

## Product Summary

BV <sub>DSS</sub>	R <sub>DSON</sub> max	I <sub>D</sub> max T <sub>C</sub> = +25°C
60V	11mΩ @ V <sub>GS</sub> = 10V	47.6A
	16mΩ @ V <sub>GS</sub> = 4.5V	39.5A

## Description and Applications

This MOSFET is designed to minimize the on-state resistance (R<sub>DSON</sub>) yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

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

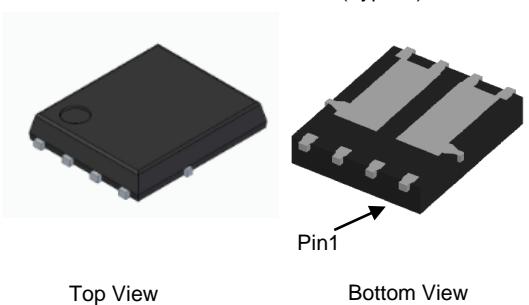
## Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching (UIS) Test in Production – Ensures More Reliable and Robust End Application
- High Conversion Efficiency
- Low Input Capacitance
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](#) or your local Diodes representative.
- <https://www.diodes.com/quality/product-definitions/>
- An Automotive-Compliant Part is Available Under Separate Datasheet ([DMTH6010LPDQ](#))

## Mechanical Data

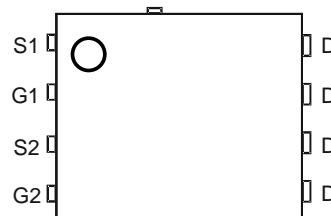
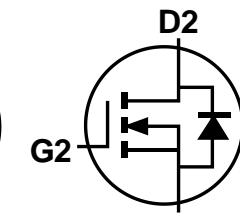
- Package: PowerDI<sup>®</sup>5060-8
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.097 grams (Approximate)

**Site1:** PowerDI5060-8 (Type C)



Top View

Bottom View

Pin out  
Top View

Equivalent Circuit

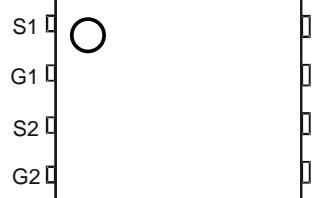
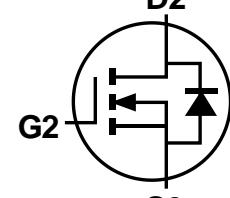
**Site2:**

PowerDI5060-8/SWP (Type UXD)



Top View

Bottom View

Pin out  
Top View

Equivalent Circuit

## Notes:

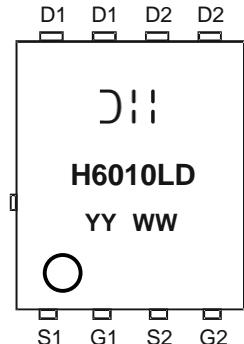
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

PowerDI is a registered trademark of Diodes Incorporated.

**Ordering Information** (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
DMTH6010LPD-13	PowerDI5060-8 (Type C)	2,500	Tape & Reel
DMTH6010LPD-13	PowerDI5060-8/SWP (Type UXD)	2,500	Tape & Reel

Note: 4. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

**Marking Information**


DII = Manufacturer's Marking  
 H6010LD = Product Type Marking Code  
 YYWW or YYWW = Date Code Marking  
 YY or YY = Year (ex: 21 = 2021)  
 WW = Week (01 to 53)

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

Characteristic		Symbol	Value	Unit
Drain-Source Voltage		$V_{DSS}$	60	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Continuous Drain Current (Note 6)	$T_c = +25^\circ\text{C}$ $T_c = +100^\circ\text{C}$	$I_D$	47.6 33.7	A
Continuous Drain Current (Note 5)	Steady State	$I_D$	13.1 10.9	A
Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)		$I_{DM}$	170	A
Maximum Continuous Body Diode Forward Current (Note 6)		$I_S$	31	A
Avalanche Current, $L = 0.1\text{mH}$		$I_{AS}$	20	A
Avalanche Energy, $L = 0.1\text{mH}$		$E_{AS}$	20	mJ

**Thermal Characteristics**

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	$T_A = +25^\circ\text{C}$	$P_D$	2.8	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	53	$^\circ\text{C}/\text{W}$
Total Power Dissipation (Note 6)	$T_c = +25^\circ\text{C}$	$P_D$	37.5	W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	4	$^\circ\text{C}/\text{W}$
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 1inch square copper plate.

