

## Product Summary

$V_{(BR)DSS}$	$R_{DS(on) \text{ max}}$	$I_D$ $T_C = +25^\circ\text{C}$
-40V	11m $\Omega$ @ $V_{GS} = -10\text{V}$	-35A
	15m $\Omega$ @ $V_{GS} = -4.5\text{V}$	-30A

## Description

This new generation MOSFET has been designed to minimize the on-state resistance ( $R_{DS(ON)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

## Applications

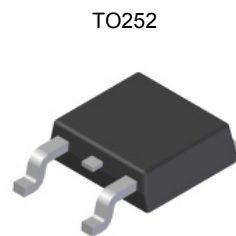
- DC-DC Converters
- Power management functions
- Backlighting

## Features and Benefits

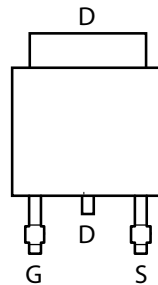
- 100% Unclamped Inductive Switch (UIS) test in production
- Low on-resistance
- Fast switching speed
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Mechanical Data

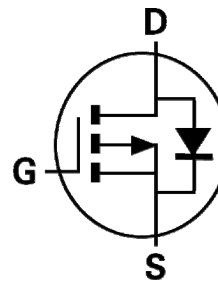
- Case: TO252 (DPAK)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Finish annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 @3
- Weight: 0.33 grams (approximate)



Top View



Top View  
Pin-Out



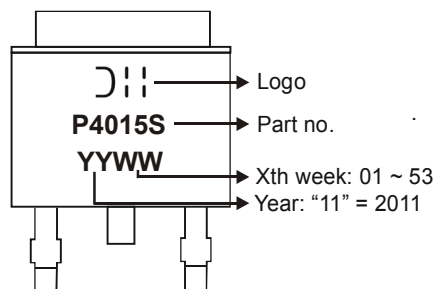
Equivalent Circuit

## Ordering Information (Note 4)

Part Number	Compliance	Case	Packaging
DMP4015SK3-13	Standard	TO252	2,500/Tape & Reel
DMP4015SK3Q-13	Automotive	TO252	2,500/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. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>

## Marking Information



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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			$V_{DSS}$	-40	V
Gate-Source Voltage			$V_{GSS}$	$\pm 25$	V
Continuous Drain Current (Note 5) $V_{GS} = -10\text{V}$	Steady State	$T_C = +25^\circ\text{C}$ $T_C = +70^\circ\text{C}$	$I_D$	-35 -27	A
	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	-14 -11	A
Continuous Drain Current (Note 5) $V_{GS} = -10\text{V}$	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	-22 -18	A
Pulsed Drain Current (10 $\mu\text{s}$ pulse, duty cycle = 1%)			$I_{DM}$	-100	A
Maximum Body Diode Forward Current (Note 5)			$I_S$	-5.5	A
Avalanche Current (Note 6)			$I_{AS}$	-57	A
Avalanche Energy (Note 6)			$E_{AS}$	162	mJ

