

## Product Summary

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> Max T <sub>C</sub> = +25°C
40V	8.8mΩ @ V <sub>GS</sub> = 10V	64.8A
	13mΩ @ V <sub>GS</sub> = 5V	53.3A

## 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:

- Brushless DC motor controls
- DC-DC converters
- Load switches

## Features

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching, Test in Production – Ensures More Reliable And Robust End Application
- Low R<sub>DS(ON)</sub> – Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**
- **The DMTH4008LPSQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**  
<https://www.diodes.com/quality/product-definitions/>

## Mechanical Data

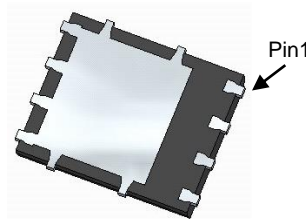
- Package: PowerDI<sup>®</sup>5060-8
- Package Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 **Ⓔ**
- Weight: 0.097 grams (Approximate)

Site 1:

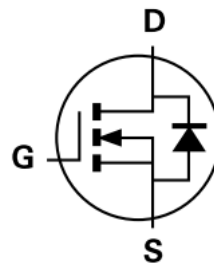
PowerDI5060-8



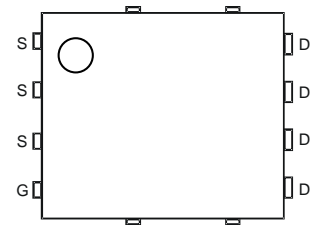
Top View



Bottom View



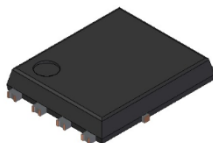
Internal Schematic



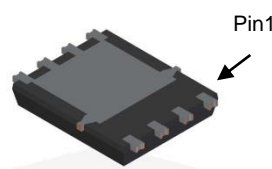
Top View  
Pin Configuration

Site 2:

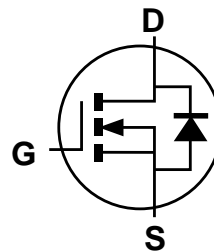
PowerDI5060-8/SWP (Type UX)



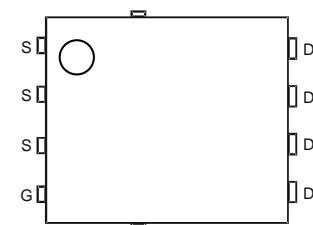
Top View



Bottom View



Internal Schematic



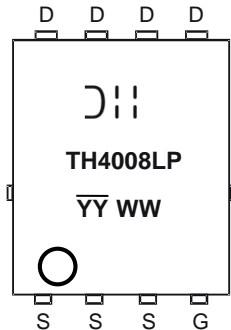
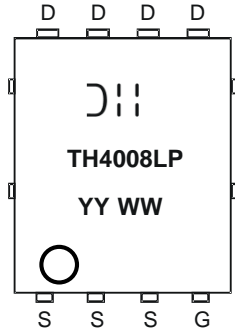
Top View  
Pin Configuration

## Ordering Information (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
DMTH4008LPSQ-13	PowerDI5060-8	2,500	Tape & Reel
DMTH4008LPSQ-13	PowerDI5060-8/SWP (Type UX)	2,500	Tape & Reel

- Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
  2. See <https://www.diodes.com/quality/lead-free/> 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 <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



D⋮ = Manufacturer's Marking  
 TH4008LP = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY or  $\overline{YY}$  = Year (ex: 23 = 2023)  
 WW = Week (01 to 53)

## 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, $V_{GS} = 10\text{V}$ (Note 5)	$I_D$	$T_A = +25^\circ\text{C}$	14.4
		$T_A = +100^\circ\text{C}$	10.2
Continuous Drain Current, $V_{GS} = 10\text{V}$ (Note 6)	$I_D$	$T_C = +25^\circ\text{C}$	64.8
		$T_C = +100^\circ\text{C}$	45.8
Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)	$I_{DM}$	110	A
Maximum Continuous Body Diode Forward Current (Note 6)	$I_S$	55.5	A
Avalanche Current, $L = 0.1\text{mH}$	$I_{AS}$	22.7	A
Avalanche Energy, $L = 0.1\text{mH}$	$E_{AS}$	25.7	mJ

