P-CHANNEL ENHANCEMENT MODE MOSFET

NEW PRODUCT

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ Max	I_D T_C = +25°C
-40V	9.9mΩ @ V_{GS} = -10V	-50A
	14mΩ @ V_{GS} = -4.5V	-45A

Description

This new generation MOSFET is 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

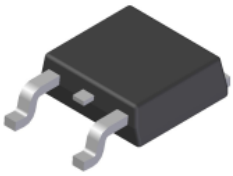
- DC-DC Converters
- Power Management Functions
- Backlighting

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

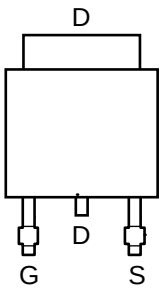
Mechanical Data

- Case: TO252
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Finish Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.33 grams (Approximate)

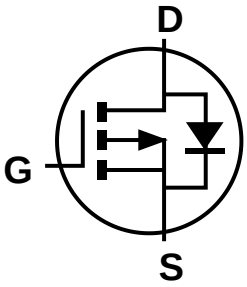


Top View

TO252



Top View
Pin-Out



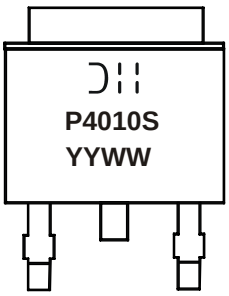
Equivalent Circuit

Ordering Information (Note 5)

Part Number	Case	Packaging
DMP4010SK3Q-13	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 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. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please 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



= Manufacturer's Marking
P4010S = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 15 = 2015)
WW = Week (01 to 53)

NEW PRODUCT

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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	-40	V
Gate-Source Voltage			V_{GSS}	±25	V
Continuous Drain Current (Note 7), V_{GS} = -10V	Steady State	T_C = +25°C T_C = +70°C	I_D	-50 -40	A
	Steady State	T_A = +25°C T_A = +70°C	I_D	-15 -12	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	-100	A
Maximum Body Diode Forward Current (Note 7)			I_S	-5.5	A
Avalanche Current, L = 1mH (Note 8)			I_{AS}	-22	A
Avalanche Energy, L = 1mH (Note 8)			E_{AS}	260	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 6)		P_D	1.7	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	73	°C/W
Total Power Dissipation (Note 7)		P_D	3.3	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	$R_{\theta JA}$	38	°C/W
Thermal Resistance, Junction to Case		$R_{\theta JC}$	1.0	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 9)						
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 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	-1.5	-2	-2.5	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	7.5	9.9	mΩ	V_{GS} = -10V, I_D = -9.8A
		—	10.5	14		V_{GS} = -4.5V, I_D = -9.8A
Diode Forward Voltage	V_{SD}	—	-0.7	-1	V	V_{GS} = 0V, I_S = -1A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{iss}	—	4234	—	pF	V_{DS} = -20V, V_{GS} = 0V f = 1MHz
Output Capacitance	C_{oss}	—	1036	—		
Reverse Transfer Capacitance	C_{rss}	—	526	—		
Gate Resistance	R_g	—	7.8	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = -4.5V)	Q_g	—	42.7	—	nC	V_{DS} = -20V, I_D = -9.8A
Total Gate Charge (V_{GS} = -10V)	Q_g	—	91	—		
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	$t_{D(OFF)}$	—	303	—		
Turn-Off Fall Time	t_F	—	138	—		
Reverse Recovery Time	t_{RR}	—	26	—	ns	I_F = -9.8A, di/dt = -100A/µs
Reverse Recovery Charge	Q_{RR}	—	20	—	nC	I_F = -9.8A, di/dt = -100A/µs

Notes:
6. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
7. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
8. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.
9. Short duration pulse test used to minimize self-heating effect.
10. Guaranteed by design. Not subject to product testing.

