

## Product Summary

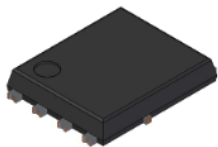
BV <sub>DSS</sub>	R <sub>DS(ON)</sub>	I <sub>D</sub> T <sub>c</sub> = +25°C
-12V	6mΩ @ V <sub>GS</sub> = -4.5V	-96A
	8mΩ @ V <sub>GS</sub> = -2.5V	-83A

## Description and Applications

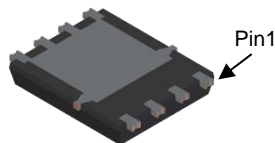
This MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

- Notebook battery power managements
- DC-DC converters
- Load switches

PowerDI5060-8 (SWP) (Type UX)



Top View



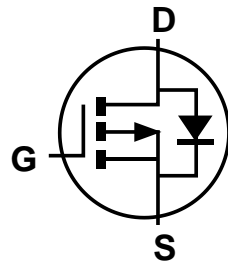
Bottom View

## Features

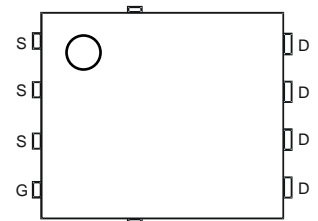
- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- High Conversion Efficiency
- Low R<sub>DS(ON)</sub> – Minimizes On State Losses
- Low Input Capacitance
- Fast Switching Speed
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](mailto:contact@diodes.com) or your local Diodes representative. <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<sup>(3)</sup>
- Weight: 0.097 grams (Approximate)



Internal Schematic



Top View  
Pin Configuration

## Ordering Information (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
DIODES™ DMPH16M1UPSW-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



DII = Manufacturer's Marking  
 PH16M1USW = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 22 = 2022)  
 WW = Week (01 to 53)

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

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DSS</sub>	-12	V
Gate-Source Voltage	V <sub>GSS</sub>	±8	V
Continuous Drain Current (Note 7) V <sub>GS</sub> = -4.5V	I <sub>D</sub>	T <sub>C</sub> = +25°C	-96
		T <sub>C</sub> = +100°C	-76
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)	I <sub>DM</sub>	-147	A
Maximum Continuous Body Diode Forward Current (Note 6)	I <sub>S</sub>	-147	A
Avalanche Current, L = 0.1mH (Note 8)	I <sub>AS</sub>	-33	A
Avalanche Energy, L = 0.1mH (Note 8)	E <sub>AS</sub>	54	mJ

**Thermal Characteristics**

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P <sub>D</sub>	1.95	W
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	64	°C/W
Total Power Dissipation (Note 6)	P <sub>D</sub>	3.47	W
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	36	°C/W
Thermal Resistance, Junction to Case (Note 7)	R <sub>θJC</sub>	1.5	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +175	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 9)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-12	—	—	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> = -12V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 9)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	-0.4	—	-1	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250µA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	4.2	6	mΩ	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -15A
		—	5.4	8		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -10A
Diode Forward Voltage	V <sub>SD</sub>	—	-0.7	-1.1	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -10A
<b>DYNAMIC CHARACTERISTICS (Note 10)</b>						
Input Capacitance	C <sub>iss</sub>	—	5392	—	pF	V <sub>DS</sub> = -10V, V <sub>GS</sub> = 0V f = 1MHz
Output Capacitance	C <sub>oss</sub>	—	608	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	564	—		
Gate Resistance	R <sub>g</sub>	—	2.05	—	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>	—	75	—	nC	V <sub>DD</sub> = -10V, I <sub>D</sub> = -20A
Total Gate Charge (V <sub>GS</sub> = -8V)	Q <sub>g</sub>	—	164	—		
Gate-Source Charge	Q <sub>gs</sub>	—	6.9	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	19.8	—		
Turn-On Delay Time	t <sub>D(ON)</sub>	—	24	—	ns	V <sub>GS</sub> = -4.5V, V <sub>DD</sub> = -10V, R <sub>g</sub> = 1Ω, I <sub>D</sub> = -10A
Turn-On Rise Time	t <sub>r</sub>	—	80	—		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	190	—		
Turn-Off Fall Time	t <sub>f</sub>	—	157	—		

