40V N-CHANNEL ENHANCEMENT MODE MOSFET
PowerDI5060-8 (Type K)

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D T_C = +25°C (Note 9)
40V	0.9mΩ @ V_{GS} = 10V	304A
	1.5mΩ @ V_{GS} = 4.5V	235A

Features

- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Thermally Efficient Package-Cooler Running Applications
- High Conversion Efficiency
- Low $R_{DS(ON)}$ – Minimizes On State Losses
- <1.1mm Package Profile – Ideal for Thin Applications (PowerDI®)
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Description and Applications

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

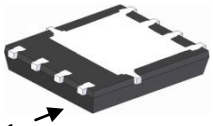
- Engine Management Systems
- Body Control Electronics
- DC-DC Converters
- Synchronous Rectification

Mechanical Data

- Case: PowerDI5060-8 (Type K)
- Case 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 e3
- Weight: 0.097 grams (Approximate)

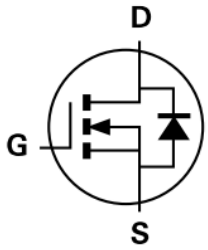
PowerDI5060-8 (Type K)

Top View

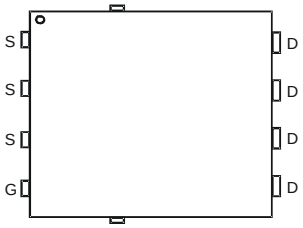


Pin1

Bottom View



Internal Schematic



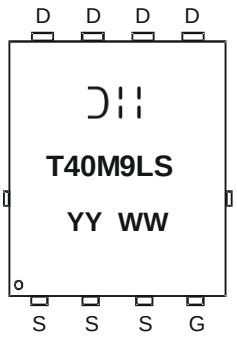
Top View
Pin Configuration

Ordering Information (Note 4)

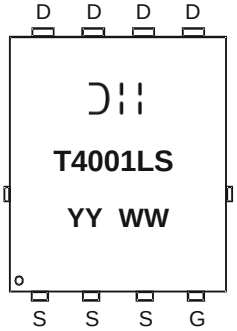
Part Number	Case	Packaging
DMT4001LPS-13	PowerDI5060-8 (Type K)	2,500 / Tape & Reel

Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
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. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

Marking Information



=Manufacturer's Marking
T40M9LS= Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 17 = 2017)
WW = Week Code (01 to 53)



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

Characteristic		Symbol	Value	Unit
Drain-Source Voltage		V_{DSS}	40	V
Gate-Source Voltage		V_{GSS}	±20	V
Continuous Drain Current, V_{GS} = 10V (Note 6 & 9)	T_C = +25°C T_C = +70°C	I_D	304 243	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)		I_{DM}	400	A
Continuous Body Diode Forward Current (Note 6)	T_C = +25°C	I_S	100	A
Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%)		I_{SM}	400	A
Avalanche Current, L = 0.1mH		I_{AS}	77.7	A
Avalanche Energy, L = 0.1mH		E_{AS}	391	mJ

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P_D	2.4	W
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	52	°C/W
Total Power Dissipation (Note 6)	P_D	125	W
Thermal Resistance, Junction to Case (Note 6)	$R_{\theta JC}$	1	°C/W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

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}	40	—	—	V	V_{GS} = 0V, I_D = 1mA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 32V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = +20V, V_{DS} = 0V V_{GS} = -16V, 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	$R_{DS(ON)}$	—	0.6	0.9	mΩ	V_{GS} = 10V, I_D = 50A
		—	1	1.5		V_{GS} = 4.5V, I_D = 50A
Diode Forward Voltage	V_{SD}	—	—	1.3	V	V_{GS} = 0V, I_S = 20A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	9903	—	pF	V_{DS} = 20V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	4518	—		
Reverse Transfer Capacitance	C_{rss}	—	410	—		
Gate Resistance	R_g	—	3.56	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 10V)	Q_g	—	159	—	nC	V_{DD} = 20V, I_D = 50A
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	72.9	—		
Gate-Source Charge	Q_{gs}	—	23.4	—		
Gate-Drain Charge	Q_{gd}	—	41.7	—		
Turn-On Delay Time	$t_{D(ON)}$	—	7.53	—	ns	V_{DD} = 20V, V_{GS} = 10V, I_D = 50A, R_g = 2.5Ω
Turn-On Rise Time	t_R	—	27.4	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	135	—		
Turn-Off Fall Time	t_F	—	68.1	—		
Reverse Recovery Time	t_{RR}	—	102	—	ns	I_F = 50A, di/dt = 100A/µs
Reverse Recovery Charge	Q_{RR}	—	238	—	nC	