NEW PRODUCT

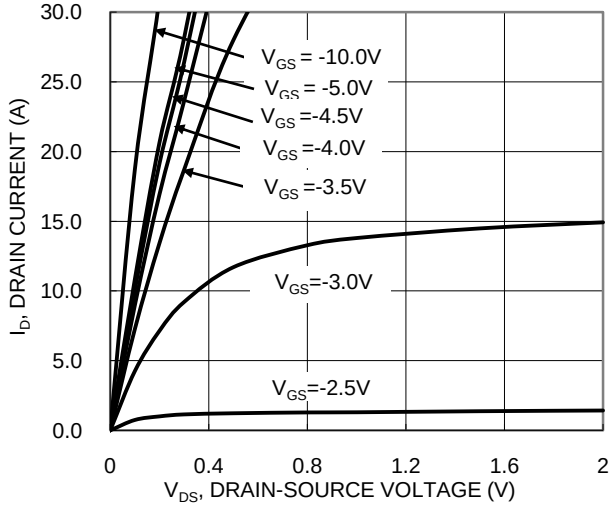


Figure 1. Typical Output Characteristic

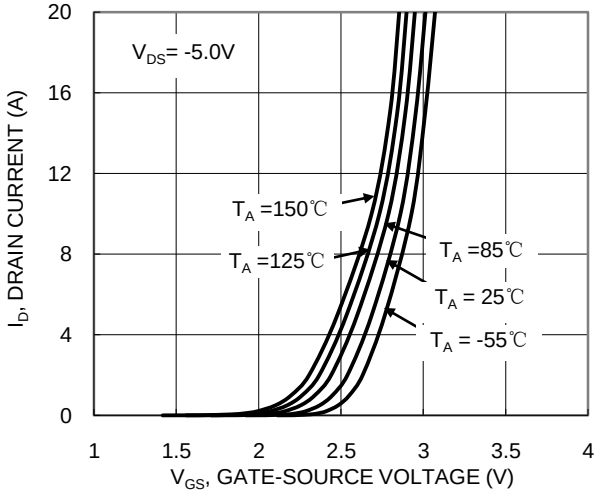


Figure 2.Typical Transfer Characteristic

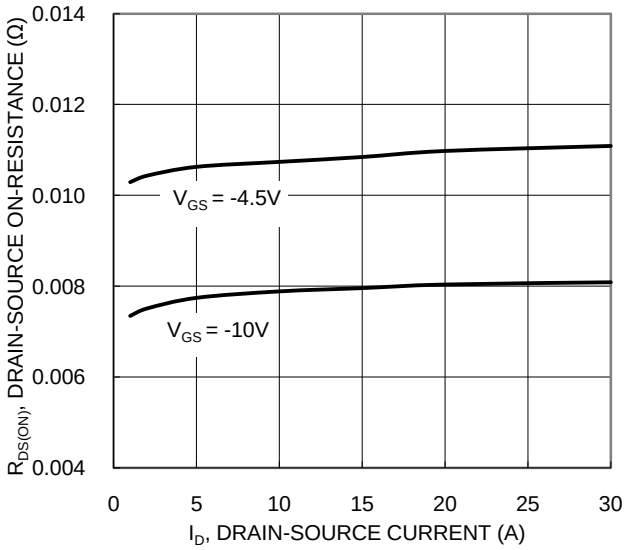


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

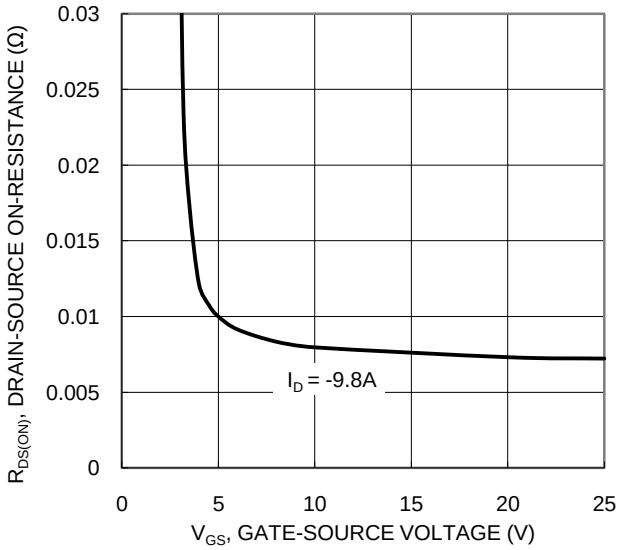


