

Product Summary

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

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

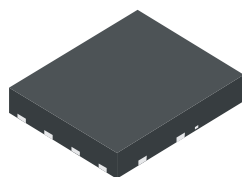
Features and Benefits

- 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**

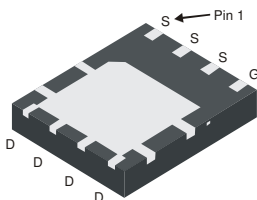
Mechanical Data

- 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)

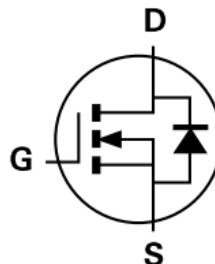
POWERDI5060-8



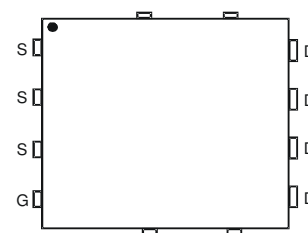
Top View



Bottom View



Internal Schematic



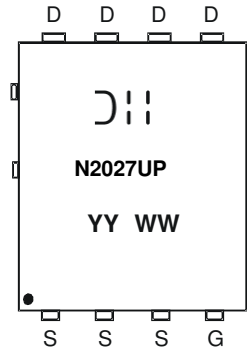
Top View

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 (@ $T_A = +25^\circ\text{C}$, 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) $V_{GS} = 4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$	I_D	10	A
		$T_A = +70^\circ\text{C}$		8	
	Steady State	$T_C = +25^\circ\text{C}$	I_D	36	A
		$T_C = +70^\circ\text{C}$		29	
Continuous Drain Current (Note 6) $V_{GS} = 2.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$	I_D	8.2	A
		$T_A = +70^\circ\text{C}$		6.6	
	Steady State	$T_C = +25^\circ\text{C}$	I_D	30	A
		$T_C = +70^\circ\text{C}$		23	
Maximum Continuous Body Diode Forward Current (Infinite Heatsink)			I_S	60	A
Pulsed Drain Current (380 μs Pulse, Duty Cycle = 1%)			I_{DM}	60	A
Avalanche Current (Note 7) $L = 0.1\text{mH}$			I_{AS}	6.8	A
Avalanche Energy (Note 7) $L = 0.1\text{mH}$			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	$^\circ\text{C/W}$
		$t < 10\text{s}$		58	$^\circ\text{C/W}$
Total Power Dissipation (Note 6)			P_D	1.9	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State		$R_{\theta JA}$	65	$^\circ\text{C/W}$
		$t < 10\text{s}$		34	$^\circ\text{C/W}$
Thermal Resistance, Junction to Case			$R_{\theta JC}$	5	$^\circ\text{C/W}$
Operating and Storage Temperature Range			T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

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

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.

