

Product Summary

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

Description

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

Applications

- DC-DC Converters
- Power Management Functions
- Backlighting

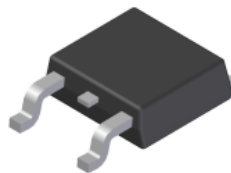
Features and Benefits

- 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**
- **PPAP Capable (Note 4)**

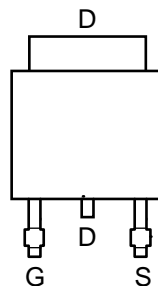
Mechanical Data

- 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 $\text{\textcircled{B}}$
- Weight: 0.33 grams (Approximate)

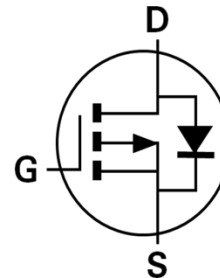
TO252 (DPAK)



Top View



Top View
Pin-Out



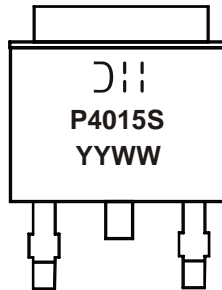
Equivalent Circuit

Ordering Information (Notes 4 & 5)

Part Number	Compliance	Case	Packaging
DMP4015SK3Q-13	Automotive	TO252 (DPAK)	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 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. Refer to http://www.diodes.com/quality/product_compliance_definitions/.
 5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



DII = Manufacturer's Marking
 P4015S = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Year (ex: 13 = 2013)
 WW = Week (01 - 53)

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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V _{DSS}	-40	V
Gate-Source Voltage			V _{GSS}	±25	V
Continuous Drain Current (Note 6) V _{GS} = -10V	Steady State	T _C = +25°C T _C = +70°C	I _D	-35 -27	A
	Steady State	T _A = +25°C T _A = +70°C	I _D	-14 -11	A
Continuous Drain Current (Note 6) V _{GS} = -10V	t < 10s	T _A = +25°C T _A = +70°C	I _D	-22 -18	A
Pulsed Drain Current (10μs pulse, duty cycle = 1%)			I _{DM}	-100	A
Maximum Body Diode Forward Current (Note 6)			I _S	-5.5	A
Avalanche Current (Note 7)			I _{AS}	-22	A
Avalanche Energy (Note 7)			E _{AS}	242	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 6)	T _A = +25°C	P _D	3.5	W
	T _A = +70°C		2.2	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	R _{θJA}	36	°C/W
	t < 10s		15	
Thermal Resistance, Junction to Case (Note 6)	Steady State	R _{θJC}	4.5	°C
Operating and Storage Temperature Range		T _J , T _{STG}	-55 to +150	°C

Notes: 6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.
 7. UIS in production with L = 0.1mH, T_J = +25°C.

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV _{DSS}	-40	—	—	V	V _{GS} = 0V, I _D = -250μA
Zero Gate Voltage Drain Current	I _{DSS}	—	—	-1	μA	V _{DS} = -40V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±25V, V _{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	V _{GS(th)}	-1.5	-2	-2.5	V	V _{DS} = V _{GS} , I _D = -250μA
Static Drain-Source On-Resistance	R _{DS(on)}	—	7	11	mΩ	V _{GS} = -10V, I _D = -9.8A
		—	9	15		V _{GS} = -4.5V, I _D = -9.8A
Forward Transfer Admittance	Y _{fs}	—	26	—	S	V _{DS} = -20V, I _D = -9.8A
Diode Forward Voltage	V _{SD}	—	-0.7	-1	V	V _{GS} = 0V, I _S = -1A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C _{iss}	—	4,234	—	pF	V _{DS} = -20V, V _{GS} = 0V f = 1MHz
Output Capacitance	C _{oss}	—	1,036	—		
Reverse Transfer Capacitance	C _{rss}	—	526	—		
Gate Resistance	R _G	—	7.77	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge	Q _g	—	47.5	—	nC	V _{DS} = -20V, V _{GS} = -5V I _D = -9.8A
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} = -10V, V _{DD} = -20V, R _G = 6Ω, I _D = -1A
Turn-On Rise Time	t _r	—	10	—		
Turn-Off Delay Time	t _{D(off)}	—	302.7	—		
Turn-Off Fall Time	t _f	—	137.9	—		

Notes: 8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to production testing.

