

## Product Summary

$BV_{DSS}$	$R_{DS(ON)} \text{ Max}$	$I_D$ $T_c = +25^\circ\text{C}$ (Note 10)
40V	3.7mΩ @ $V_{GS} = 10\text{V}$	100A

## Features

- Rated to +175°C – Ideal For High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable And Robust End Application
- Low  $R_{DS(ON)}$  – Minimizes Power Losses
- Low  $Q_g$  – 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
- PPAP Capable (Note 4)

## Description and Applications

This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

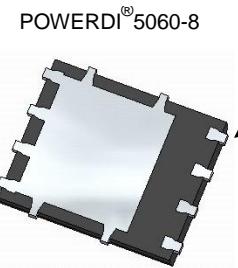
- Engine Management Systems
- Body Control Electronics
- DC-DC Converters

## Mechanical Data

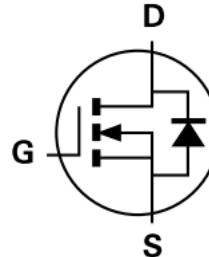
- Case: POWERDI®5060-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.097 grams (Approximate)



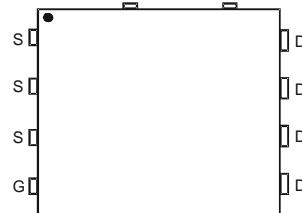
Top View



Bottom View



Internal Schematic


 Top View  
Pin Configuration

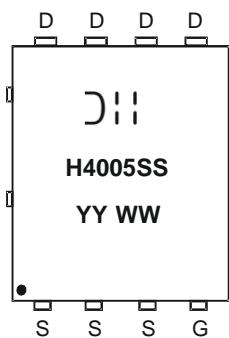
## Ordering Information (Note 5)

Part Number	Case	Packaging
DMTH4005SPSQ-13	POWERDI®5060-8	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. Automotive products are AEC-Q101 qualified and are PPAP capable. For more information, please refer to [http://www.diodes.com/product\\_compliance\\_definitions.html](http://www.diodes.com/product_compliance_definitions.html).
5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



DII = Manufacturer's Marking  
 H4005SS = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 14 = 2014)  
 WW = Week (01 to 53)

POWERDI is a registered trademark of Diodes Incorporated.

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

Characteristic	Symbol	Value	Unit	
Drain-Source Voltage	$V_{DSS}$	40	V	
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V	
Continuous Drain Current (Note 6)	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	20.9 17.5	A
Continuous Drain Current (Notes 7 & 10)	$T_C = +25^\circ\text{C}$ $T_C = +100^\circ\text{C}$	$I_D$	100 100	A
Maximum Continuous Body Diode Forward Current (Note 7)	$I_S$	100	A	
Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)	$I_{DM}$	150	A	
Avalanche Current, $L=0.6\text{mH}$	$I_{AS}$	21	A	
Avalanche Energy, $L=0.6\text{mH}$	$E_{AS}$	132.3	mJ	

**Thermal Characteristics**

Characteristic	Symbol	Value	Unit	
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	$P_D$	2.6	W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	57	$^\circ\text{C}/\text{W}$	
Total Power Dissipation (Note 7)	$T_C = +25^\circ\text{C}$	$P_D$	150	W
Thermal Resistance, Junction to Case (Note 7)	$R_{\theta JC}$	1	$^\circ\text{C}/\text{W}$	
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +175	$^\circ\text{C}$	

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	40	—	—	V	$V_{GS} = 0\text{V}, I_D = 1\text{mA}$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 32\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	2	—	4	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	2.9	3.7	$\text{m}\Omega$	$V_{GS} = 10\text{V}, I_D = 50\text{A}$
Diode Forward Voltage	$V_{SD}$	—	0.88	—	V	$V_{GS} = 0\text{V}, I_S = 50\text{A}$
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	$C_{iss}$	—	3,062	—	pF	$V_{DS} = 20\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Output Capacitance	$C_{oss}$	—	902.2	—		
Reverse Transfer Capacitance	$C_{rss}$	—	179.2	—		
Gate Resistance	$R_g$	—	0.67	—	nC	$V_{DD} = 20\text{V}, I_D = 50\text{A}, V_{GS} = 10\text{V}$
Total Gate Charge	$Q_g$	—	49.1	—		
Gate-Source Charge	$Q_{gs}$	—	10.3	—		
Gate-Drain Charge	$Q_{gd}$	—	13	—		
Turn-On Delay Time	$t_{D(ON)}$	—	8.7	—		
Turn-On Rise Time	$t_R$	—	6.8	—	ns	$V_{DD} = 20\text{V}, V_{GS} = 10\text{V}, I_D = 50\text{A}, R_G = 3\Omega$
Turn-Off Delay Time	$t_{D(OFF)}$	—	18.6	—		
Turn-Off Fall Time	$t_F$	—	7.3	—		
Body Diode Reverse Recovery Time	$t_{RR}$	—	31.8	—	nC	$I_F = 50\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	$Q_{RR}$	—	26.5	—		