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1 inch square copper plate.
  - Thermal resistance from junction to soldering point (on the exposed drain pad).
  - I<sub>AS</sub> and E<sub>AS</sub> ratings are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

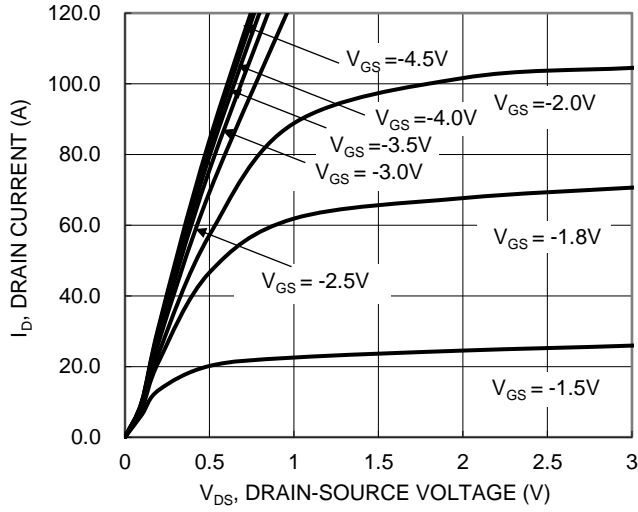


Figure 1. Typical Output Characteristic

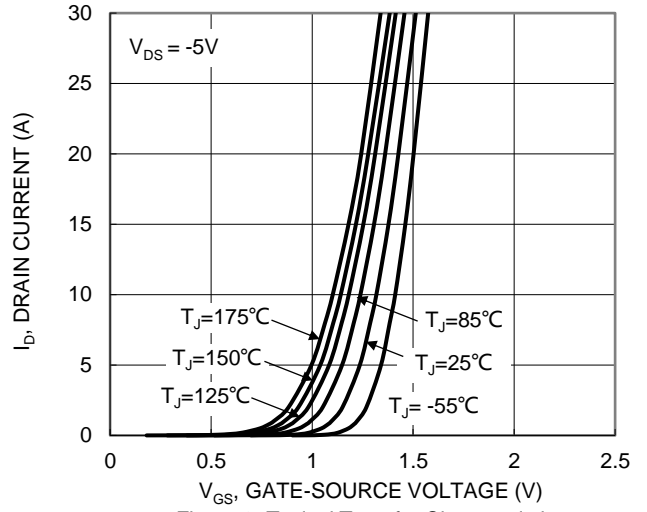


Figure 2. Typical Transfer Characteristic

