



**THE DATASHEET OF
DMT2004UPS-13**



Product Summary

BV _{DSS}	R _{DS(ON)} max	I _D max T _C = +25°C
24V	5mΩ @ V _{GS} = 10V	80A
	6.5mΩ @ V _{GS} = 4.5V	70A
	10mΩ @ V _{GS} = 2.5V	55A

Description and Applications

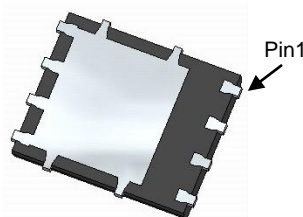
This MOSFET is designed to minimize the on-state resistance (R_{DS(ON)}) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Backlighting
- Power Management Functions
- DC-DC Converters

PowerDI5060-8



Top View



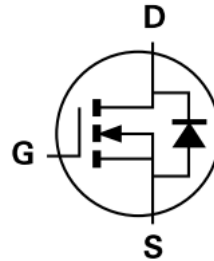
Bottom View

Features and Benefits

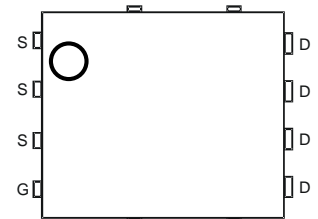
- Low R_{DS(ON)} – Minimizes On-State Losses
- Excellent Q_{gd} x R_{DS(ON)} Product (FOM)
- Advanced Technology for DC-DC Converters
- Small Form Factor Thermally Efficient Package Enables Higher Density End Products
- 100% Unclamped Inductive Switching – Ensures More Reliability
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

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 Indicator: See Diagram
- Terminals: Finish — Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.097 grams (Approximate)



Internal Schematic

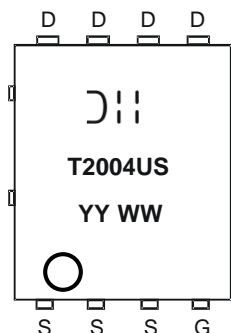

 Top View
Pin Configuration

Ordering Information (Note 4)

Part Number	Case	Packaging
DMT2004UPS-13	PowerDI5060-8	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
 T2004US = 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}	24	V
Gate-Source Voltage			V_{GSS}	± 12	V
Continuous Drain Current (Note 7) $V_{GS} = 10\text{V}$	Steady State	$T_C = +25^\circ\text{C}$	I_D	80	A
		$T_C = +70^\circ\text{C}$		65	
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)			I_{DM}	160	A
Continuous Source-Drain Diode Current (Note 6)			I_S	2	A
Avalanche Current (Note 8) $L = 0.1\text{mH}$			I_{AS}	26	A
Avalanche Energy (Note 8) $L = 0.1\text{mH}$			E_{AS}	36	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	$T_A = +25^\circ\text{C}$	P_D	1.4	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	88	$^\circ\text{C/W}$
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	P_D	3.0	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	42	$^\circ\text{C/W}$
Thermal Resistance, Junction to Case (Note 7)		$R_{\theta JC}$	2.5	$^\circ\text{C/W}$
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

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}	24	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current ($T_J = +25^\circ\text{C}$)	I_{DSS}	—	—	1	μA	$V_{DS} = 20\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 10\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.55	—	1.45	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	3.7	5.0	m Ω	$V_{GS} = 10\text{V}, I_D = 20\text{A}$
		—	4.5	6.5		$V_{GS} = 4.5\text{V}, I_D = 20\text{A}$
		—	7.5	10.0		$V_{GS} = 2.5\text{V}, I_D = 20\text{A}$
Diode Forward Voltage	V_{SD}	—	0.65	1.0	V	$V_{GS} = 0\text{V}, I_S = 2\text{A}$
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{iss}	—	1683	—	pF	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	—	581	—		
Reverse Transfer Capacitance	C_{rss}	—	559	—		
Gate Resistance	R_G	—	1.6	—	Ω	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Total Gate Charge ($V_{GS} = 4.5\text{V}$)	Q_g	—	29.6	—	nC	$V_{DD} = 15\text{V}, I_D = 9\text{A}$
Total Gate Charge ($V_{GS} = 10\text{V}$)	Q_g	—	53.7	—		
Gate-Source Charge	Q_{gs}	—	4.2	—		
Gate-Drain Charge	Q_{gd}	—	13.4	—		
Turn-On Delay Time	$t_{D(ON)}$	—	3.9	—	ns	$V_{DD} = 15\text{V}, V_{GS} = 10\text{V}, R_G = 3\Omega, I_D = 9\text{A}$
Turn-On Rise Time	t_R	—	9.6	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	30.8	—		
Turn-Off Fall Time	t_F	—	38.6	—		
Reverse Recovery Time	t_{RR}	—	11.2	—	ns	$I_F = 1.5\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Reverse Recovery Charge	Q_{RR}	—	22.9	—	nC	