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).
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.
9. Limited by package. Silicon chip capability is 304A at +25°C.

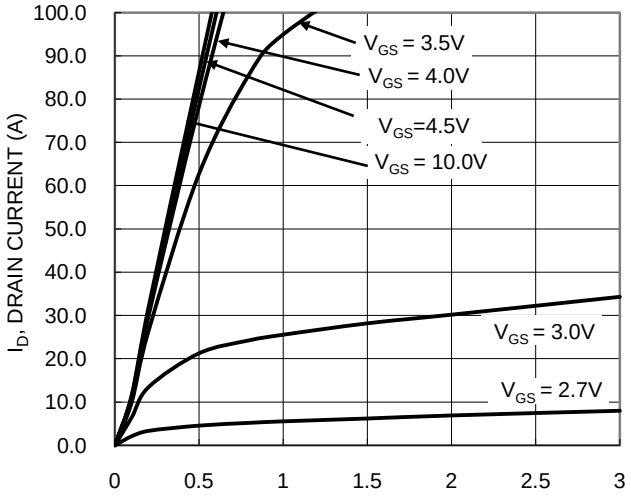


Figure 1. Typical Output Characteristic

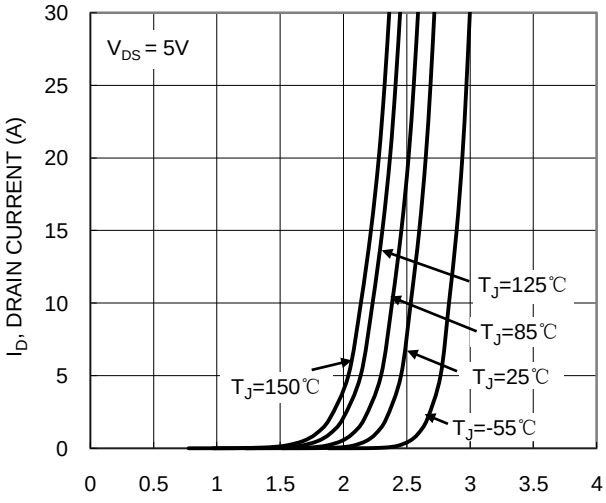


Figure 2. Typical Transfer Characteristic

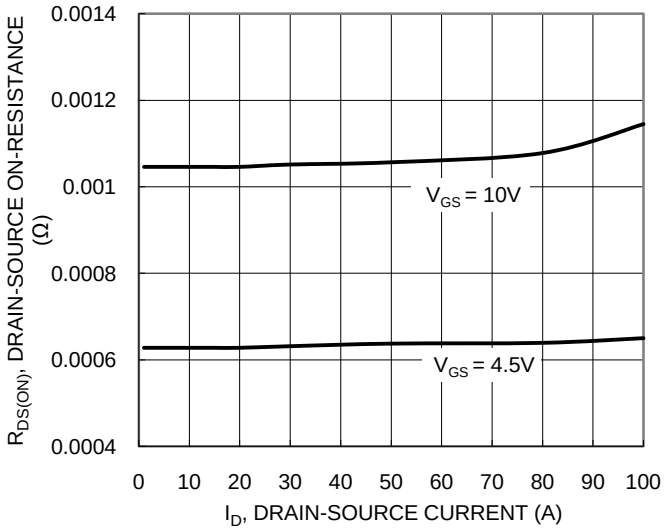


