600V N-CHANNEL ENHANCEMENT MODE MOSFET

NEW PRODUCT

Product Summary

$V_{(BR)DSS}$ (@ T_J Max)	$R_{DS(ON)}$ Max	I_D T_C = +25°C
650V	2.3Ω @ V_{GS} = 10V	3.7A

Features

- 100% Unclamped Inductive Switch (UIS) Test in Production
- Low Gate Input Resistance
- Low Input Capacitance
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

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.

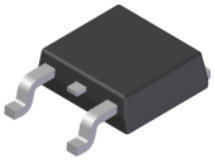
Mechanical Data

- 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 Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.33 grams (Approximate)

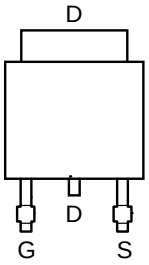
Applications

- Motor Control
- Backlighting
- DC-DC Converters
- Power Management Functions

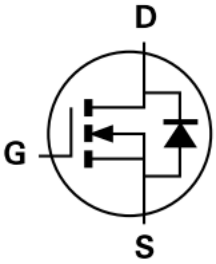
TO252



Top View



Top View



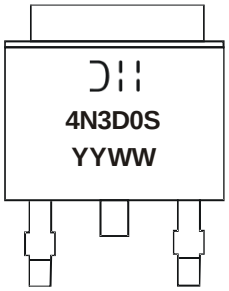
Internal Schematic

Ordering Information (Note 4)

Part Number	Compliance	Case	Packaging
DMG4N60SK3-13	Standard	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. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

Marking Information



=Manufacturer's Marking
4N3D0S= Product Type Marking Code
YYWW = Date Code Marking
YY or YY= Last Digit of Year (ex: 14 = 2014)
WW or WW= Week Code (01 to 53)

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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	600	V
Gate-Source Voltage			V_{GSS}	±30	V
Continuous Drain Current, V_{GS} = 10V	Steady State	T_C = +25°C T_C = +100°C	I_D	3.7 2.4	A
Maximum Body Diode Forward Current			I_S	3.7	A
Pulsed Drain Current (10µs pulse, Duty Cycle = 1%)			I_{DM}	5	A
Avalanche Current, L = 60mH (Note 6)			I_{AS}	1.7	A
Avalanche Energy, L = 60mH (Note 6)			E_{AS}	90	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation	T_C = +25°C	P_D	48	W
	T_C = +100°C		19	
Thermal Resistance, Junction to Ambient (Note 5)		$R_{\theta JA}$	47	°C/W
Thermal Resistance, Junction to Case		$R_{\theta JC}$	2.6	
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 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	600	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 600V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	100	nA	V_{GS} = ±30V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	2.5	3.5	4.5	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	2.0	2.3	Ω	V_{GS} = 10V, I_D = 2A
Diode Forward Voltage	V_{SD}	—	0.8	1.4	V	V_{GS} = 0V, I_S = 1A
DYNAMIC CHARACTERISTICS (Note 6)						
Input Capacitance	C_{iss}	—	532	—	pF	V_{DS} = 25V, f = 1.0MHz, V_{GS} = 0
Output Capacitance	C_{oss}	—	47	—		
Reverse Transfer Capacitance	C_{rss}	—	4	—		
Gate Resistance	R_G	—	3.3	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge (V_{GS} = 10V)	Q_g	—	14.3	—	nC	V_{DD} = 480V, I_D = 4A, V_{GS} = 10V
Gate-Source Charge	Q_{gs}	—	3.3	—		
Gate-Drain Charge	Q_{gd}	—	6.9	—		
Turn-On Delay Time	$t_{D(ON)}$	—	14	—	ns	V_{DD} = 300V, R_G = 25Ω, I_D = 4A, V_{GS} = 10V
Turn-On Rise Time	t_R	—	34	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	32	—		
Turn-Off Fall Time	t_F	—	25	—		
Body Diode Reverse Recovery Time	t_{RR}	—	229	—	ns	dI/dt = 100A/µs, V_{DS} = 100V, I_F = 4A
Body Diode Reverse Recovery Charge	Q_{RR}	—	1564	—	nC	

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper pad layout.
6. Guaranteed by design. Not subject to production testing.
7. Short duration pulse test used to minimize self-heating effect.