- 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} rating are based on low frequency and duty cycles to keep $T_J = +25^\circ\text{C}$.
 9. Short duration pulse test used to minimize self-heating effect.
 10. Guaranteed by design. Not subject to product testing.

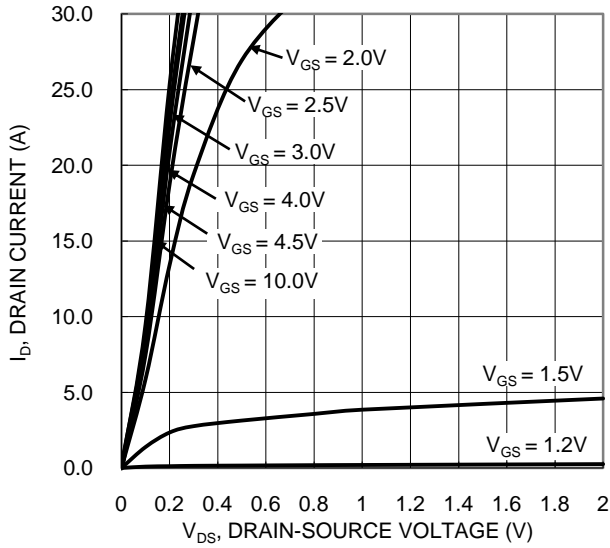


Figure 1. Typical Output Characteristic

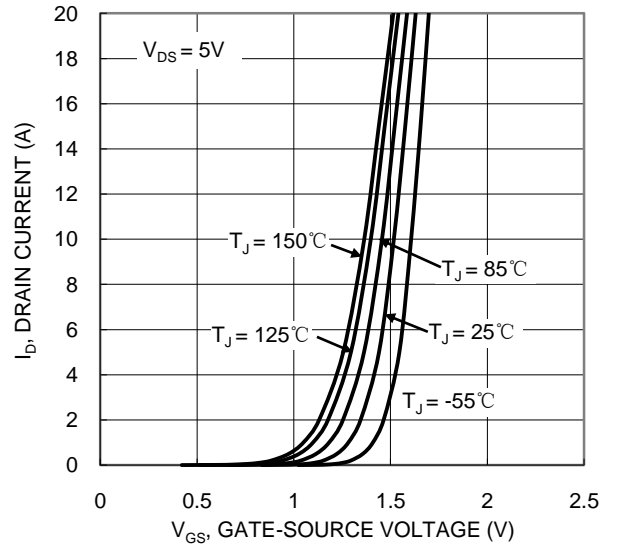