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	$T_A = +25^\circ\text{C}$	$P_D$	3.5	W
	$T_A = +70^\circ\text{C}$		2.2	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	$R_{\theta JA}$	36	$^\circ\text{C/W}$
	$t < 10\text{s}$		15	
Thermal Resistance, Junction to Case (Note 5)	Steady state	$R_{\theta JC}$	4.5	$^\circ\text{C/W}$
Operating and Storage Temperature Range		$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	-40	—	—	V	$V_{GS} = 0\text{V}, I_D = -250\mu\text{A}$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	-1	$\mu\text{A}$	$V_{DS} = -40\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 25\text{V}, V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	-1.5	-2.0	-2.5	V	$V_{DS} = V_{GS}, I_D = -250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(on)}$	—	7	11	m $\Omega$	$V_{GS} = -10\text{V}, I_D = -9.8\text{A}$
		—	9	15		$V_{GS} = -4.5\text{V}, I_D = -9.8\text{A}$
Forward Transfer Admittance	$ Y_{fs} $	—	26	—	S	$V_{DS} = -20\text{V}, I_D = -9.8\text{A}$
Diode Forward Voltage	$V_{SD}$	—	-0.7	-1.0	V	$V_{GS} = 0\text{V}, I_S = -1\text{A}$
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	$C_{iss}$	—	4234	—	pF	$V_{DS} = -20\text{V}, V_{GS} = 0\text{V}$ $f = 1.0\text{MHz}$
Output Capacitance	$C_{oss}$	—	1036	—		
Reverse Transfer Capacitance	$C_{rss}$	—	526	—		
Gate Resistance	$R_G$	—	7.77	—	$\Omega$	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Total Gate Charge	$Q_g$	—	47.5	—	nC	$V_{DS} = -20\text{V}, V_{GS} = -5\text{V}$ $I_D = -9.8\text{A}$
Gate-Source Charge	$Q_{gs}$	—	14.2	—		
Gate-Drain Charge	$Q_{gd}$	—	13.5	—		
Turn-On Delay Time	$t_{D(on)}$	—	13.2	—	ns	$V_{GS} = -10\text{V}, V_{DD} = -20\text{V},$ $R_G = 6\Omega, I_D = -1\text{A}$
Turn-On Rise Time	$t_r$	—	10.0	—		
Turn-Off Delay Time	$t_{D(off)}$	—	302.7	—		
Turn-Off Fall Time	$t_f$	—	137.9	—		

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
  - UIS in production with  $L = 0.1\text{mH}$ ,  $T_J = +25^\circ\text{C}$ .
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to production testing.

