

Product Summary

BV_{DSS}	$R_{DS(ON)} \text{ Max}$	$I_D \text{ Max}$ $T_C = +25^\circ\text{C}$
150V	19mΩ @ $V_{GS} = 10\text{V}$	61A
	22mΩ @ $V_{GS} = 8\text{V}$	40A

Description

This new generation N-Channel Enhancement Mode MOSFET is designed to minimize $R_{DS(ON)}$ yet maintain superior switching performance. This device is ideal for use in Notebook battery power management and load switch.

Applications

- Motor Control
- DC-DC Converters
- Power Management

Features

- Rated to $+175^\circ\text{C}$ – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching (UIS) Test in Production – Ensures More Reliable and Robust End Application
- Thermally Efficient Package-Cooler Running Applications
- High Conversion Efficiency
- Low $R_{DS(ON)}$ – Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed
- $<1.1\text{mm}$ Package Profile – Ideal for Thin Applications (PowerDI®)
- **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-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](#) or your local Diodes representative.**

<https://www.diodes.com/quality/product-definitions/>

Mechanical Data

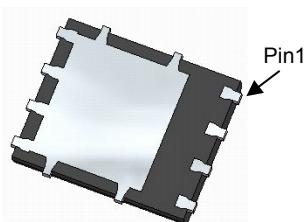
- Case: PowerDI5060-8
- Case Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Terminal Finish - Matte Tin Annealed over Copper Lead-Frame. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.097 grams (Approximate)

Site 1:

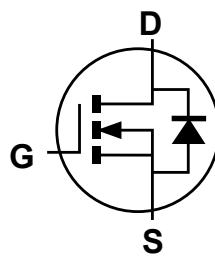
PowerDI5060-8



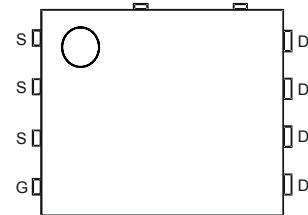
Top View



Bottom View



Internal Schematic



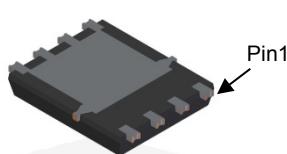
Top View
Pin Configuration

Site 2:

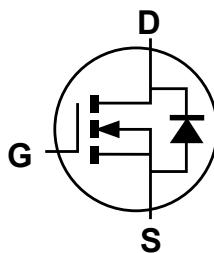
PowerDI5060-8 (SWP) (Type UX)



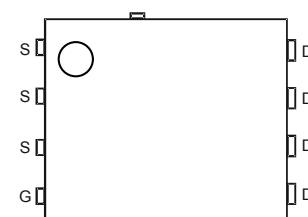
Top View



Bottom View



Internal Schematic



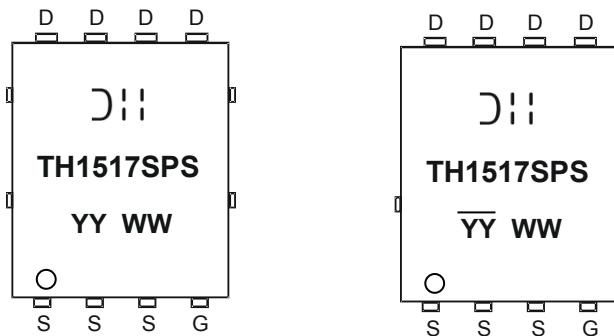
Top View
Pin Configuration

Ordering Information (Note 4)

Part Number	Case	Packaging
DMTH15H017SPS-13	PowerDI5060-8	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
 TH1517SPS = Product Type Marking Code
 YYWW or YYWW = Date Code Marking
 YY or YY = Last Two Digits of Year (ex: 20 = 2020)
 WW = Week Code (01 to 53)

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

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	150	V
Gate-Source Voltage	V_{GSS}	± 20	V
Continuous Drain Current $V_{GS} = 10\text{V}$ (Note 6)	I_D	11	A
		7	
Continuous Drain Current $V_{GS} = 10\text{V}$ (Note 7)	I_D	61	A
		40	
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)	I_{DM}	250	A
Maximum Continuous Body Diode Forward Current	I_S	61	A
Pulsed Body Diode Current (10 μs Pulse, Duty Cycle = 1%)	I_{SM}	250	A
Avalanche Current (Note 8), $L = 3\text{mH}$	I_{AS}	14.4	A
Avalanche Energy (Note 8), $L = 3\text{mH}$	E_{AS}	311	mJ

