

## Product Summary

$BV_{DSS}$	$R_{DS(ON)}$ Max	$I_D$ Max $T_C = +25^\circ C$ (Note 10)
40V	8.6m $\Omega$ @ $V_{GS} = 10V$	45A

## 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:

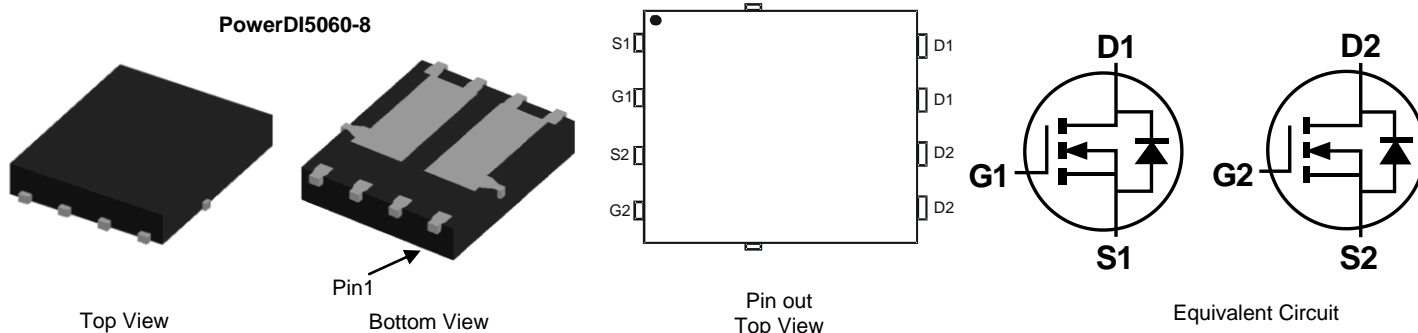
- Backlighting
- Power Management Functions
- DC-DC Converters

## Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- High Conversion Efficiency
- Low  $R_{DS(ON)}$  – Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed
- **Totally Lead-Free & Fully 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: PowerDI<sup>®</sup>5060-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 @3
- Weight: 0.097 grams (Approximate)

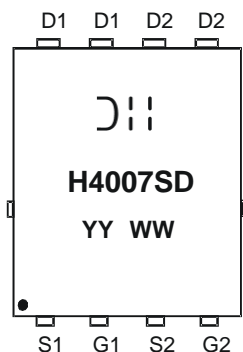


## Ordering Information (Note 5)

Part Number	Case	Packaging
DMTH4007SPDQ-13	PowerDI5060-8	2,500/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  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. 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



⌋|| = Manufacturer's Marking  
 H4007SD = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 15 = 2015)  
 WW = Week (01 - 53)

## Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Units
Drain-Source Voltage	V <sub>DSS</sub>	40	V
Gate-Source Voltage	V <sub>GSS</sub>	±20	V
Continuous Drain Current (Note 7)	I <sub>D</sub>	T <sub>C</sub> = +25°C (Note 10)	45
		T <sub>C</sub> = +100°C	38.1
Continuous Drain Current (Note 6)	I <sub>D</sub>	T <sub>A</sub> = +25°C	14.2
		T <sub>A</sub> = +70°C	11.9
Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%)	I <sub>DM</sub>	90	A
Maximum Continuous Body Diode Forward Current (Note 7)	I <sub>S</sub>	34	A
Avalanche Current, L = 0.1mH	I <sub>AS</sub>	20	A
Avalanche Energy, L = 0.1mH	E <sub>AS</sub>	20	mJ