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

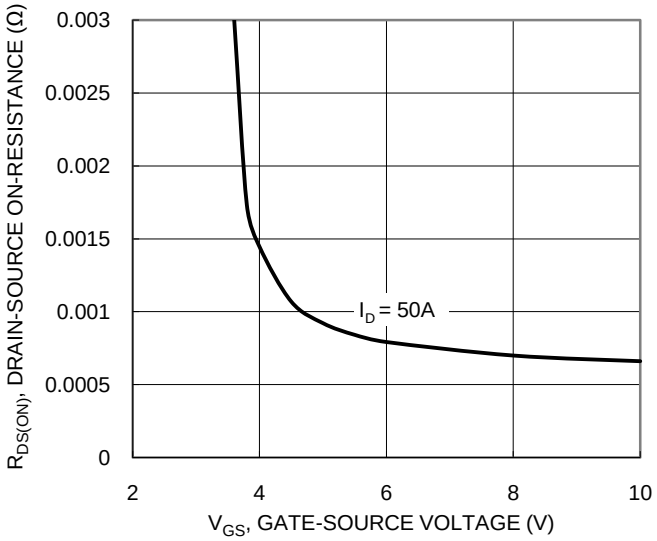


Figure 4. Typical Transfer Characteristic

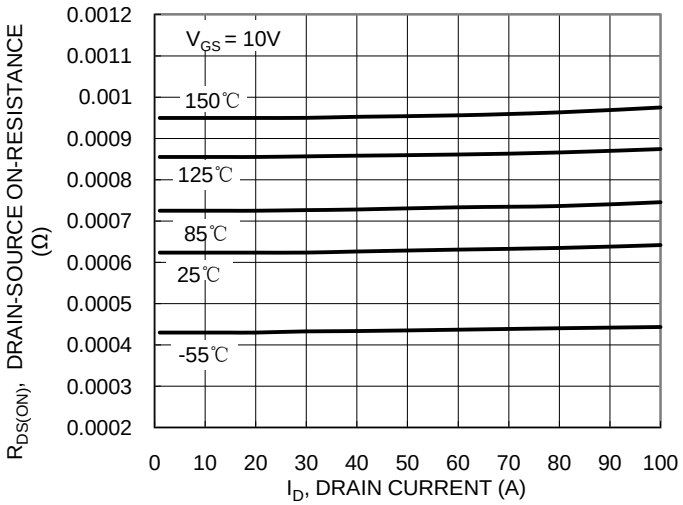


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

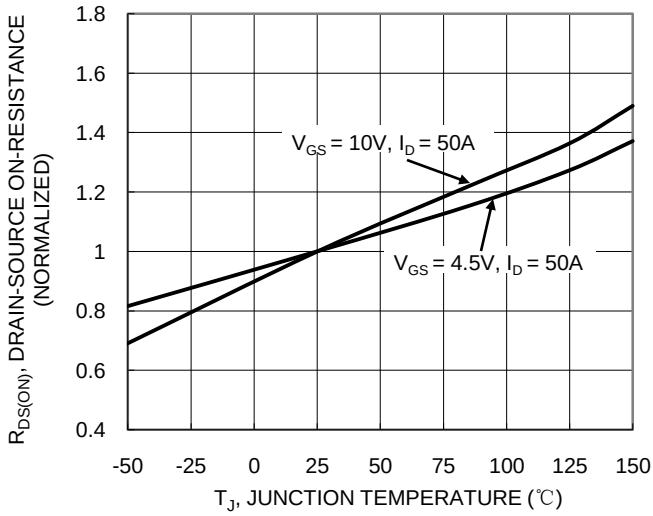


Figure 6. On-Resistance Variation with Junction Temperature

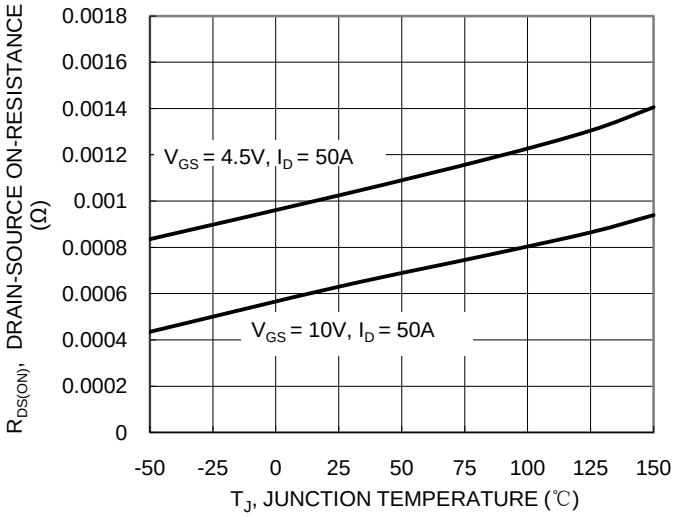


