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.

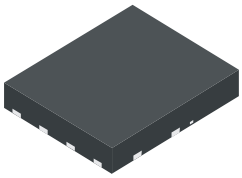
Applications

- Backlighting
- Power Management Functions
- DC-DC Converters

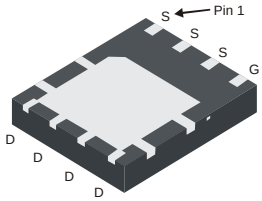
Mechanical Data

- 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)

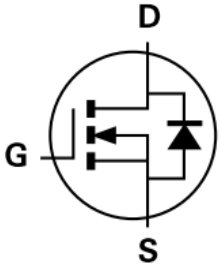
POWERDI5060-8



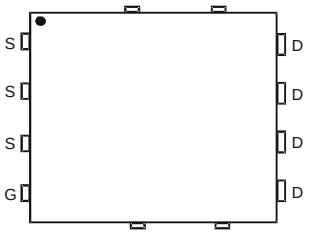
Top View



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.

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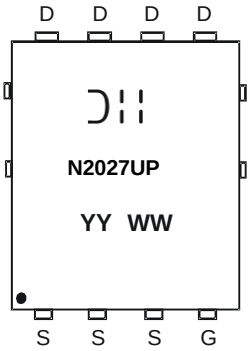
Marking Information



= 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.

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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.

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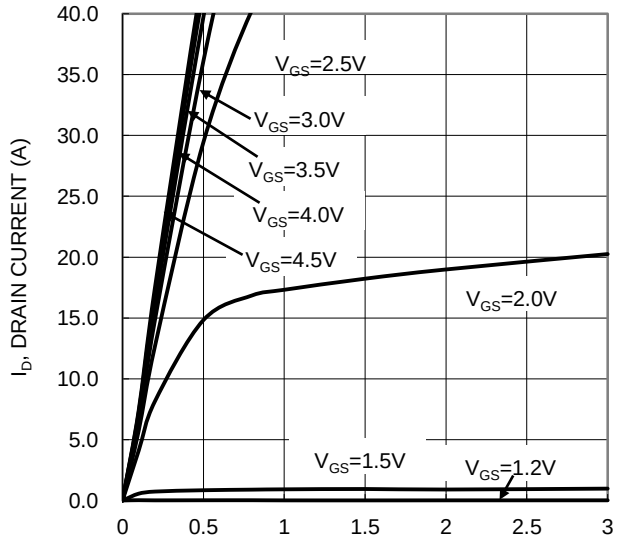