Thermal Characteristics

Characteristic	Symbol	Value	Unit	
Total Power Dissipation (Note 5)	$T_A = +25^\circ\text{C}$	P_D	1.5	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	97	$^\circ\text{C}/\text{W}$
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	P_D	3.2	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	47	$^\circ\text{C}/\text{W}$
Total Power Dissipation (Note 7)	$T_C = +25^\circ\text{C}$	P_D	107	W
Thermal Resistance, Junction to Case (Note 7)	$R_{\theta JC}$	1.4	$^\circ\text{C}/\text{W}$	
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +175	$^\circ\text{C}$	

Notes:

5. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
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).
8. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep $T_J = +25^\circ\text{C}$.

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 9)						
Drain-Source Breakdown Voltage	BV_{DSS}	150	—	—	V	$\text{V}_{\text{GS}} = 0\text{V}, \text{I}_{\text{D}} = 10\text{mA}$
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	$\text{V}_{\text{DS}} = 120\text{V}, \text{V}_{\text{GS}} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$\text{V}_{\text{GS}} = \pm 20\text{V}, \text{V}_{\text{DS}} = 0\text{V}$
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	$\text{V}_{\text{GS(TH)}}$	2	—	4	V	$\text{V}_{\text{DS}} = \text{V}_{\text{GS}}, \text{I}_{\text{D}} = 250\mu\text{A}$
Static Drain-Source On-Resistance	$\text{R}_{\text{DS(ON)}}$	—	14	19	$\text{m}\Omega$	$\text{V}_{\text{GS}} = 10\text{V}, \text{I}_{\text{D}} = 20\text{A}$
		—	16	22		$\text{V}_{\text{GS}} = 8\text{V}, \text{I}_{\text{D}} = 15\text{A}$
Diode Forward Voltage	V_{SD}	—	0.8	1.2	V	$\text{V}_{\text{GS}} = 0\text{V}, \text{I}_{\text{S}} = 20\text{A}$
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{iss}	—	2344	—	pF	$\text{V}_{\text{DS}} = 75\text{V}, \text{V}_{\text{GS}} = 0\text{V}$ $f = 1\text{MHz}$
Output Capacitance	C_{oss}	—	213	—		
Reverse Transfer Capacitance	C_{rss}	—	6.9	—		
Gate Resistance	R_{g}	—	1.8	—	Ω	$\text{V}_{\text{DS}} = 0\text{V}, \text{V}_{\text{GS}} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge	Q_{g}	—	34	—	nC	$\text{V}_{\text{DD}} = 75\text{V}, \text{I}_{\text{D}} = 20\text{A},$ $\text{V}_{\text{GS}} = 10\text{V}$
Gate-Source Charge	Q_{gs}	—	12	—		
Gate-Drain Charge	Q_{gd}	—	9	—		
Turn-On Delay Time	$\text{t}_{\text{D(ON)}}$	—	13.2	—	ns	$\text{V}_{\text{DD}} = 75\text{V}, \text{V}_{\text{GS}} = 10\text{V},$ $\text{I}_{\text{D}} = 20\text{A}, \text{R}_{\text{g}} = 6\Omega$
Turn-On Rise Time	t_{R}	—	22.4	—		
Turn-Off Delay Time	$\text{t}_{\text{D(OFF)}}$	—	26.3	—		
Turn-Off Fall Time	t_{F}	—	16.1	—		
Reverse Recovery Time	t_{RR}	—	69	—	ns	$\text{I}_{\text{F}} = 20\text{A}, \text{di/dt} = 100\text{A}/\mu\text{s}$
Reverse Recovery Charge	Q_{RR}	—	196	—	nC	