## Thermal Characteristics

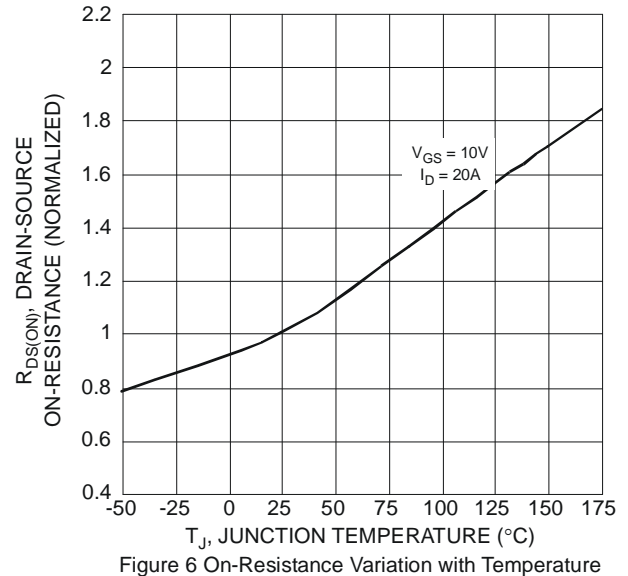
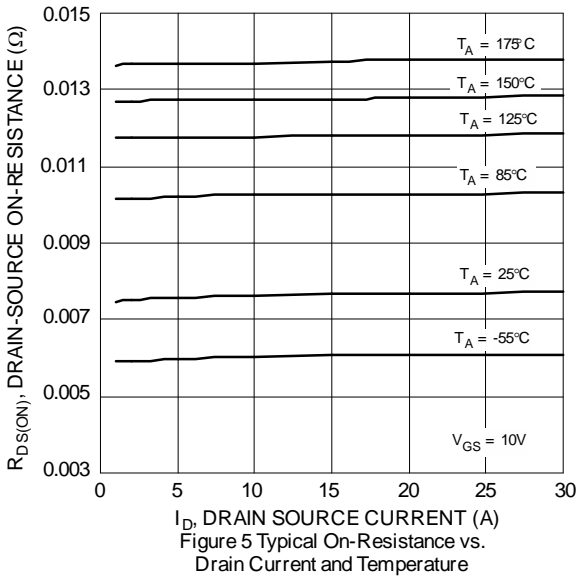
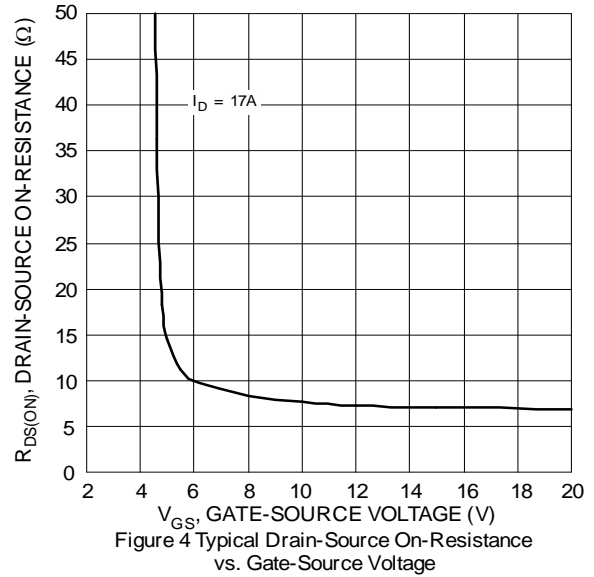
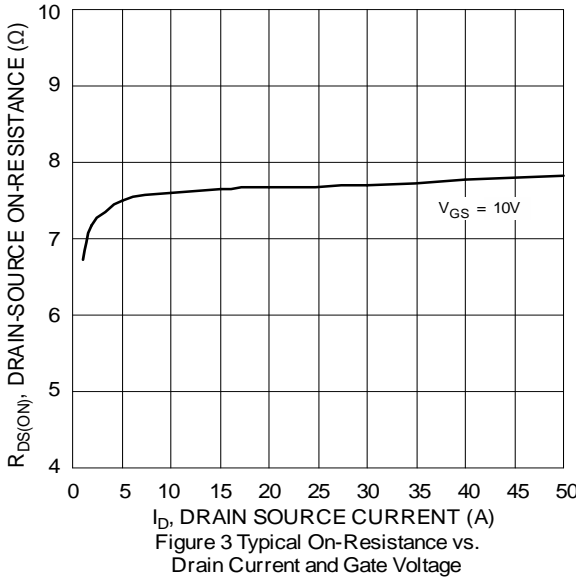
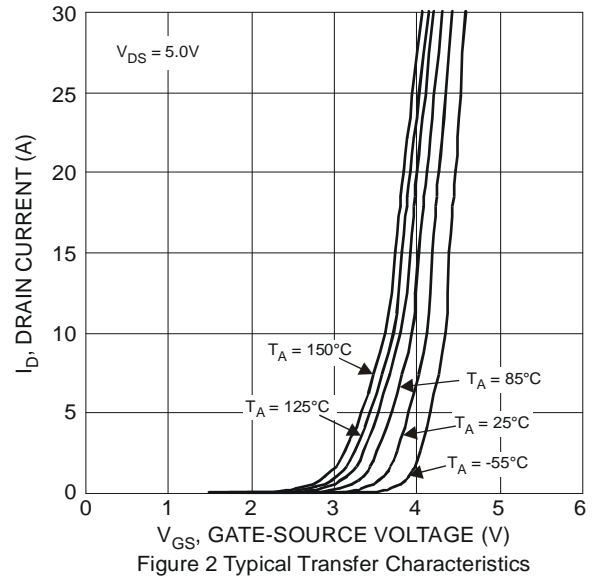
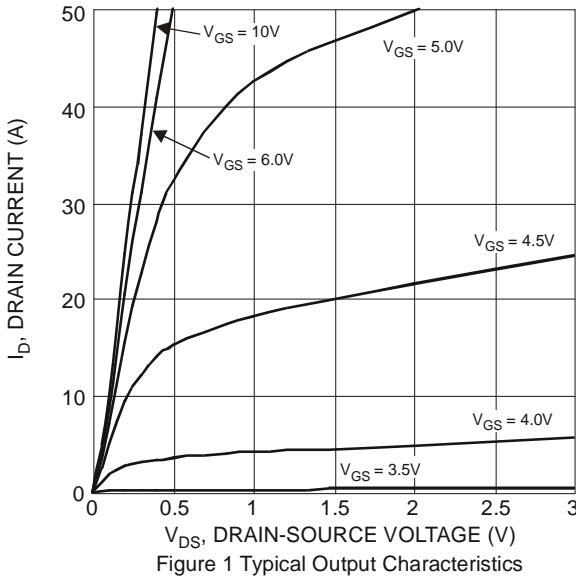
Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 6)	P <sub>D</sub>	2.6	W
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	57	°C/W
Total Power Dissipation (Note 7)	P <sub>D</sub>	37.5	W
Thermal Resistance, Junction to Case (Note 7)	R <sub>θJC</sub>	4	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +175	°C