Figure 1. Typical Output Characteristic

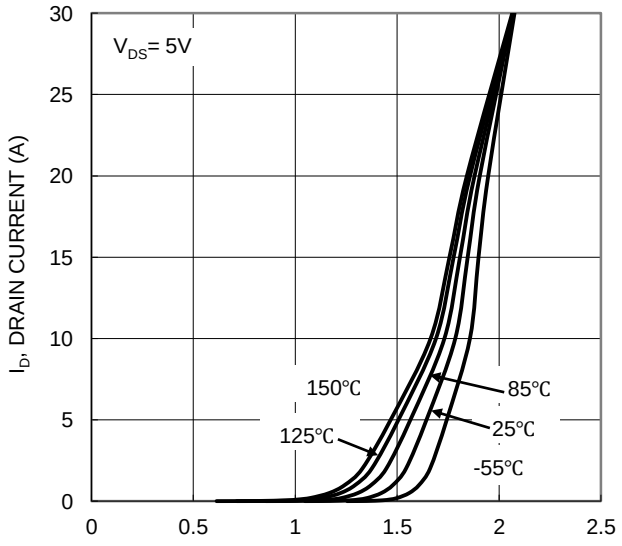

Figure 2. Typical Transfer Characteristic

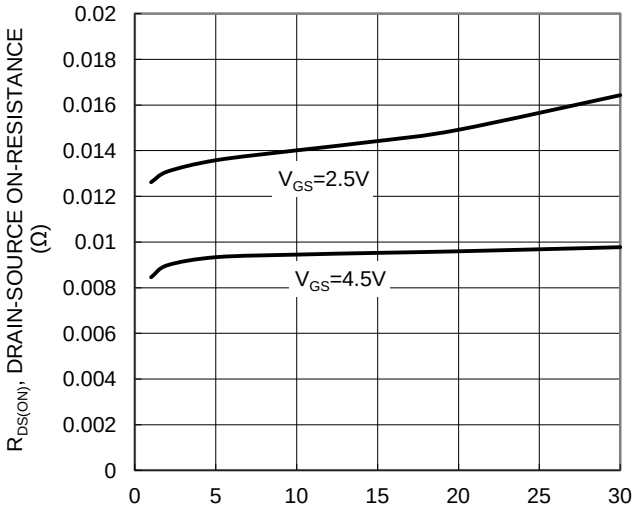

Figure 3. Typical On-Resistance vs Drain Current and Gate Voltage

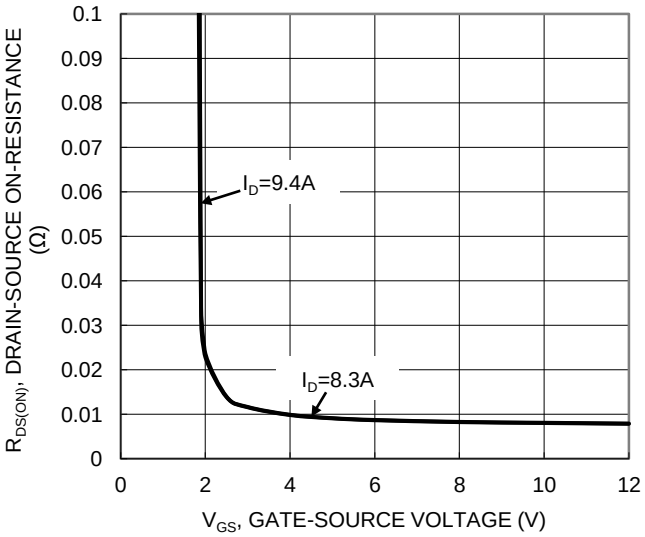

Figure 4. Typical Transfer Characteristic