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

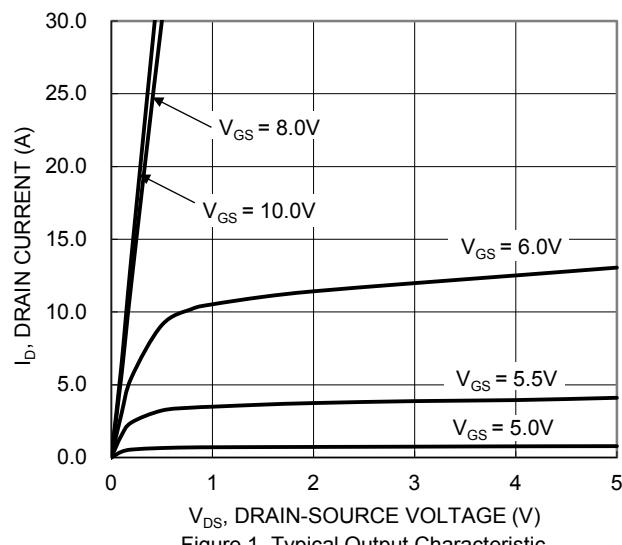


Figure 1. Typical Output Characteristic

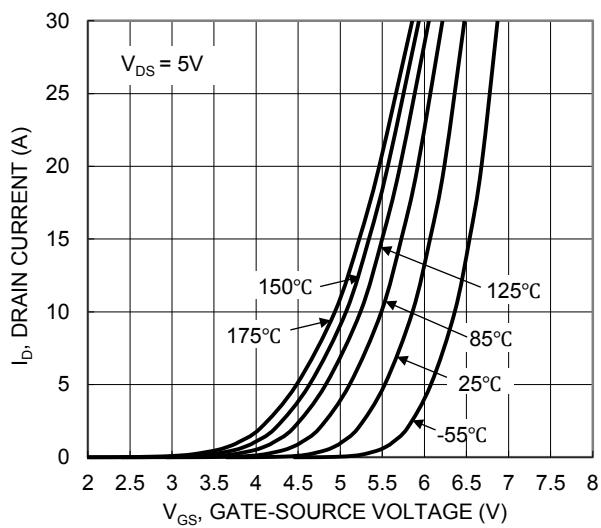


Figure 2. Typical Transfer Characteristic

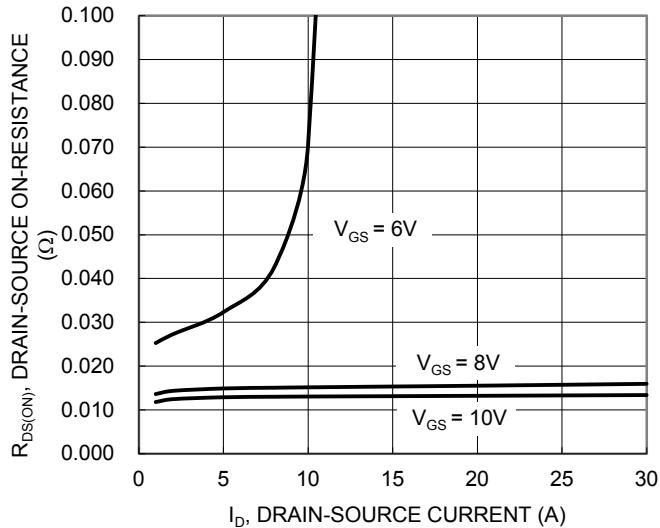


