

Product Summary

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

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:

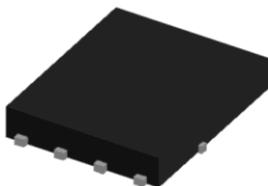
- Engine Management Systems
- Body Control Electronics
- DCDC Converters

Features and Benefits

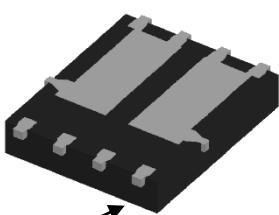
- Rated to $+175^\circ\text{C}$ – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – ensures more reliable and robust end application
- High Conversion Efficiency
- Low Input Capacitance
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- Qualified to AEC-Q101 Standards for High Reliability
- PPAP Capable (Note 4)

Mechanical Data

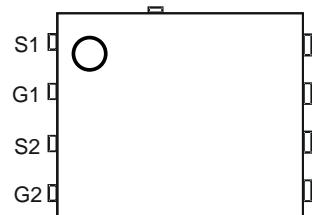
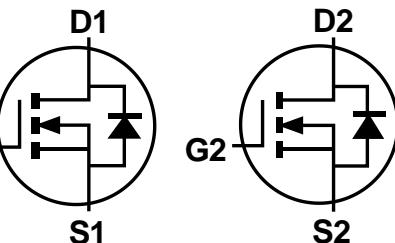
- Case: PowerDI5060-8 (Type C)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.097 grams (Approximate)



Top View



Bottom View


 Pin out
Top View


Equivalent Circuit

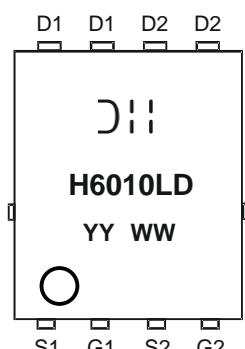
Ordering Information (Note 5)

Part Number	Case	Packaging
DMTH6010LPDQ-13	PowerDI5060-8 (Type C)	2,500/Tape & Reel

Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to http://www.diodes.com/product_compliance_definitions.html.
5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



DII = Manufacturer's Marking
 H6010LD = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Year (ex: 16 = 2016)
 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}	± 20	V	
Continuous Drain Current (Note 7)	$T_C = +25^\circ\text{C}$ $T_C = +100^\circ\text{C}$	I_D	47.6 33.7	A
Continuous Drain Current (Note 6)	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	13.1 10.9	A
Pulsed Drain Current (10 μs pulse, duty cycle = 1%)	I_{DM}	90	A	
Maximum Continuous Body Diode Forward Current (Note 7)	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 6)	$T_A = +25^\circ\text{C}$	P_D	2.8	W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	53	$^\circ\text{C}/\text{W}$	
Total Power Dissipation (Note 7)	$T_C = +25^\circ\text{C}$	P_D	37.5	W
Thermal Resistance, Junction to Case (Note 7)	$R_{\theta JC}$	4	$^\circ\text{C}/\text{W}$	
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +175	$^\circ\text{C}$	

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	60	—	—	V	$V_{GS} = 0\text{V}, I_D = 1\text{mA}$
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	$V_{DS} = 48\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	3	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	8.5	11	$\text{m}\Omega$	$V_{GS} = 10\text{V}, I_D = 20\text{A}$
		—	10.9	16		$V_{GS} = 4.5\text{V}, I_D = 20\text{A}$
Diode Forward Voltage	V_{SD}	—	0.9	1.2	V	$V_{GS} = 0\text{V}, I_S = 20\text{A}$
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	2615	—	pF	$V_{DS} = 30\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Output Capacitance	C_{oss}	—	1415	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	58	—	pF	
Gate Resistance	R_g	—	0.67	—	Ω	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge ($V_{GS} = 4.5\text{V}$)	Q_g	—	20.3	—	nC	$V_{DS} = 30\text{V}, I_D = 20\text{A}$
Total Gate Charge ($V_{GS} = 10\text{V}$)	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	$V_{DD} = 30\text{V}, V_{GS} = 10\text{V}, I_D = 20\text{A}, R_G = 3\Omega$
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	$I_F = 20\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	Q_{RR}	—	37.5	—	nC	

