20V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ Max	I_D Max T_C = +25°C
20V	12.5mΩ @ V_{GS}= 4.5V	36A
	19mΩ @ V_{GS}= 2.5V	30A

Features and Benefits

- Low $R_{DS(ON)}$ – Ensures On-State Losses Are Minimized
- Small Form Factor Thermally Efficient Package Enables Higher Density End Products
- **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**

Description

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.

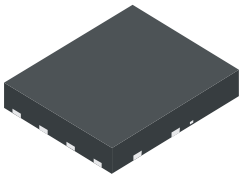
Applications

- Backlighting
- Power Management Functions
- DC-DC Converters

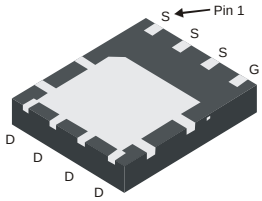
Mechanical Data

- Case: POWERDI®5060-8
- 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
- Weight: 0.097 grams (Approximate)

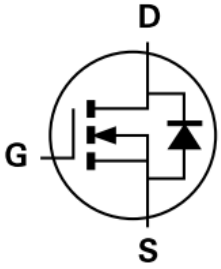
POWERDI5060-8



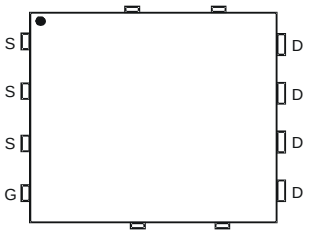
Top View



Bottom View



Internal Schematic



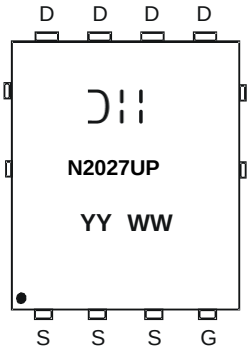
Top View

Ordering Information (Note 4)

Part Number	Case	Packaging
DMN2027UPS-13	POWERDI5060-8	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. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

Marking Information



= Manufacturer's Marking
N2027UP = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 15 = 2015)
WW = Week (01 - 53)

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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	20	V
Gate-Source Voltage			V_{GSS}	±12	V
Continuous Drain Current (Note 6) V_{GS} = 4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	10 8	A
	Steady State	T_C = +25°C T_C = +70°C	I_D	36 29	A
Continuous Drain Current (Note 6) V_{GS} = 2.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	8.2 6.6	A
	Steady State	T_C = +25°C T_C = +70°C	I_D	30 23	A
Maximum Continuous Body Diode Forward Current (Infinite Heatsink)			I_S	60	A
Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)			I_{DM}	60	A
Avalanche Current (Note 7) L = 0.1mH			I_{AS}	6.8	A
Avalanche Energy (Note 7) L = 0.1mH			E_{AS}	2.3	mJ

Thermal Characteristics

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)		P_D	1.1	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	112	°C/W
	t<10s		58	°C/W
Total Power Dissipation (Note 6)		P_D	1.9	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	65	°C/W
	t<10s		34	°C/W
Thermal Resistance, Junction to Case		$R_{\theta JC}$	5	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate.
7. I_{AS} and E_{AS} rating are based on low frequency and duty cycles to keep T_J = +25°C.

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	20	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1.0	µA	V_{DS} = 20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±12V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.7	—	1.3	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	—	12.5	mΩ	V_{GS} = 4.5V, I_D = 9.4A
		—	—	19		V_{GS} = 2.5V, I_D = 8.3A
Diode Forward Voltage	V_{SD}	—	0.7	1.3	V	V_{GS} = 0V, I_S = 1.3A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	1091	—	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	163	—		
Reverse Transfer Capacitance	C_{rss}	—	148	—		
Gate Resistance	R_g	—	1.5	3.2	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 2.5V)	Q_g	—	7.0	—	nC	V_{DS} = 10V, I_D = 9.4A
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	11.6	—		
Gate-Source Charge	Q_{gs}	—	2.5	—		
Gate-Drain Charge	Q_{gd}	—	3.5	—		
Turn-On Delay Time	$t_{D(ON)}$	—	6.6	—	nS	V_{GS} = 4.5V, V_{DS} = 10V, R_G = 6Ω , I_D = 1A
Turn-On Rise Time	t_R	—	8.4	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	26.6	—		
Turn-Off Fall Time	t_F	—	12.6	—		
Reverse Recovery Time	t_{RR}	—	13.2	—	nS	I_F = 12A, di/dt = 500A/µs
Reverse Recovery Charge	Q_{RR}	—	7.6	—	nC	