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

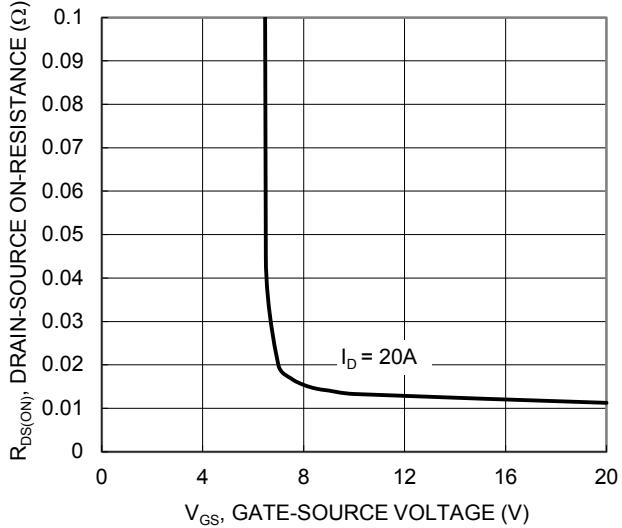


Figure 4. Typical Transfer Characteristic

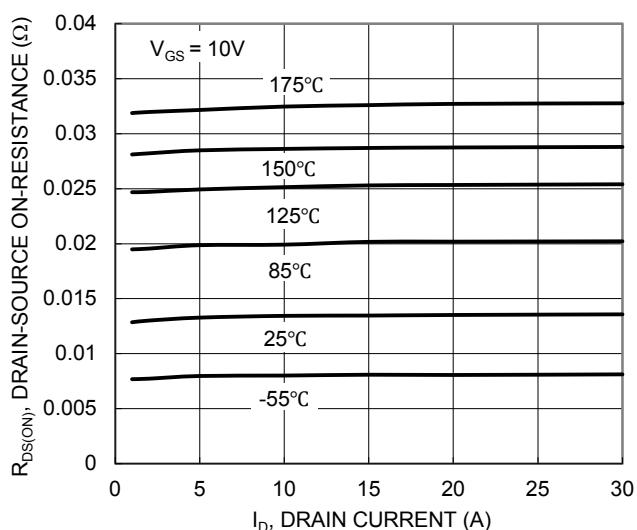


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

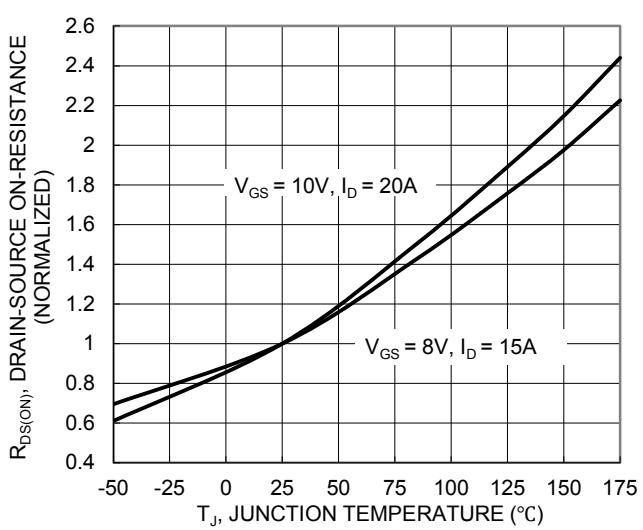