Notes: 6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.

7. Thermal resistance from junction to soldering point (on the exposed drain pad).

8. Short duration pulse test used to minimize self-heating effect.

9. Guaranteed by design. Not subject to product testing.

10. Package limited.

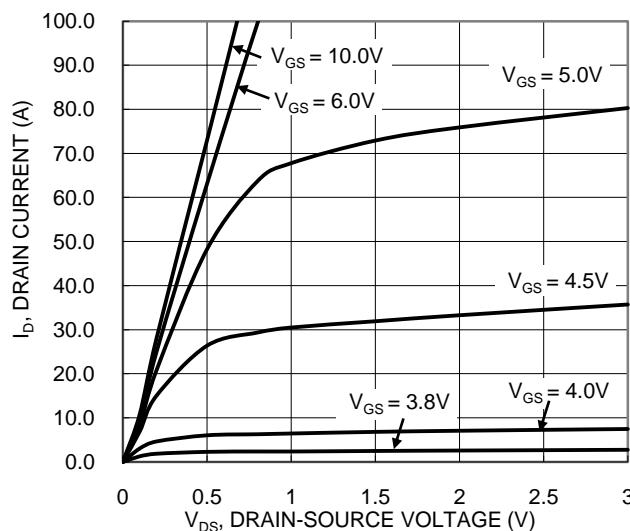