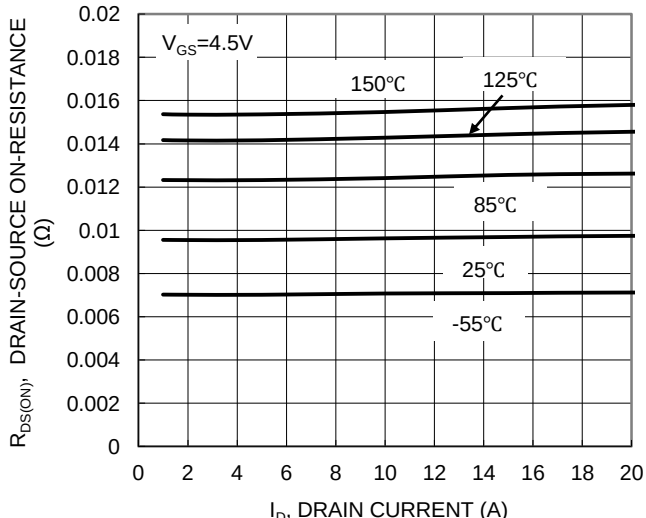

Figure 5. Typical On-Resistance vs Drain Current and Junction Temperature

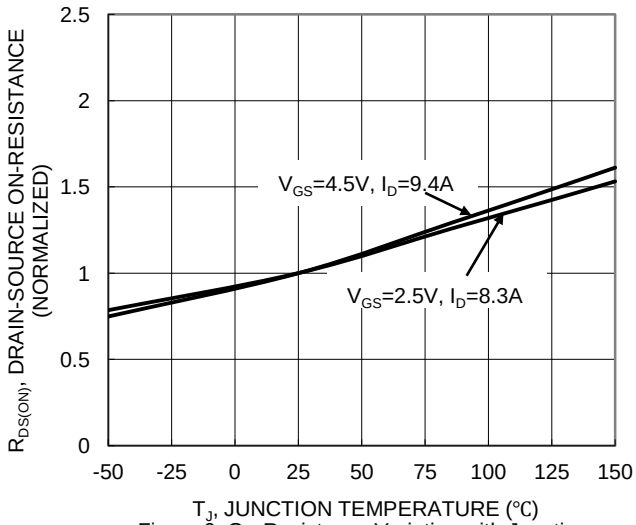

Figure 6. On-Resistance Variation with Junction Temperature

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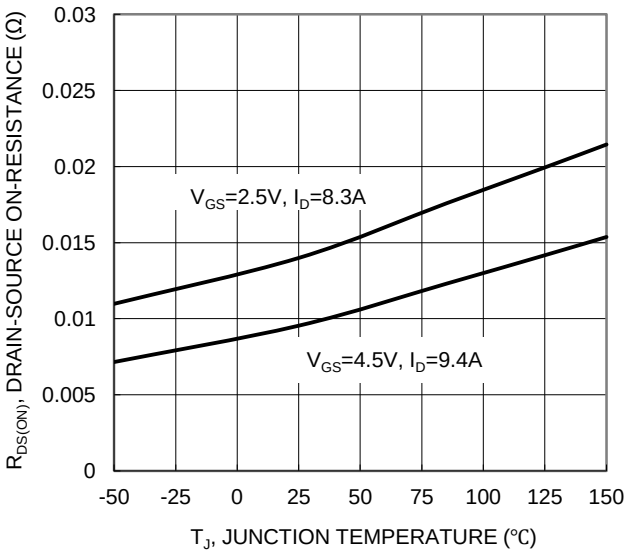

