60V 175°C DUAL N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ max	I_D max T_C = +25°C
60V	11mΩ @ V_{GS} = 10V	47.6A
	16mΩ @ V_{GS} = 4.5V	39.5A

Description and Applications

This MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

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

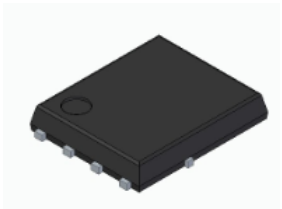
Features and Benefits

- 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)**

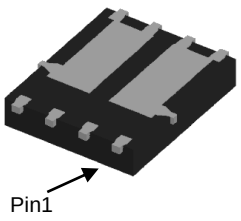
Mechanical Data

- Package: PowerDI®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)

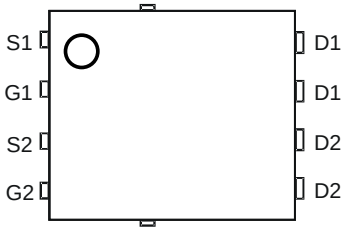
Site1: PowerDI5060-8 (Type C)



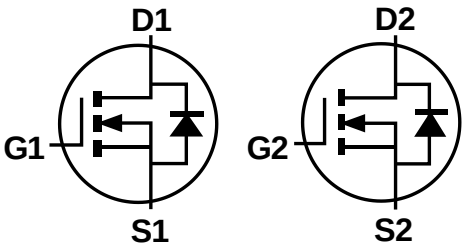
Top View



Bottom View

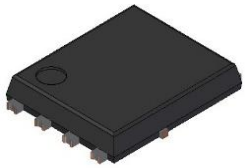


Pin out
Top View

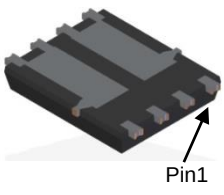


Equivalent Circuit

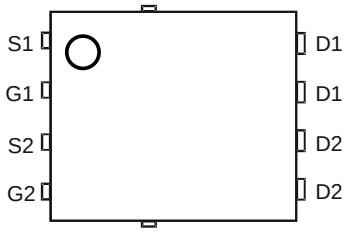
Site2: PowerDI5060-8/SWP (Type UXD)



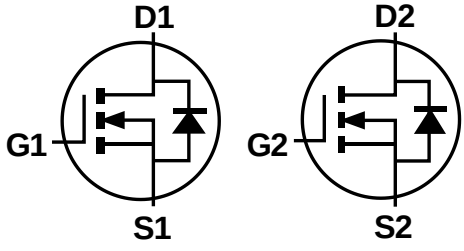
Top View



Bottom View



Pin out
Top View



Equivalent Circuit

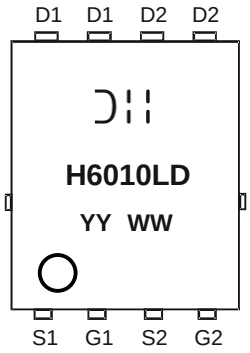
Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen-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

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



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

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	60	V
Gate-Source Voltage			V_{GSS}	±20	V
Continuous Drain Current (Note 6)		T_C = +25°C T_C = +100°C	I_D	47.6 33.7	A
Continuous Drain Current (Note 5)	Steady State	T_A = +25°C T_A = +70°C	I_D	13.1 10.9	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	170	A
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	31	A
Avalanche Current, L = 0.1mH			I_{AS}	20	A
Avalanche Energy, L = 0.1mH			E_{AS}	20	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	2.8	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	53	°C/W
Total Power Dissipation (Note 6)	T_C = +25°C	P_D	37.5	W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	4	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +175	°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°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	60	—	—	V	V_{GS} = 0V, I_D = 1mA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	V_{DS} = 48V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	3	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	8.5	11	mΩ	V_{GS} = 10V, I_D = 20A
		—	10.9	16		V_{GS} = 4.5V, I_D = 20A
Diode Forward Voltage	V_{SD}	—	0.9	1.2	V	V_{GS} = 0V, I_S = 20A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	2615	—	pF	V_{DS} = 30V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	1415	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	58	—	pF	
Gate Resistance	R_g	—	0.67	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	20.3	—	nC	V_{DS} = 30V, I_D = 20A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	40.2	—	nC	
Gate-Source Charge	Q_{gs}	—	5.9	—	nC	
Gate-Drain Charge	Q_{gd}	—	9.3	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	5.7	—	ns	V_{DD} = 30V, V_{GS} = 10V, I_D = 20A, R_G = 3Ω
Turn-On Rise Time	t_R	—	8.8	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	20.8	—	ns	
Turn-Off Fall Time	t_F	—	7.4	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	34.5	—	ns	I_F = 20A, di/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q_{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.