Notes: 6. Device mounted on FR-4 substrate PC board, 2oz. copper, with thermal bias to bottom layer 1inch square copper plate.  
 7. Thermal resistance from junction to soldering point (on the exposed drain pad).

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 8)						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	40	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 1mA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	1	μA	V <sub>DS</sub> = 32V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS</b> (Note 8)						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	2	—	4	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	7.5	8.6	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 17A
Diode Forward Voltage	V <sub>SD</sub>	—	0.85	—	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 17A
<b>DYNAMIC CHARACTERISTICS</b> (Note 9)						
Input Capacitance	C <sub>ISS</sub>	—	2,026	—	pF	V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V, f = 1MHz
Output Capacitance	C <sub>OSS</sub>	—	702	—	pF	
Reverse Transfer Capacitance	C <sub>RSS</sub>	—	84.8	—	pF	
Gate Resistance	R <sub>G</sub>	—	0.46	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge	Q <sub>G</sub>	—	41.9	—	nC	V <sub>DS</sub> = 30V, I <sub>D</sub> = 20A, V <sub>GS</sub> = 10V
Gate-Source Charge	Q <sub>GS</sub>	—	10	—	nC	
Gate-Drain Charge	Q <sub>GD</sub>	—	11.5	—	nC	
Turn-On Delay Time	t <sub>D(ON)</sub>	—	7	—	ns	V <sub>DD</sub> = 30V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A, R <sub>G</sub> = 3Ω
Turn-On Rise Time	t <sub>R</sub>	—	11.5	—	ns	
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	15.6	—	ns	
Turn-Off Fall Time	t <sub>F</sub>	—	8.8	—	ns	
Body Diode Reverse Recovery Time	t <sub>RR</sub>	—	29.9	—	ns	I <sub>F</sub> = 20A, di/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>	—	23	—	nC	