## Thermal Characteristics

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	$P_D$	2.99	W
Thermal Resistance, Junction to Ambient (Note 5)			
Total Power Dissipation (Note 6)	$P_D$	55.5	W
Thermal Resistance, Junction to Case (Note 6)			
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +175	$^\circ\text{C}$

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.  
 6. 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 (Note 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	40	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
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 (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	1	1.6	3	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	7.3	8.8	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 10A
		—	10	13		V <sub>GS</sub> = 5V, I <sub>D</sub> = 10A
Diode Forward Voltage	V <sub>SD</sub>	—	0.8	1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 10A
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	—	1088	—	pF	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V, f = 1MHz
Output Capacitance	C <sub>oss</sub>	—	322	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	27	—		
Gate Resistance	R <sub>g</sub>	—	2.6	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>g</sub>	—	7.4	—	nC	V <sub>DS</sub> = 20V, I <sub>D</sub> = 10A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	—	15.3	—		
Gate-Source Charge	Q <sub>gs</sub>	—	2.4	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	3.4	—		
Turn-On Delay Time	t <sub>D(ON)</sub>	—	4.3	—	ns	V <sub>DD</sub> = 20V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 10A, R <sub>G</sub> = 6Ω
Turn-On Rise Time	t <sub>R</sub>	—	7.5	—		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	16.7	—		
Turn-Off Fall Time	t <sub>F</sub>	—	5.8	—		
Body Diode Reverse Recovery Time	t <sub>RR</sub>	—	20.2	—	ns	I <sub>F</sub> = 10A, di/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>	—	8.9	—	nC	

Notes: 7. Short duration pulse test used to minimize self-heating effect.  
8. Guaranteed by design. Not subject to product testing.