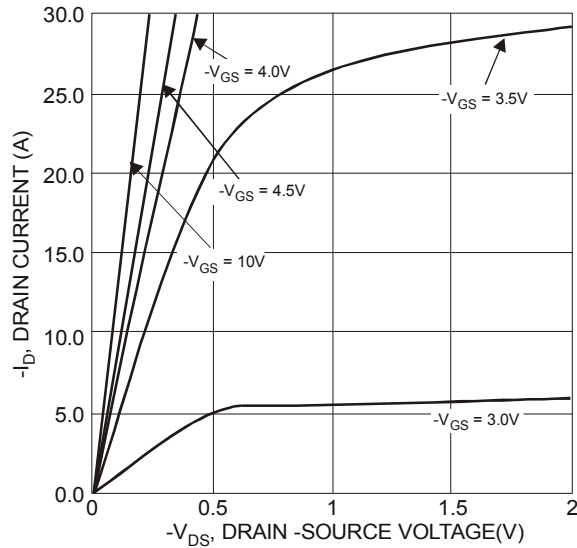


Fig. 1 Typical Output Characteristics

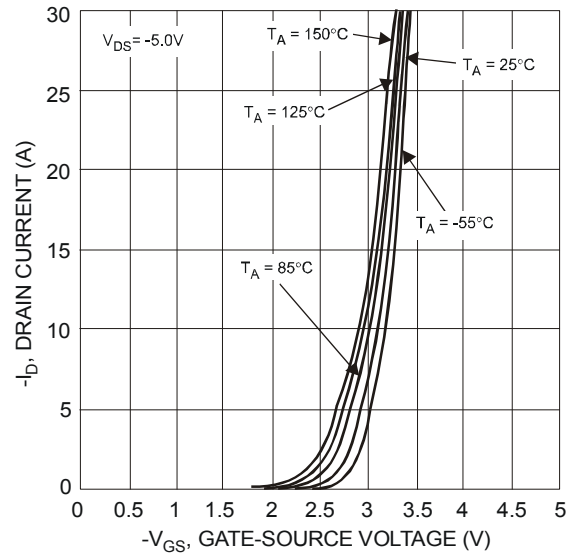


Fig. 2 Typical Transfer Characteristics

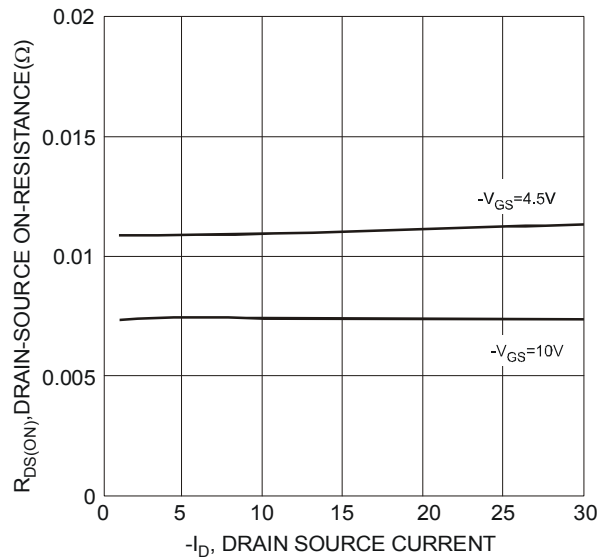


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

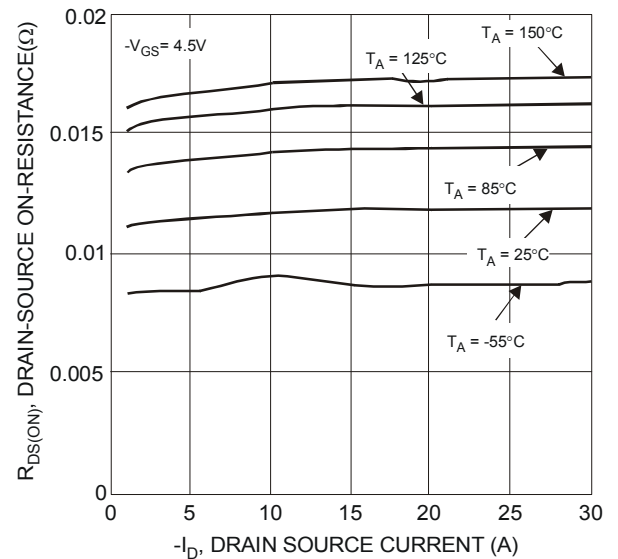


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

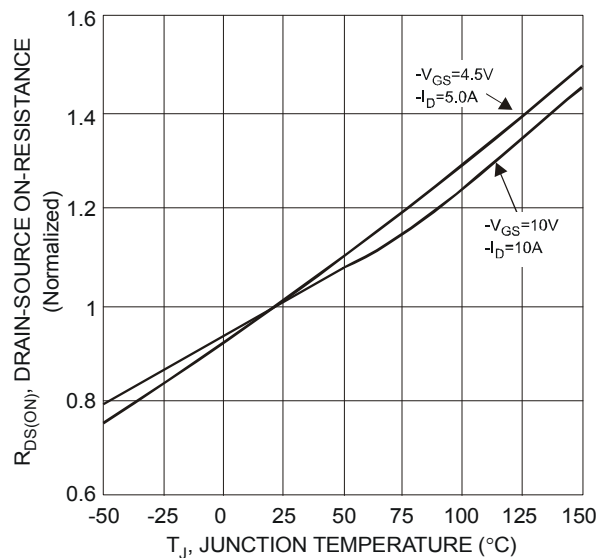