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

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	$\text{BV}_{\text{DSS}}$	60	—	—	V	$\text{V}_{\text{GS}} = 0\text{V}$ , $\text{I}_D = 1\text{mA}$
Zero Gate Voltage Drain Current	$\text{I}_{\text{DSS}}$	—	—	1	$\mu\text{A}$	$\text{V}_{\text{DS}} = 48\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$
Gate-Source Leakage	$\text{I}_{\text{GSS}}$	—	—	$\pm 100$	nA	$\text{V}_{\text{GS}} = \pm 20\text{V}$ , $\text{V}_{\text{DS}} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	$\text{V}_{\text{GS(TH)}}$	1	—	3	V	$\text{V}_{\text{DS}} = \text{V}_{\text{GS}}$ , $\text{I}_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$\text{R}_{\text{DS(ON)}}$	—	8.5	11	$\text{m}\Omega$	$\text{V}_{\text{GS}} = 10\text{V}$ , $\text{I}_D = 20\text{A}$
		—	10.9	16		$\text{V}_{\text{GS}} = 4.5\text{V}$ , $\text{I}_D = 20\text{A}$
Diode Forward Voltage	$\text{V}_{\text{SD}}$	—	0.9	1.2	V	$\text{V}_{\text{GS}} = 0\text{V}$ , $\text{I}_S = 20\text{A}$
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	$\text{C}_{\text{iss}}$	—	2615	—	pF	$\text{V}_{\text{DS}} = 30\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$ , $f = 1\text{MHz}$
Output Capacitance	$\text{C}_{\text{oss}}$	—	1415	—	pF	
Reverse Transfer Capacitance	$\text{C}_{\text{rss}}$	—	58	—	pF	
Gate Resistance	$\text{R}_g$	—	0.67	—	$\Omega$	$\text{V}_{\text{DS}} = 0\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$ , $f = 1\text{MHz}$
Total Gate Charge ( $\text{V}_{\text{GS}} = 4.5\text{V}$ )	$\text{Q}_g$	—	20.3	—	nC	$\text{V}_{\text{DS}} = 30\text{V}$ , $\text{I}_D = 20\text{A}$
Total Gate Charge ( $\text{V}_{\text{GS}} = 10\text{V}$ )	$\text{Q}_g$	—	40.2	—	nC	
Gate-Source Charge	$\text{Q}_{\text{gs}}$	—	5.9	—	nC	
Gate-Drain Charge	$\text{Q}_{\text{gd}}$	—	9.3	—	nC	
Turn-On Delay Time	$\text{t}_{\text{D(ON)}}$	—	5.7	—	ns	$\text{V}_{\text{DD}} = 30\text{V}$ , $\text{V}_{\text{GS}} = 10\text{V}$ , $\text{I}_D = 20\text{A}$ , $\text{R}_G = 3\Omega$
Turn-On Rise Time	$\text{t}_R$	—	8.8	—	ns	
Turn-Off Delay Time	$\text{t}_{\text{D(OFF)}}$	—	20.8	—	ns	
Turn-Off Fall Time	$\text{t}_F$	—	7.4	—	ns	
Body Diode Reverse Recovery Time	$\text{t}_{\text{RR}}$	—	34.5	—	ns	$\text{I}_F = 20\text{A}$ , $\text{di/dt} = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	$\text{Q}_{\text{RR}}$	—	37.5	—	nC	

Notes: 7. Short duration pulse test used to minimize self-heating effect.