Figure 4.Typical Transfer Characteristic

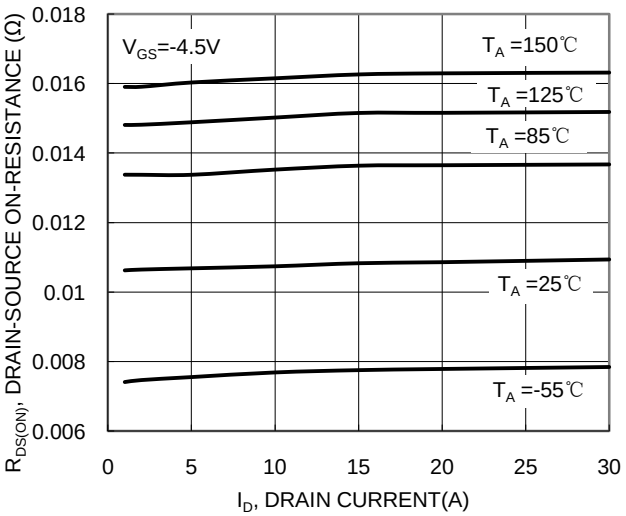


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

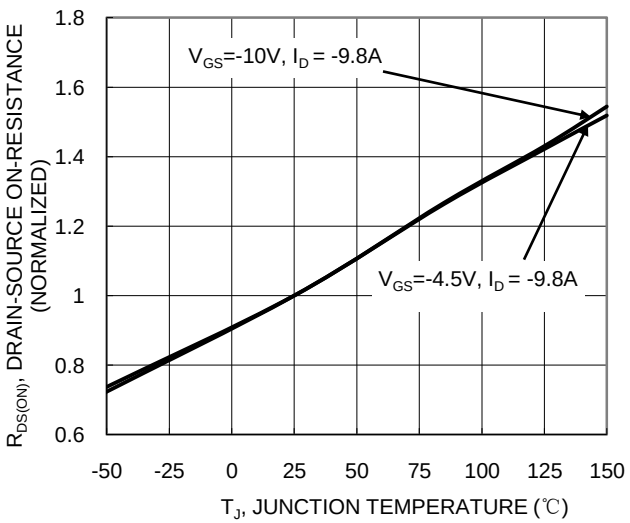


Figure 6.On-Resistance Variation with Temperature

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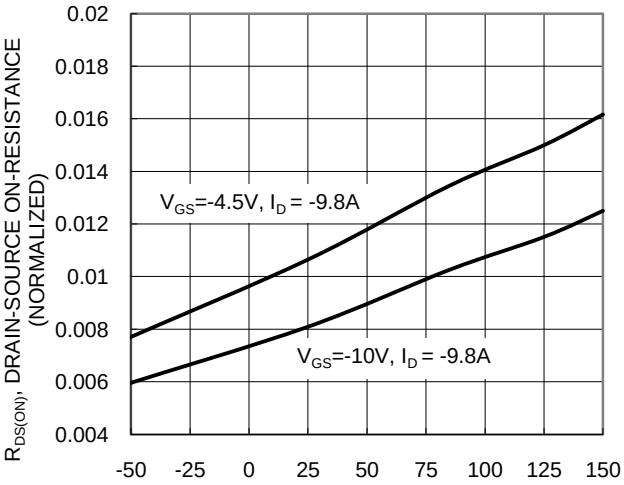