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

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

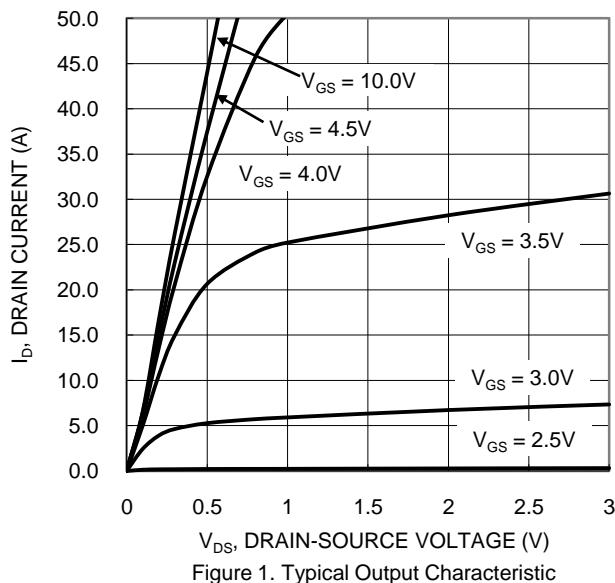


Figure 1. Typical Output Characteristic

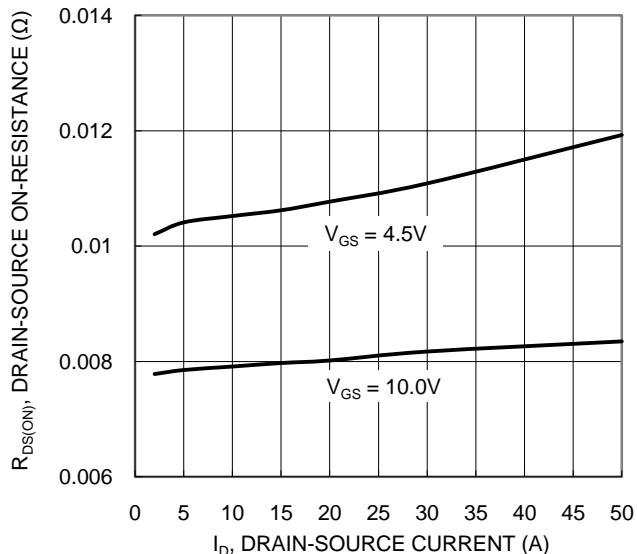


Figure 3. Typical On-Resistance vs Drain Current and Gate Voltage

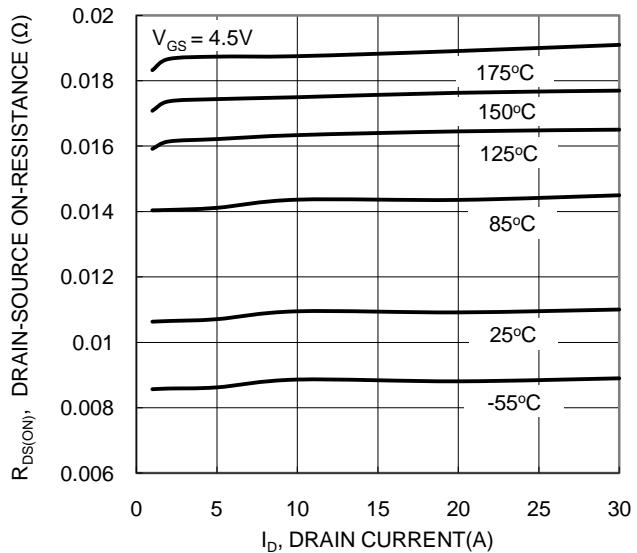


Figure 5. Typical On-Resistance vs Drain Current and Junction Temperature