Figure 1 Typical Output Characteristic

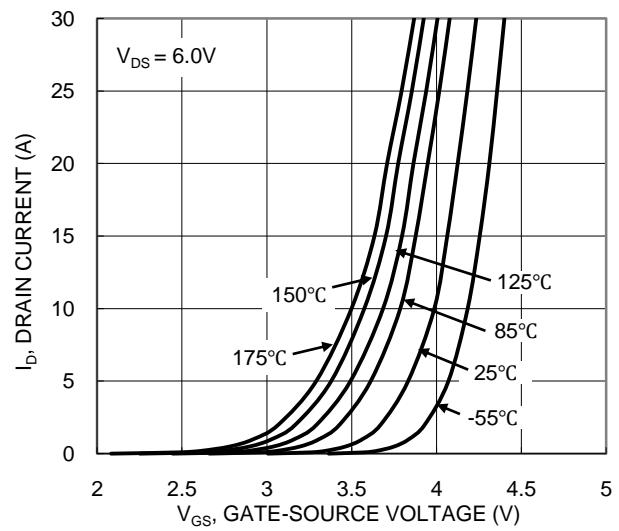


Figure 2 Typical Transfer Characteristic

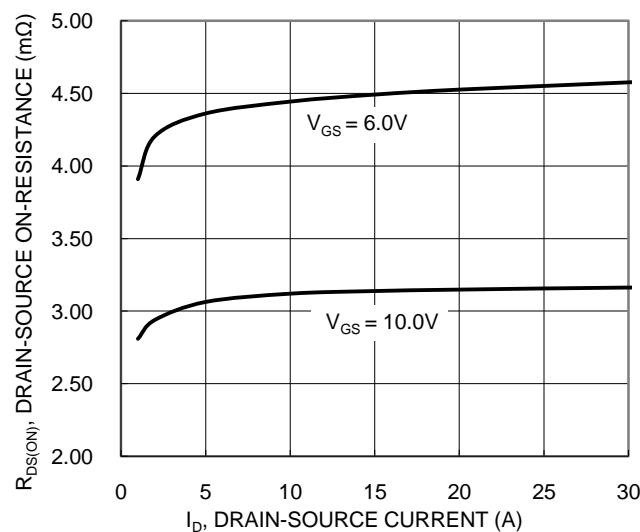


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

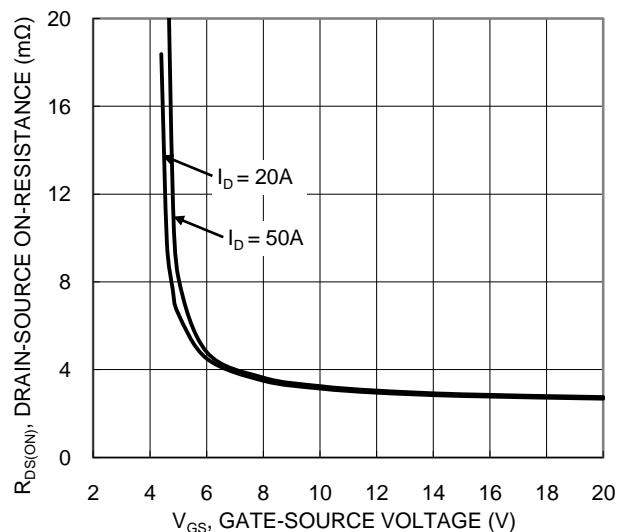


Figure 4 Typical Transfer Characteristic

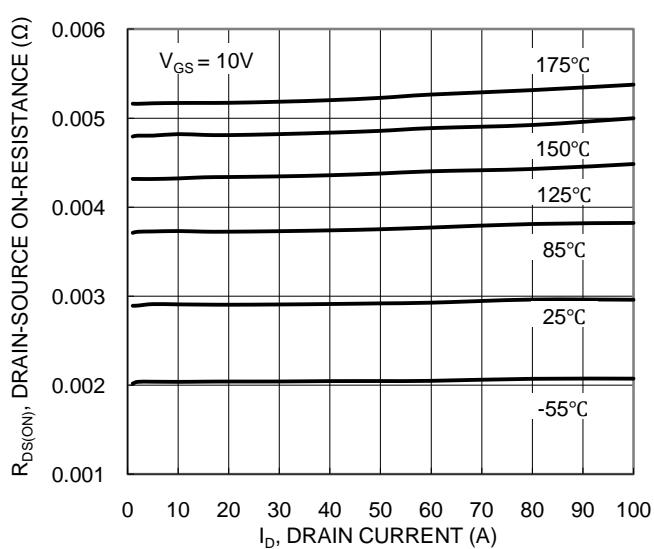