Figure 7.On-Resistance Variation with Temperature

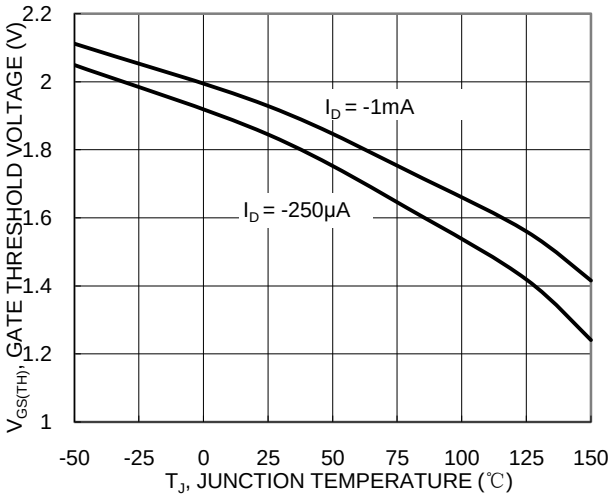

Figure.8 Gate Threshold Variation vs. Junction Temperature

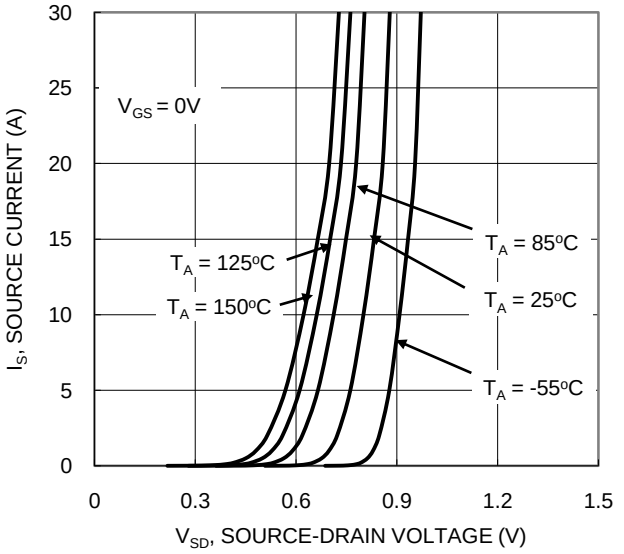

Figure 9 . Diode Forward Voltage vs. Current

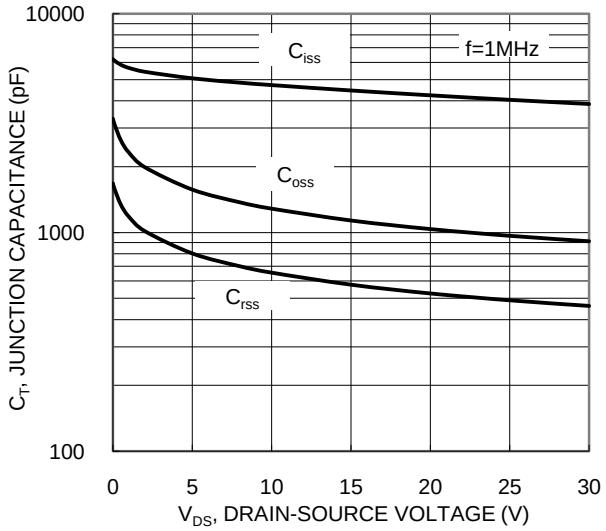

Figure 10. Typical Junction Capacitance

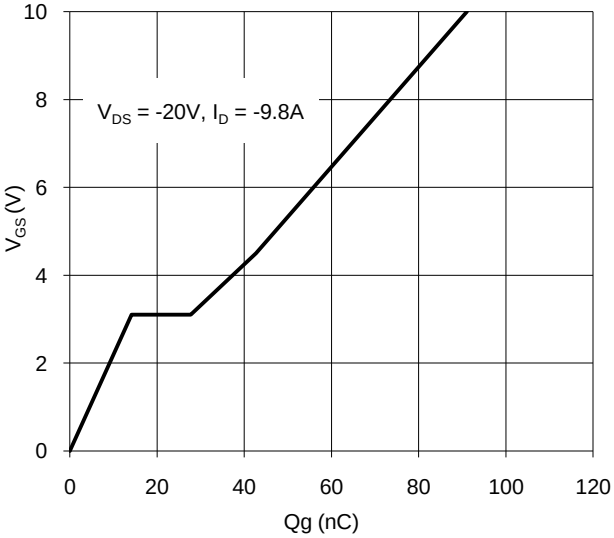

Figure 11.Gate Charge

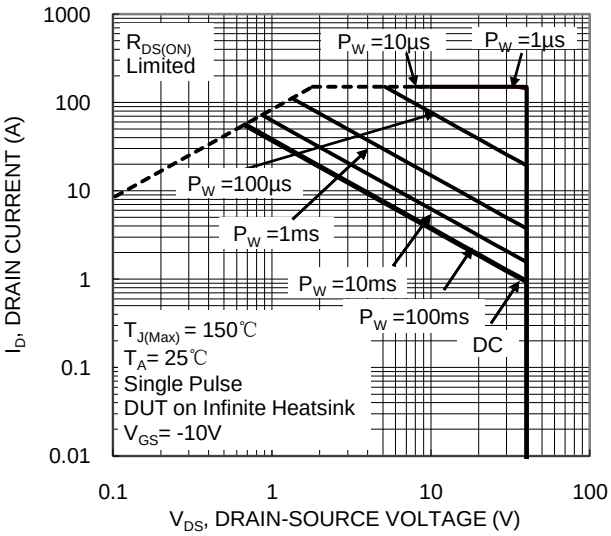

Figure 12. SOA, Safe Operation Area