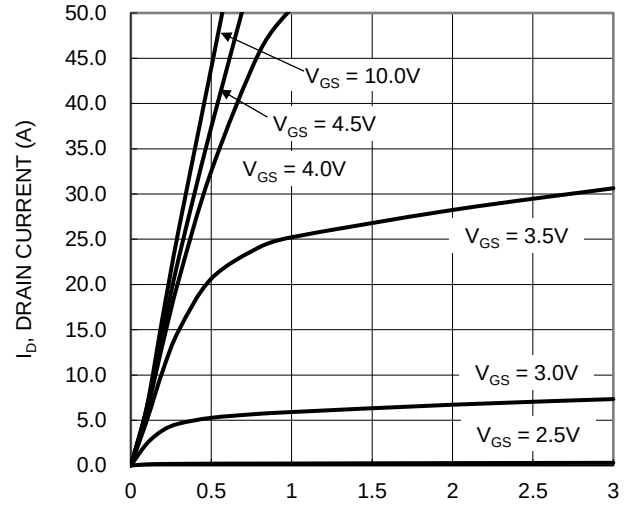


Figure 1. Typical Output Characteristic

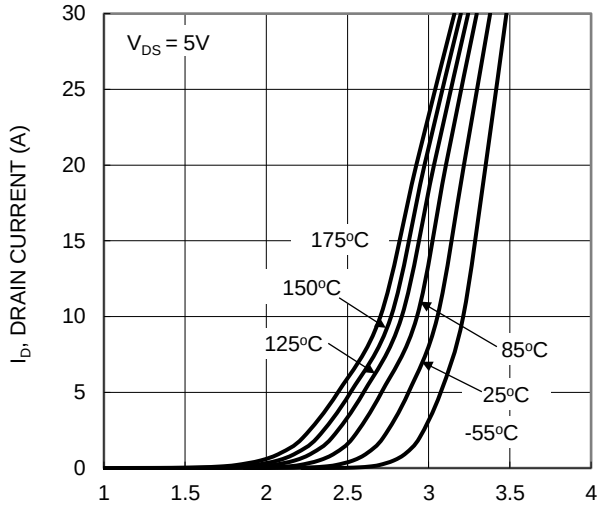


Figure 2. Typical Transfer Characteristic

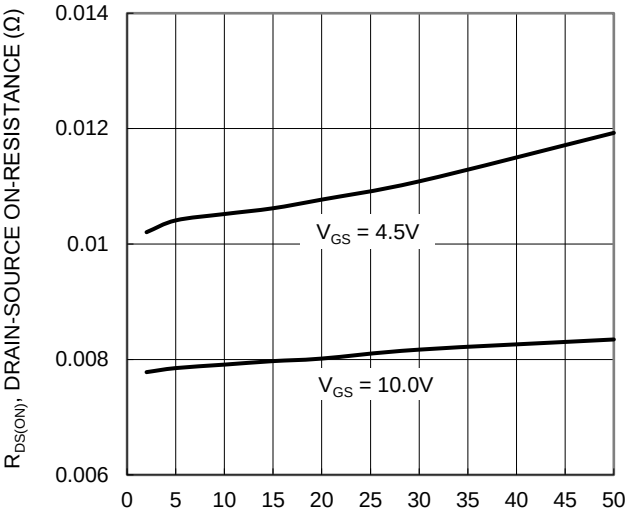


Figure 3. Typical On-Resistance vs Drain Current and Gate Voltage