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

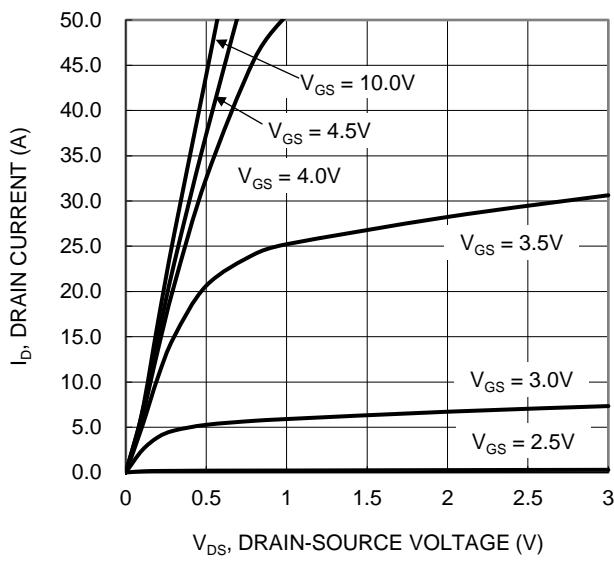


Figure 1. Typical Output Characteristic

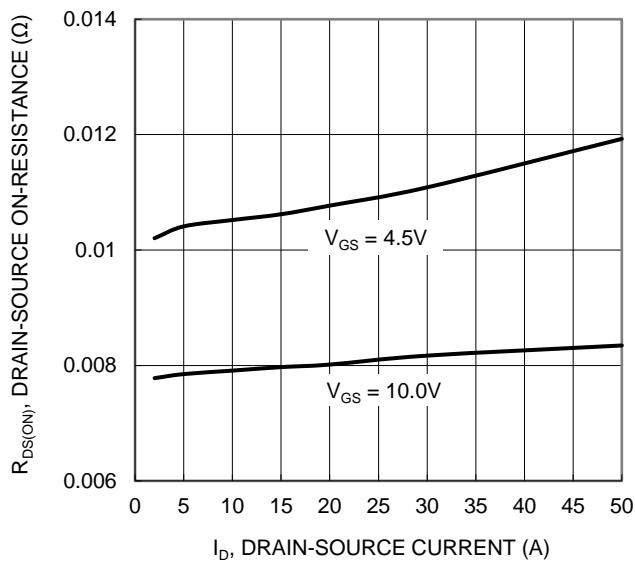


Figure 3. Typical On-Resistance vs Drain Current and Gate Voltage