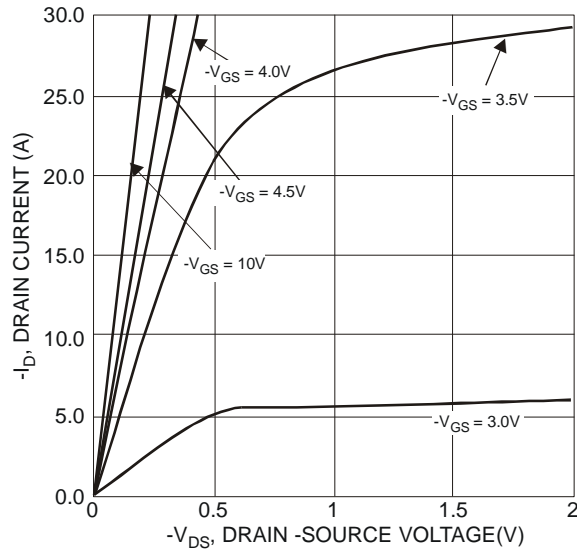


Fig. 1 Typical Output Characteristics

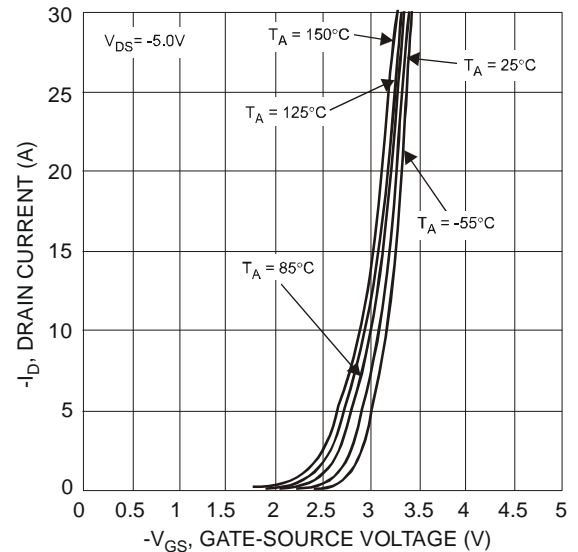


Fig. 2 Typical Transfer Characteristics

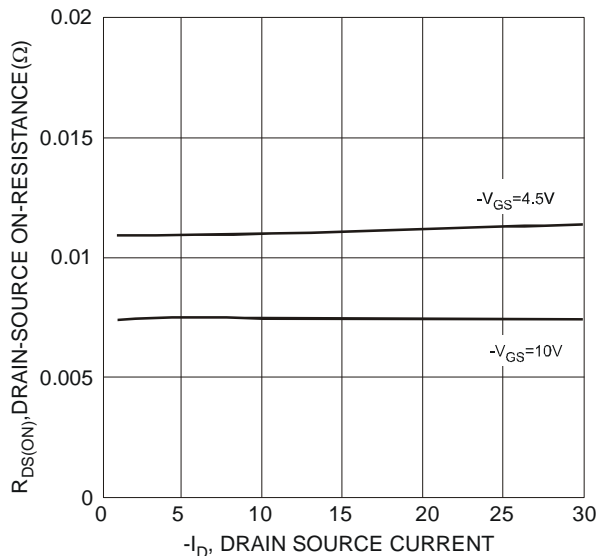


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

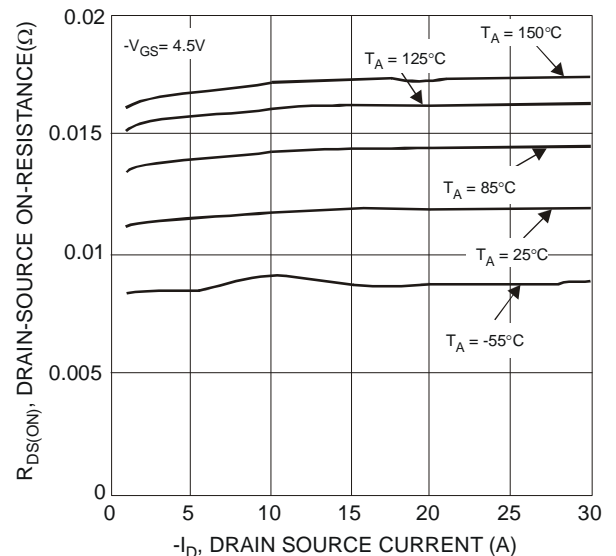


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

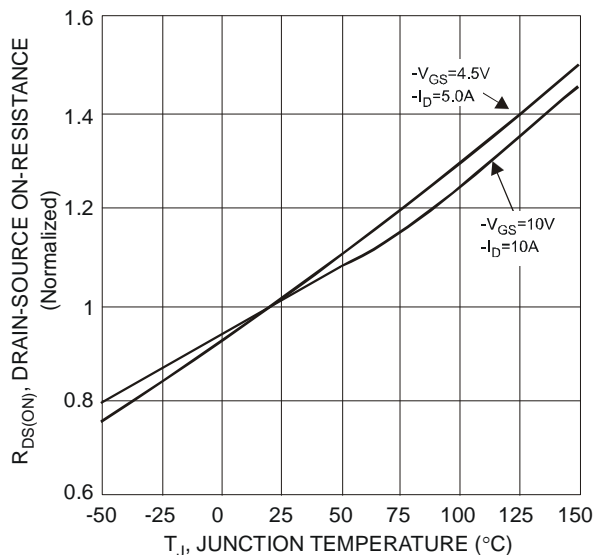