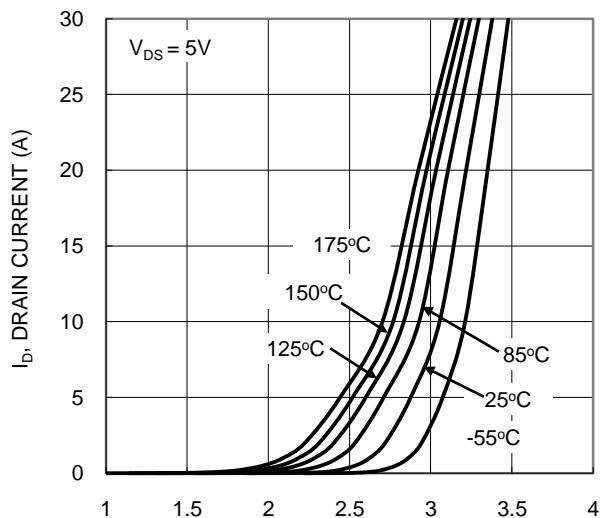


Figure 2. Typical Transfer Characteristic

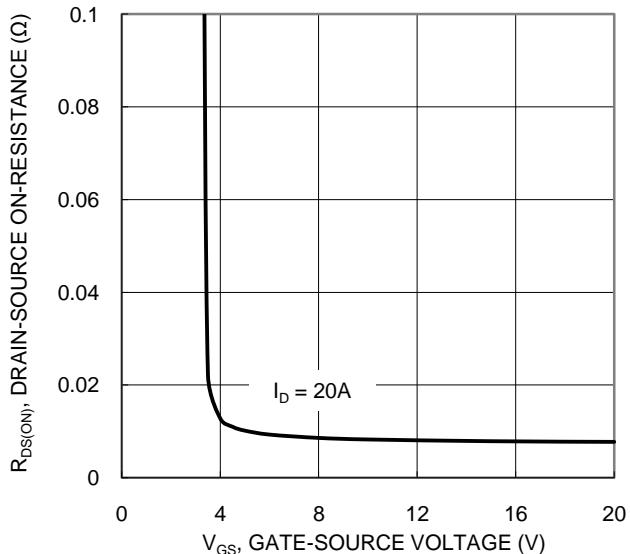


Figure 4. Typical Transfer Characteristic

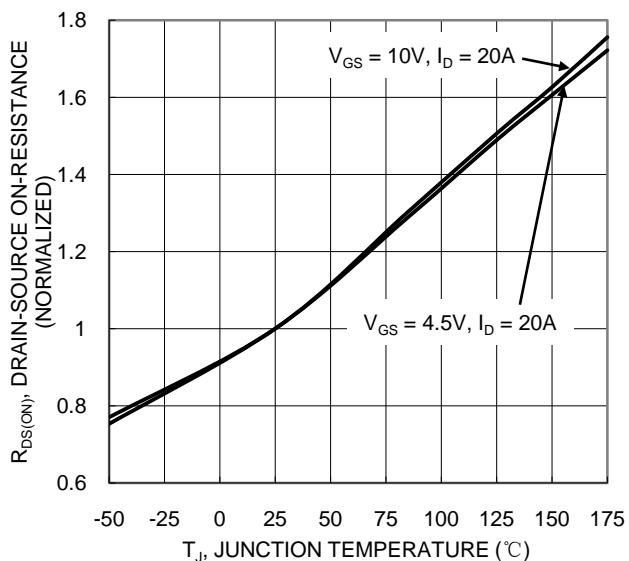


Figure 6. On-Resistance Variation with Junction Temperature

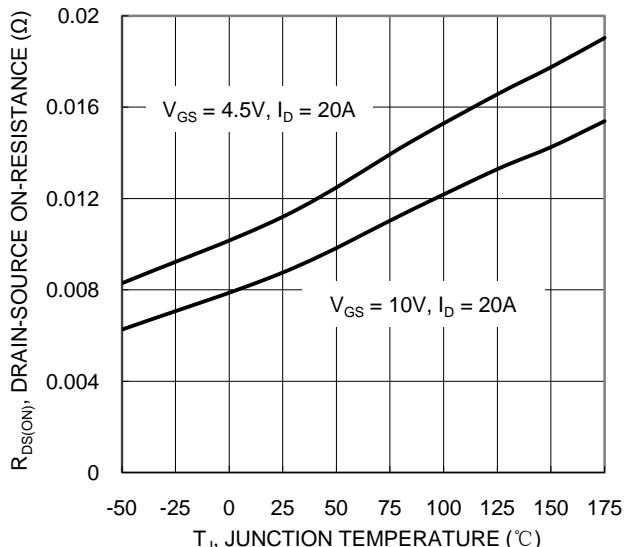


Figure 7. On-Resistance Variation with Junction Temperature