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



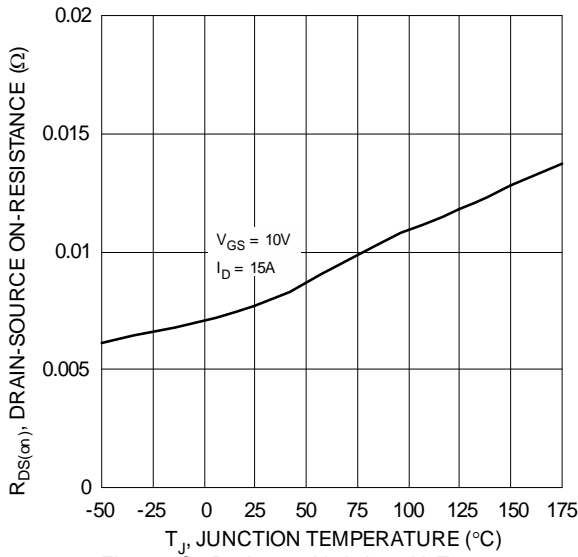


Figure 7 On-Resistance Variation with Temperature

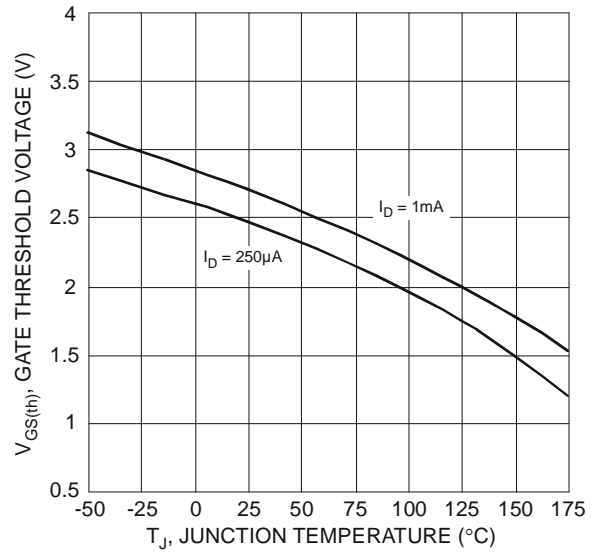


Figure 8 Gate Threshold Variation vs. Ambient Temperature

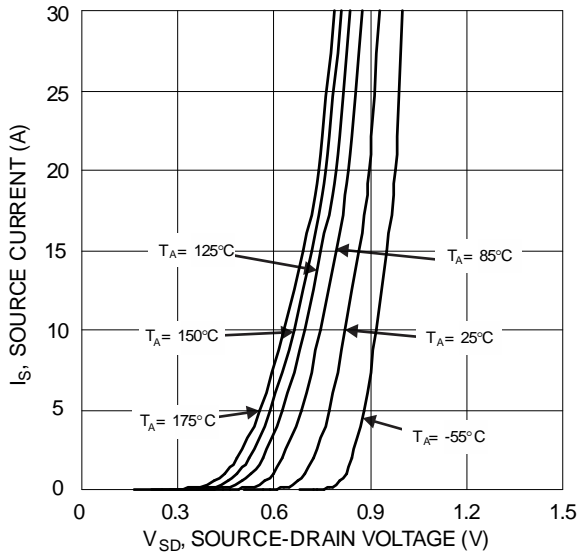


Figure 9 Diode Forward Voltage vs. Current

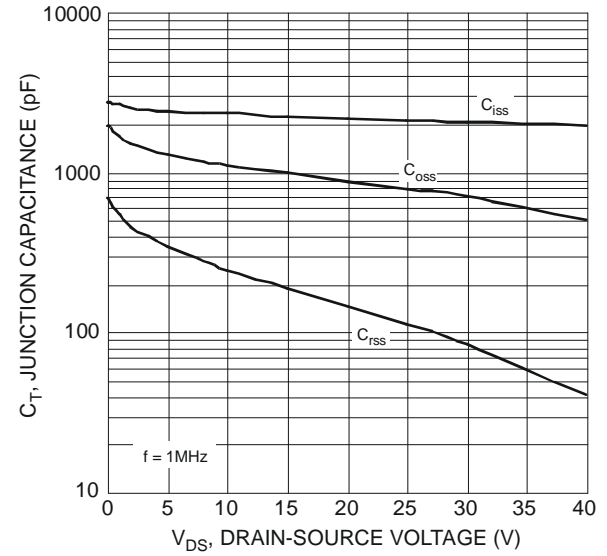


Figure 10 Typical Junction Capacitance

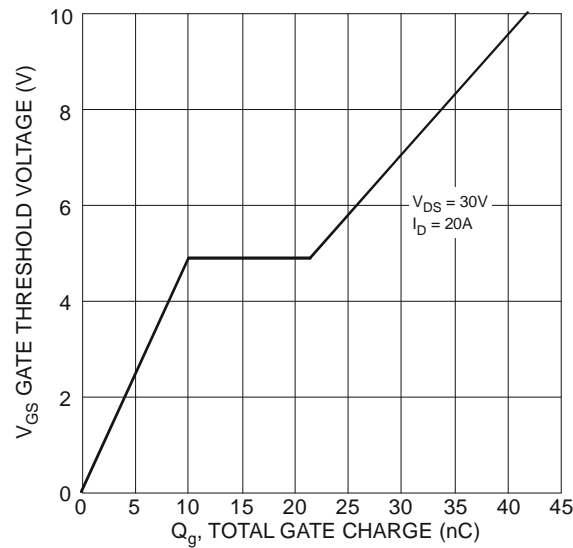


Figure 11 Gate Charge

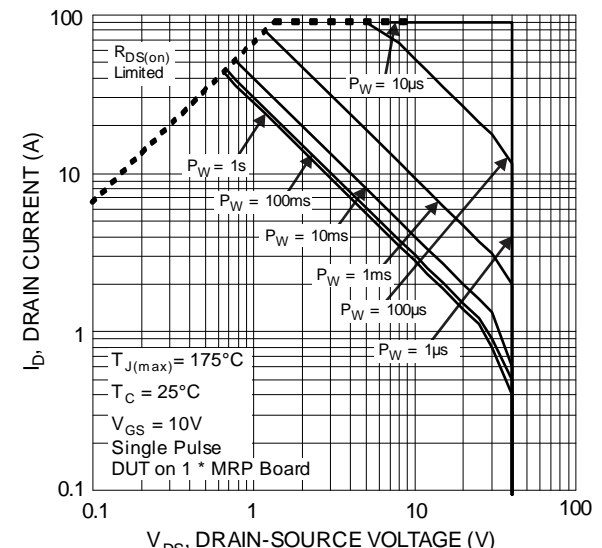