Fig. 5 On-Resistance Variation with Temperature

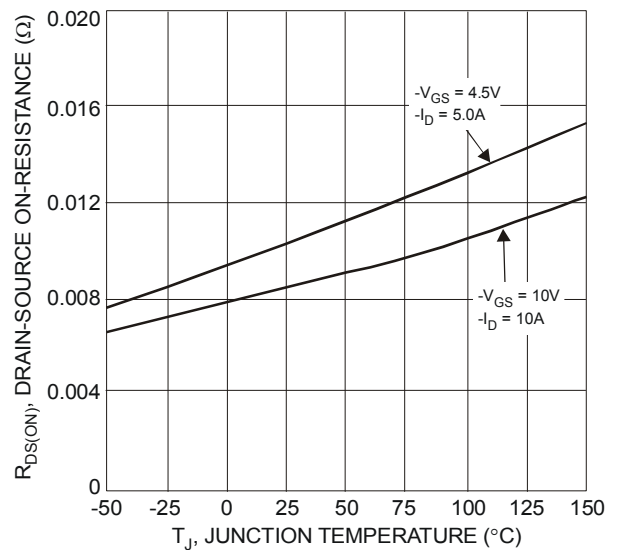


Fig. 6 On-Resistance Variation with Temperature

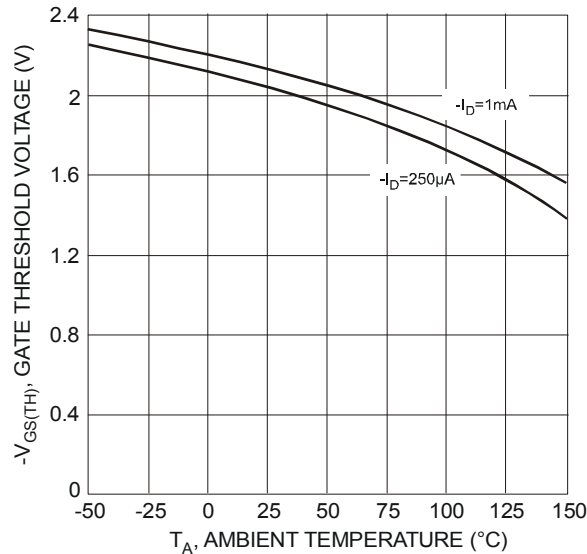


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

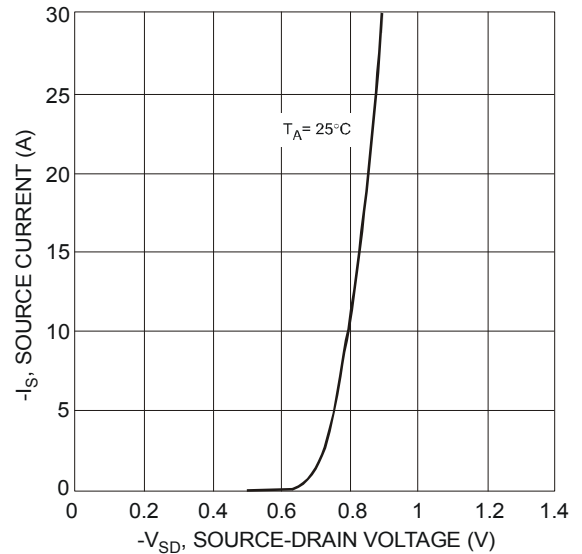


Fig. 8 Diode Forward Voltage vs. Current

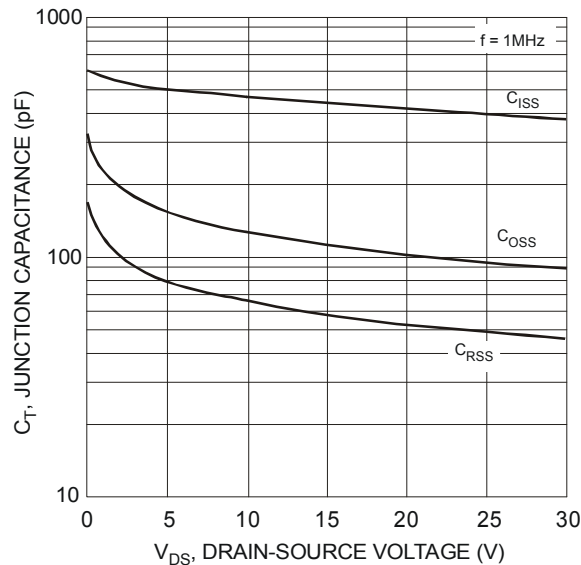


Fig. 9 Typical Junction Capacitance