Figure 2. Typical Transfer Characteristic

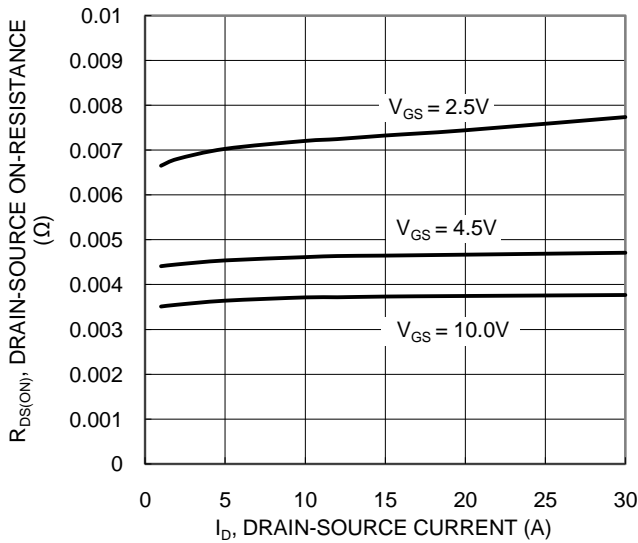


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

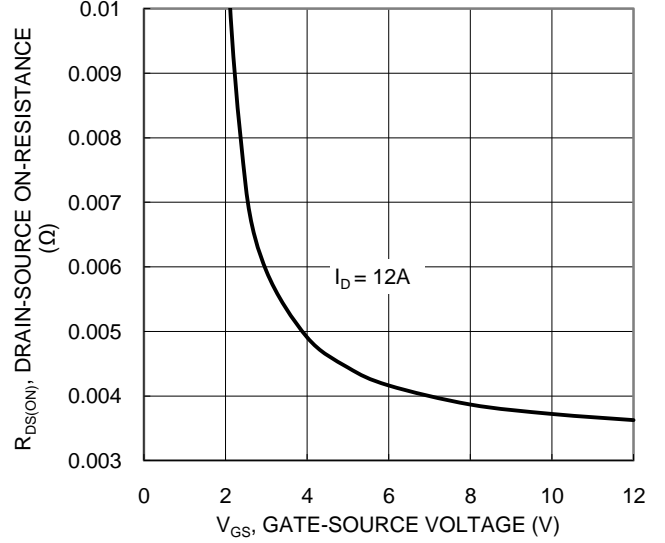


Figure 4. Typical Transfer Characteristic

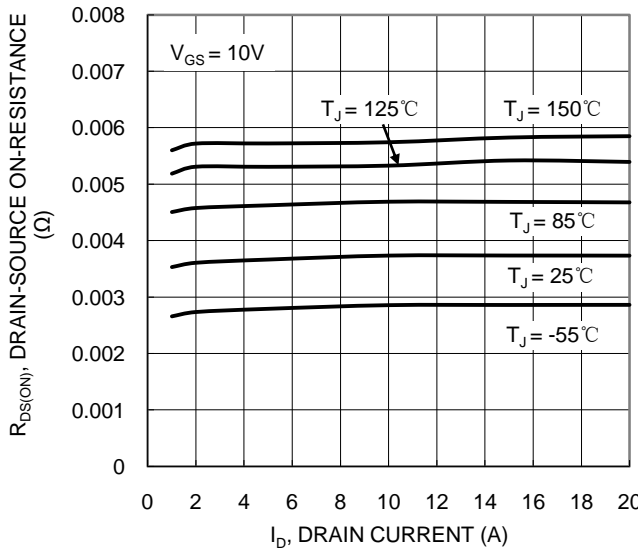


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

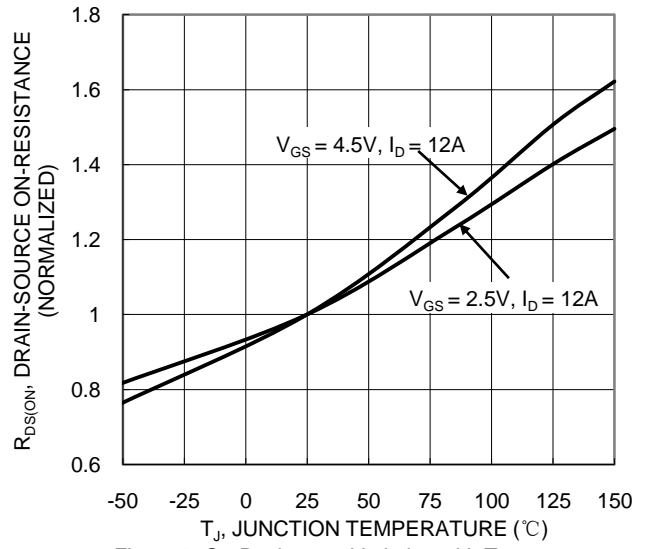


Figure 6. On-Resistance Variation with Temperature