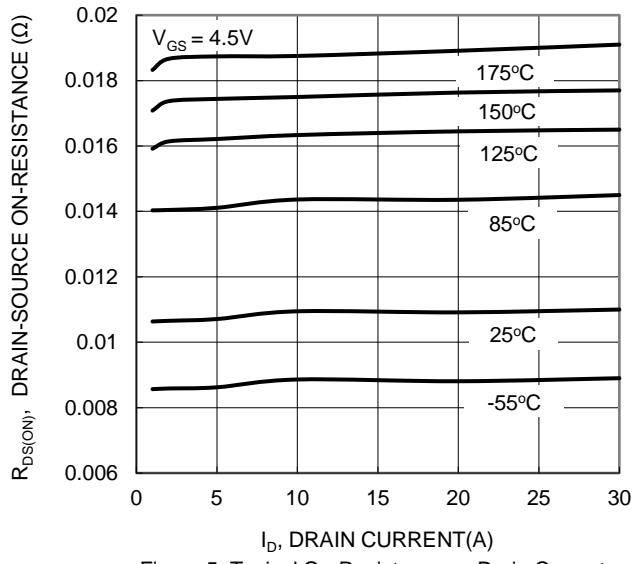


Figure 5. Typical On-Resistance vs Drain Current and Junction Temperature

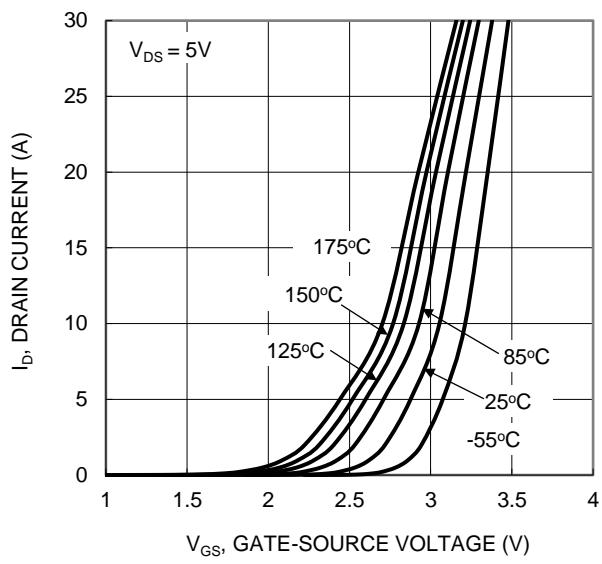


Figure 2. Typical Transfer Characteristic

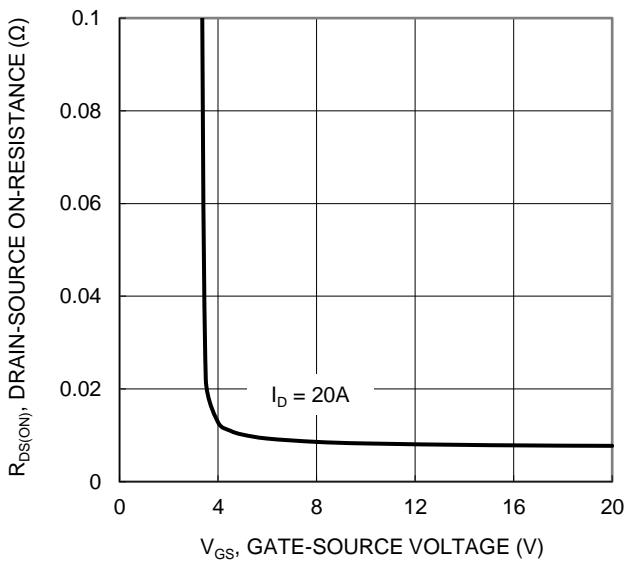


Figure 4. Typical Transfer Characteristic