Fig. 5 On-Resistance Variation with Temperature

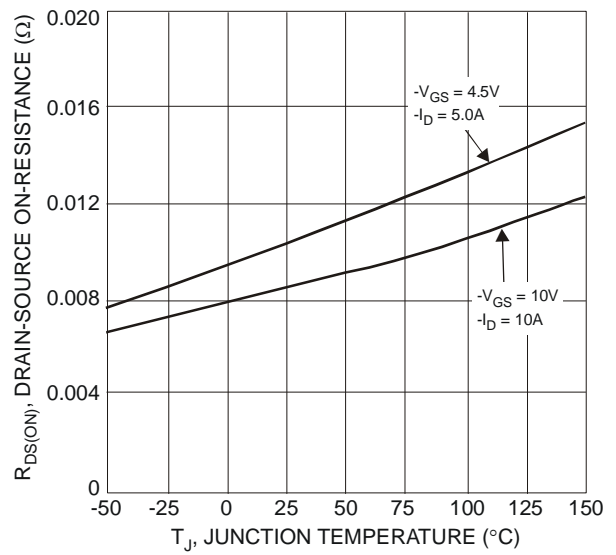


Fig. 6 On-Resistance Variation with Temperature

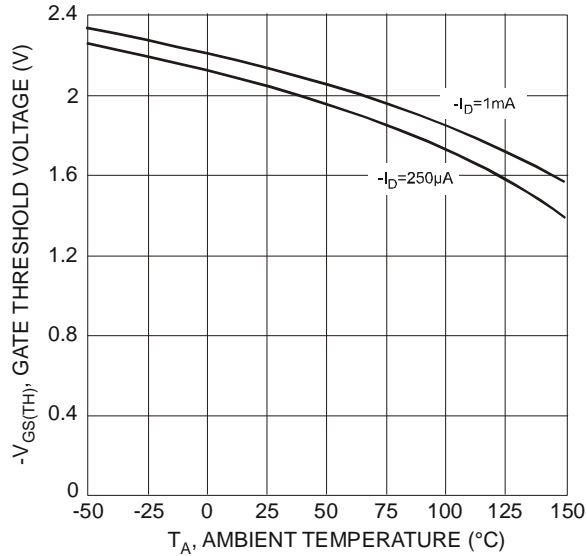


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

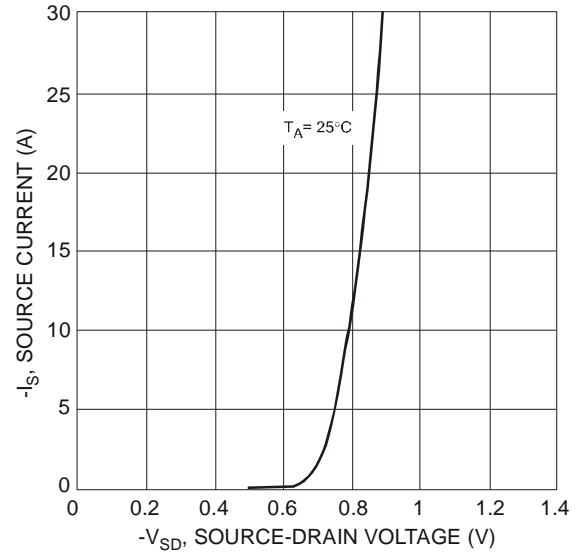


Fig. 8 Diode Forward Voltage vs. Current

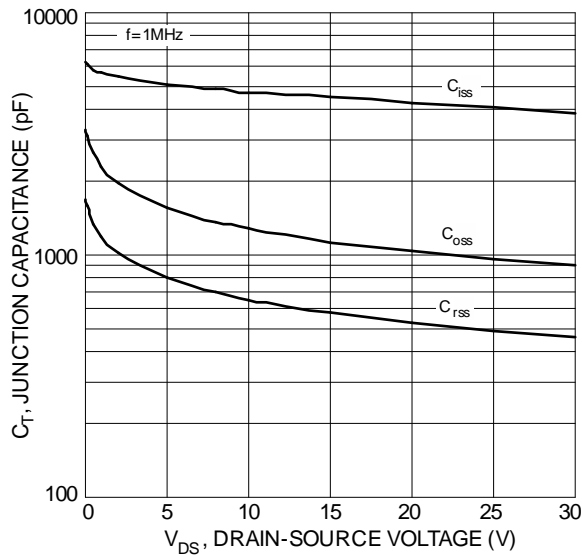