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

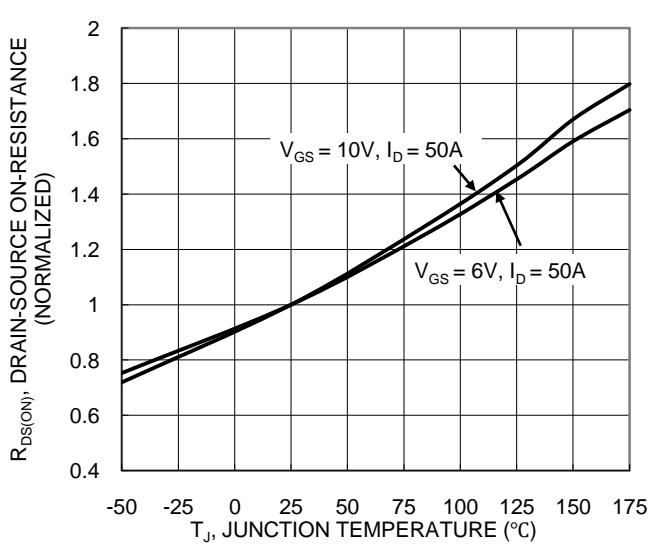


Figure 6 On-Resistance Variation with Temperature

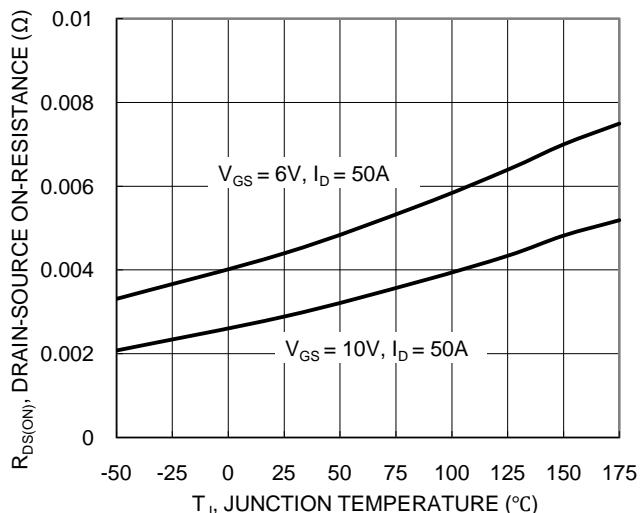


Figure 7 On-Resistance Variation with Temperature

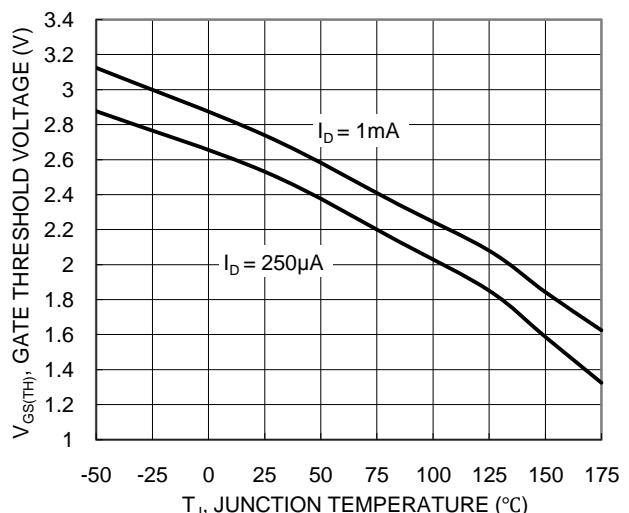


Figure 8 Gate Threshold Variation vs. Temperature

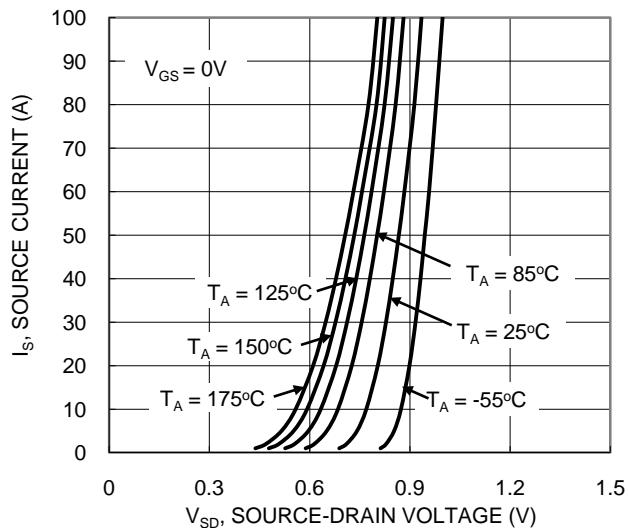