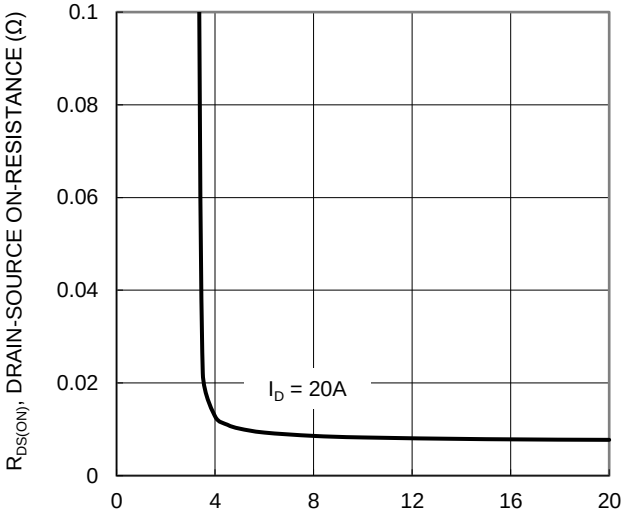


Figure 4. Typical Transfer Characteristic

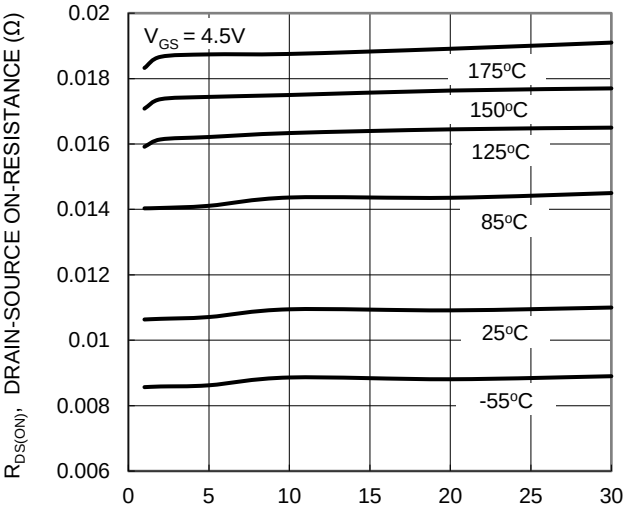


Figure 5. Typical On-Resistance vs Drain Current and Junction Temperature