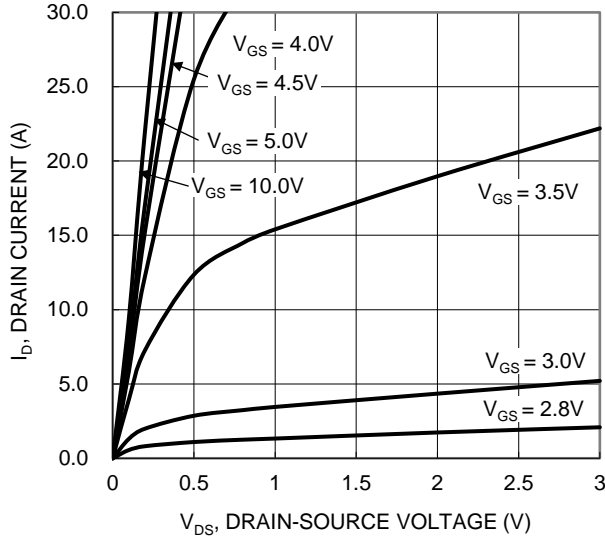


Figure 1. Typical Output Characteristic

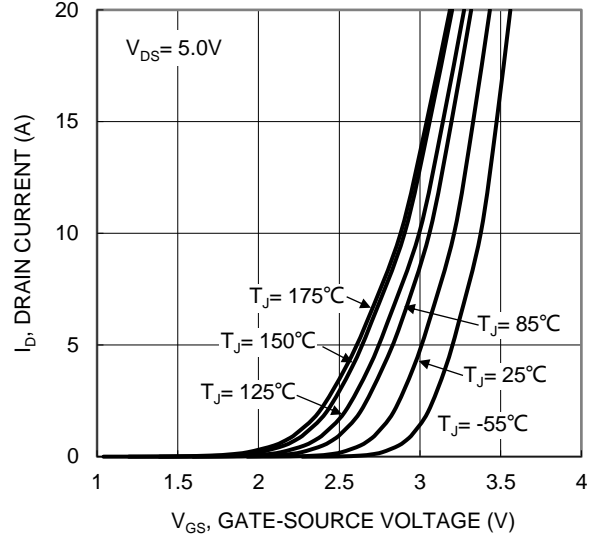


Figure 2. Typical Transfer Characteristic

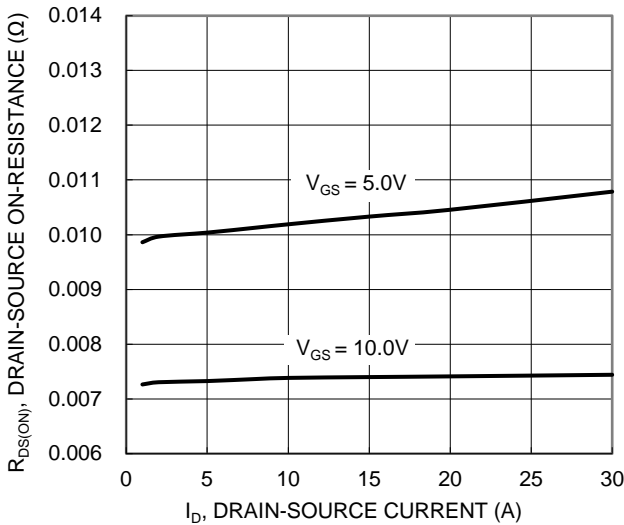


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

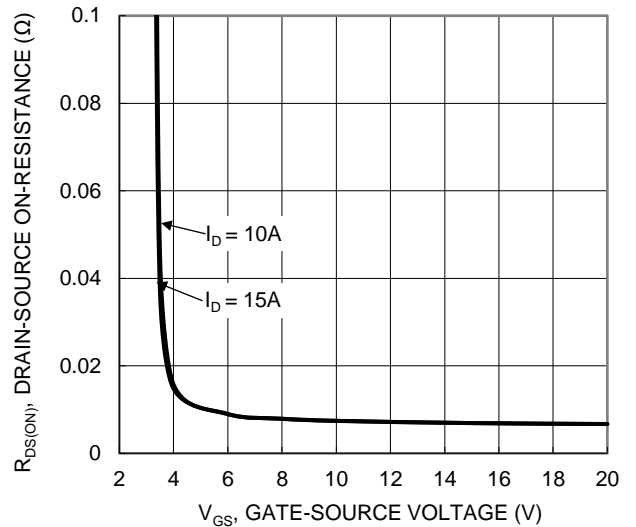


