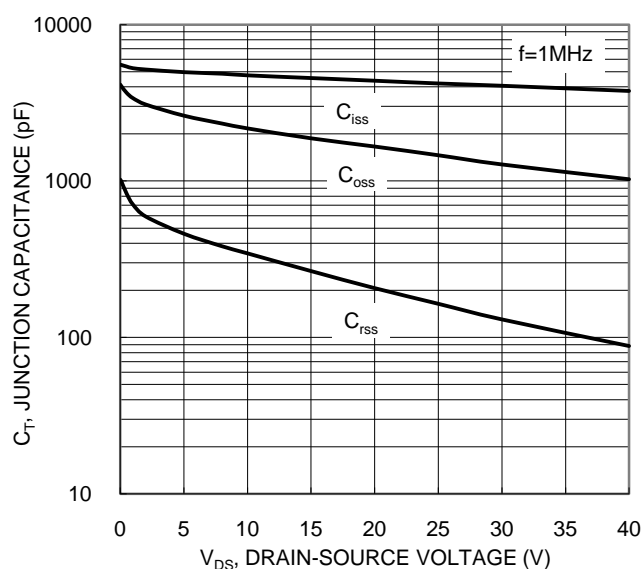
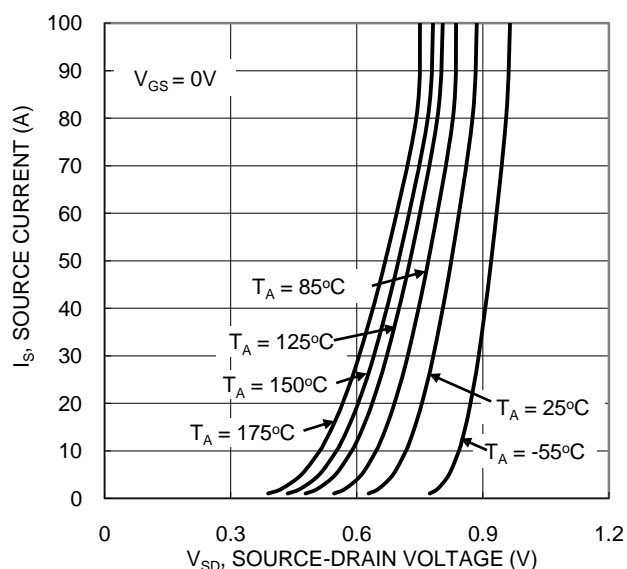
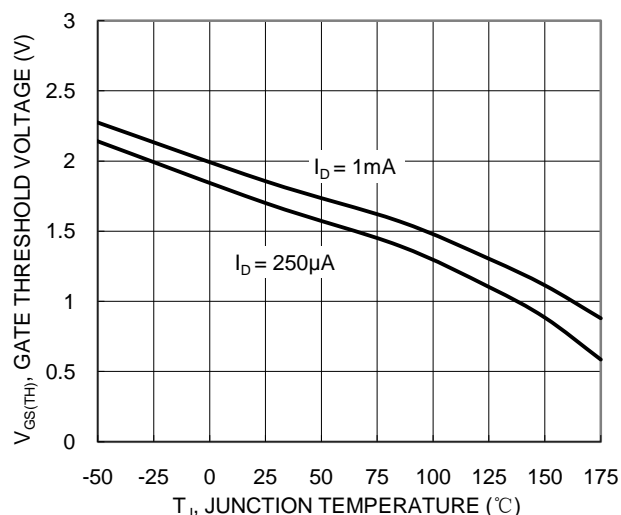
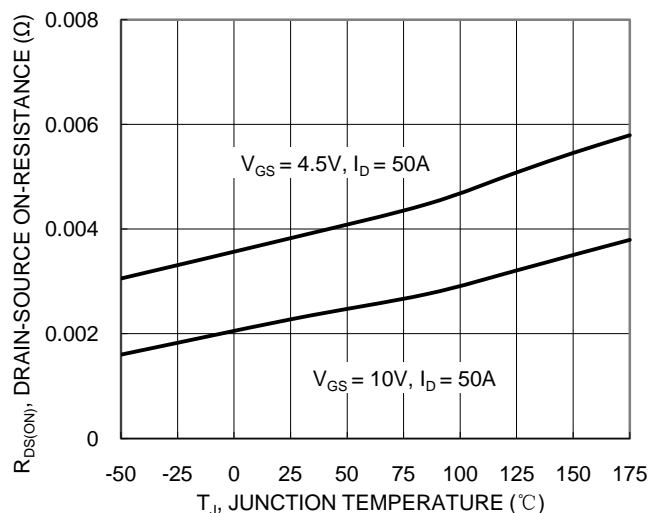