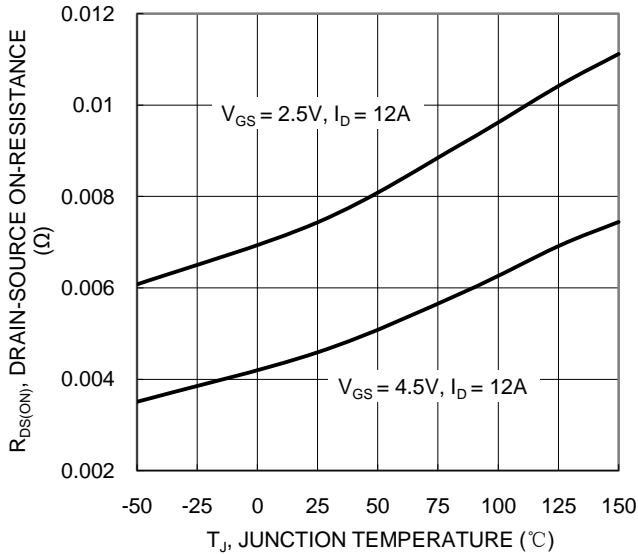


Figure 7. On-Resistance Variation with Temperature

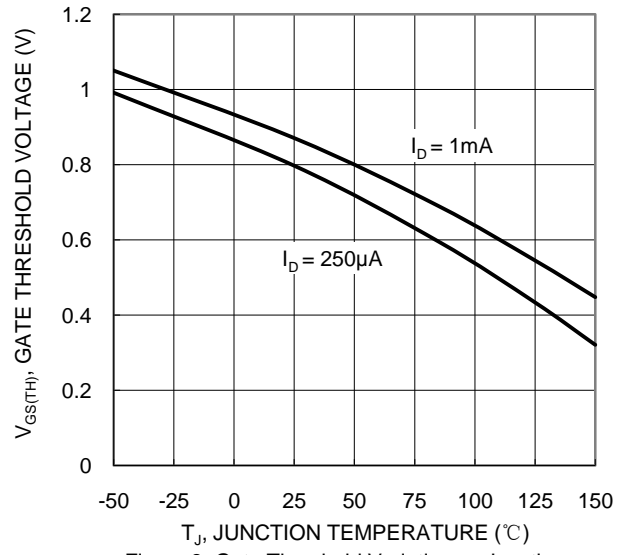


Figure 8. Gate Threshold Variation vs. Junction Temperature

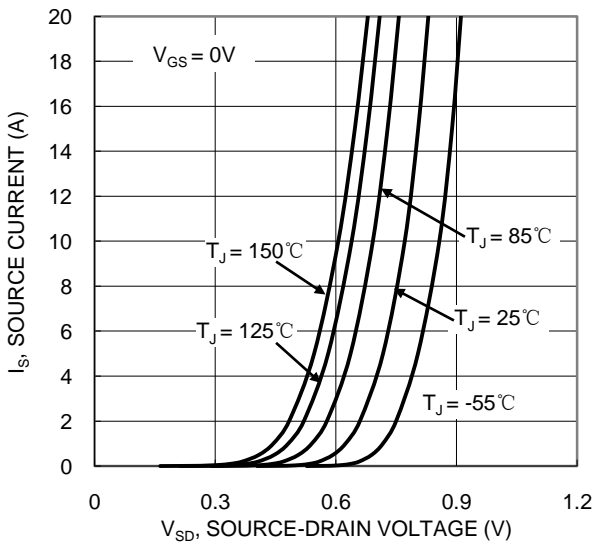


Figure 9. Diode Forward Voltage vs. Current

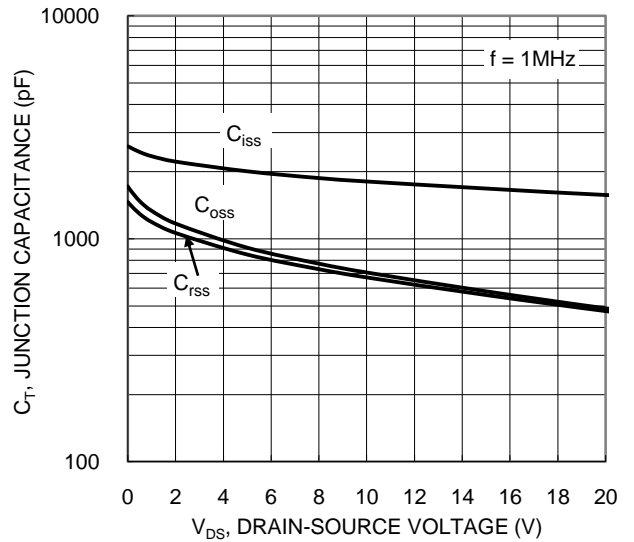


Figure 10. Typical Junction Capacitance

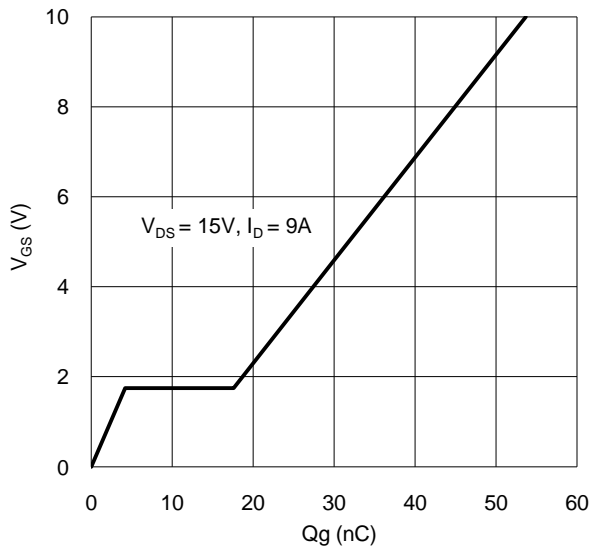