Figure 4. Typical Transfer Characteristic

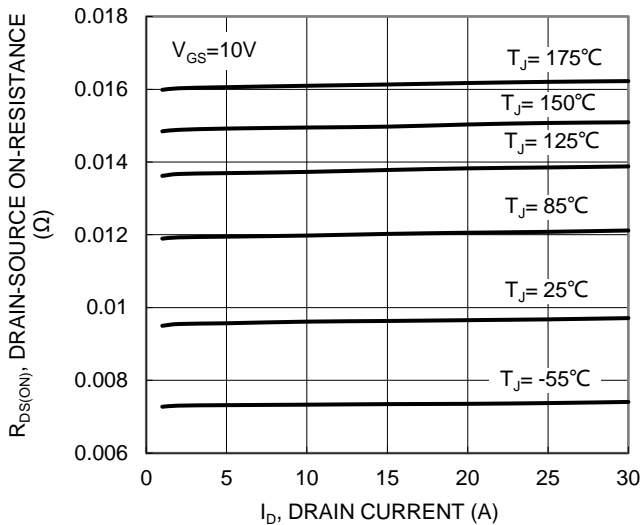


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

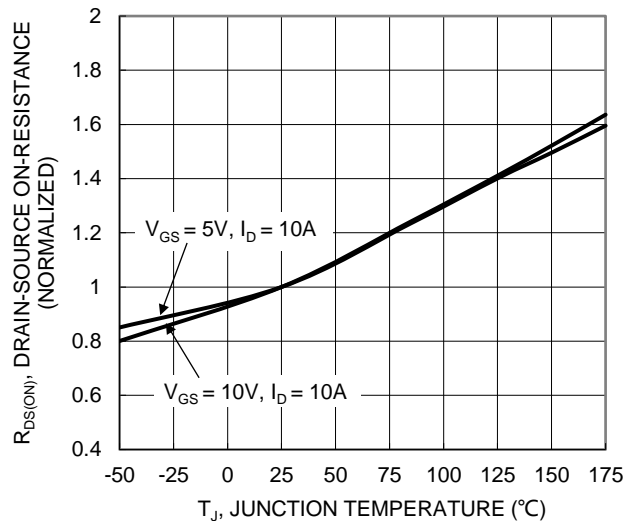


Figure 6. On-Resistance Variation with Temperature

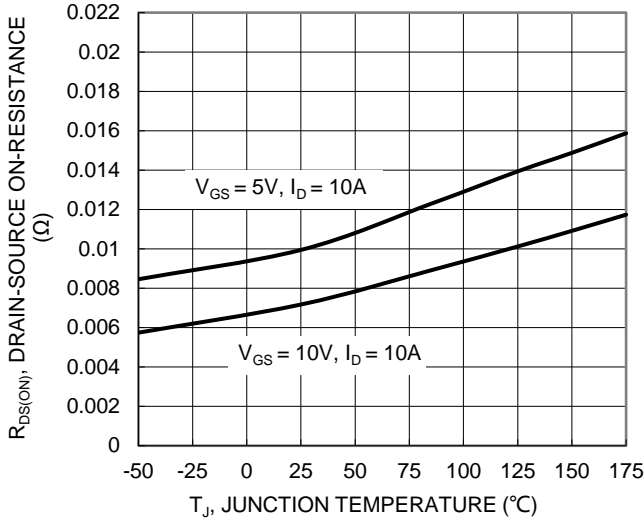


Figure 7. On-Resistance Variation with Temperature