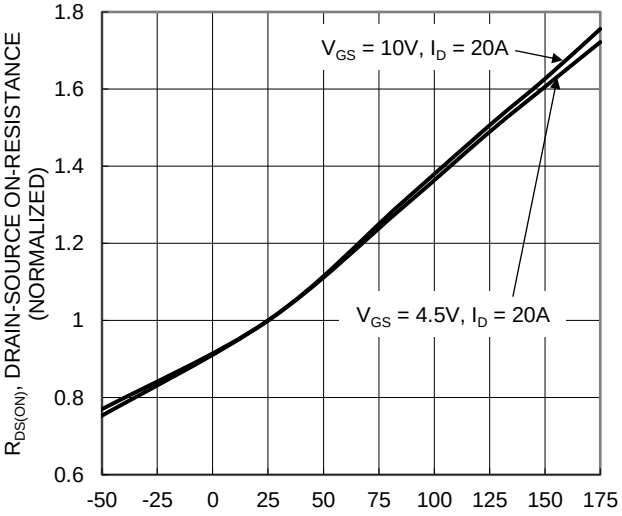


Figure 6. On-Resistance Variation with Junction Temperature

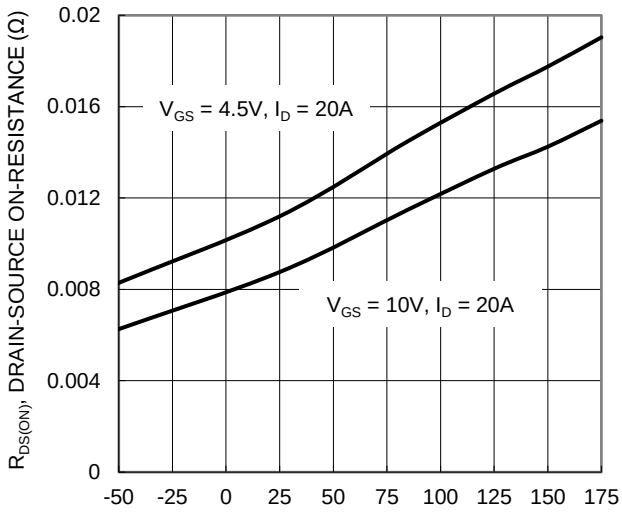


Figure 7. On-Resistance Variation with Junction Temperature

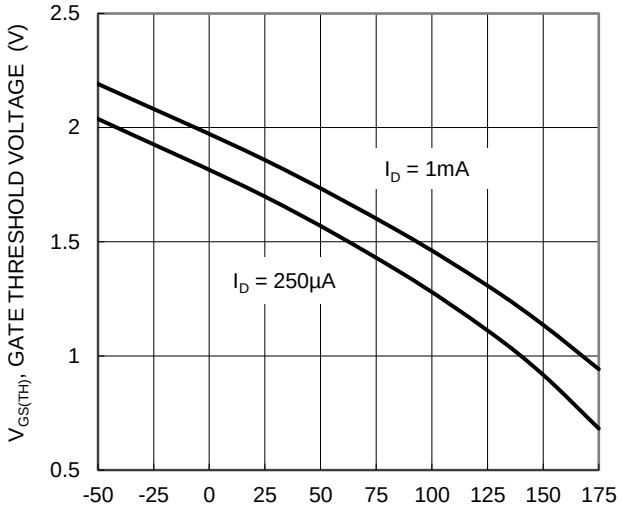