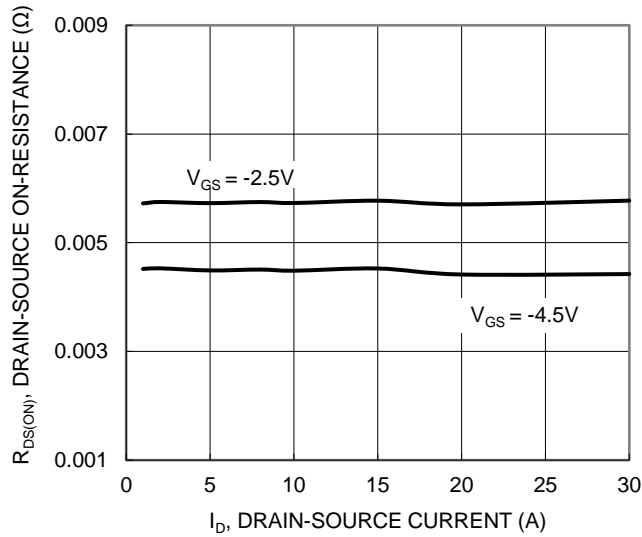


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

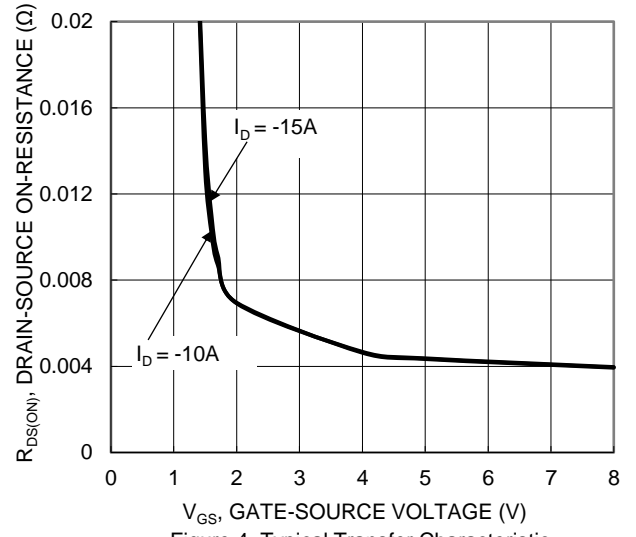


Figure 4. Typical Transfer Characteristic

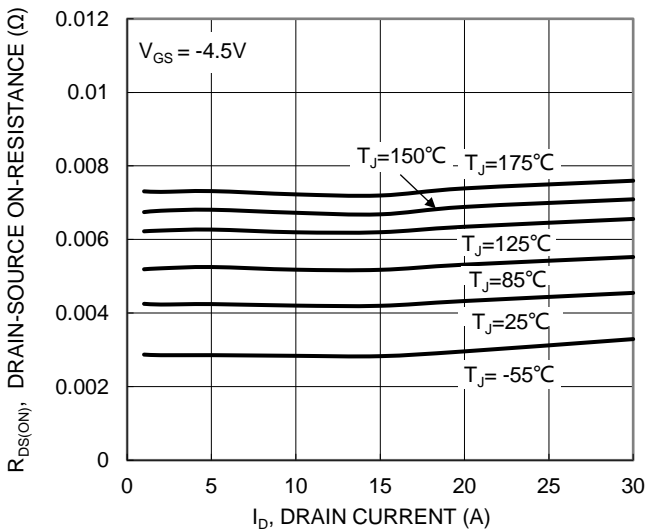


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

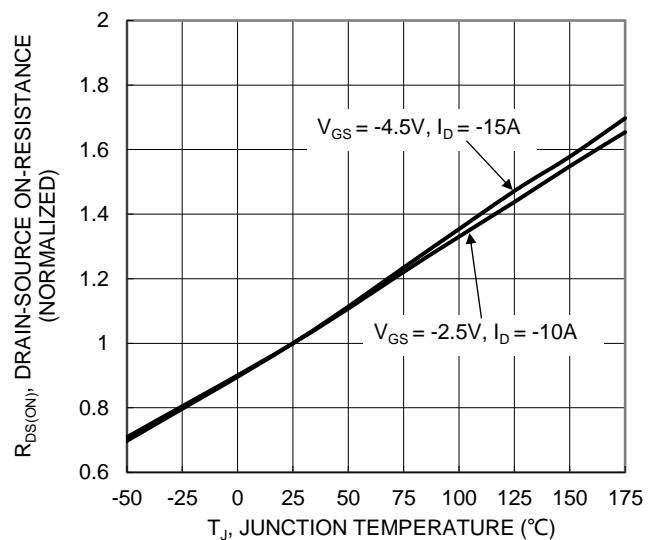


Figure 6. On-Resistance Variation with Temperature

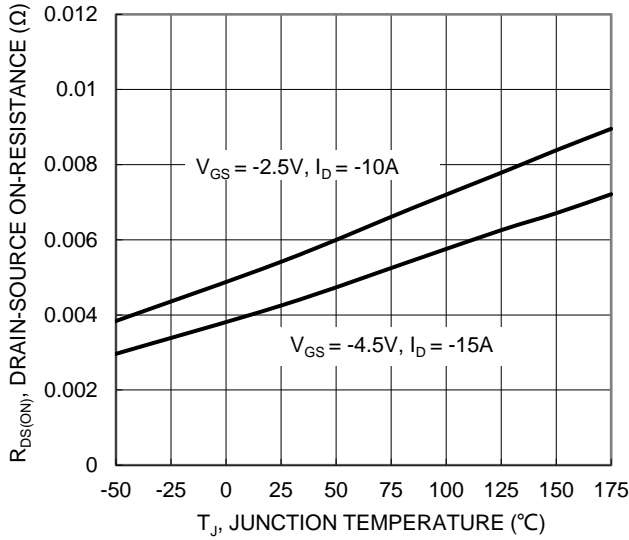


Figure 7. On-Resistance Variation with Temperature