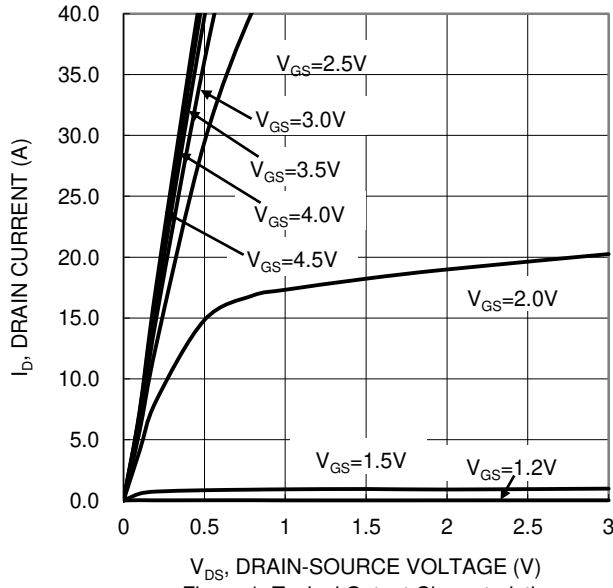


Figure 1. Typical Output Characteristic

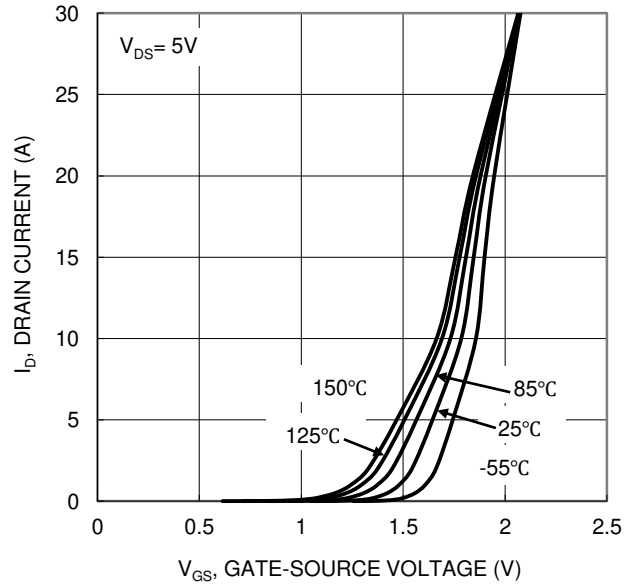


Figure 2. Typical Transfer Characteristic

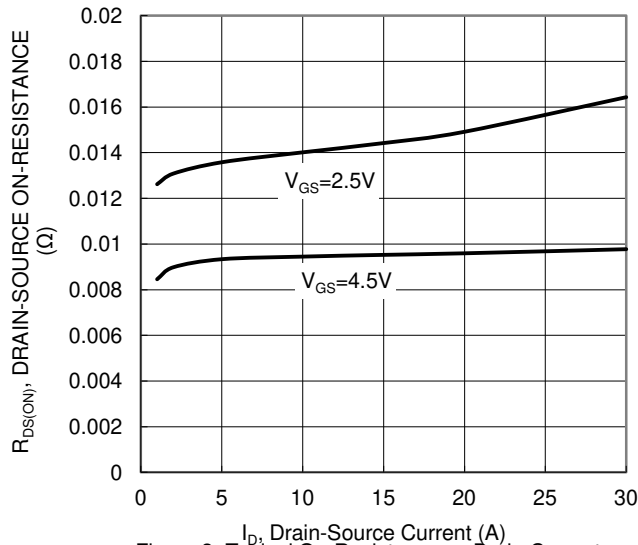


Figure 3. Typical On-Resistance vs Drain Current and Gate Voltage

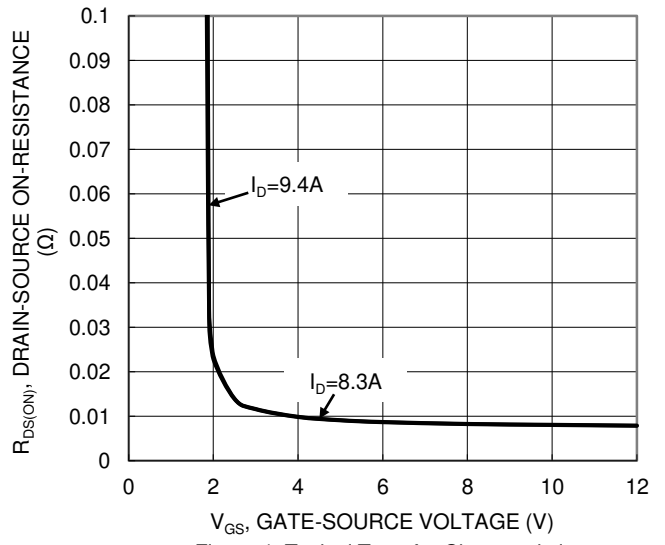


Figure 4. Typical Transfer Characteristic

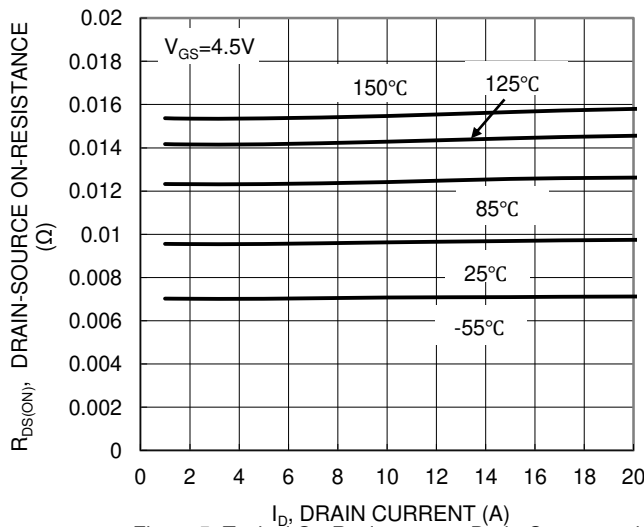