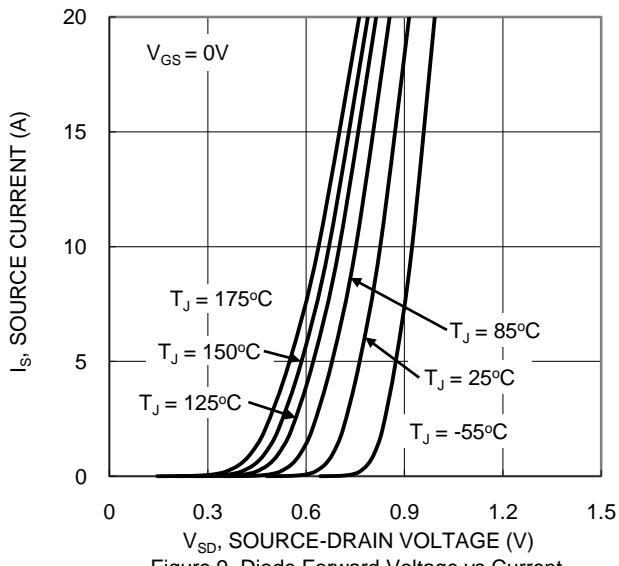


Figure 9. Diode Forward Voltage vs Current

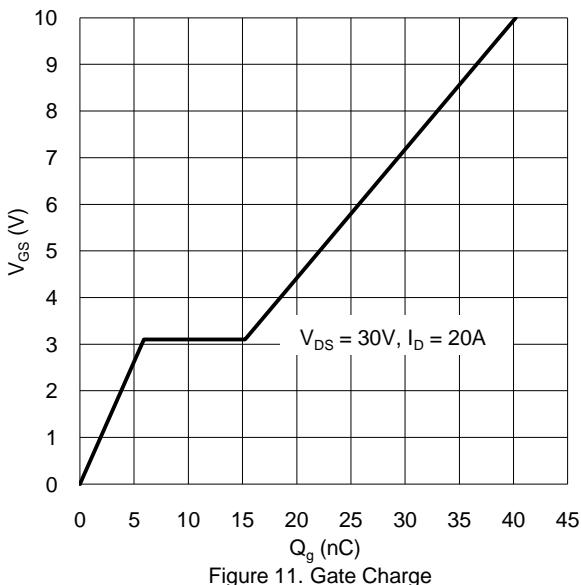


Figure 11. Gate Charge

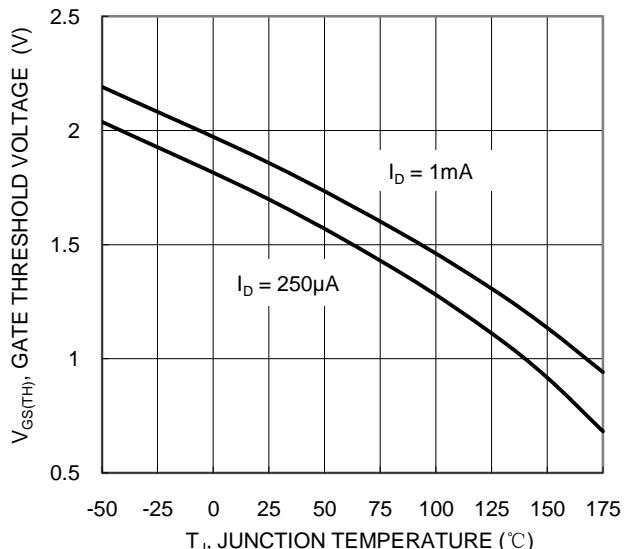


Figure 8. Gate Threshold Variation vs Junction Temperature

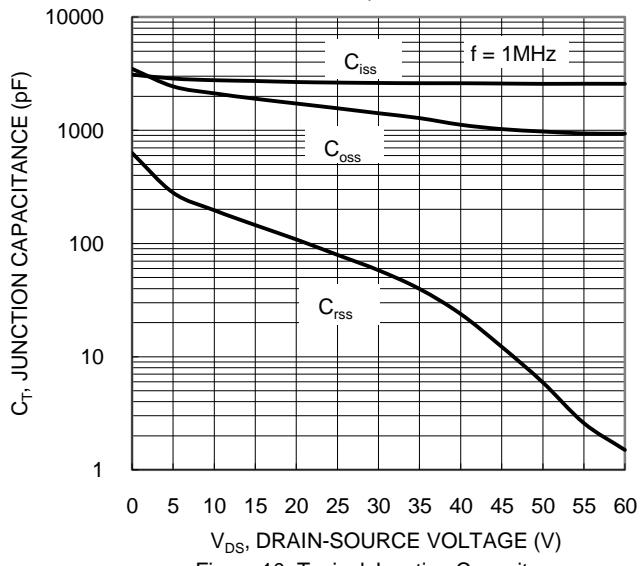


Figure 10. Typical Junction Capacitance

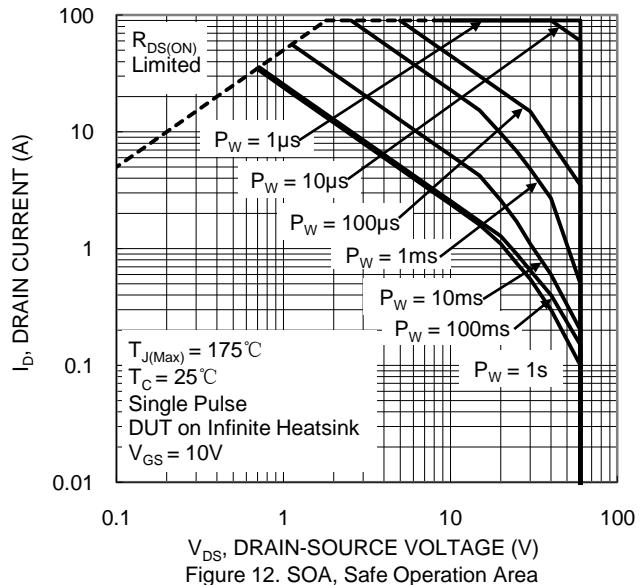