Figure 7. On-Resistance Variation with Junction Temperature

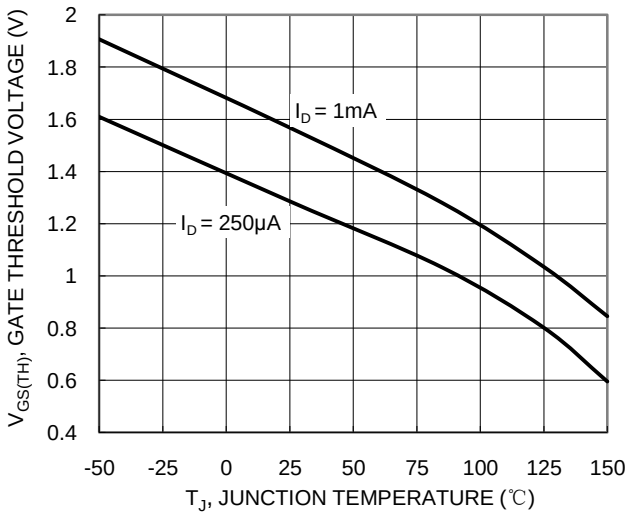


Figure 8. Gate Threshold Variation vs. Junction Temperature

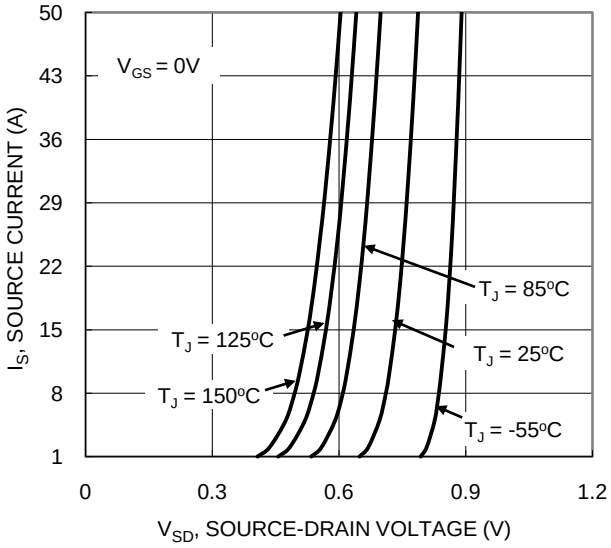


Figure 9. Diode Forward Voltage vs. Current

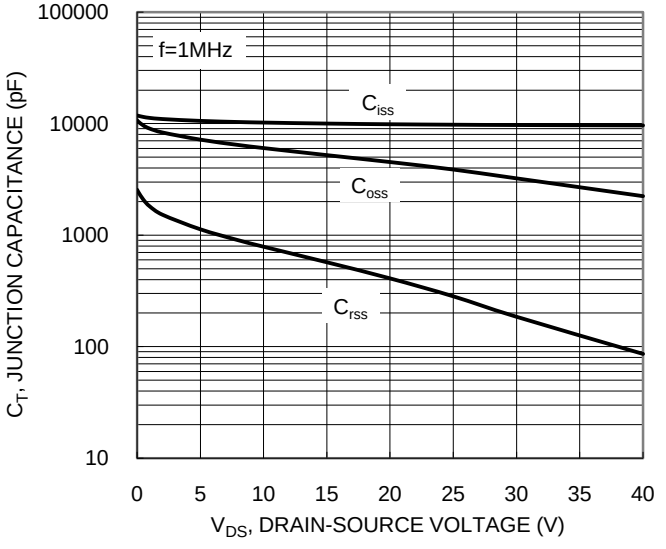


Figure 10. Typical Junction Capacitance

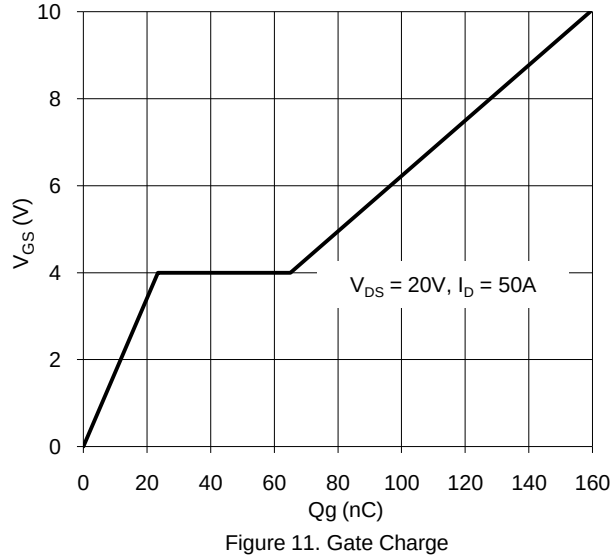


Figure 11. Gate Charge