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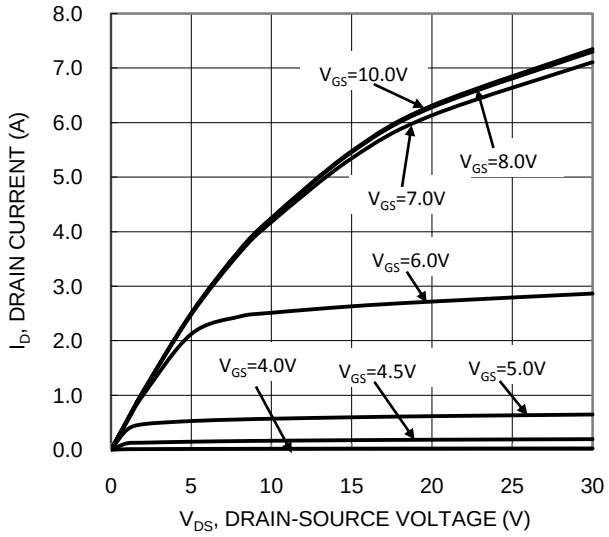

Figure 1. Typical Output Characteristic

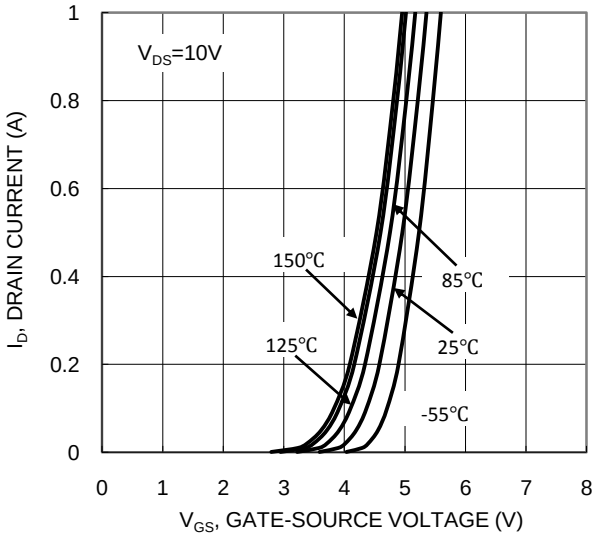

Figure 2. Typical Transfer Characteristic

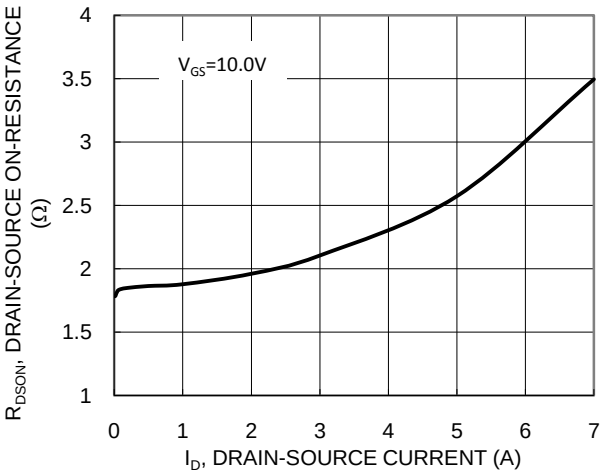

Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

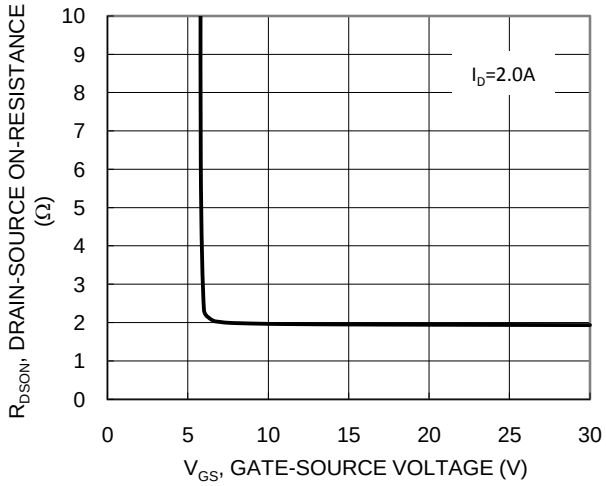