Figure 7. On-Resistance Variation with Junction Temperature

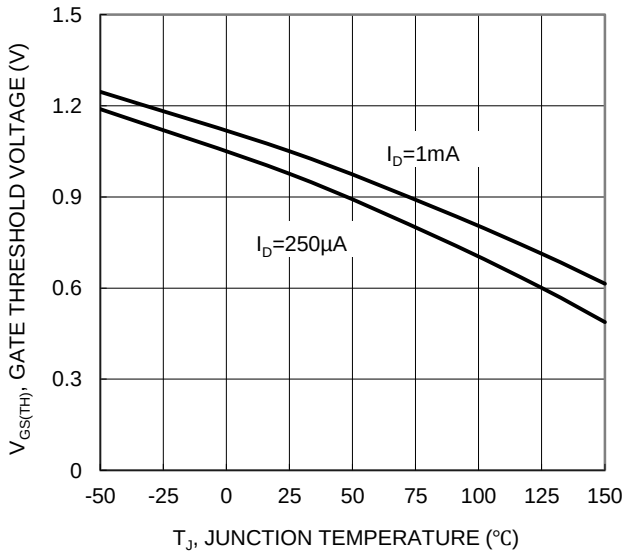

Figure 8. Gate Threshold Variation vs Junction Temperature

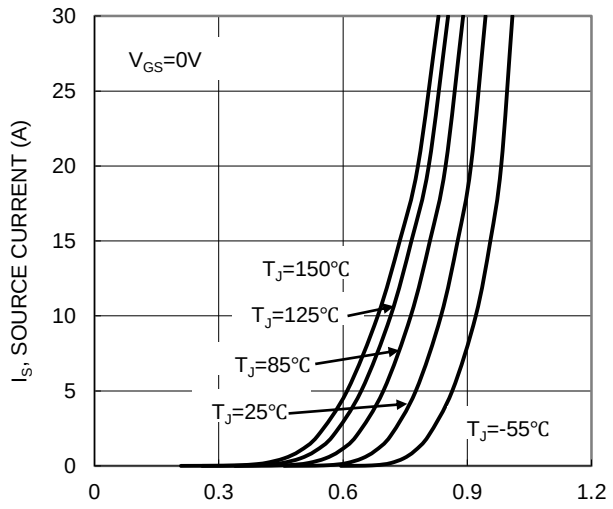

Figure 9. Diode Forward Voltage vs Current

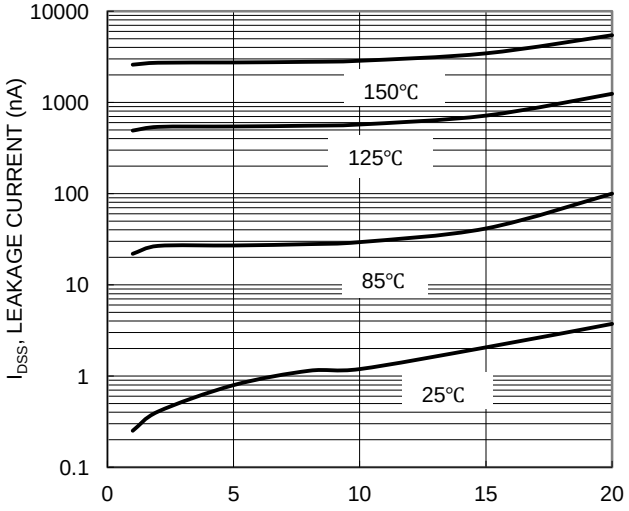

Figure 10. Typical Drain-Source Leakge Current vs Voltage

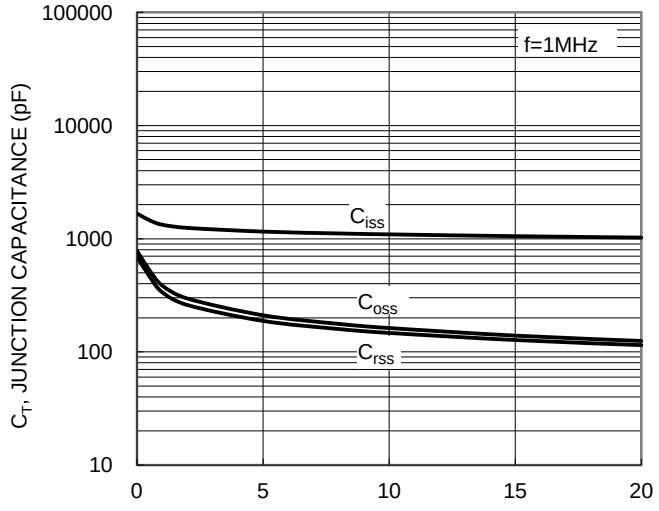

Figure 11. Typical Junction Capacitance

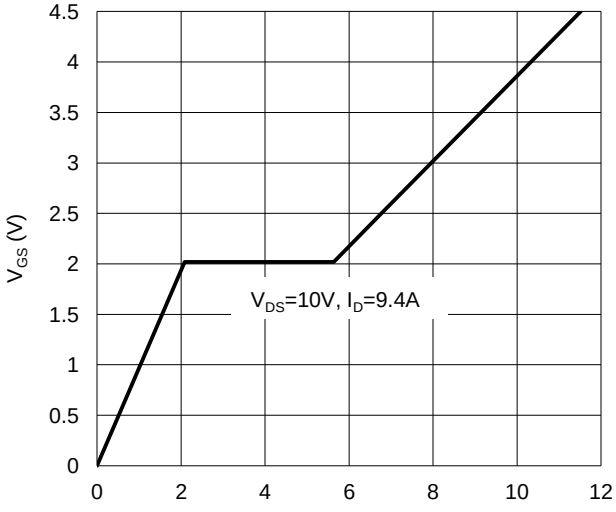

Figure 12. Gate Charge

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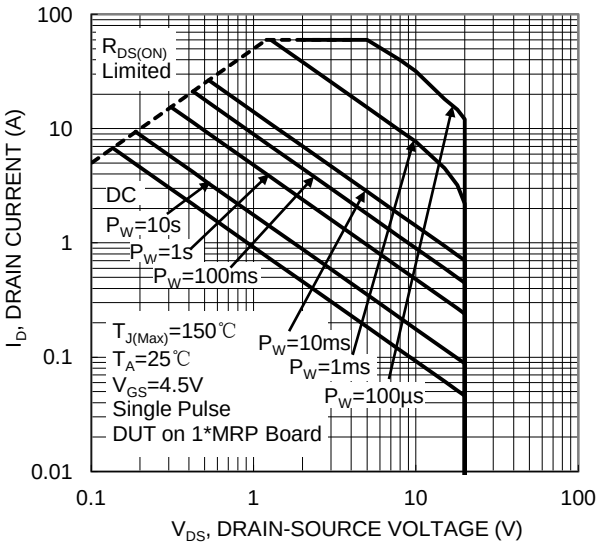