Fig. 9 Typical Junction Capacitance

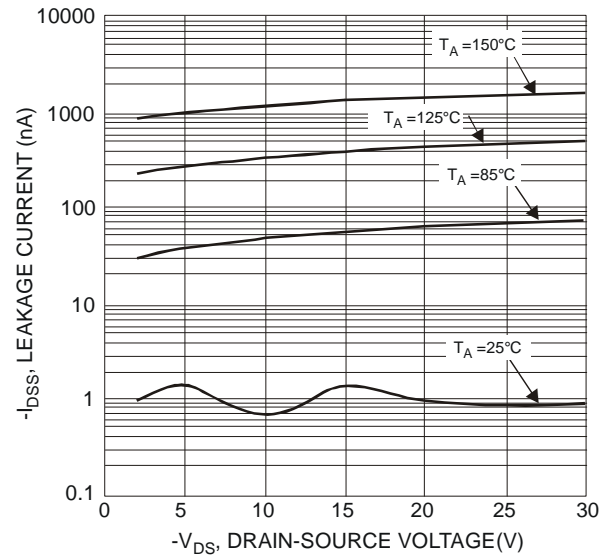


Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

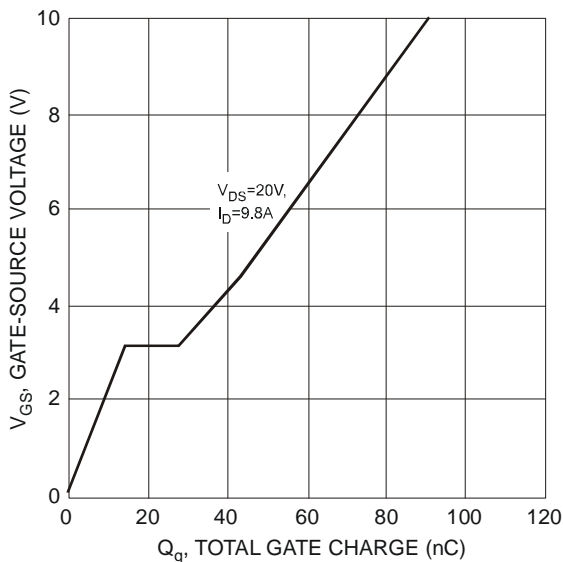


Fig. 11 Gate-Charge Characteristics

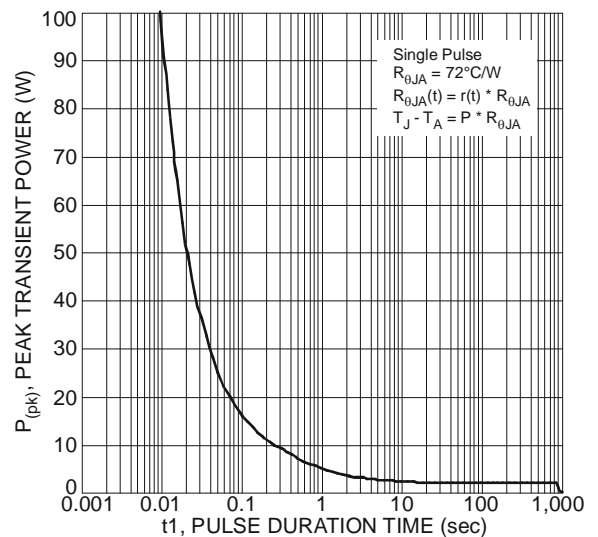


Fig. 12 Single Pulse Maximum Power Dissipation

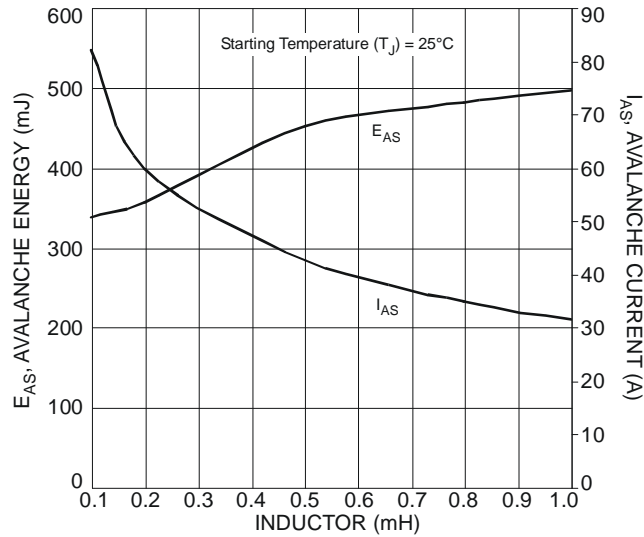


Fig. 13 Single-Pulse Avalanche Tested