Figure 5. Typical On-Resistance vs Drain Current and Junction Temperature

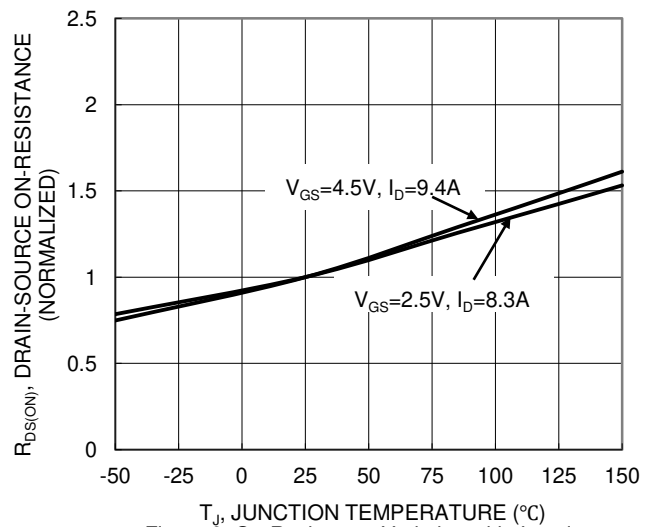


Figure 6. On-Resistance Variation with Junction Temperature

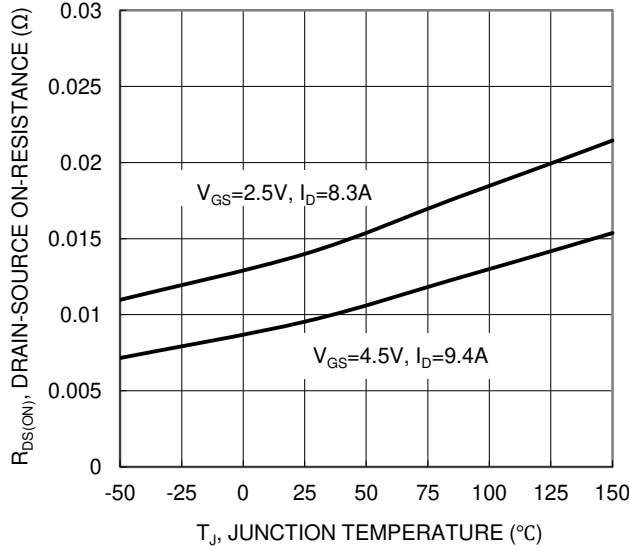


Figure 7. On-Resistance Variation with Junction Temperature

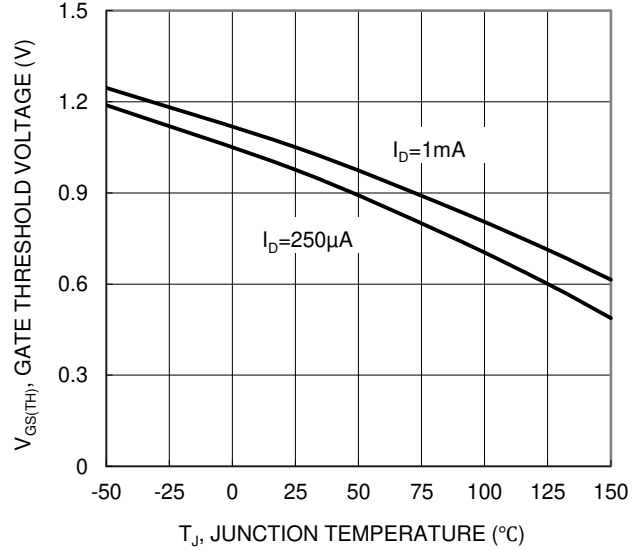


Figure 8. Gate Threshold Variation vs Junction Temperature