Figure 4. Typical Transfer Characteristic

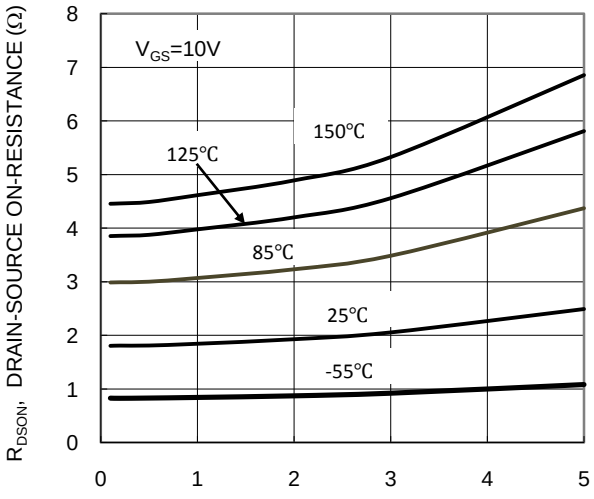

Figure 5. Typical On-Resistance vs Drain Current and Temperature

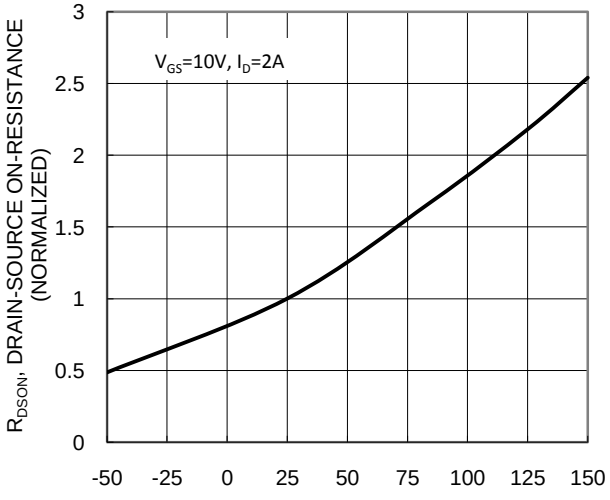

Figure 6. On-Resistance Variation with Temperature

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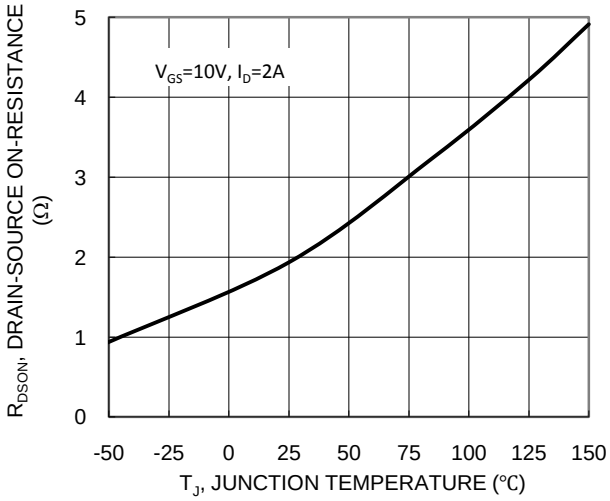