Notes: 8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

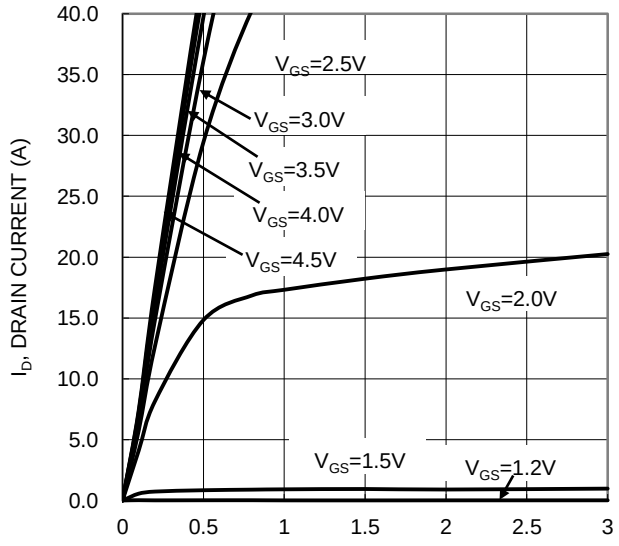


Figure 1. Typical Output Characteristic

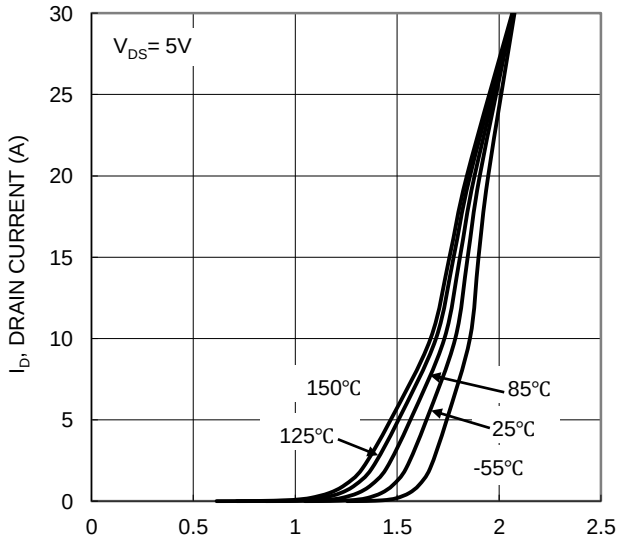


Figure 2. Typical Transfer Characteristic

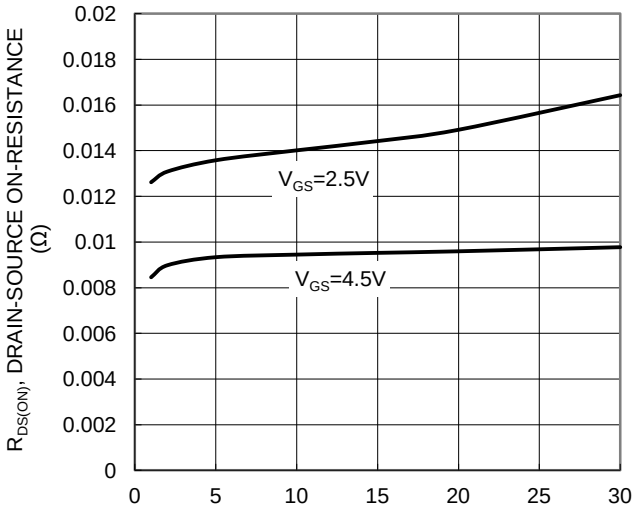


Figure 3. Typical On-Resistance vs Drain Current and Gate Voltage

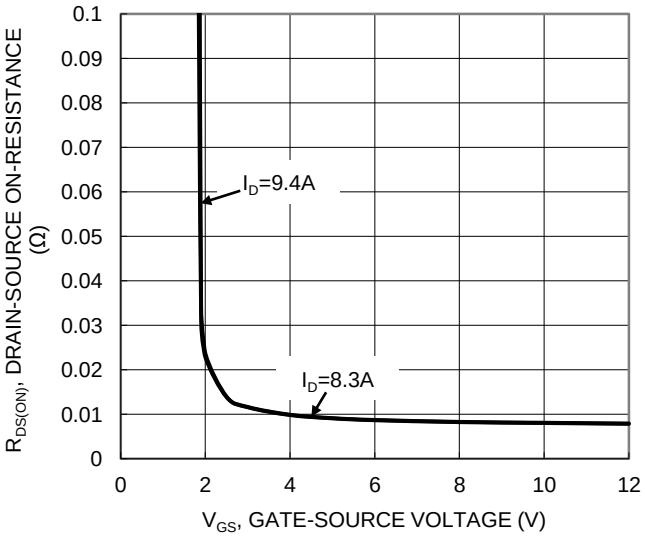


Figure 4. Typical Transfer Characteristic