Figure 9 Diode Forward Voltage vs. Current

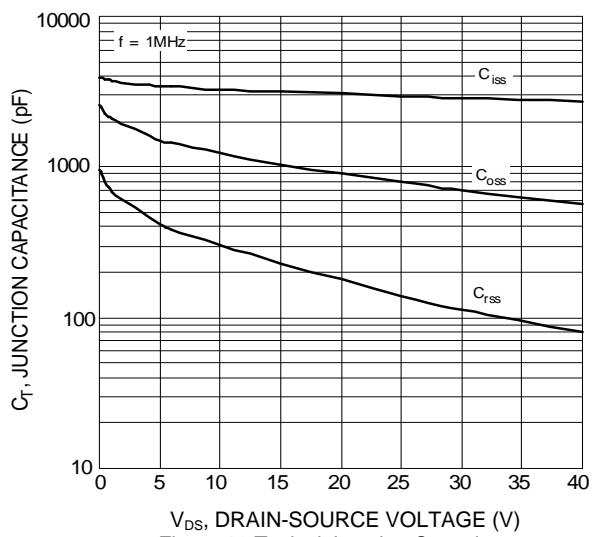


Figure 10 Typical Junction Capacitance

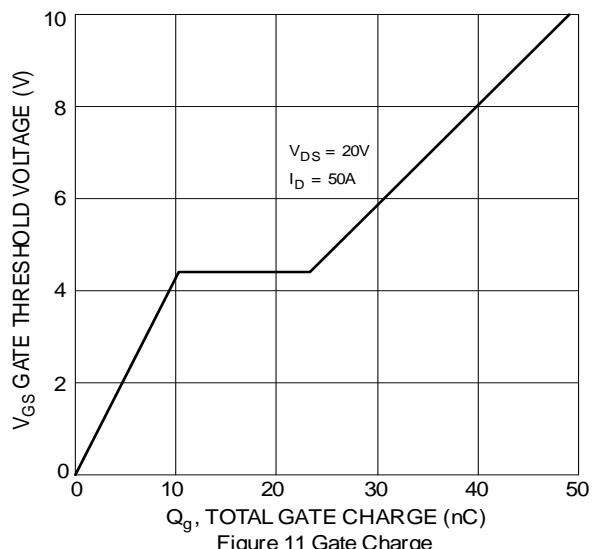


Figure 11 Gate Charge

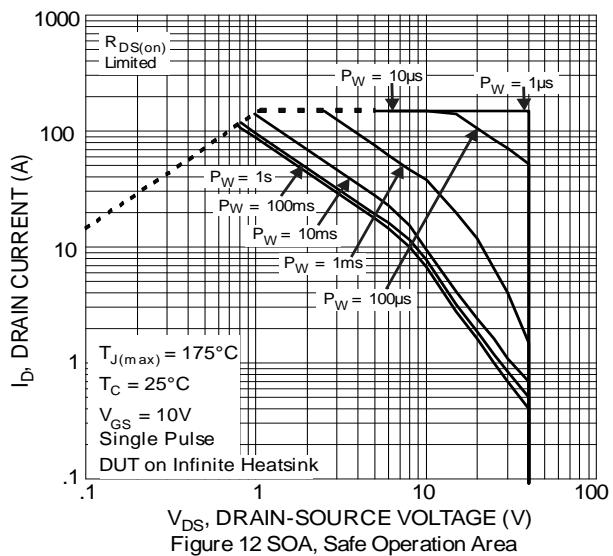


Figure 12 SOA, Safe Operation Area

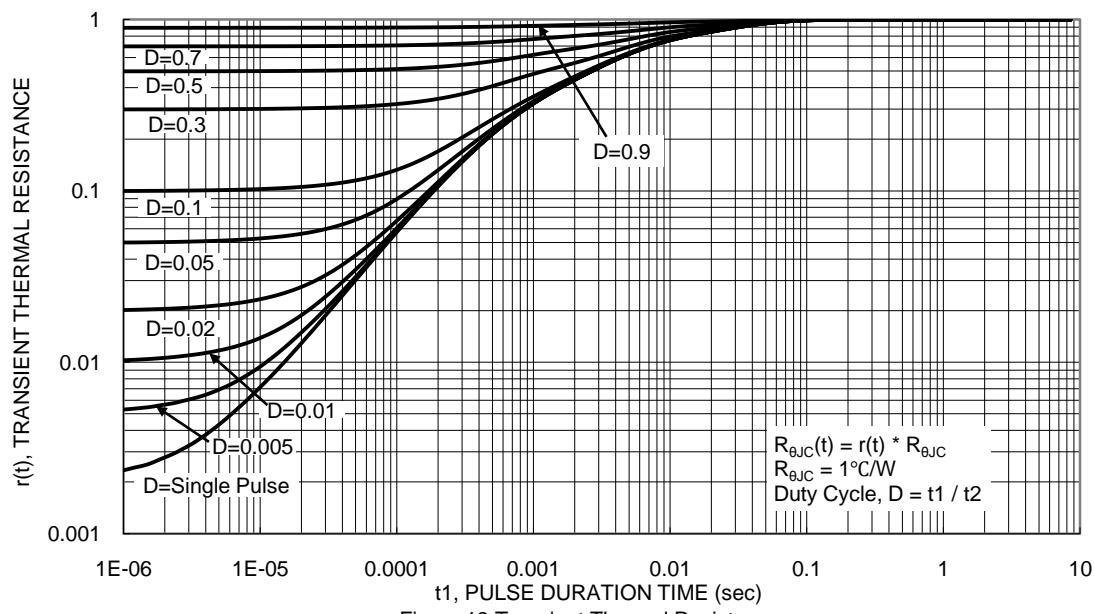
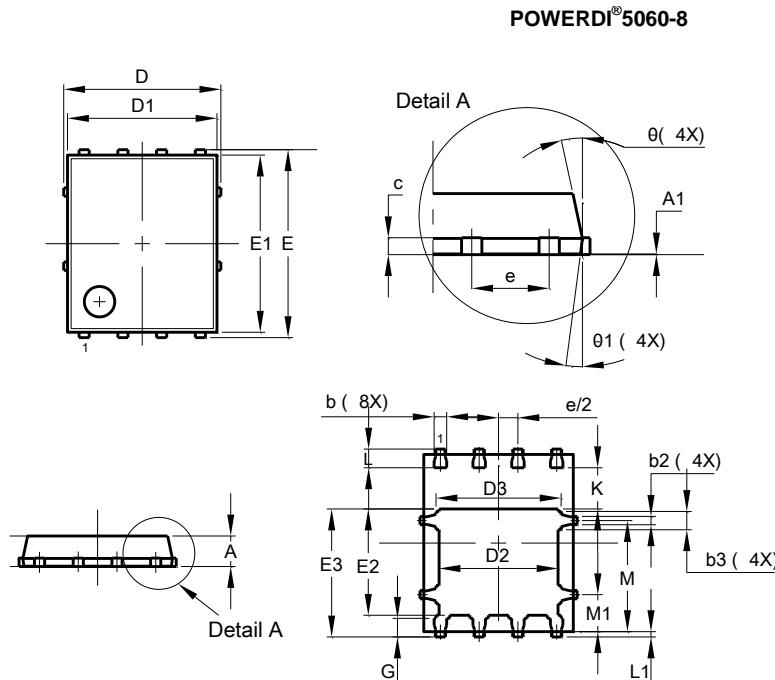