Figure 8. Gate Threshold Variation vs Junction Temperature

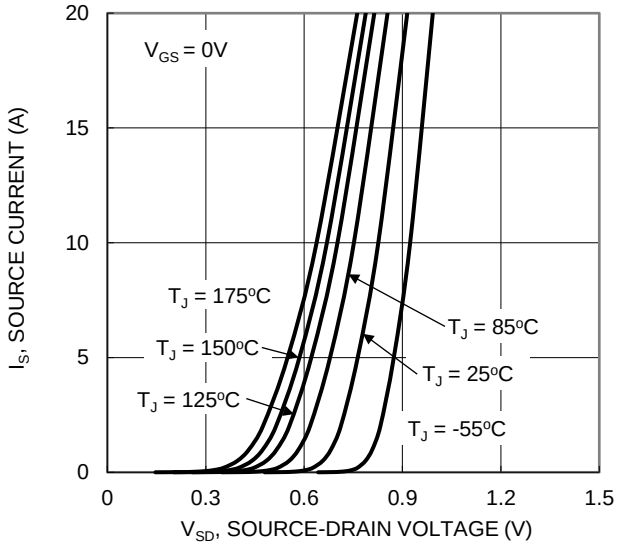


Figure 9. Diode Forward Voltage vs Current

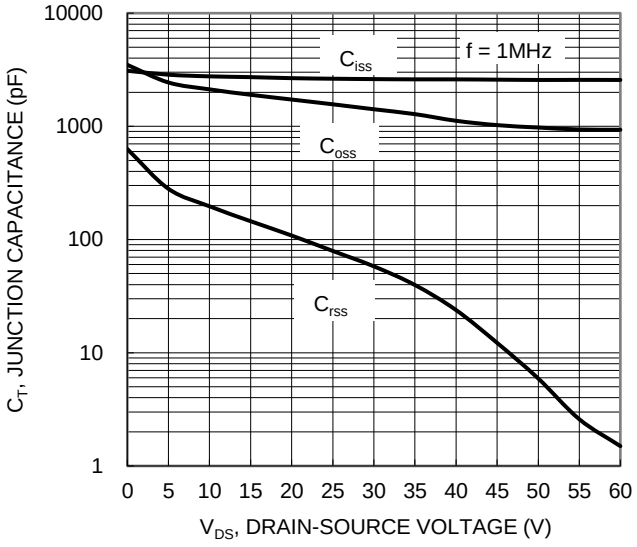


Figure 10. Typical Junction Capacitance

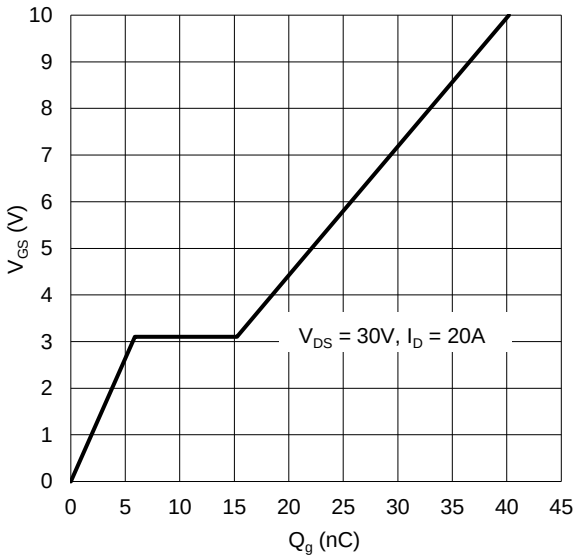