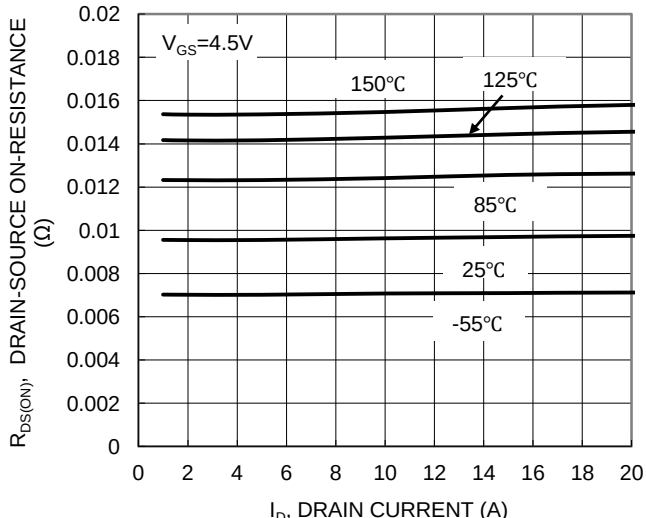


Figure 5. Typical On-Resistance vs Drain Current and Junction Temperature

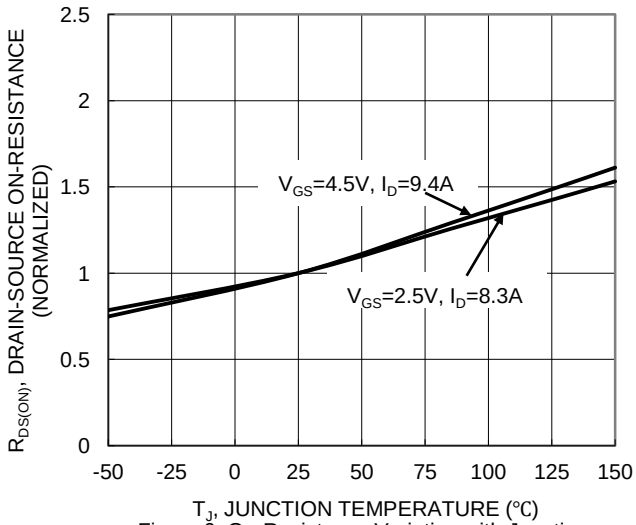


Figure 6. On-Resistance Variation with Junction Temperature

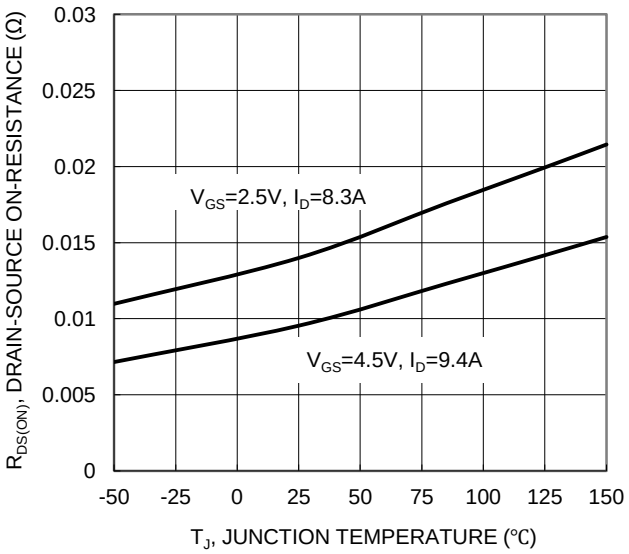


Figure 7. On-Resistance Variation with Junction Temperature

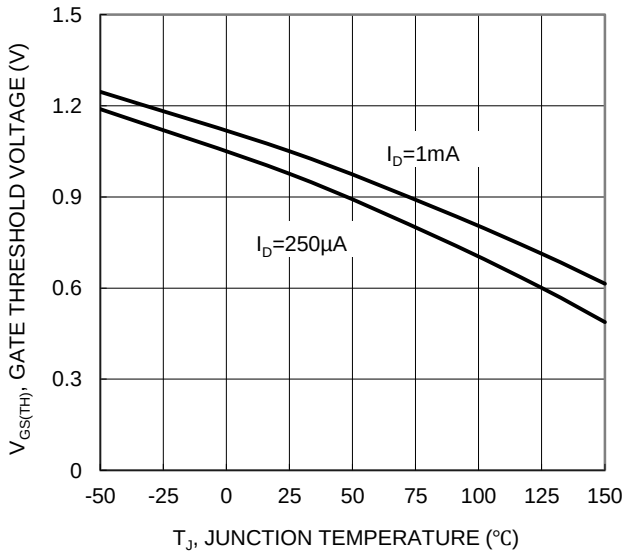