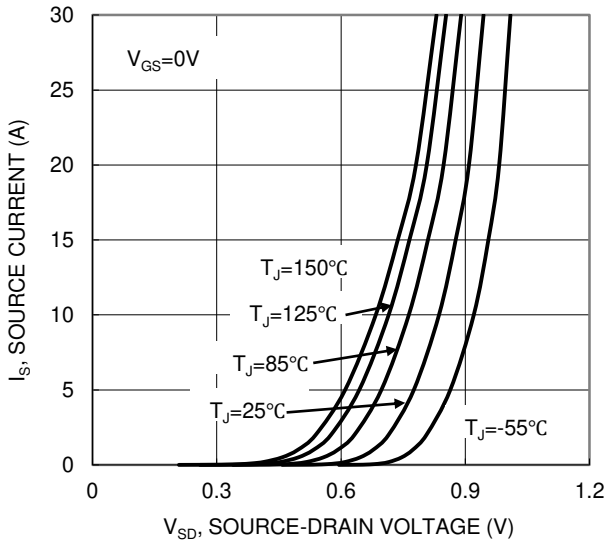


Figure 9. Diode Forward Voltage vs Current

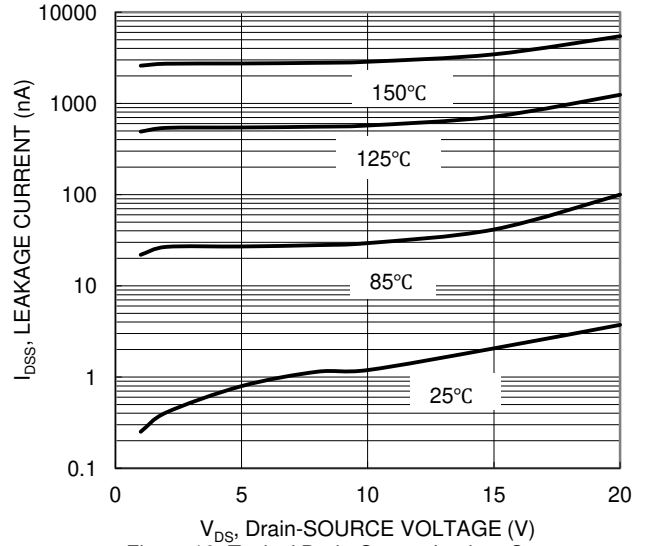


Figure 10. Typical Drain-Source Leakage Current vs Voltage

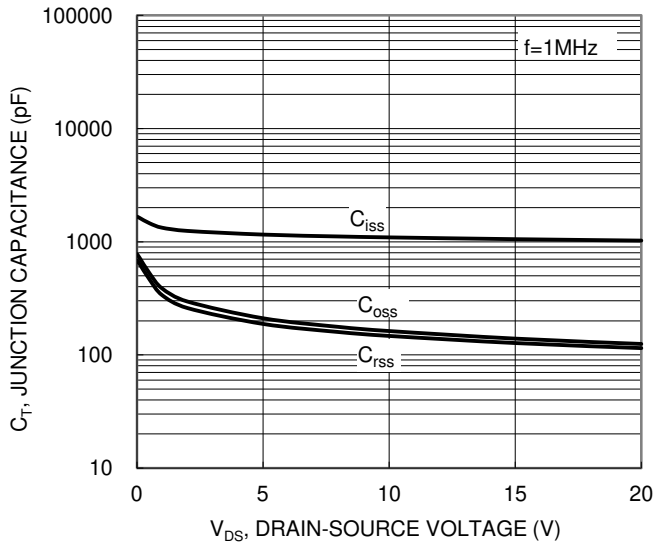


Figure 11. Typical Junction Capacitance

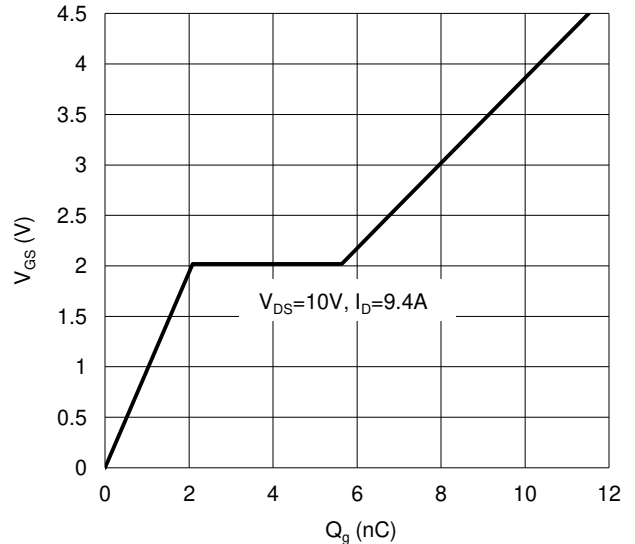


Figure 12. Gate Charge

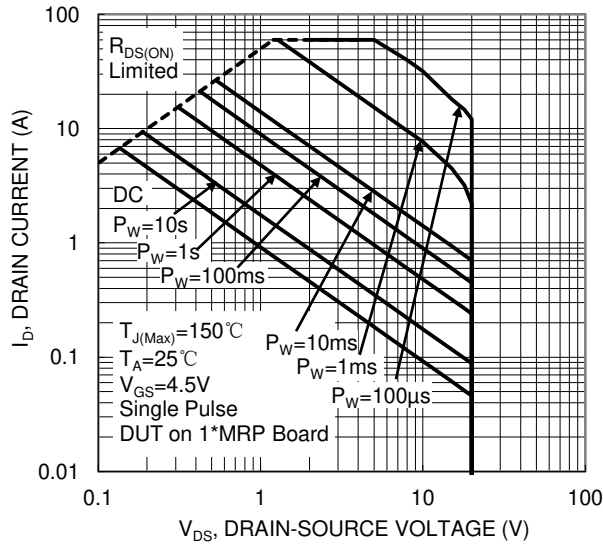