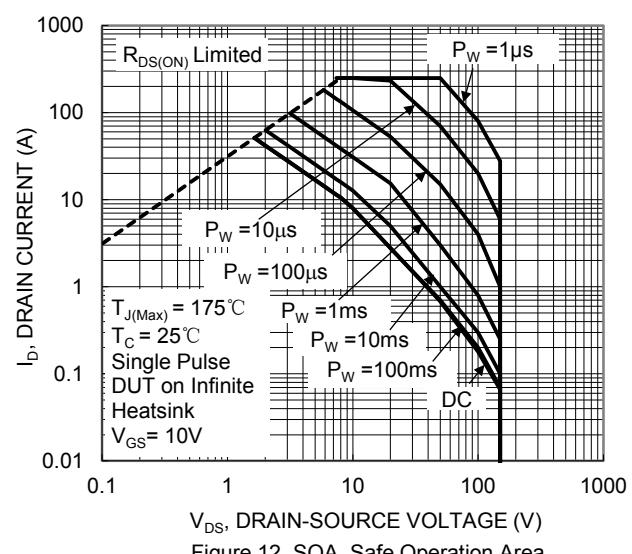
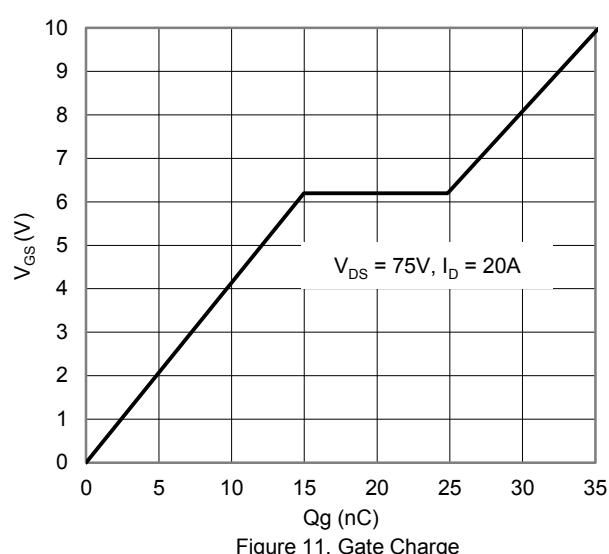
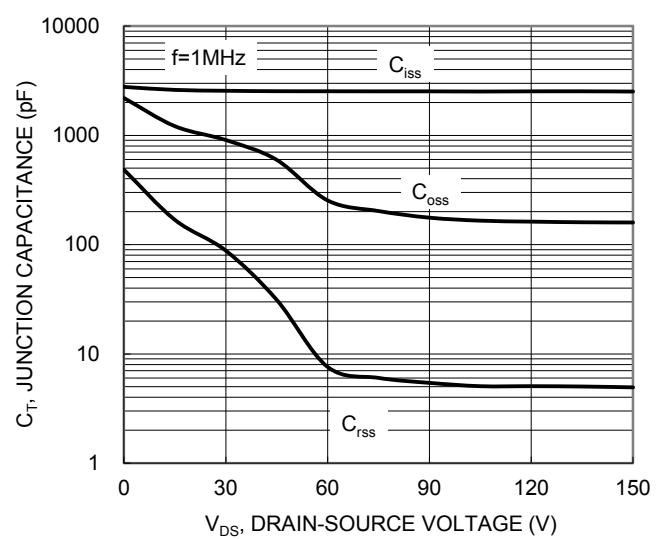
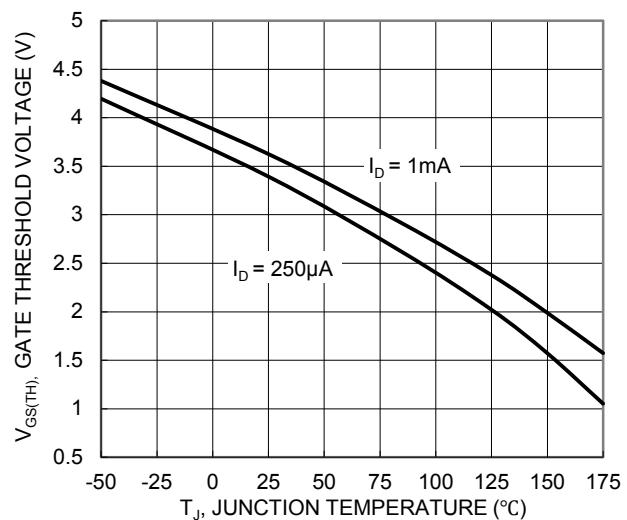
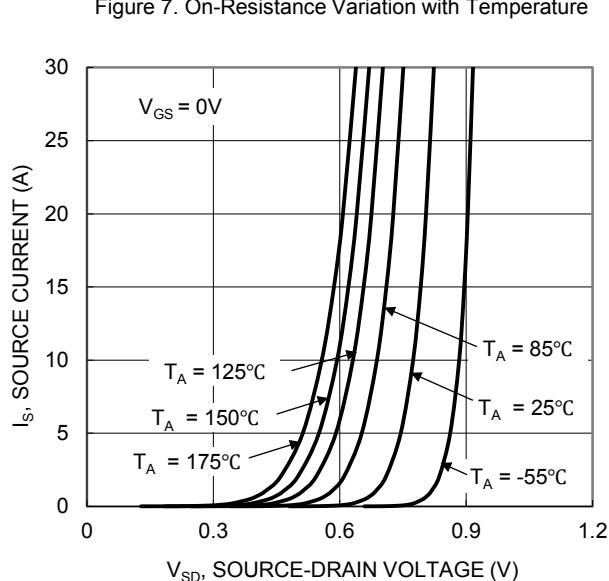
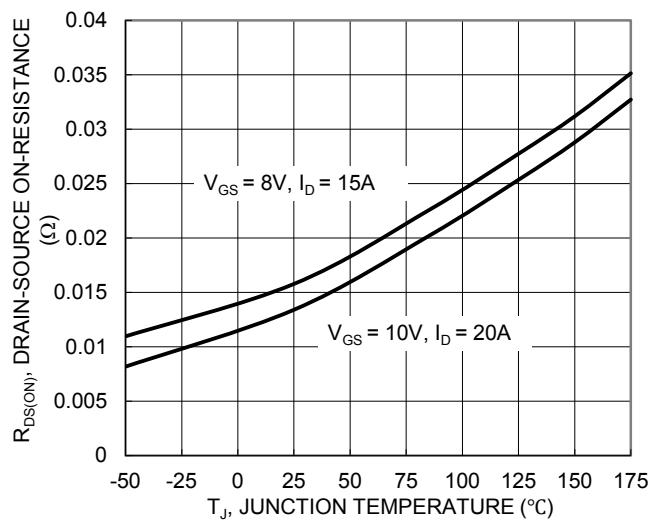