Figure 12 SOA, Safe Operation Area

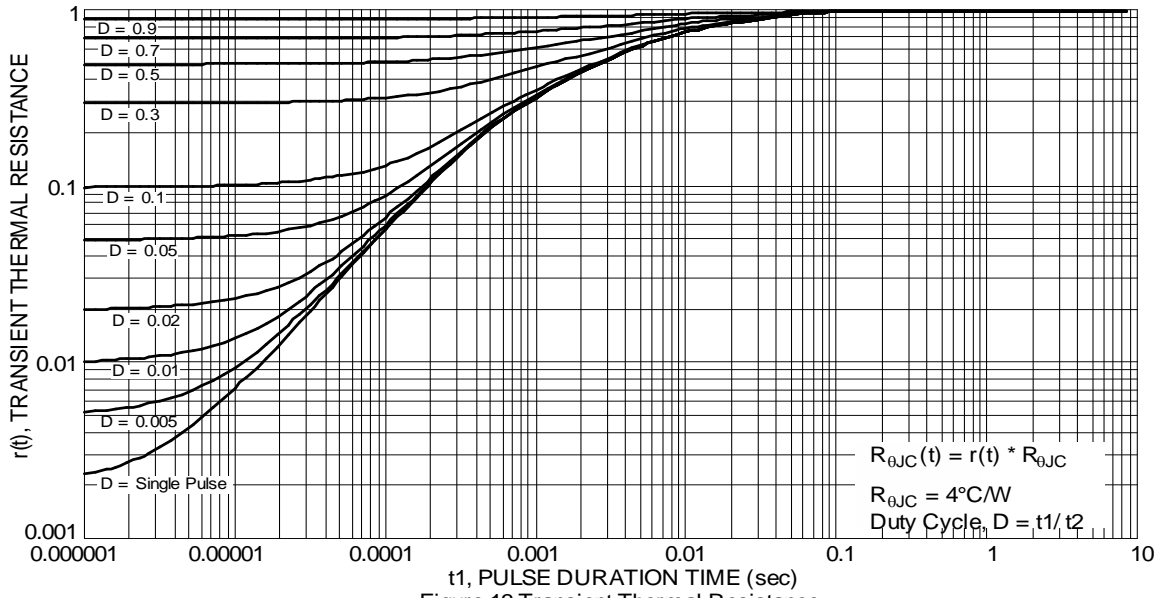
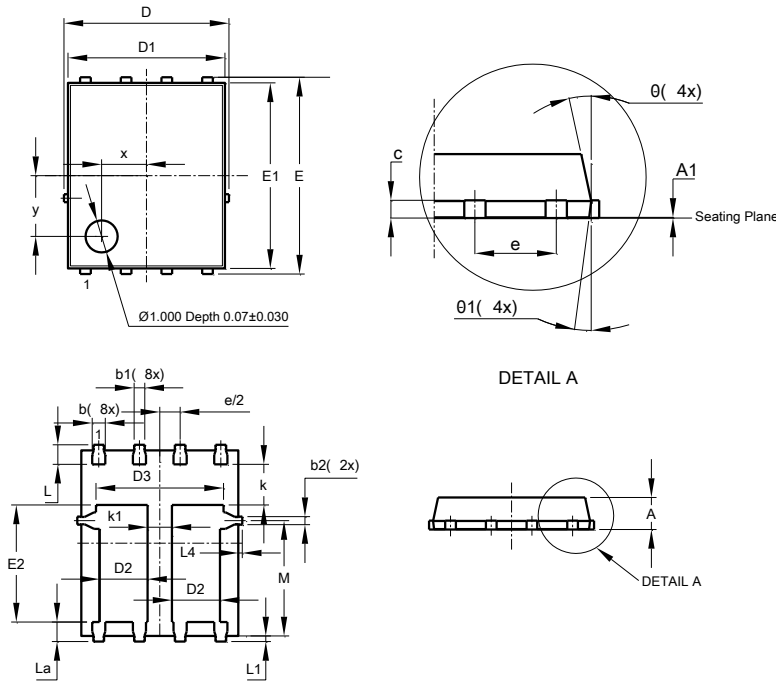


Figure 13 Transient Thermal Resistance

**Package Outline Dimensions**

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

**PowerDI5060-8 (Type C)**

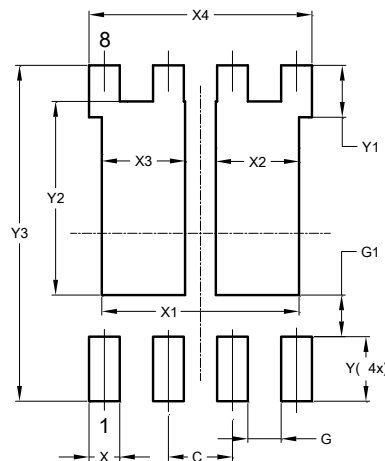


PowerDI5060-8 (Type C)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0	0.05	0.02
b	0.33	0.51	0.41
b1	0.300	0.366	0.333
b2	0.20	0.35	0.25
c	0.23	0.33	0.277
D	5.15 BSC		
D1	4.85	4.95	4.90
D2	1.40	1.60	1.50
D3	-	-	3.98
E	6.15 BSC		
E1	5.75	5.85	5.80
E2	3.56	3.76	3.66
e	1.27BSC		
k	-	-	1.27
k1	0.56	-	-
L	0.51	0.71	0.61
La	0.51	0.71	0.61
L1	0.05	0.20	0.175
L4	-	-	0.125
M	3.50	3.71	3.605
x	-	-	1.400
y	-	-	1.900
θ	10°	12°	11°
θ1	6°	8°	7°
All Dimensions in mm			

**Suggested Pad Layout**

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

**PowerDI5060-8 (Type C)**



Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	3.910
X2	1.650
X3	1.650
X4	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610

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