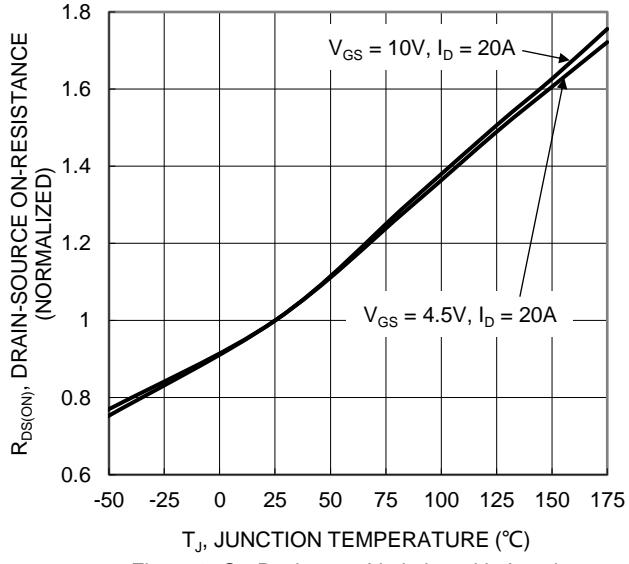


Figure 6. On-Resistance Variation with Junction Temperature

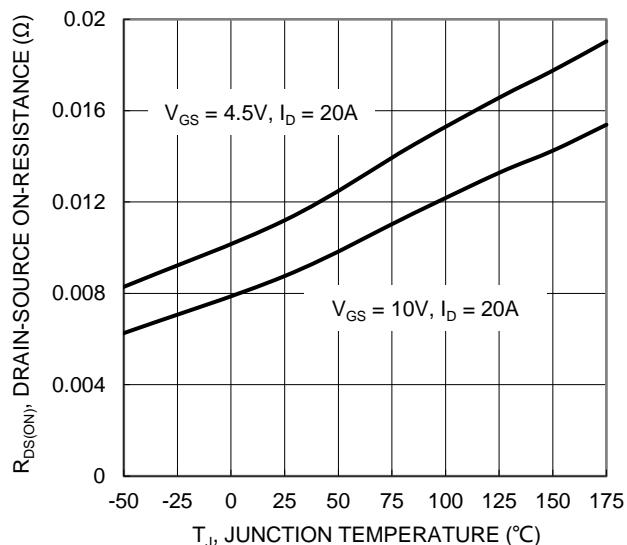


Figure 7. On-Resistance Variation with Junction Temperature

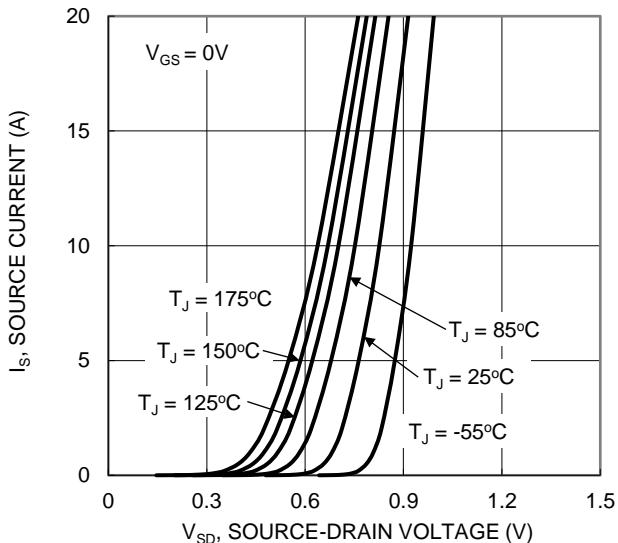