Figure 7. On-Resistance Variation with Temperature

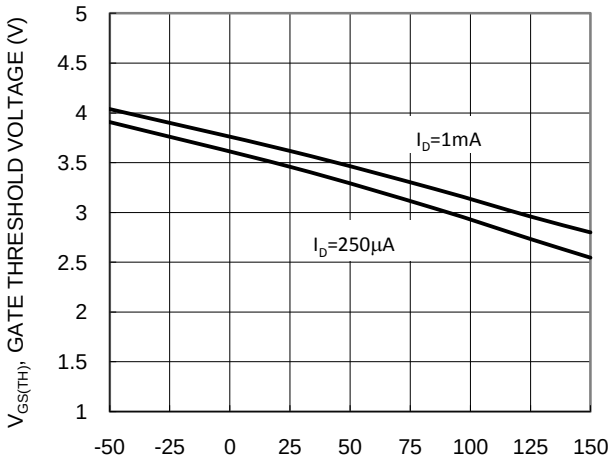

Figure 8. Gate Threshold Variation vs. Junction Temperature

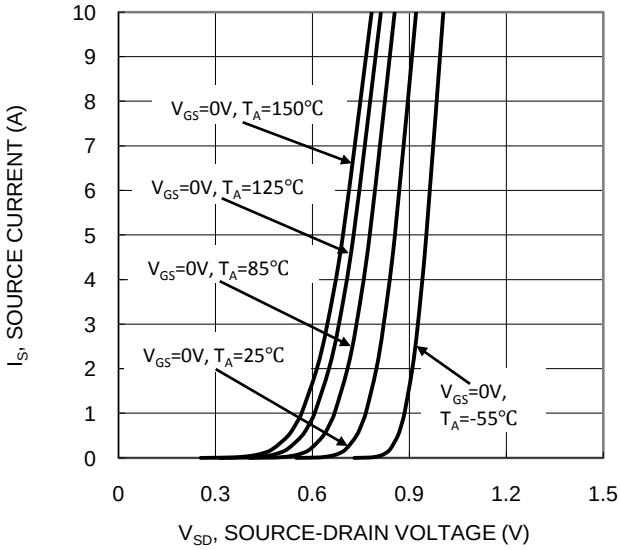

Figure 9. Diode Forward Voltage vs. Current

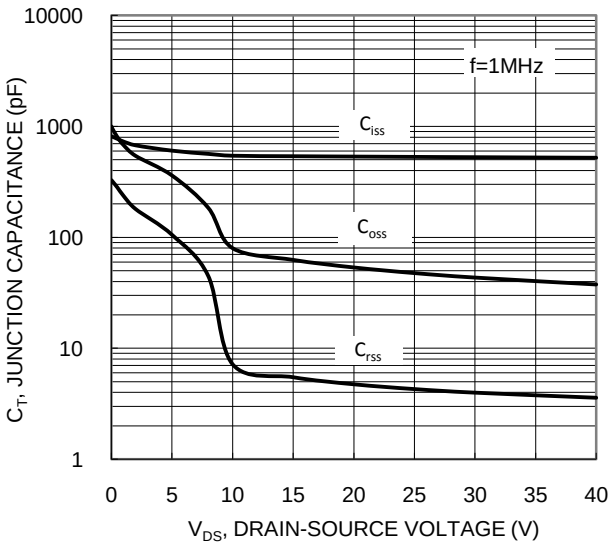

Figure 10. Typical Junction Capacitance

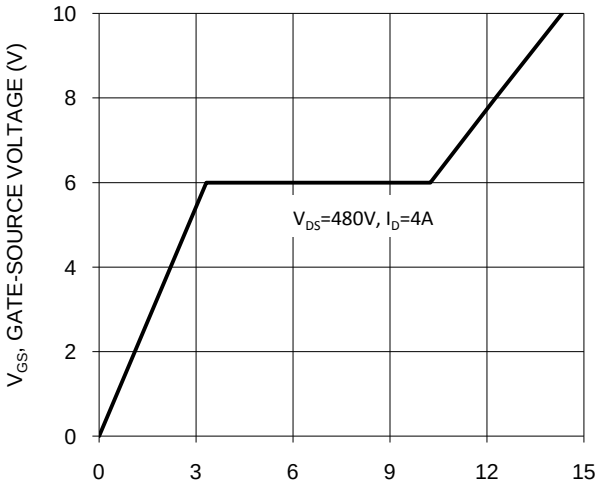

Figure 11. Gate Charge

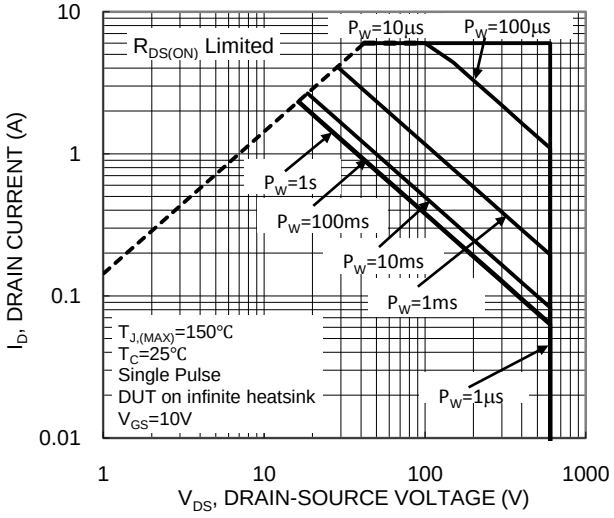