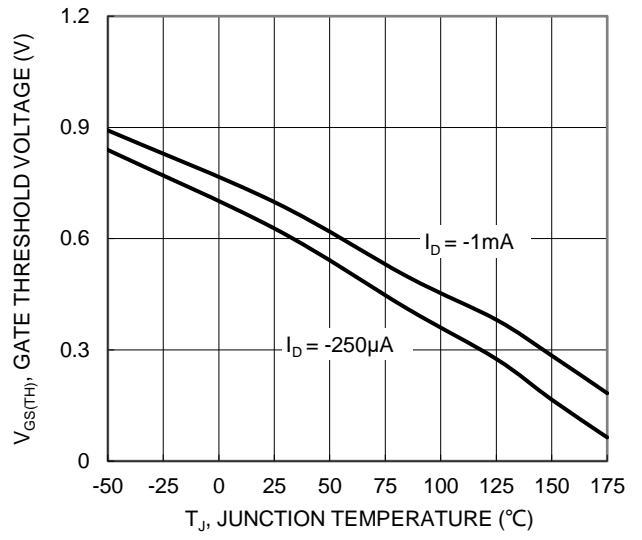


Figure 8. Gate Threshold Variation vs. Temperature

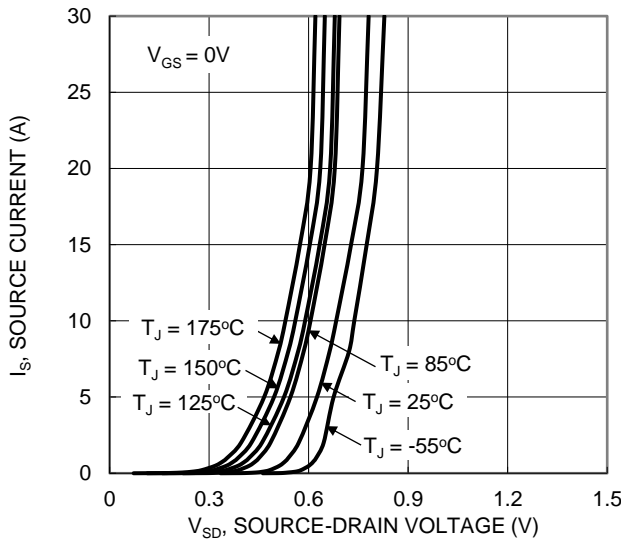


Figure 9. Diode Forward Voltage vs. Current

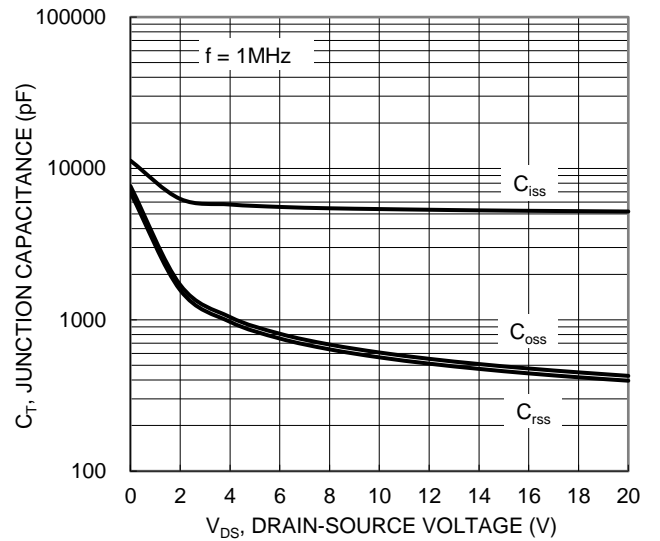


Figure 10. Typical Junction Capacitance

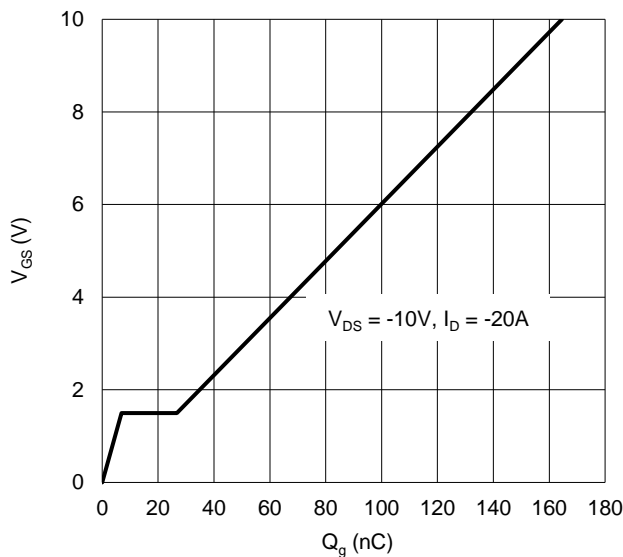


Figure 11. Gate Charge

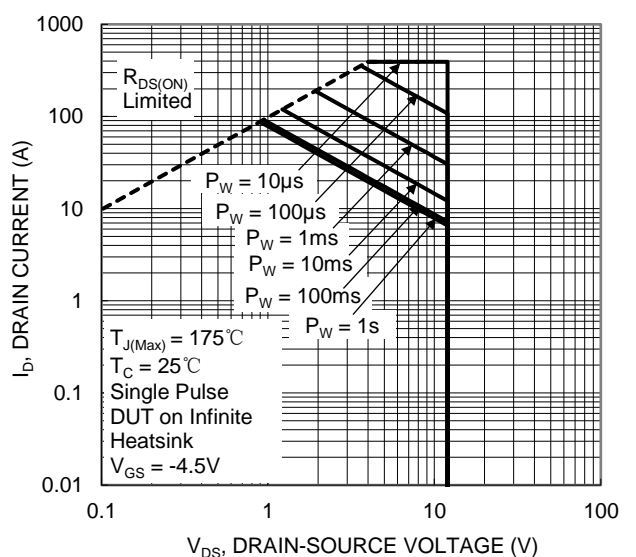


Figure 12. SOA, Safe Operation Area

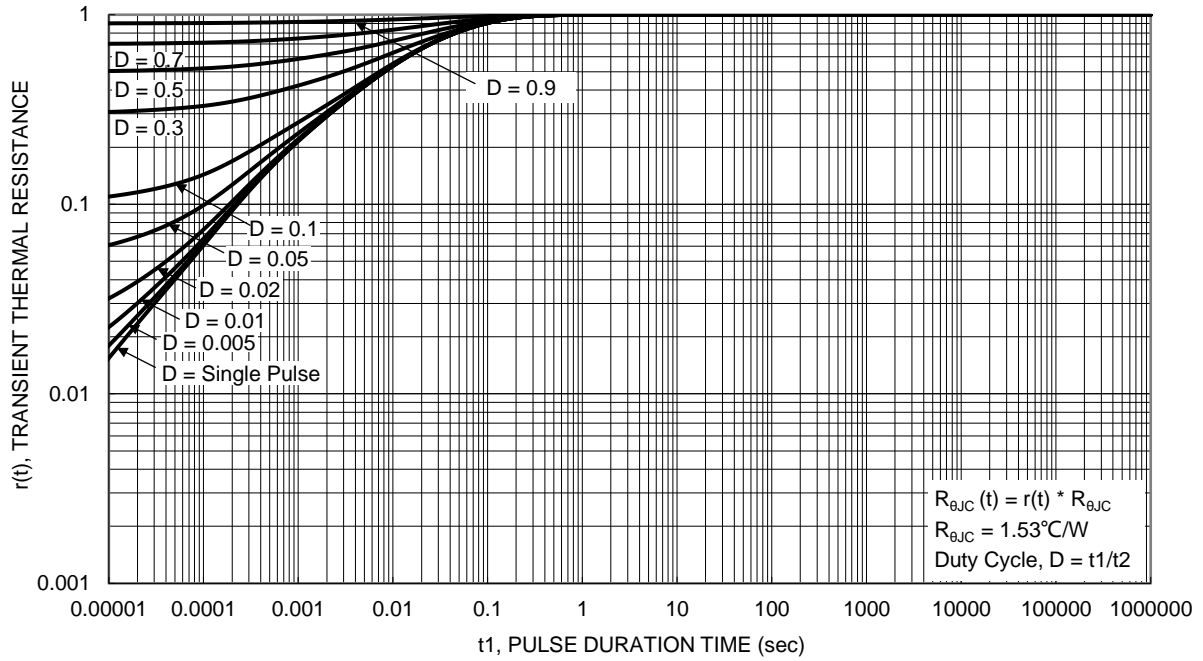