Figure 9. Diode Forward Voltage vs Current

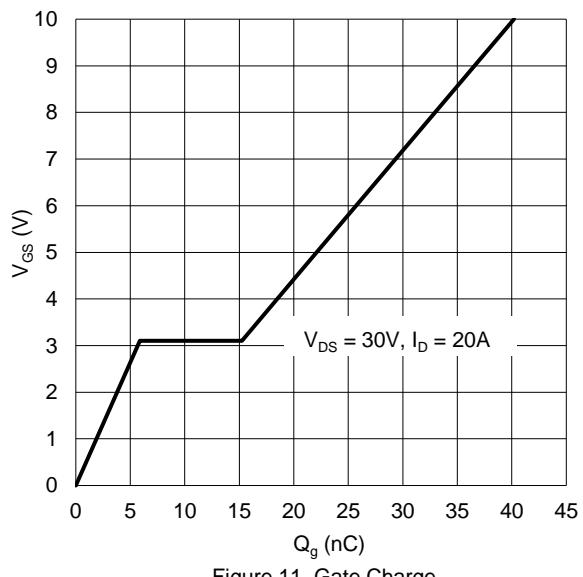


Figure 11. Gate Charge

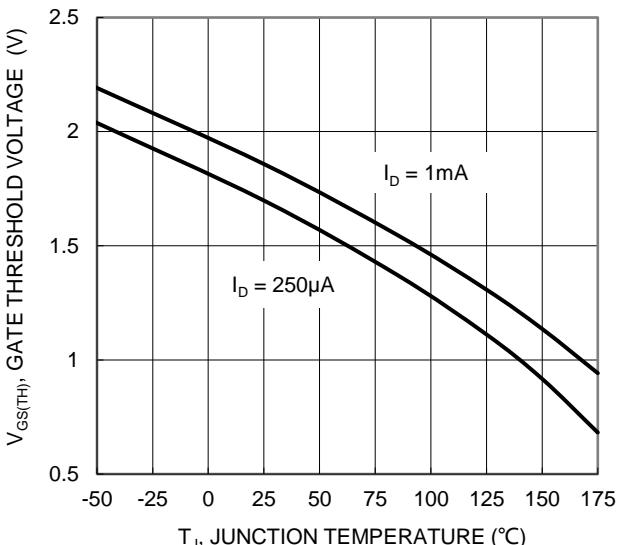


Figure 8. Gate Threshold Variation vs Junction Temperature

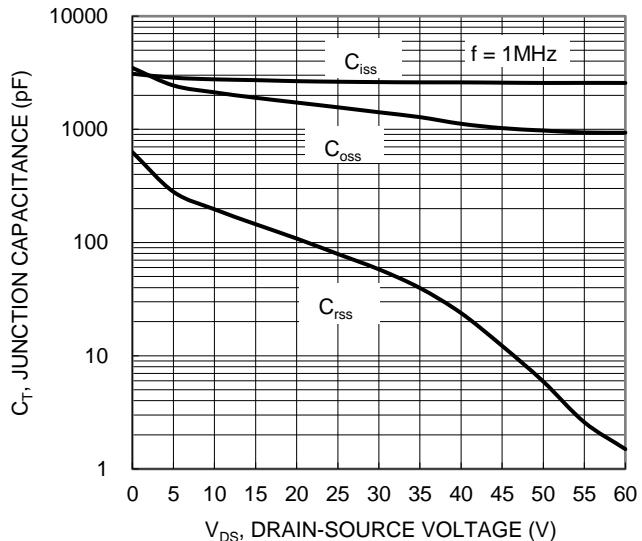