Figure 6. On-Resistance Variation with Temperature



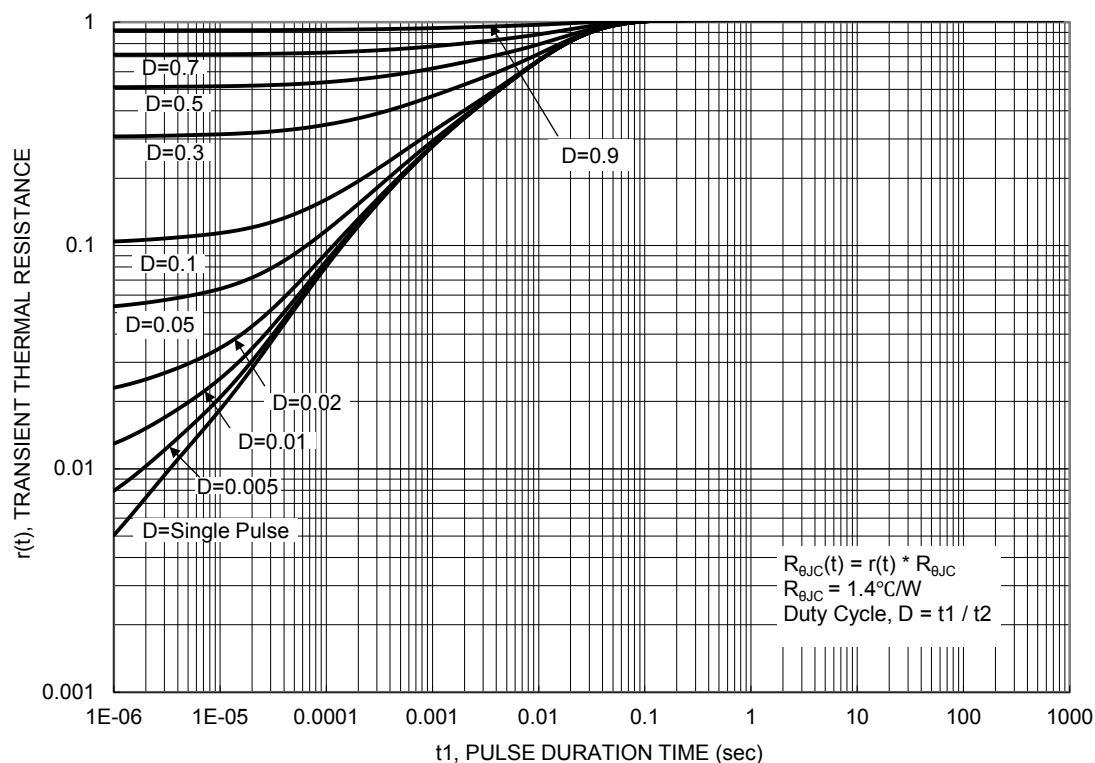
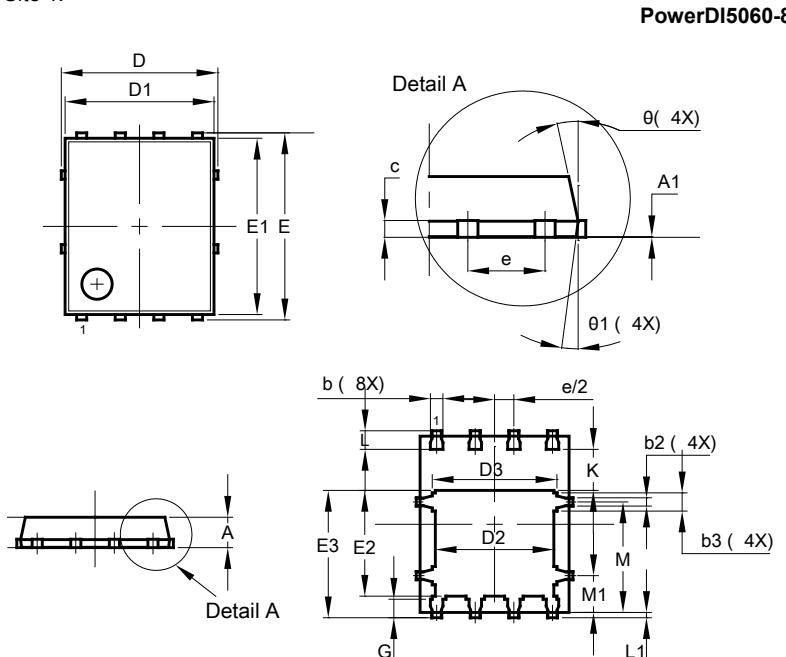