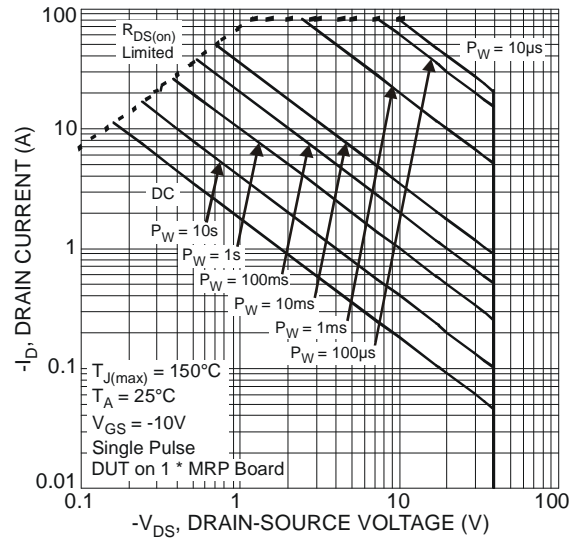


Fig. 14 SOA, Safe Operation Area

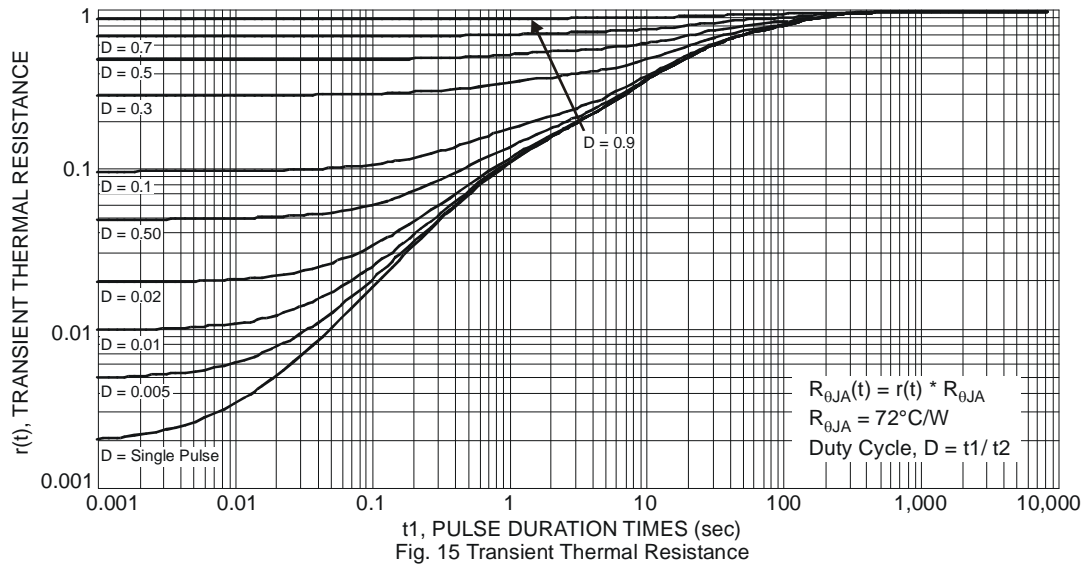
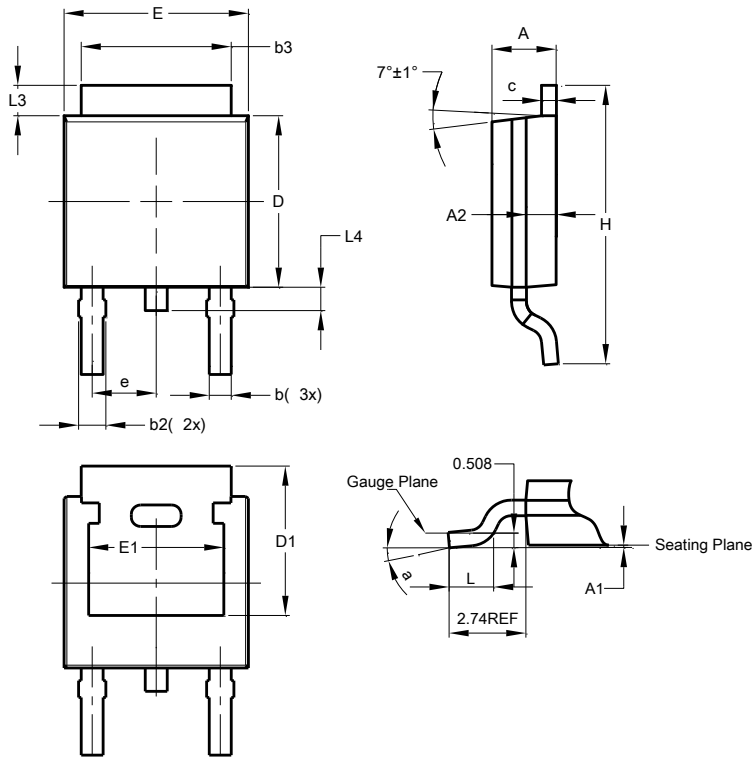


Fig. 15 Transient Thermal Resistance

Package Outline Dimensions

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

TO252 (DPAK)

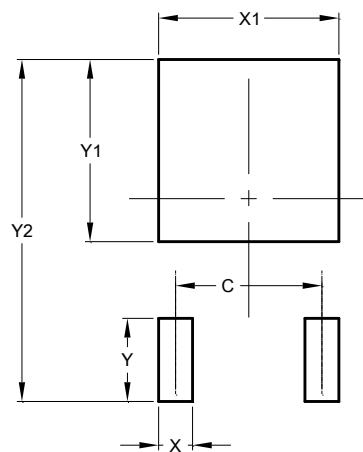


TO252 (DPAK)			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	—	—
e	—	—	2.286
E	6.45	6.70	6.58
E1	4.32	—	—
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°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

Suggested Pad Layout

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

TO252 (DPAK)



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

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