Figure 13. SOA, Safe Operation Area

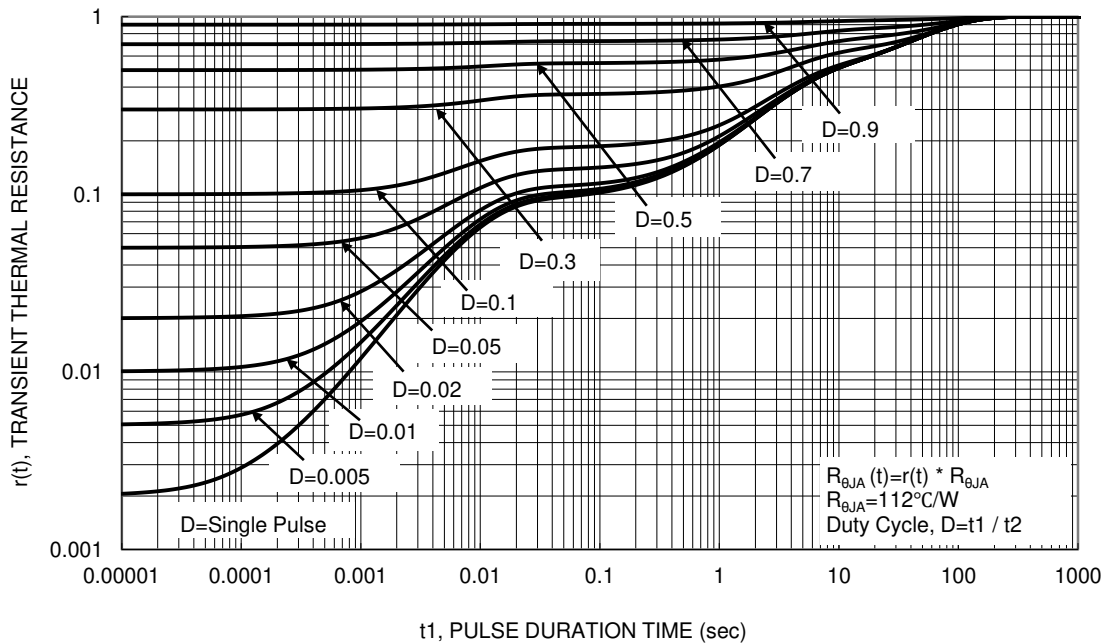
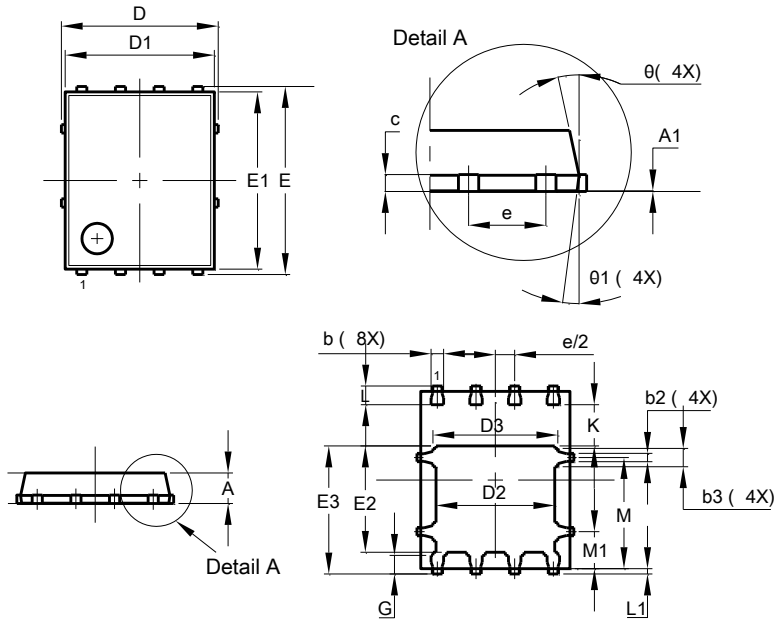


Figure 14 Transient Thermal Resistance

Package Outline Dimensions

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

POWERDI5060-8

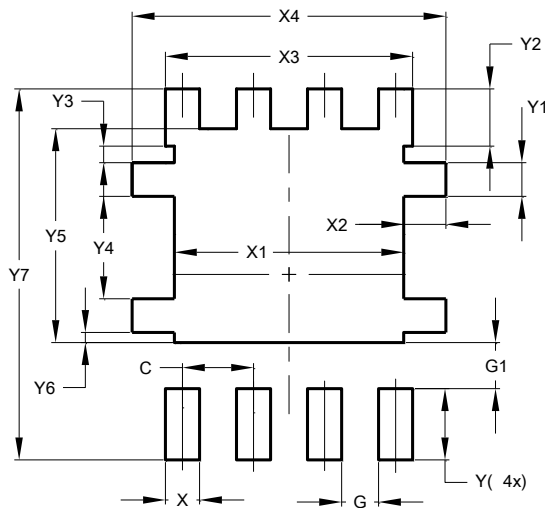


POWERDI5060-8			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0.00	0.05	—
b	0.33	0.51	0.41
b2	0.200	0.350	0.273
b3	0.40	0.80	0.60
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.70	4.10	3.90
D3	3.90	4.30	4.10
E	6.15 BSC		
E1	5.60	6.00	5.80
E2	3.28	3.68	3.48
E3	3.99	4.39	4.19
e	1.27 BSC		
G	0.51	0.71	0.61
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
theta	10°	12°	11°
theta1	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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