Figure 11. Gate Charge

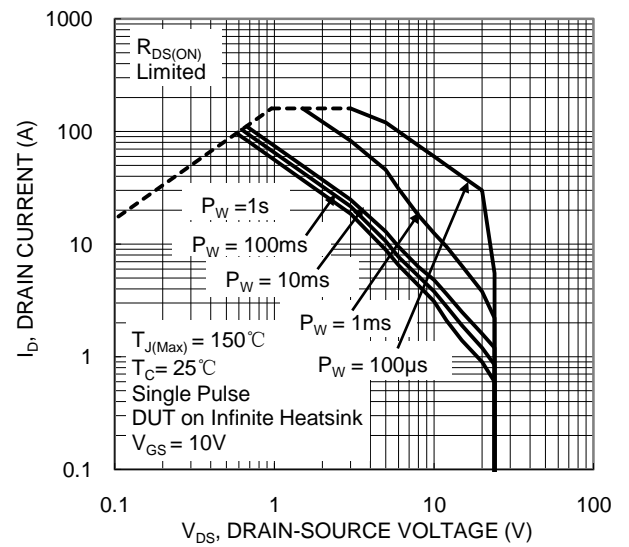


Figure 12. SOA, Safe Operation Area

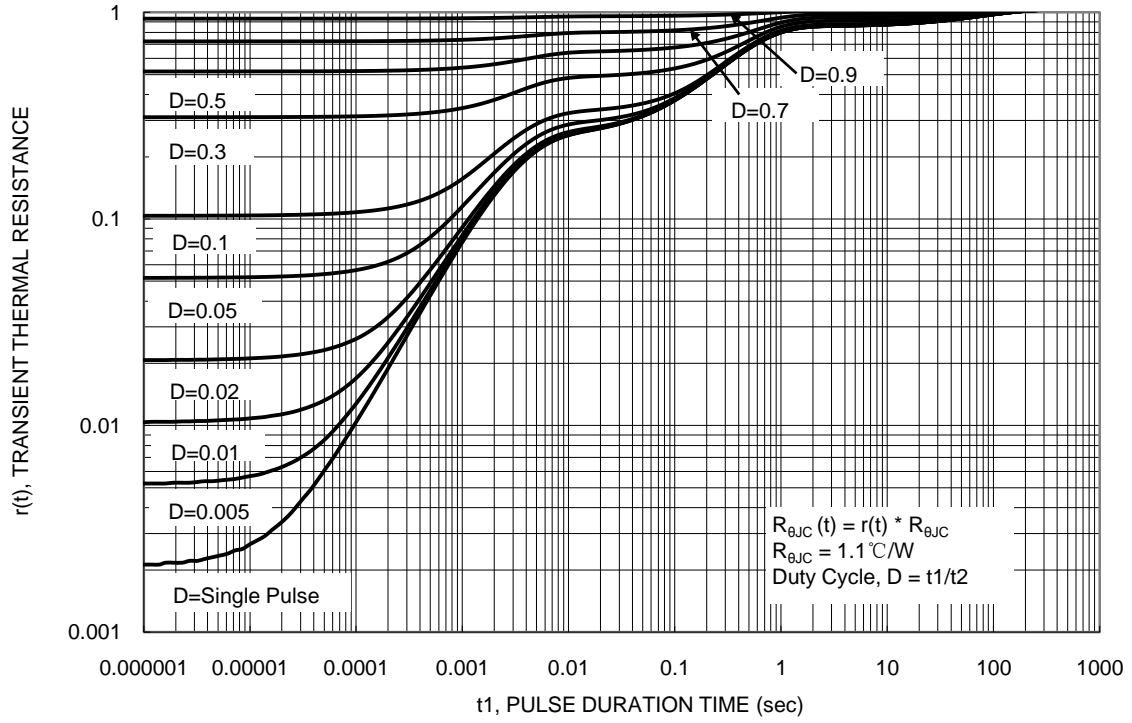
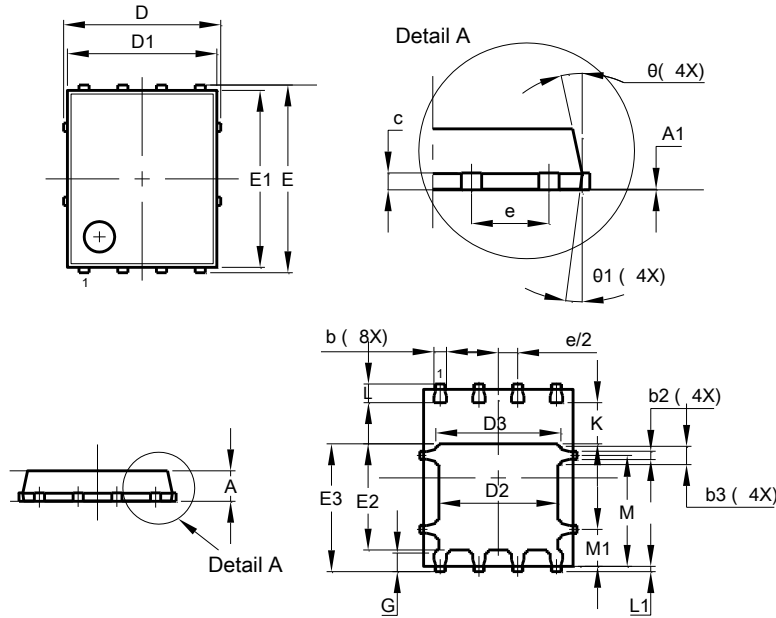


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI5060-8

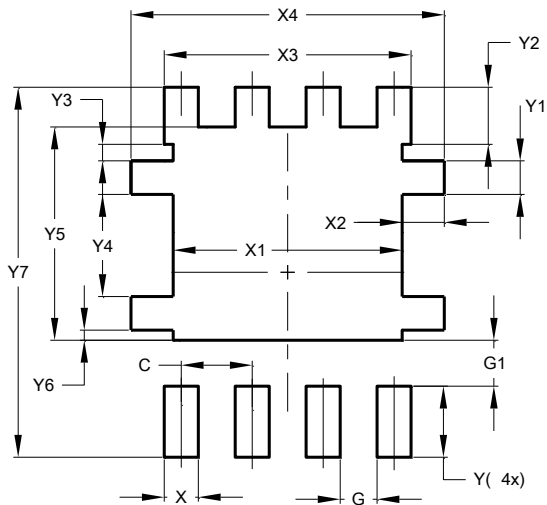


PowerDI5060-8			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0.00	0.05	
b	0.33	0.51	0.41
b2	0.200	0.350	0.273
b3	0.40	0.80	0.60
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.70	4.10	3.90
D3	3.90	4.30	4.10
E	6.15 BSC		
E1	5.60	6.00	5.80
E2	3.28	3.68	3.48
E3	3.99	4.39	4.19
e	1.27 BSC		
G	0.51	0.71	0.61
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
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



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

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