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

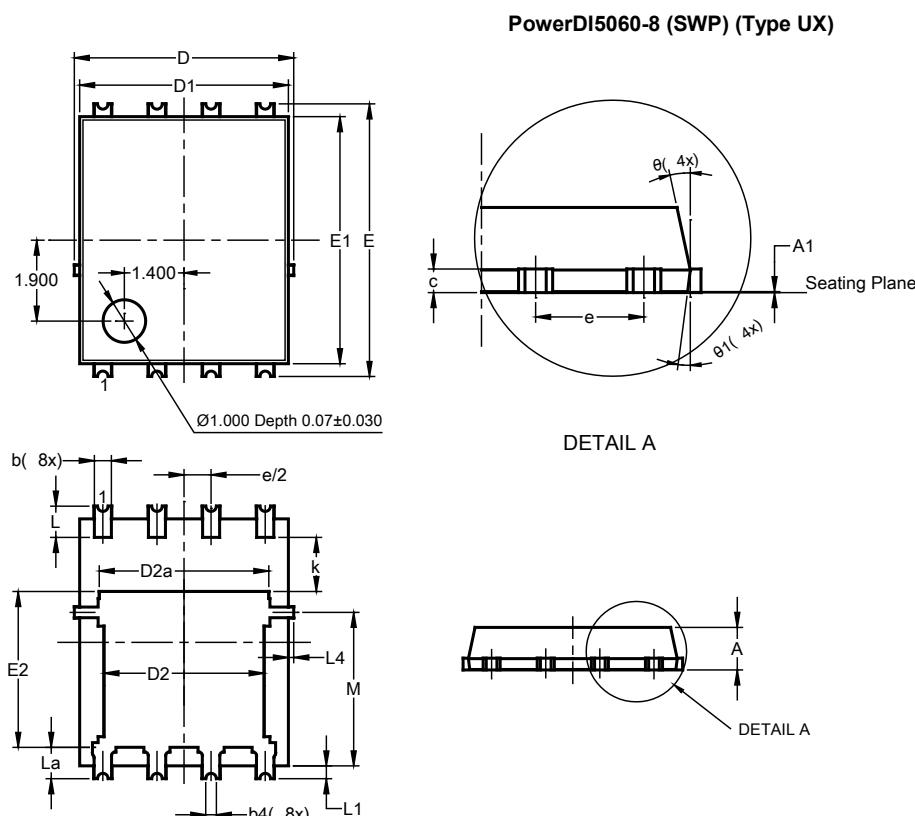
Site 1:



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
theta	10°	12°	11°
theta1	6°	8°	7°

All Dimensions in mm

Site 2:



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
theta	10°	12°	11°
theta1	6°	8°	7°

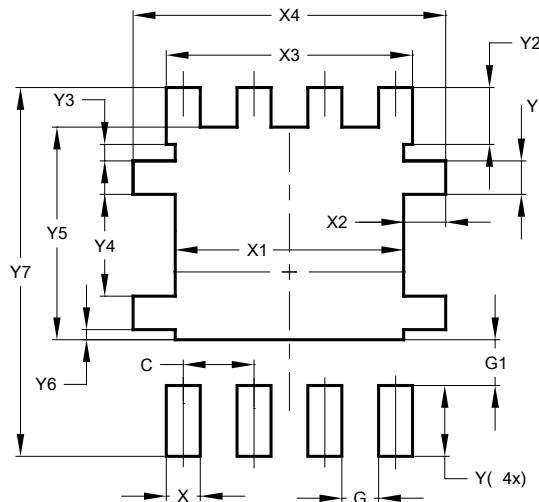
All Dimensions in mm

Suggested Pad Layout

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

Site 1:

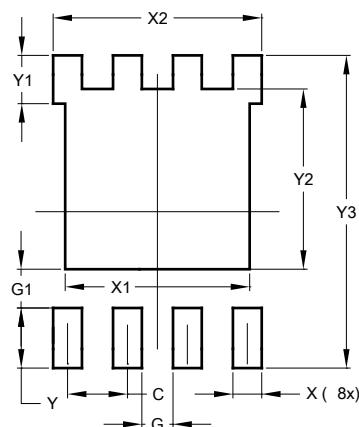
PowerDI5060-8



Dimensions	Value (in mm)
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

Site 2:

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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