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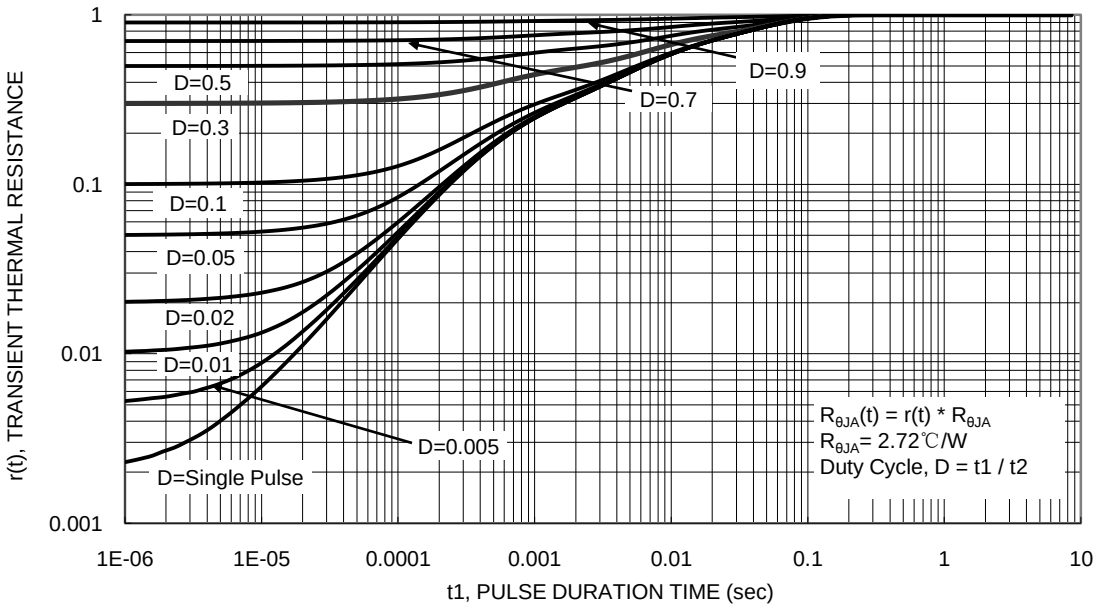

Figure 13. Transient Thermal Resistance

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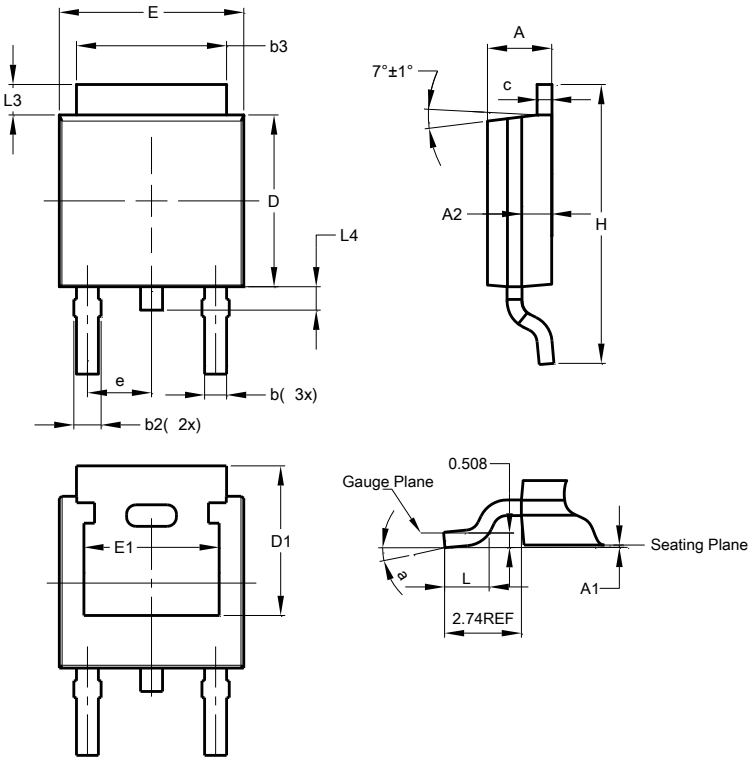
Package Outline Dimensions

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

TO252 (DPAK)

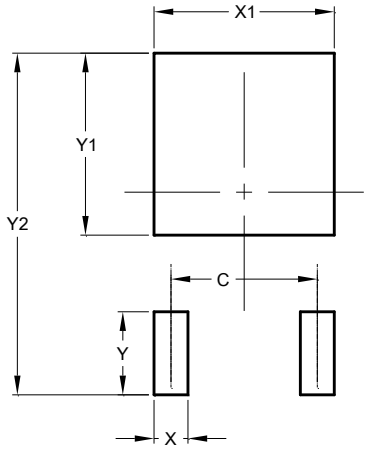


TO252 (DPAK)			
Dim	**Min**	**Max**	**Typ**
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02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