Figure 10. Typical Junction Capacitance

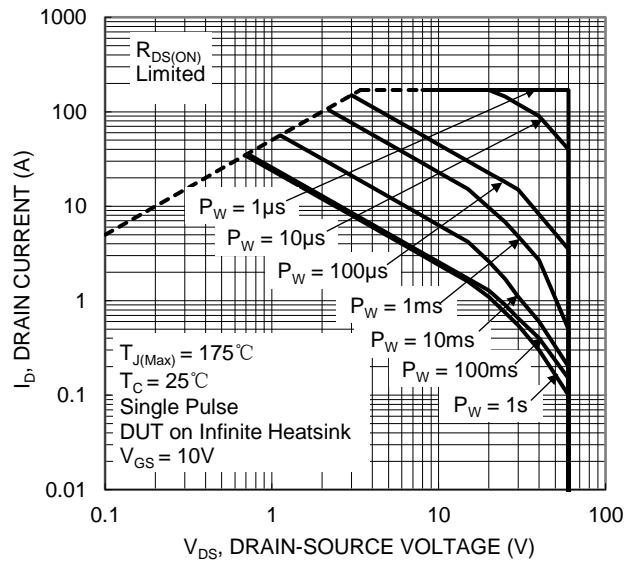


Figure 12. SOA, Safe Operation Area

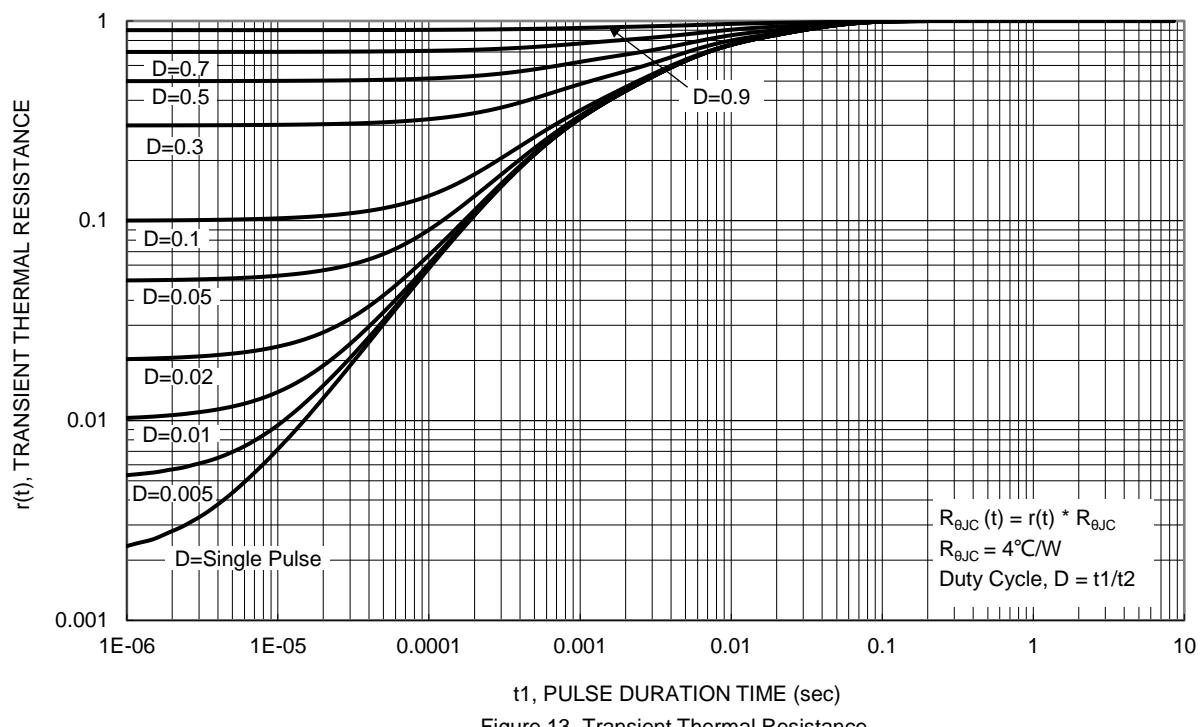


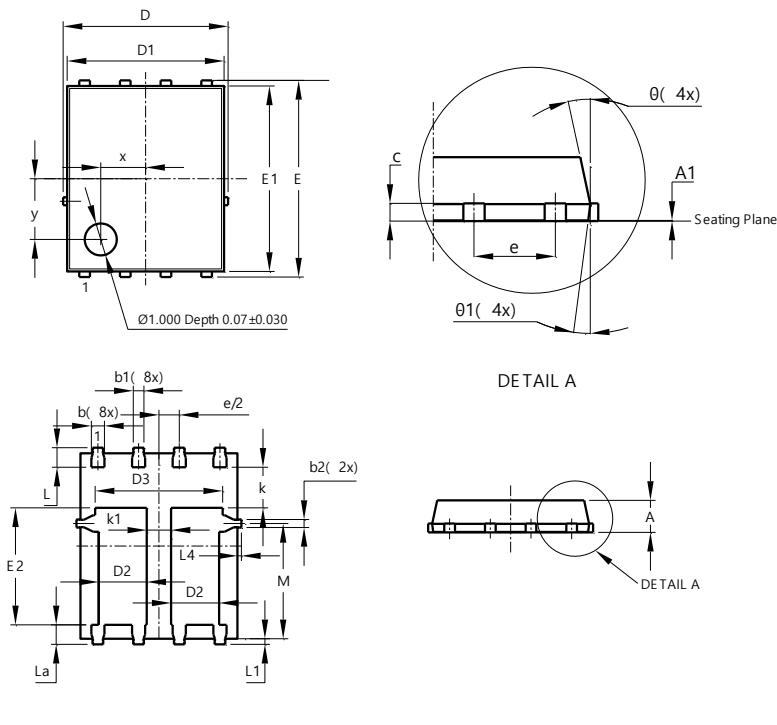
Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