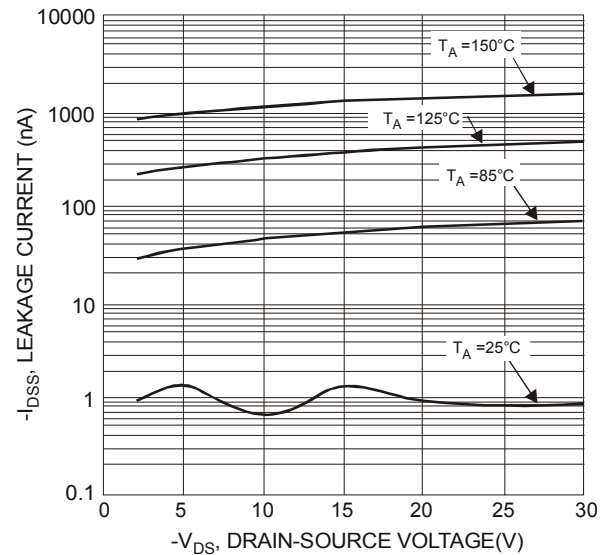


Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

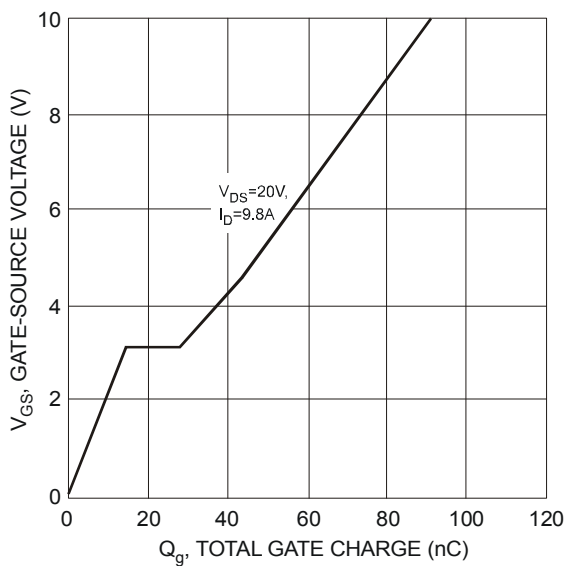


Fig. 11 Gate-Charge Characteristics

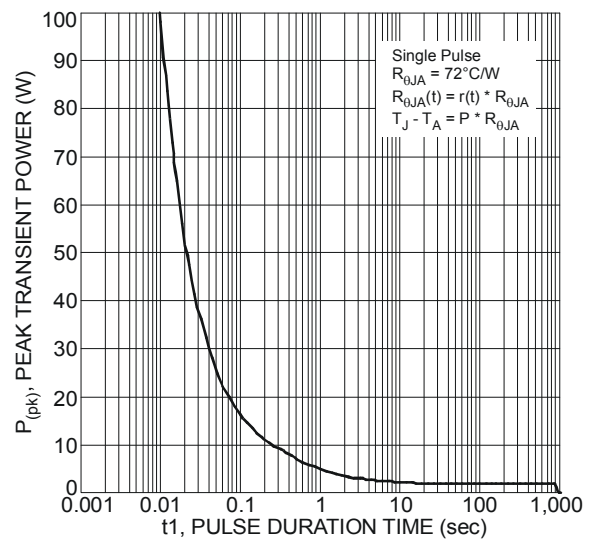


Fig. 12 Single Pulse Maximum Power Dissipation

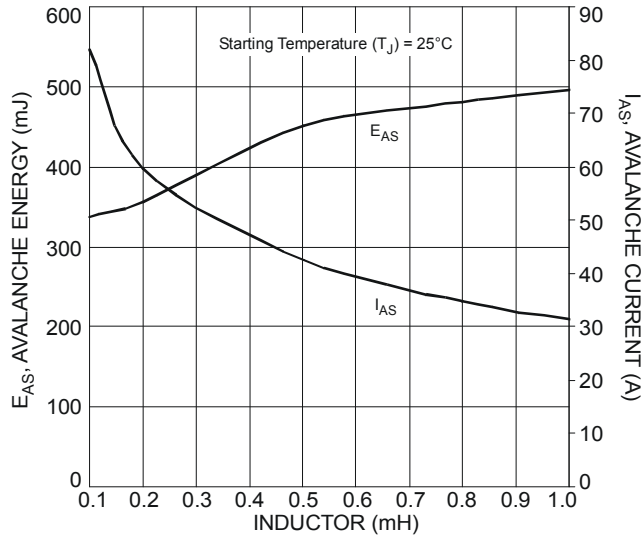


Fig. 13 Single-Pulse Avalanche Tested

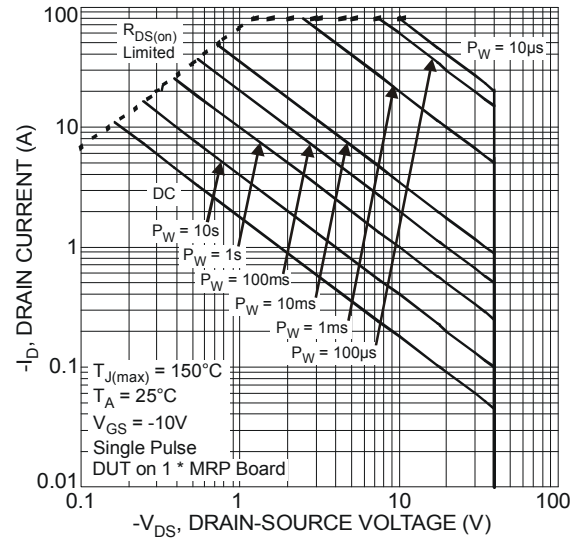