Figure 11. Gate Charge

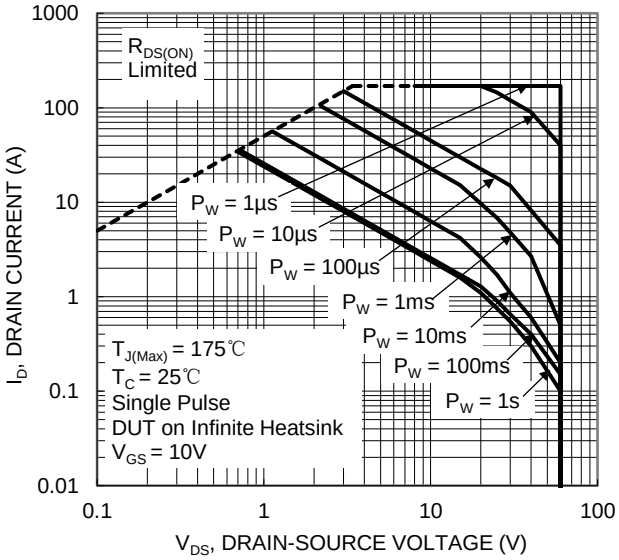


Figure 12. SOA, Safe Operation Area

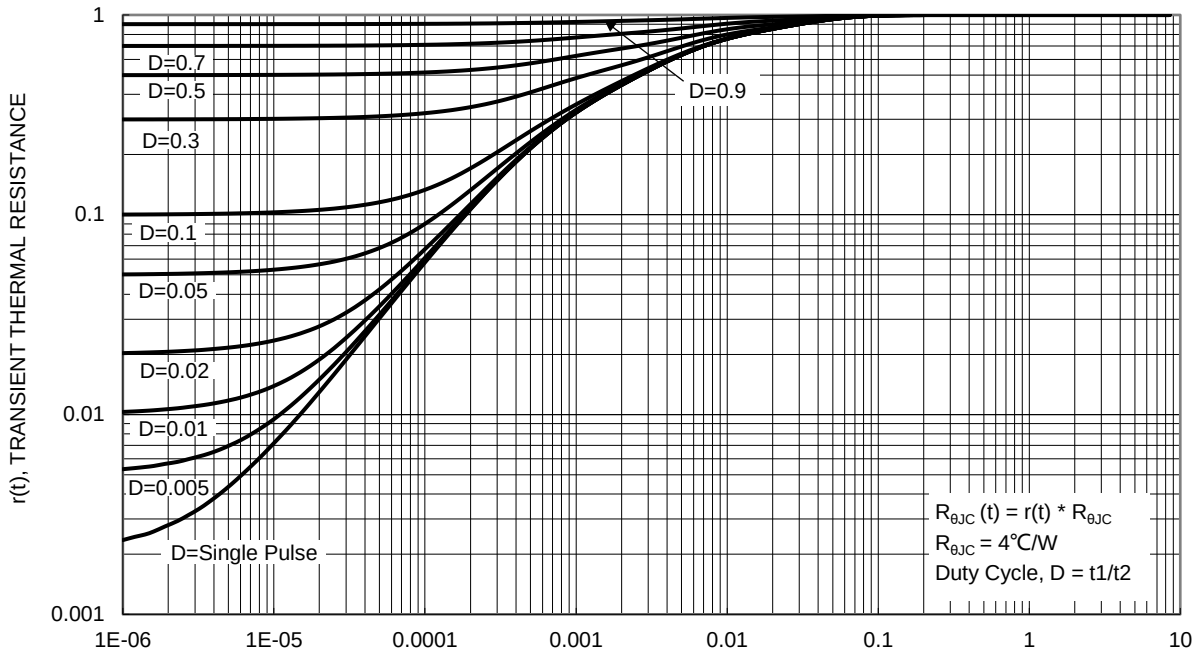


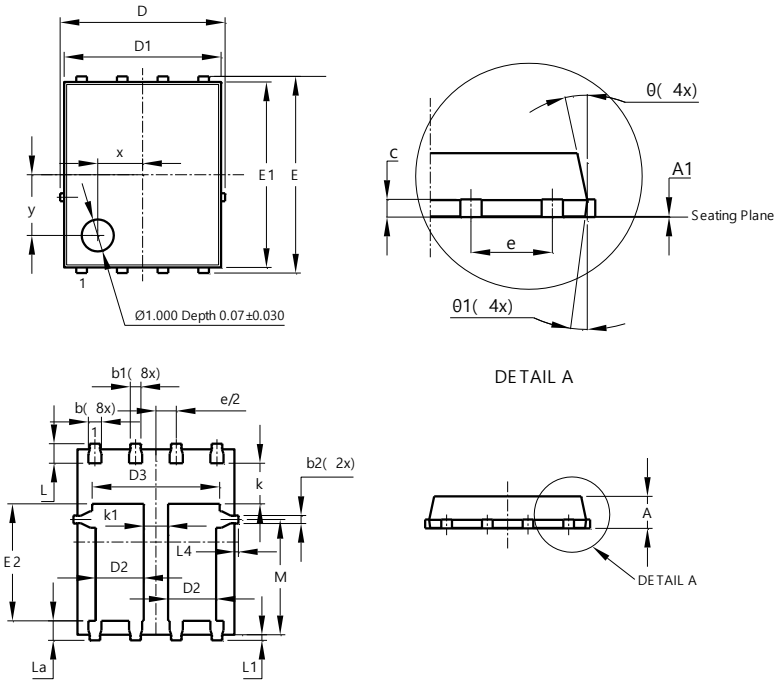
Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

Site1:

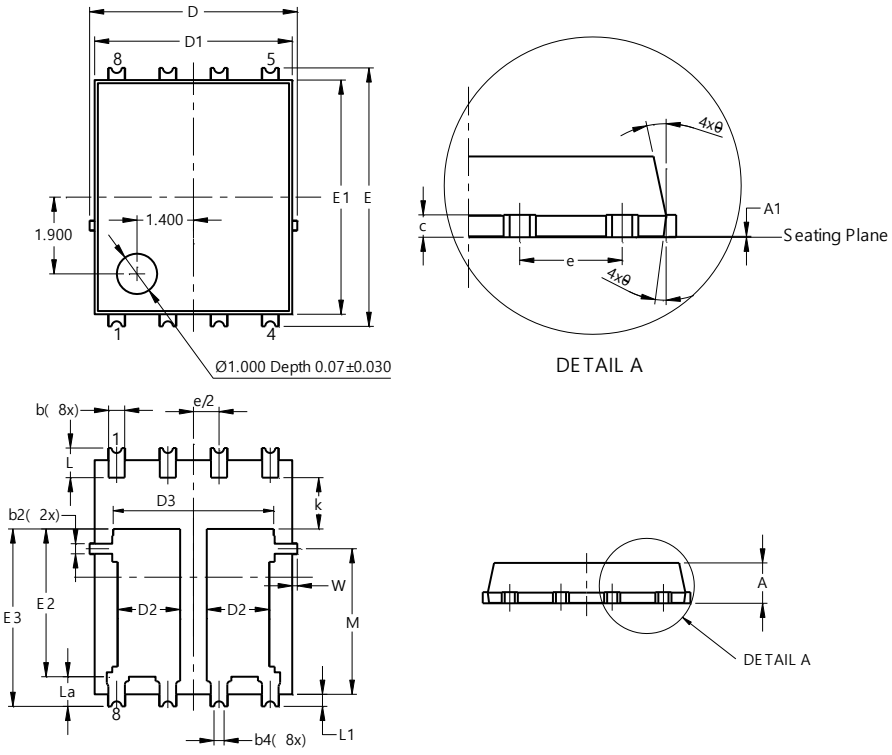
PowerDI5060-8 (Type C)



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			

Site2:

PowerDI5060-8/SWP (Type UXD)



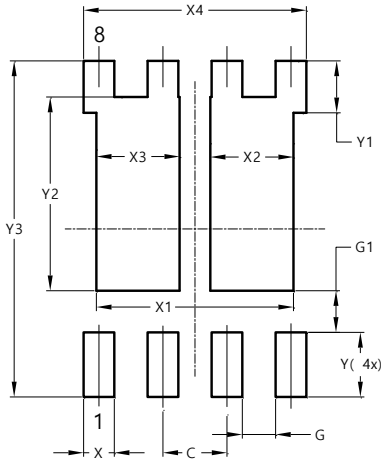
PowerDI5060-8/SWP (Type UXD)			
Dim	**Min**	**Max**	**Typ**
A	0.90	1.10	1.00
A1	0.00	0.05	--
b	0.30	0.50	0.41
b2	0.20	0.35	0.25
b4	0.25REF		
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	1.46	1.66	1.55
D3	3.78	4.18	3.98
E	6.40 BSC		
E1	5.60	6.00	5.80
E2	3.46	3.86	3.66
E2a	4.195	4.595	4.395
e	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°
All Dimensions in mm			

Suggested Pad Layout

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

Site1:

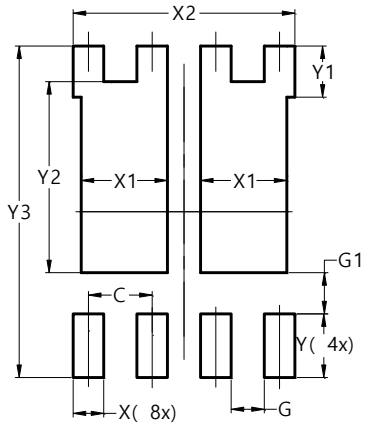
PowerDI5060-8 (Type C)



Dimensions	Value (in mm)
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

Site2:

PowerDI5060-8/SWP (Type UXD)



Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	1.720
X2	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610

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