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

### Site1:

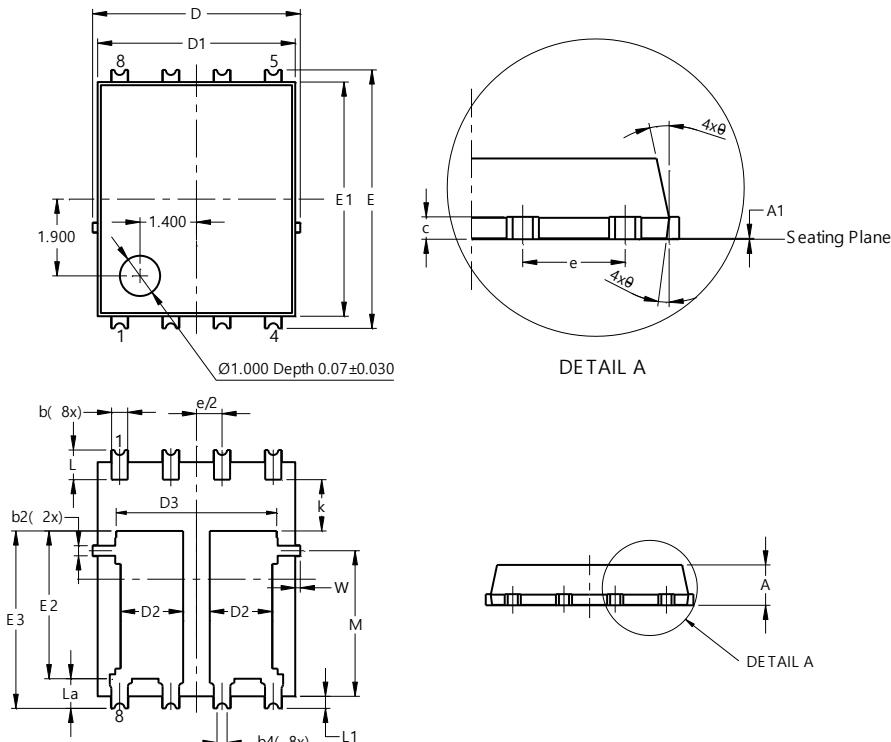
## PowerDI5060-8 (Type C)



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

## Site2:

PowerDI5060-8/SWP (Type UXD)



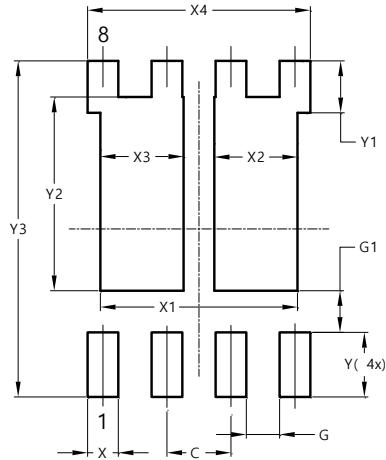
PowerDI5060-8/SWP (Type UXD)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0.00	0.05	--
b	0.30	0.50	0.41
b2	0.20	0.35	0.25
b4	0.25REF		
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	1.46	1.66	1.55
D3	3.78	4.18	3.98
E	6.40 BSC		
E1	5.60	6.00	5.80
E2	3.46	3.86	3.66
E2a	4.195	4.595	4.395
e	1.27BSC		
k	1.05	--	--
L	0.635	0.835	0.735
La	0.635	0.835	0.735
L1	0.200	0.400	0.300
M	3.205	4.005	3.605
W	0.025	0.225	0.125
θ	10°	12°	11°
θ1	6°	8°	7°

## Suggested Pad Layout

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

### Site1:

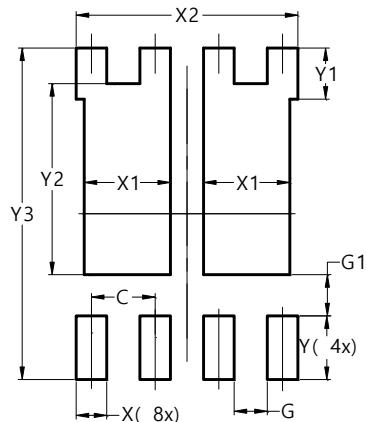
PowerDI5060-8 (Type C)



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>	3.910
<b>X2</b>	1.650
<b>X3</b>	1.650
<b>X4</b>	4.420
<b>Y</b>	1.270
<b>Y1</b>	1.020
<b>Y2</b>	3.810
<b>Y3</b>	6.610

### Site2:

PowerDI5060-8/SWP (Type UXD)



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>	1.720
<b>X2</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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