Fig. 14 SOA, Safe Operation Area

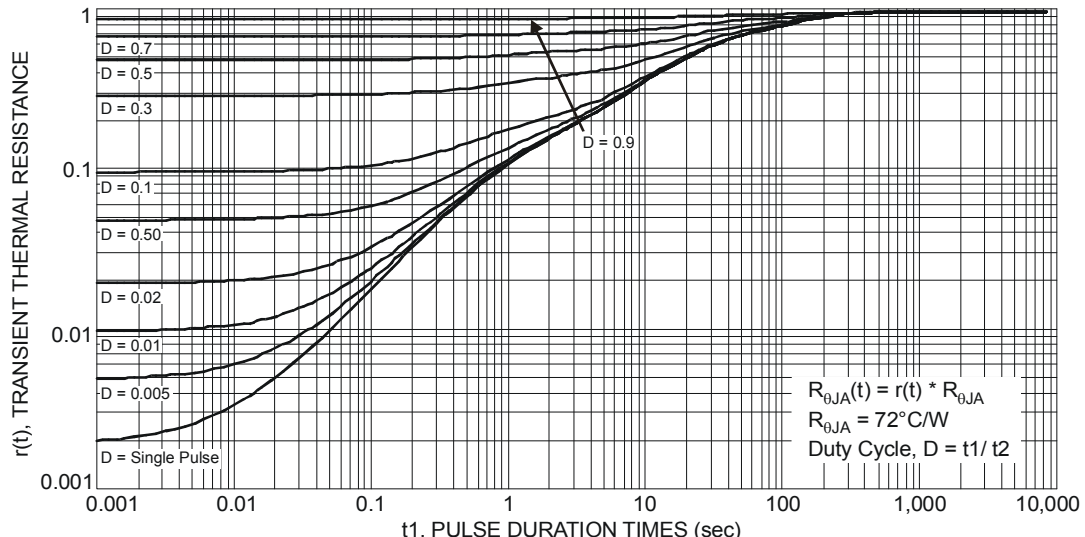
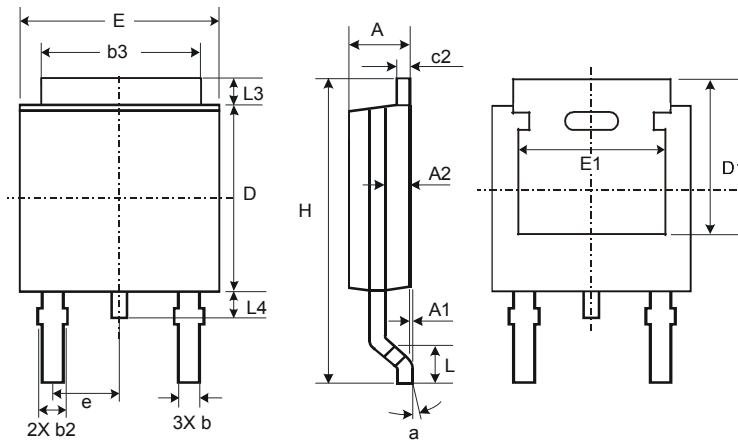


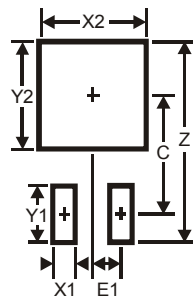
Fig. 15 Transient Thermal Resistance

## Package Outline Dimensions



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



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

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