Figure 12. SOA, Safe Operation Area

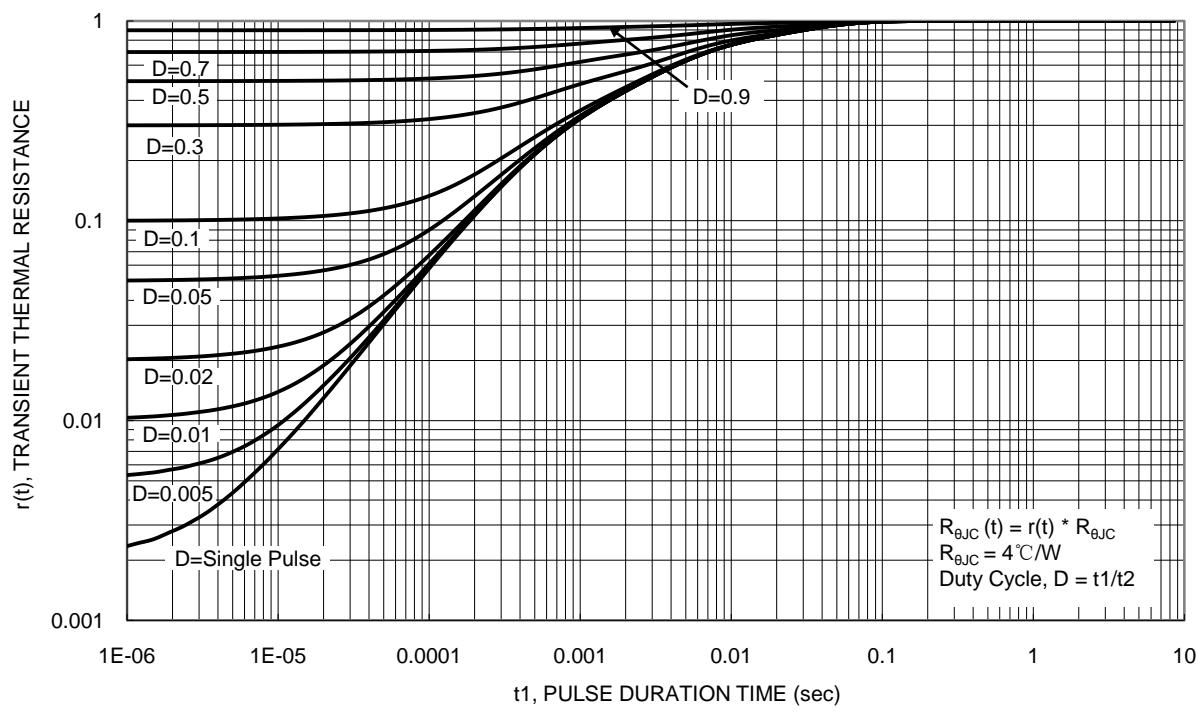
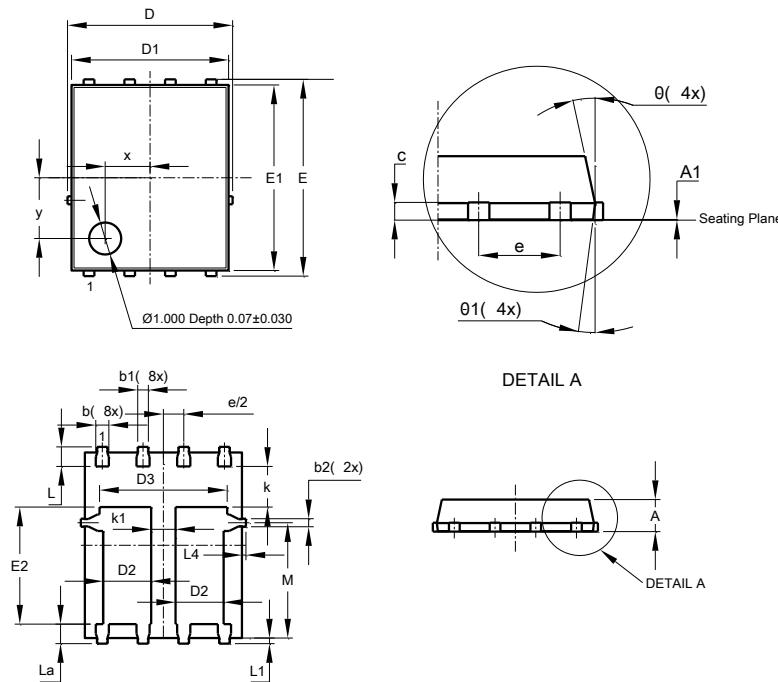


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI5060-8 (Type C)

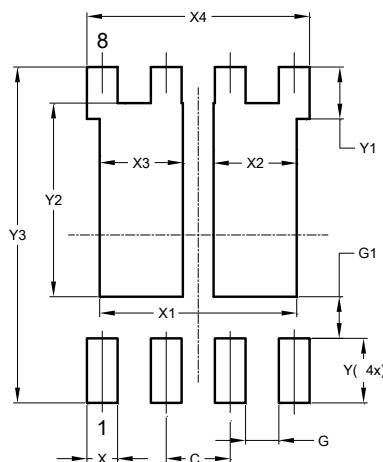


PowerDI5060-8 (Type C)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0	0.05	0.02
b	0.33	0.51	0.41
b1	0.300	0.366	0.333
b2	0.20	0.35	0.25
c	0.23	0.33	0.277
D	5.15 BSC		
D1	4.85	4.95	4.90
D2	1.40	1.60	1.50
D3	-	-	3.98
E	6.15 BSC		
E1	5.75	5.85	5.80
E2	3.56	3.76	3.66
e	1.27 BSC		
k	-	-	1.27
k1	0.56	-	-
L	0.51	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			

Suggested Pad Layout

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

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

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