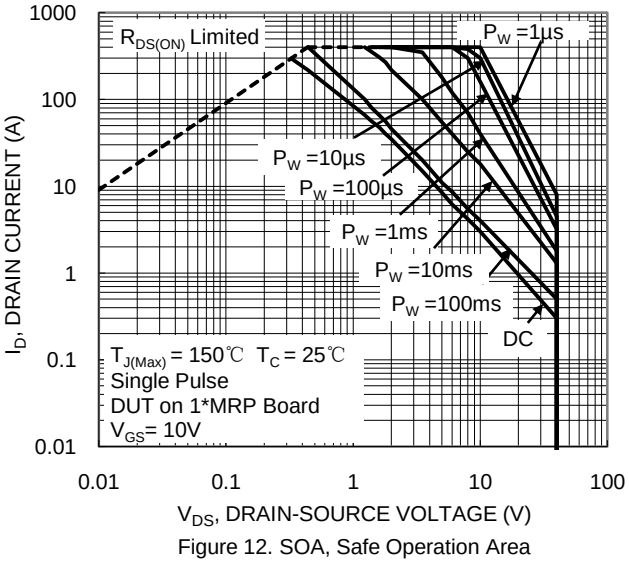


Figure 12. SOA, Safe Operation Area

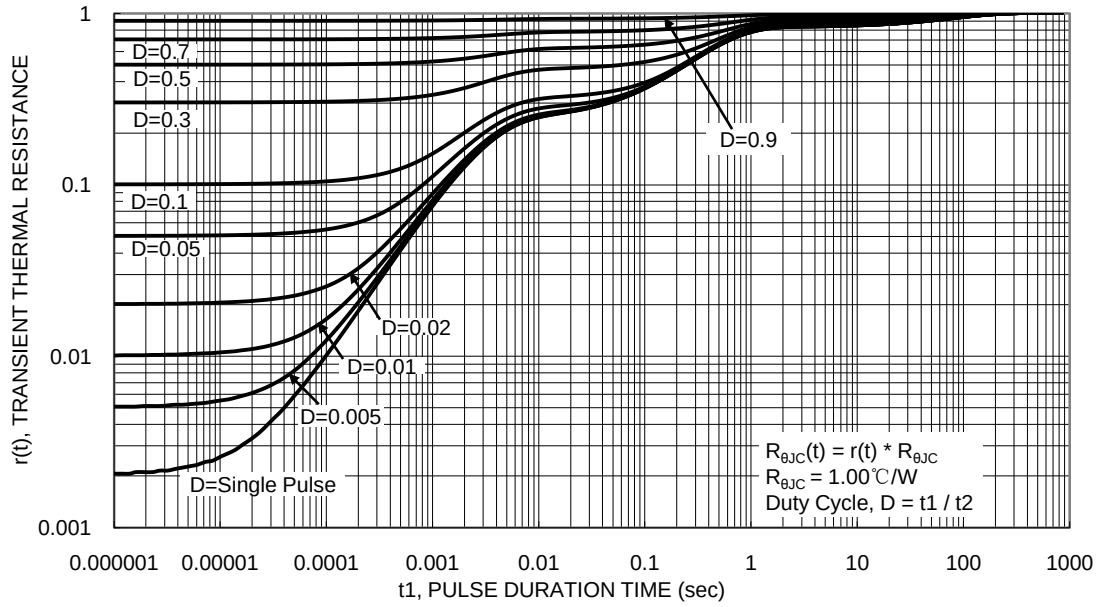
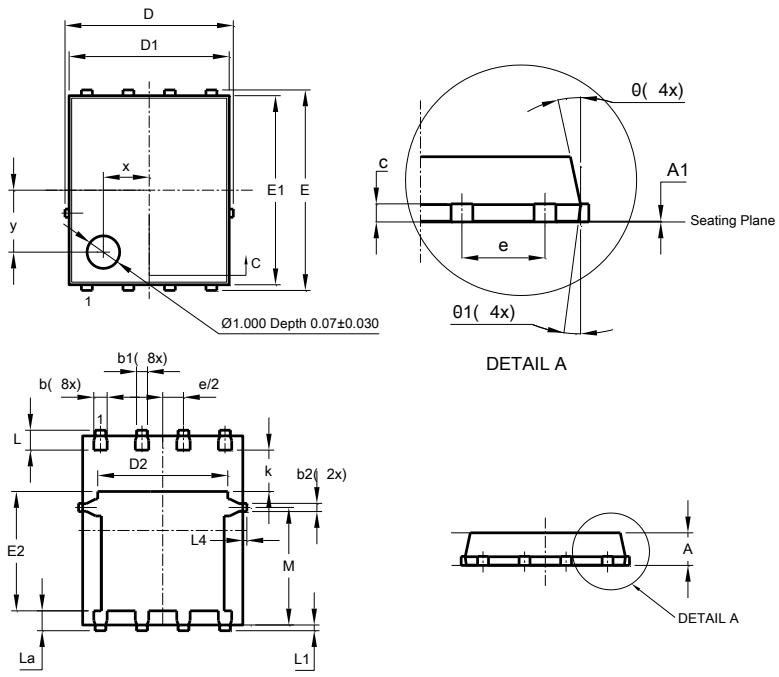


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI5060-8 (Type K)

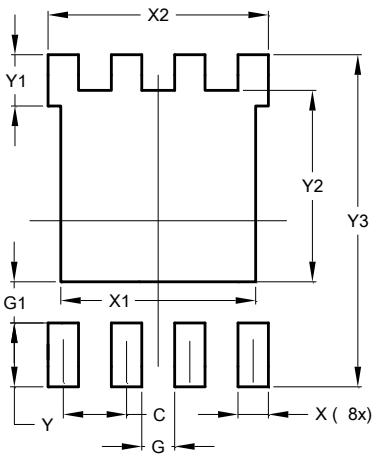


PowerDI5060-8 (Type K)			
Dim	**Min**	**Max**	**Typ**
A	0.90	1.10	1.00
A1	0	0.05	0.02
b	0.33	0.51	0.41
b1	0.300	0.366	0.333
b2	0.20	0.35	0.25
c	0.23	0.33	0.277
D	5.15 BSC		
D1	4.85	4.95	4.90
D2	-	-	3.98
E	6.15 BSC		
E1	5.75	5.85	5.80
E2	3.56	3.76	3.66
E	1.27BSC		
k	-	-	1.27
L	0.51	0.71	0.61
La	0.51	0.71	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 K)



Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	3.910
X2	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610

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