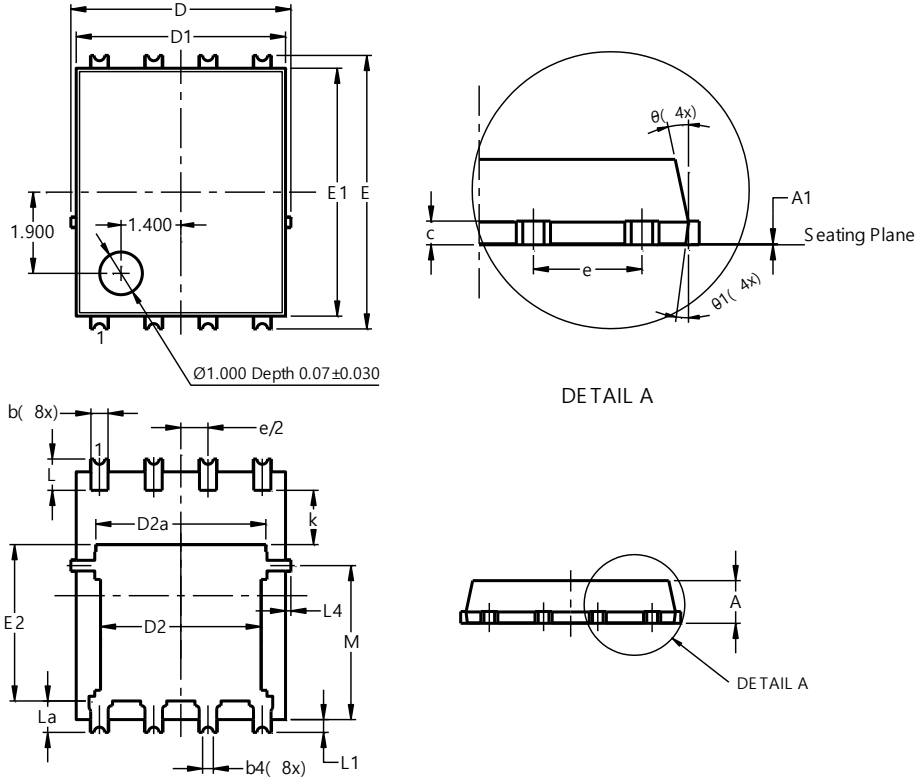


Figure 13. Transient Thermal Resistance

**Package Outline Dimensions**

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

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

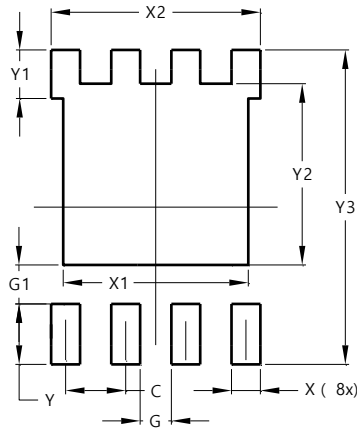


PowerDI5060-8 (SWP) (Type UX)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0	0.05	--
b	0.30	0.50	0.41
b2	0.20	0.35	0.25
b4	0.25REF		
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.56	3.96	3.76
D2a	3.78	4.18	3.98
E	6.40 BSC		
E1	5.60	6.00	5.80
E2	3.46	3.86	3.66
E2a	4.195	4.595	4.395
e	1.27BSC		
k	1.05	--	--
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°
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

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

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



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

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