Figure 13. SOA, Safe Operation Area

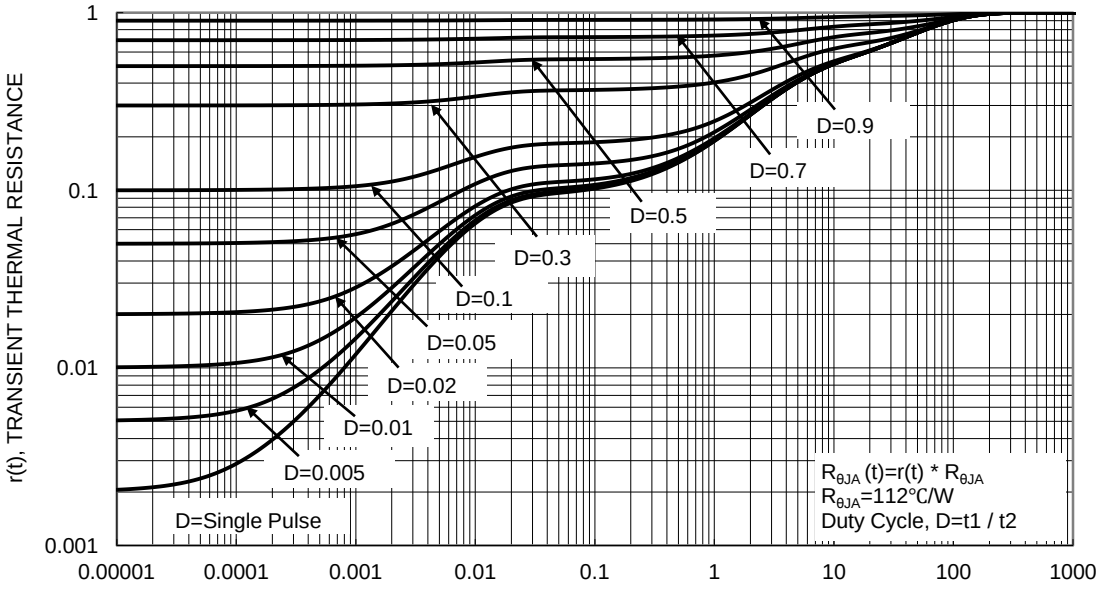

Figure 14 Transient Thermal Resistance

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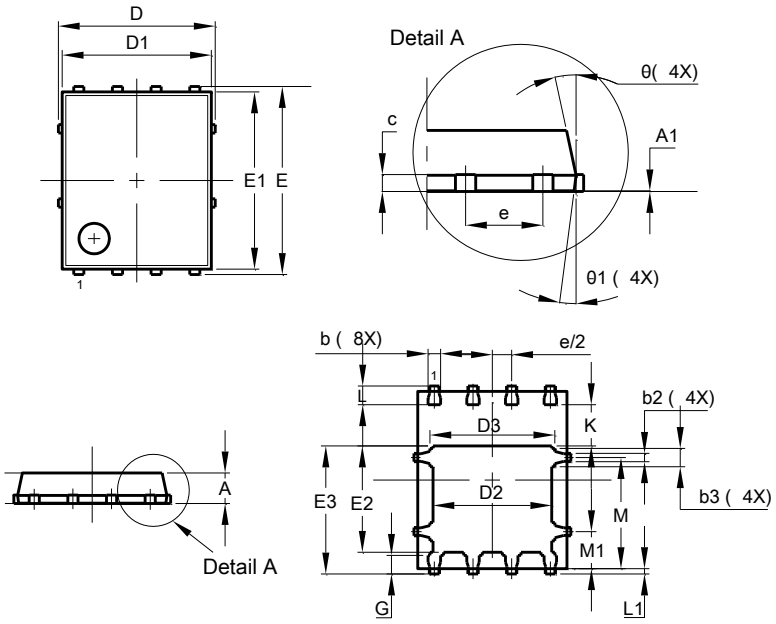
Package Outline Dimensions

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

POWERDI5060-8

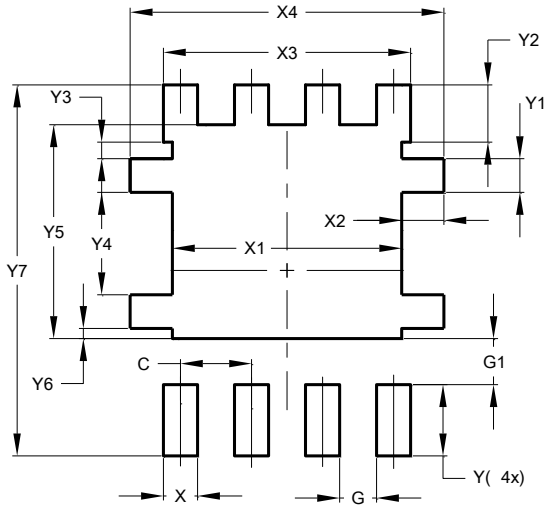


POWERDI5060-8			
Dim	**Min**	**Max**	**Typ**
A	0.90	1.10	1.00
A1	0.00	0.05	—
b	0.33	0.51	0.41
b2	0.200	0.350	0.273
b3	0.40	0.80	0.60
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.70	4.10	3.90
D3	3.90	4.30	4.10
E	6.15 BSC		
E1	5.60	6.00	5.80
E2	3.28	3.68	3.48
E3	3.99	4.39	4.19
e	1.27 BSC		
G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