Figure 12. SOA, Safe Operation Area

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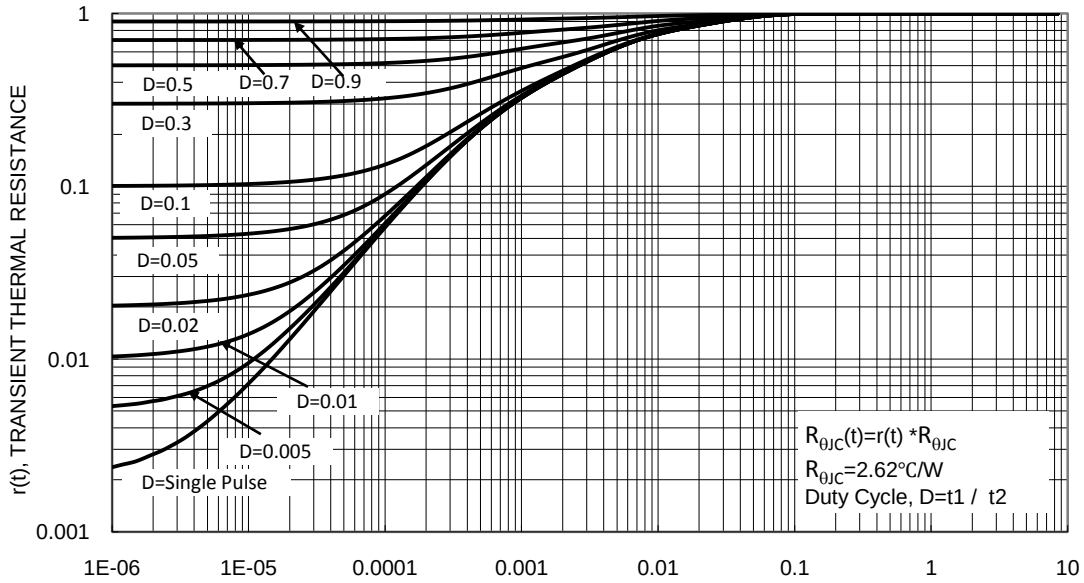
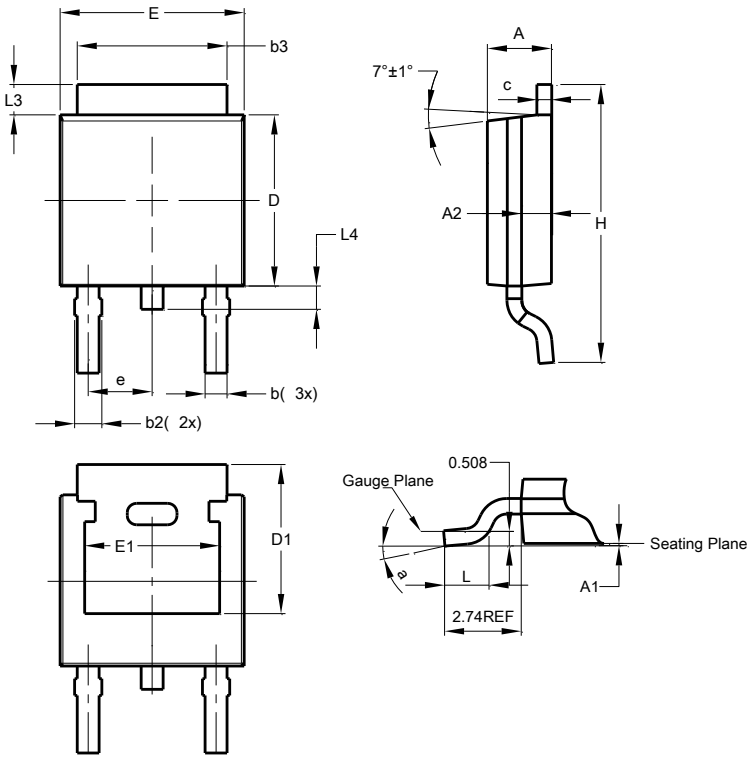


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

(1) Package Type: 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			

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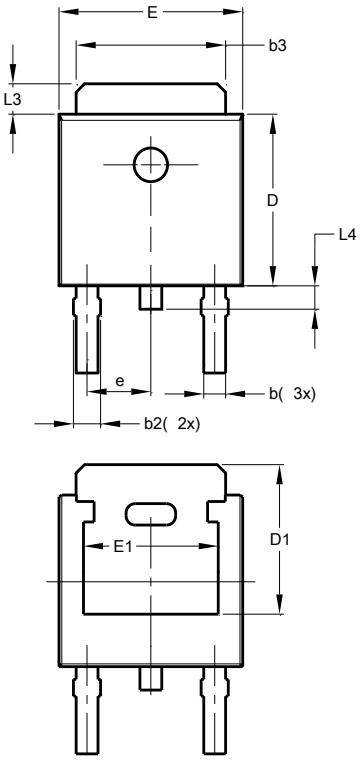
Package Outline Dimensions (Cont.)