Figure 8. Gate Threshold Variation vs Junction Temperature

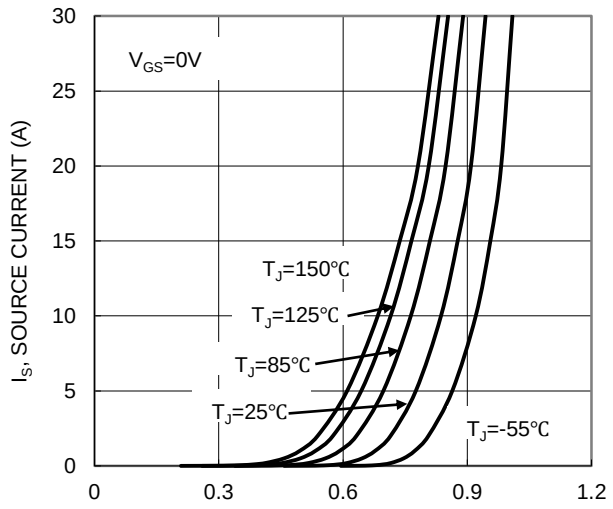


Figure 9. Diode Forward Voltage vs Current

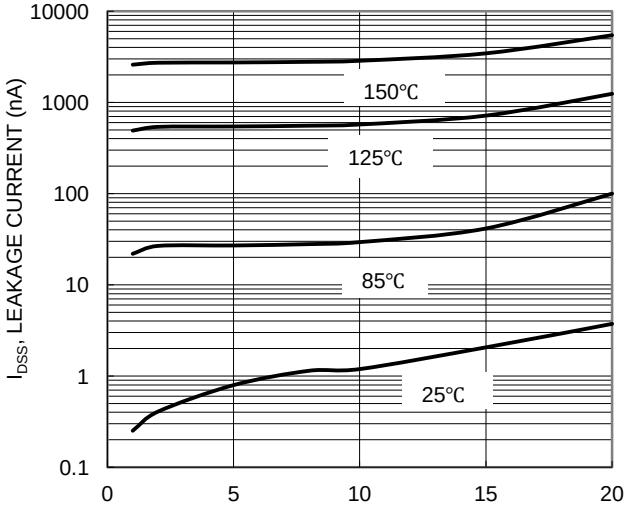


Figure 10. Typical Drain-Source Leakge Current vs Voltage

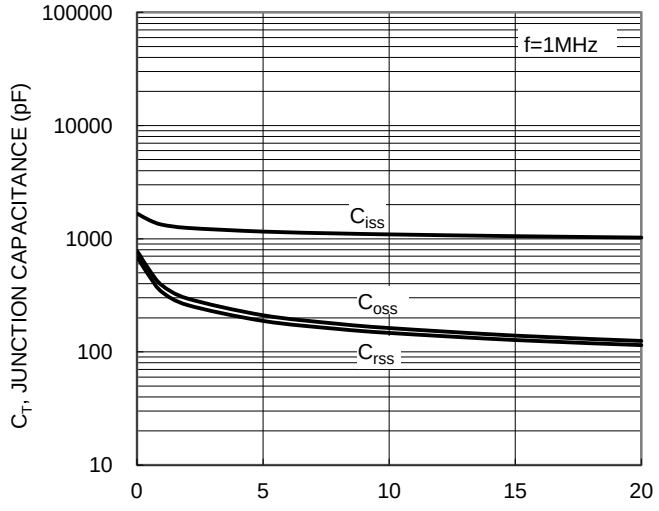


Figure 11. Typical Junction Capacitance

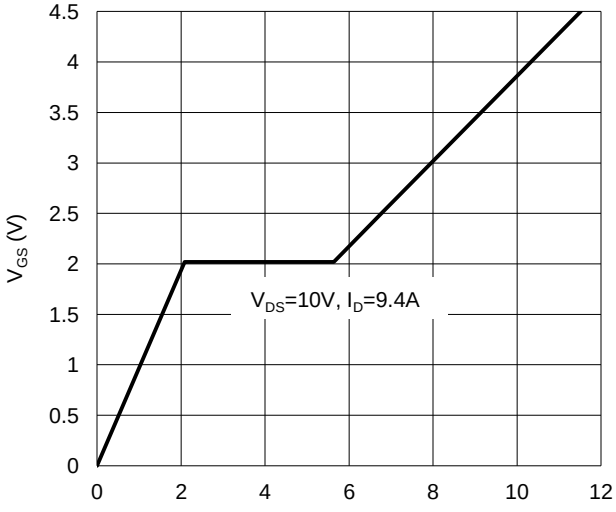


Figure 12. Gate Charge

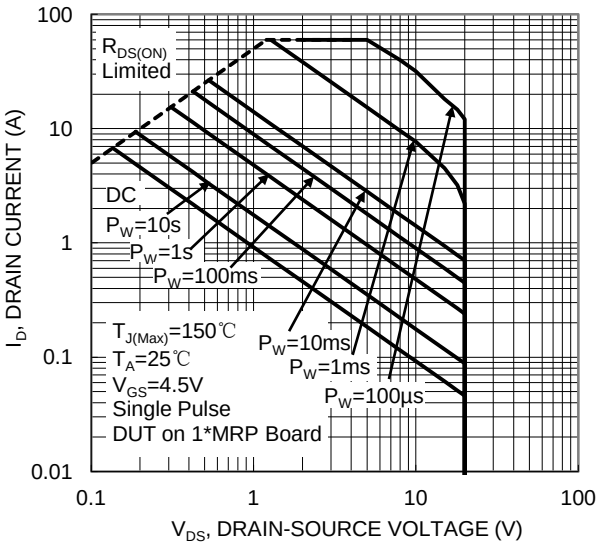