Figure 6. On-Resistance Variation with Temperature



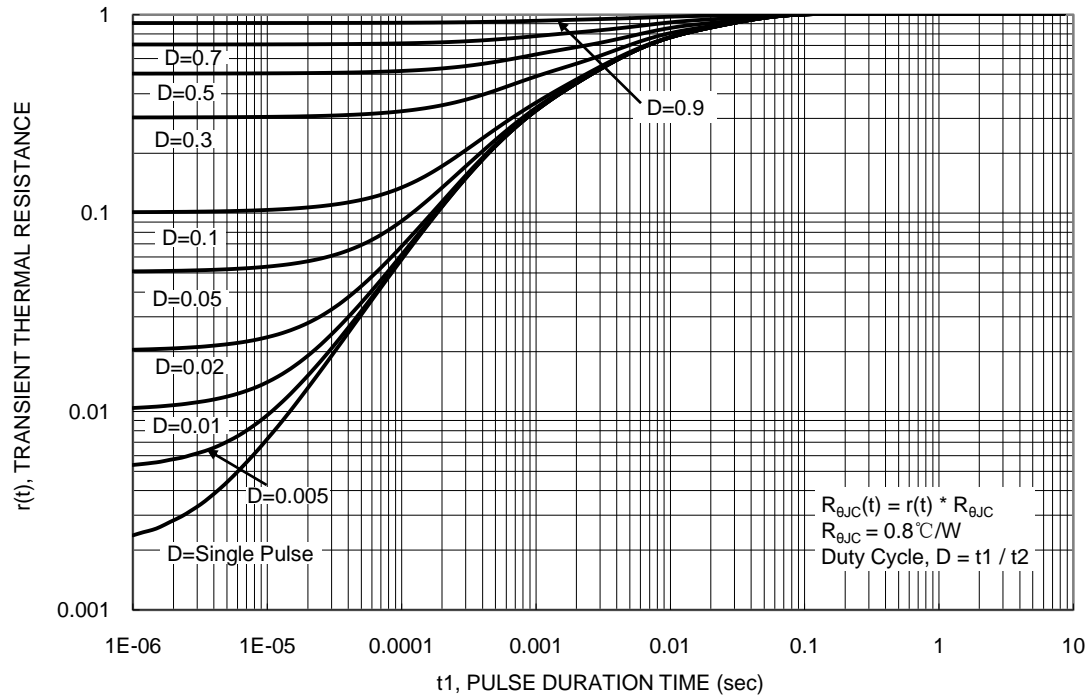
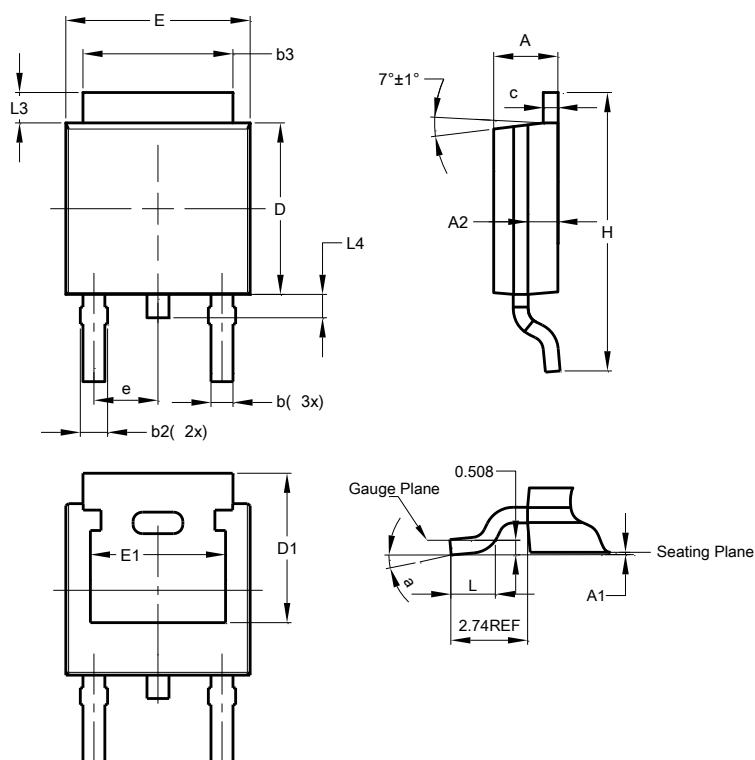


Figure 13. Transient Thermal Resistance

## Package Outline

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

### TO252 (DPAK)

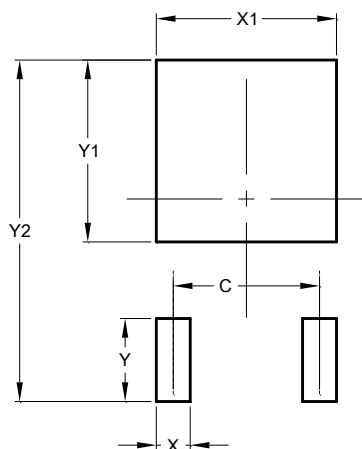


TO252 (DPAK)			
Dim	Min	Max	Typ
<b>A</b>	2.19	2.39	2.29
<b>A1</b>	0.00	0.13	0.08
<b>A2</b>	0.97	1.17	1.07
<b>b</b>	0.64	0.88	0.783
<b>b2</b>	0.76	1.14	0.95
<b>b3</b>	5.21	5.46	5.33
<b>c</b>	0.45	0.58	0.531
<b>D</b>	6.00	6.20	6.10
<b>D1</b>	5.21	-	-
<b>e</b>	-	-	2.286
<b>E</b>	6.45	6.70	6.58
<b>E1</b>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

## Suggested Pad Layout

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

### TO252 (DPAK)



Dimensions	Value (in mm)
<b>C</b>	4.572
<b>X</b>	1.060
<b>X1</b>	5.632
<b>Y</b>	2.600
<b>Y1</b>	5.700
<b>Y2</b>	10.700

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