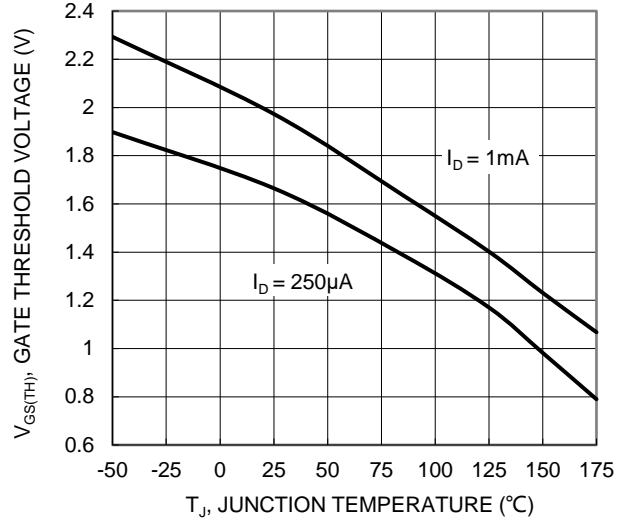


Figure 8. Gate Threshold Variation vs. Junction Temperature

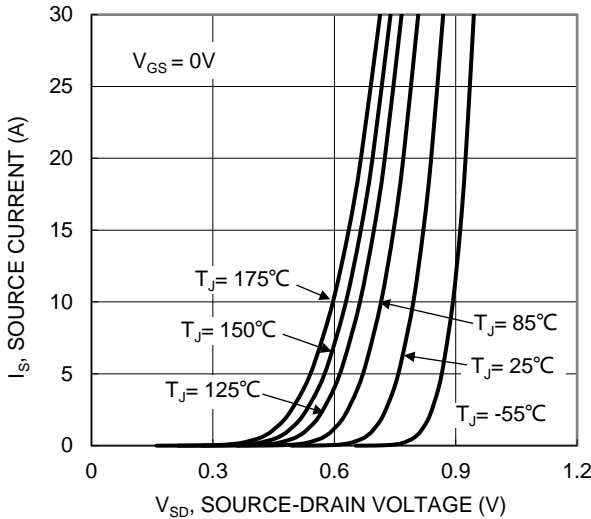


Figure 9. Diode Forward Voltage vs. Current

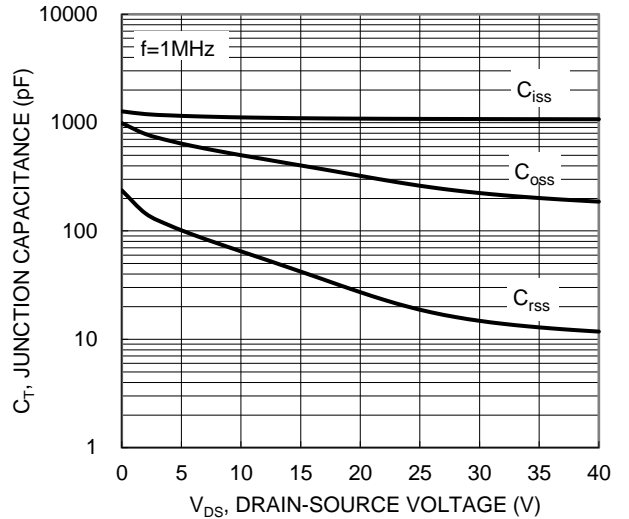


Figure 10. Typical Junction Capacitance

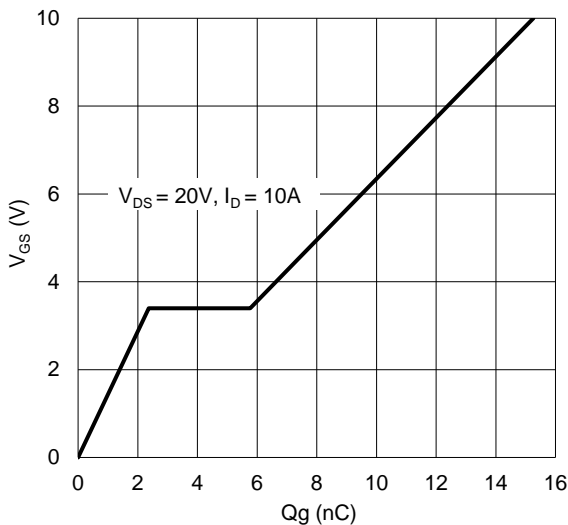