Figure 13. SOA, Safe Operation Area

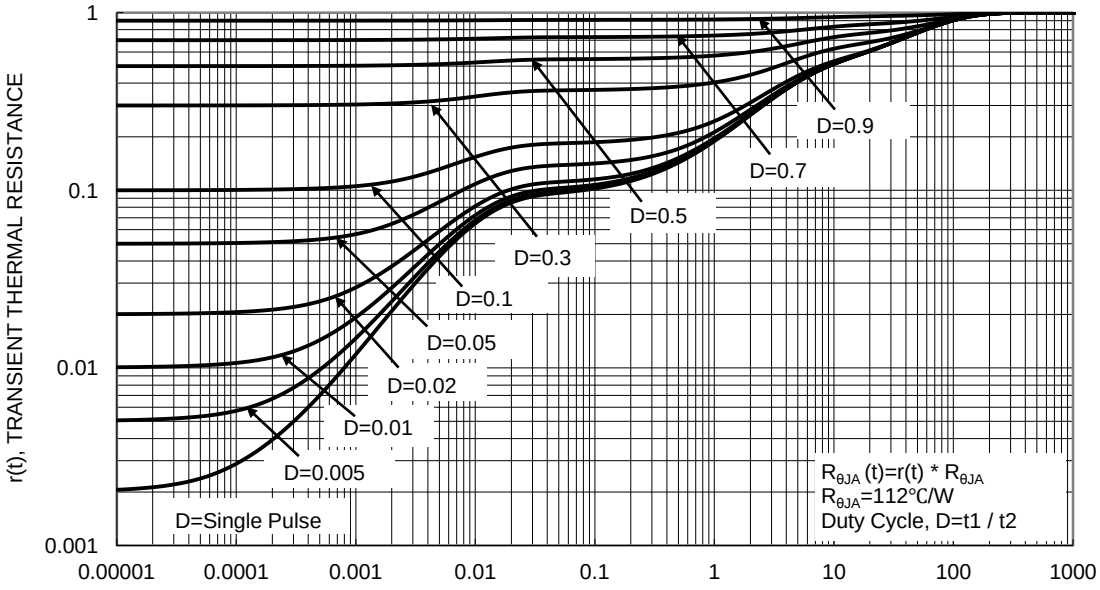
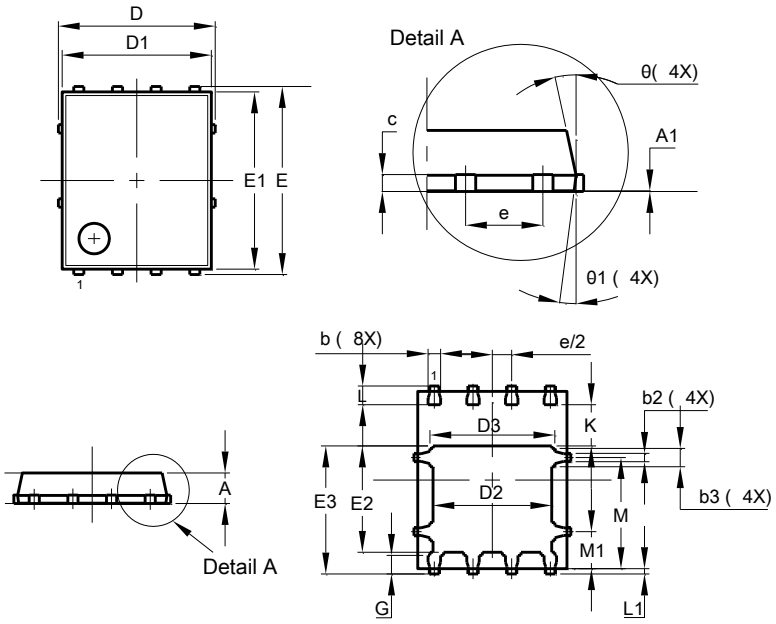


Figure 14 Transient Thermal Resistance

Package Outline Dimensions

Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.

POWERDI5060-8

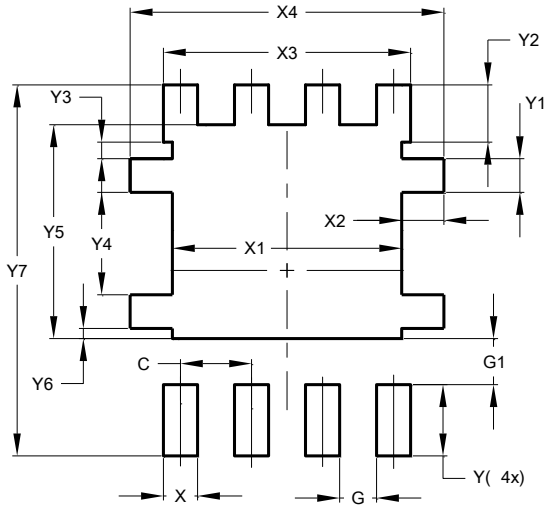


POWERDI5060-8			
Dim	**Min**	**Max**	**Typ**
A	0.90	1.10	1.00
A1	0.00	0.05	—
b	0.33	0.51	0.41
b2	0.200	0.350	0.273
b3	0.40	0.80	0.60
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.70	4.10	3.90
D3	3.90	4.30	4.10
E	6.15 BSC		
E1	5.60	6.00	5.80
E2	3.28	3.68	3.48
E3	3.99	4.39	4.19
e	1.27 BSC		
G	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 AP02001 at http://www.diodes.com/datasheets/ap02001.pdf 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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