Figure 13 Transient Thermal Resistance

## Package Outline Dimensions

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

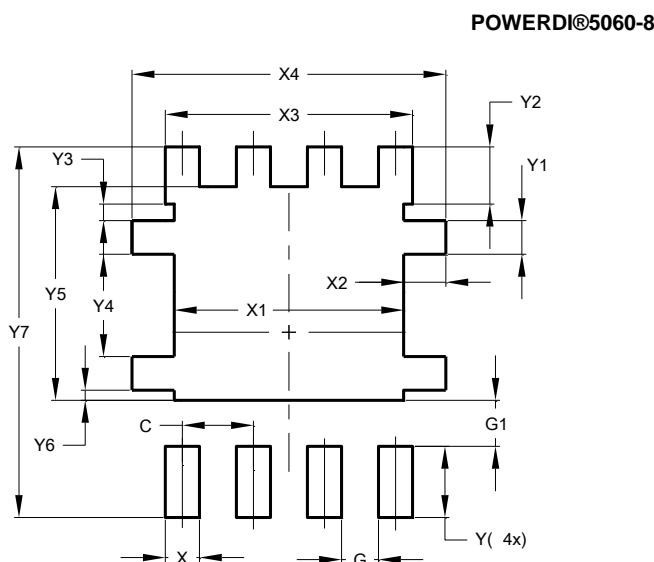


POWERDI® 5060-8			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0.00	0.05	—
b	0.33	0.51	0.41
b2	0.200	0.350	0.273
b3	0.40	0.80	0.60
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.70	4.10	3.90
D3	3.90	4.30	4.10
E	6.15 BSC		
E1	5.60	6.00	5.80
E2	3.28	3.68	3.48
E3	3.99	4.39	4.19
e	1.27 BSC		
G	0.51	0.71	0.61
K	0.51	—	—
L	0.51	0.71	0.61
L1	0.100	0.200	0.175
M	3.235	4.035	3.635
M1	1.00	1.40	1.21
Θ	10°	12°	11°
Θ1	6°	8°	7°

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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	1.270
G	0.660
G1	0.820
X	0.610
X1	4.100
X2	0.755
X3	4.420
X4	5.610
Y	1.270
Y1	0.600
Y2	1.020
Y3	0.295
Y4	1.825
Y5	3.810
Y6	0.180
Y7	6.610

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