Figure 11. Gate Charge

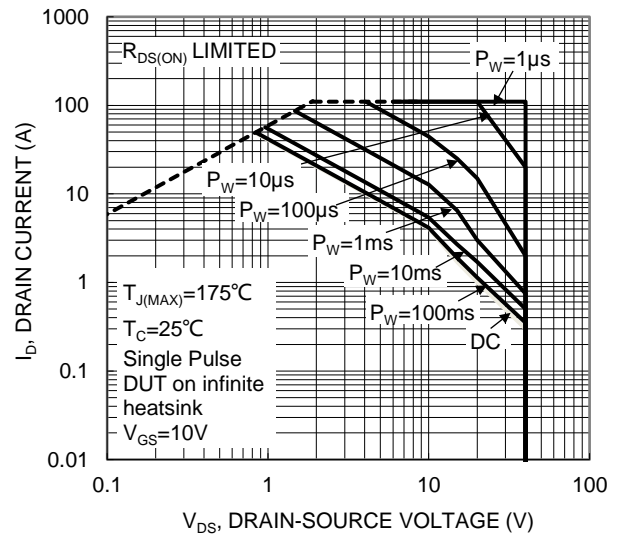


Figure 12. SOA, Safe Operation Area

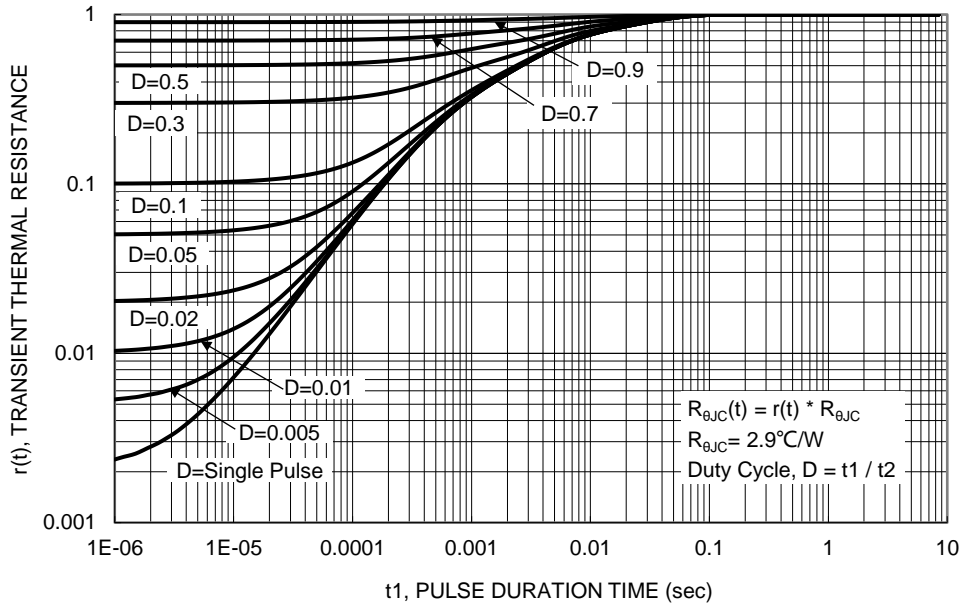


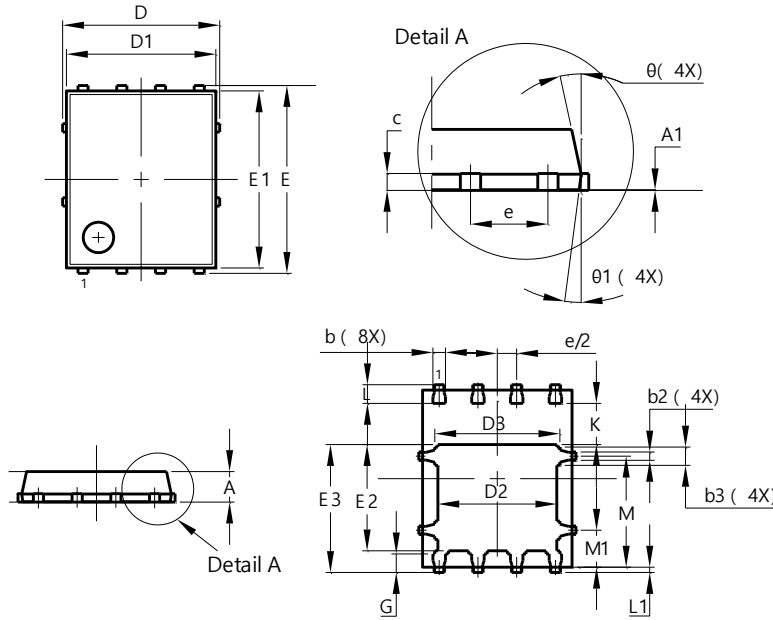
Figure 13. Transient Thermal Resistance

**Package Outline Dimensions**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

Site 1:

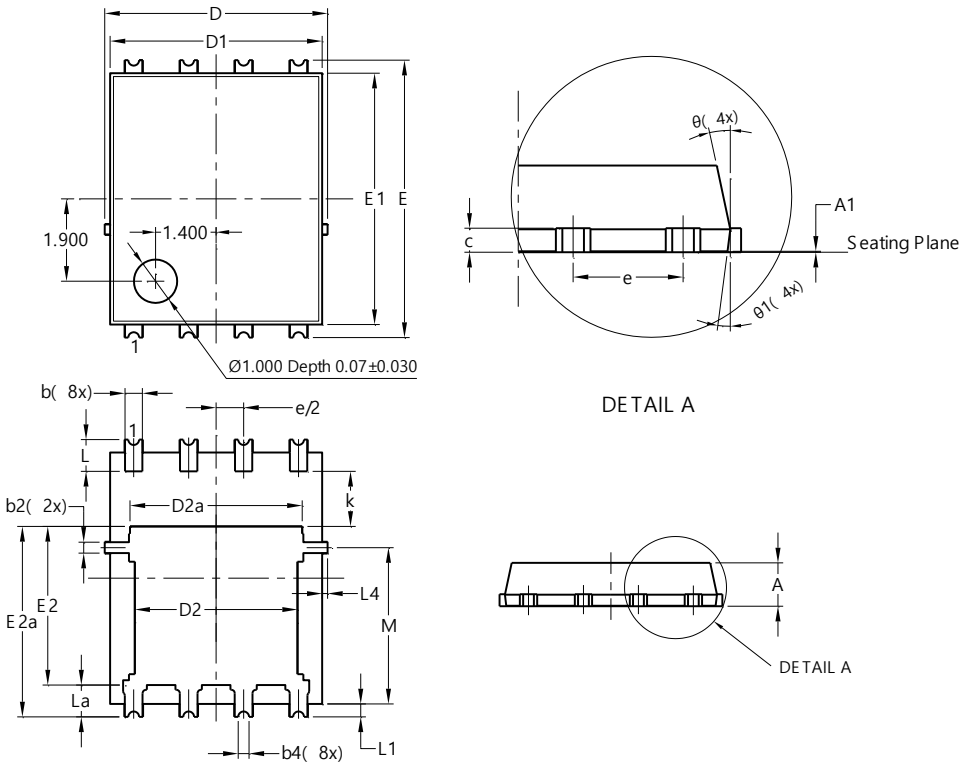
**PowerDI5060-8**



PowerDI5060-8			
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°
All Dimensions in mm			

Site 2:

**PowerDI5060-8/SWP (Type UX)**



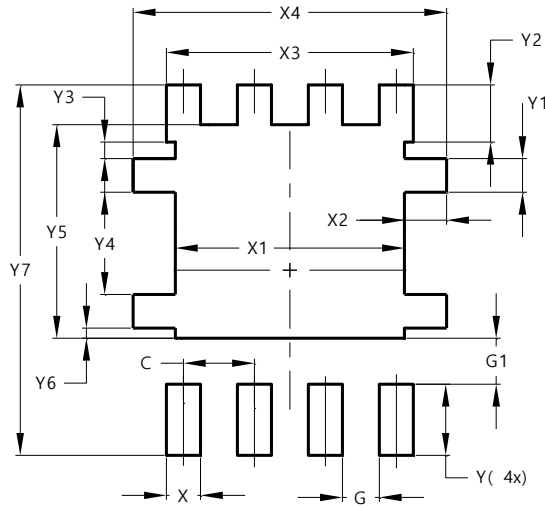
PowerDI5060-8/SWP (Type UX)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0	0.05	—
b	0.30	0.50	0.41
b2	0.20	0.35	0.25
b4	0.25REF		
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.56	3.96	3.76
D2a	3.78	4.18	3.98
E	6.40 BSC		
E1	5.60	6.00	5.80
E2	3.46	3.86	3.66
E2a	4.195	4.595	4.395
e	1.27BSC		
k	1.05	—	—
L	0.635	0.835	0.735
La	0.635	0.835	0.735
L1	0.200	0.400	0.300
L1a	0.050REF		
L4	0.025	0.225	0.125
M	3.205	4.005	3.605
θ	10°	12°	11°
θ1	6°	8°	7°
All Dimensions in mm			

**Suggested Pad Layout**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

Site 1:

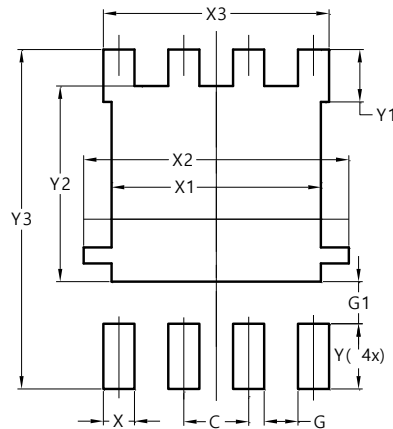
**PowerDI5060-8**



Dimensions	Value (in mm)
<b>C</b>	1.270
<b>G</b>	0.660
<b>G1</b>	0.820
<b>X</b>	0.610
<b>X1</b>	4.100
<b>X2</b>	0.755
<b>X3</b>	4.420
<b>X4</b>	5.610
<b>Y</b>	1.270
<b>Y1</b>	0.600
<b>Y2</b>	1.020
<b>Y3</b>	0.295
<b>Y4</b>	1.825
<b>Y5</b>	3.810
<b>Y6</b>	0.180
<b>Y7</b>	6.610

Site 2:

**PowerDI5060-8/SWP (Type UX)**



Dimensions	Value (in mm)
<b>C</b>	1.270
<b>G</b>	0.660
<b>G1</b>	0.820
<b>X</b>	0.610
<b>X1</b>	4.100
<b>X2</b>	5.190
<b>X3</b>	4.420
<b>Y</b>	1.270
<b>Y1</b>	1.020
<b>Y2</b>	3.810
<b>Y3</b>	6.610



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