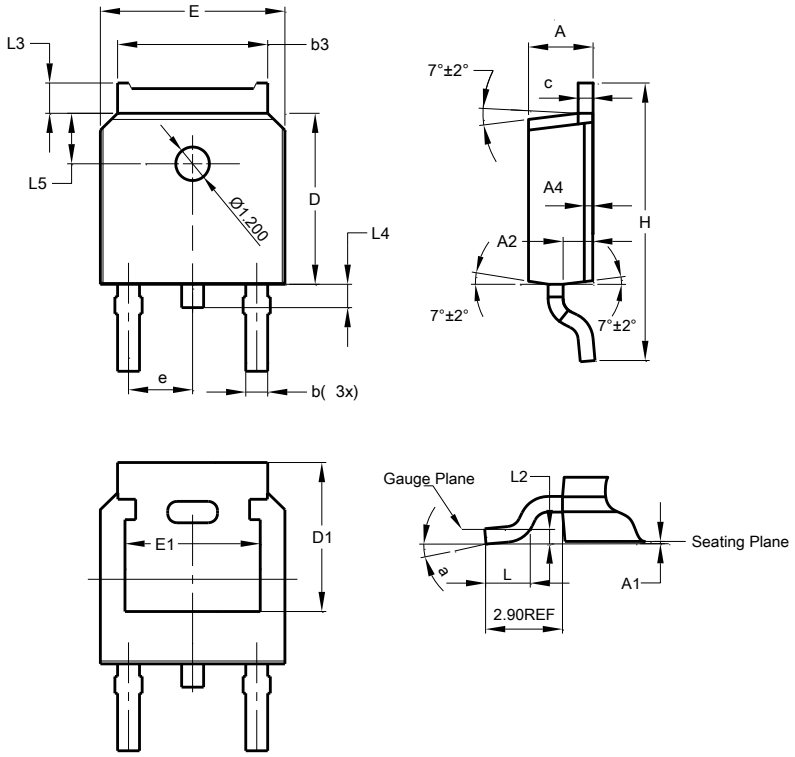
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.

(2) Package Type: TO252 (DPAK) (Type BR)



TO252 (DPAK) (Type BR)			
Dim	Min	Max	Typ
A	2.20	2.40	-
A1	0.00	0.10	-
b	0.50	0.70	-
b3	5.20	5.40	-
c	0.45	0.55	-
D	5.95	6.25	-
D1	5.10	5.50	-
E	6.45	6.70	-
E1	4.71	4.91	-
e	2.24	2.34	
H	9.45	9.95	-
L	1.25	1.75	-
L3	0.95	1.25	-
L4	0.60	0.90	-
All Dimensions in mm			

(3) Package Type: TO252 (DPAK) (Type TH)



TO252 (DPAK) (Type TH)			
Dim	Min	Max	Typ
A	2.20	2.38	2.30
A1	0.00	0.10	-
A2	0.97	1.17	1.07
A4	0.10 REF		
b	0.72	0.85	0.78
b3	5.23	5.45	5.33
c	0.47	0.58	0.53
D	6.00	6.20	6.10
D1	5.30 REF		
e	2.286 BSC		
E	6.50	6.70	6.60
E1	4.70	4.92	4.83
H	9.90	10.10	10.30
L	1.40	1.70	1.60
L2	0.51 BSC		
L3	0.90	1.25	-
L4	0.60	1.00	0.80
L5	1.70	1.90	1.80
a	0°	8°	-
All Dimensions in mm			

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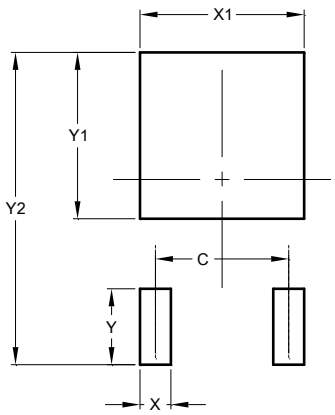
Suggested Pad Layout

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



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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