



## Product Summary

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

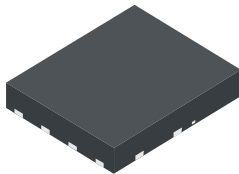
## Features and Benefits

- 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**

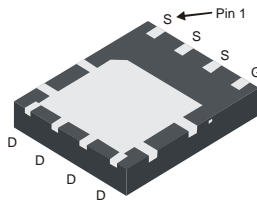
## Mechanical Data

- Case: POWERDI<sup>®</sup>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)

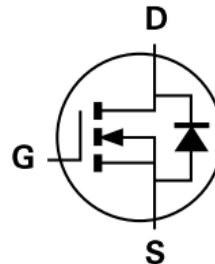
### POWERDI5060-8



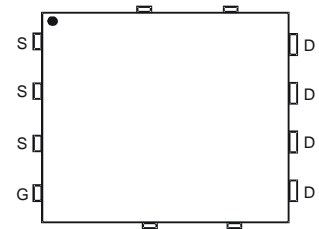
Top View



Bottom View



Internal Schematic



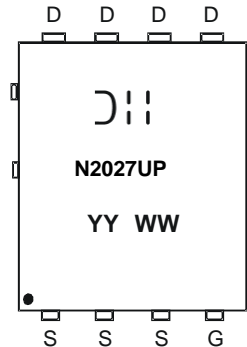
Top View

## 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](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



D = 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			$V_{GSS}$	$\pm 12$	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 $\mu\text{s}$ 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<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 8)						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	20	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	1.0	μA	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS</b> (Note 8)						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	0.7	—	1.3	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	—	12.5	mΩ	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 9.4A
		—	—	19		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 8.3A
Diode Forward Voltage	V <sub>SD</sub>	—	0.7	1.3	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 1.3A
<b>DYNAMIC CHARACTERISTICS</b> (Note 9)						
Input Capacitance	C <sub>iss</sub>	—	1091	—	pF	V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	163	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	148	—		
Gate Resistance	R <sub>g</sub>	—	1.5	3.2	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (V <sub>GS</sub> = 2.5V)	Q <sub>g</sub>	—	7.0	—	nC	V <sub>DS</sub> = 10V, I <sub>D</sub> = 9.4A
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>g</sub>	—	11.6	—		
Gate-Source Charge	Q <sub>gs</sub>	—	2.5	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	3.5	—		
Turn-On Delay Time	t <sub>D(ON)</sub>	—	6.6	—	nS	V <sub>GS</sub> = 4.5V, V <sub>DS</sub> = 10V, R <sub>G</sub> = 6Ω, I <sub>D</sub> = 1A
Turn-On Rise Time	t <sub>R</sub>	—	8.4	—		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	26.6	—		
Turn-Off Fall Time	t <sub>F</sub>	—	12.6	—		
Reverse Recovery Time	t <sub>RR</sub>	—	13.2	—	nS	I <sub>F</sub> = 12A, di/dt = 500A/μs
Reverse Recovery Charge	Q <sub>RR</sub>	—	7.6	—	nC	

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

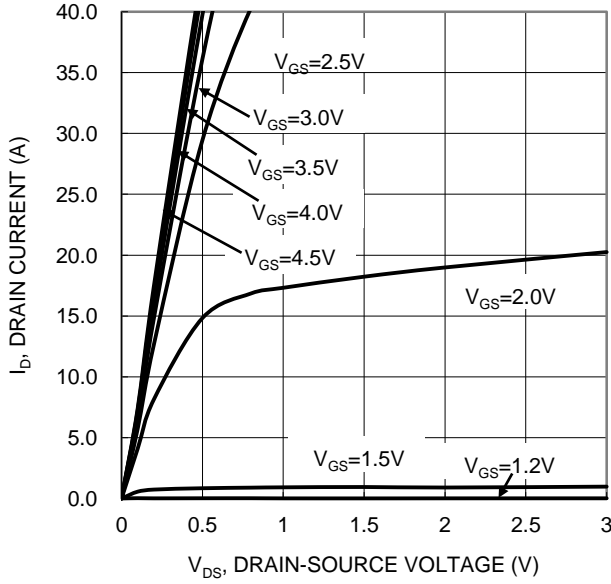


Figure 1. Typical Output Characteristic

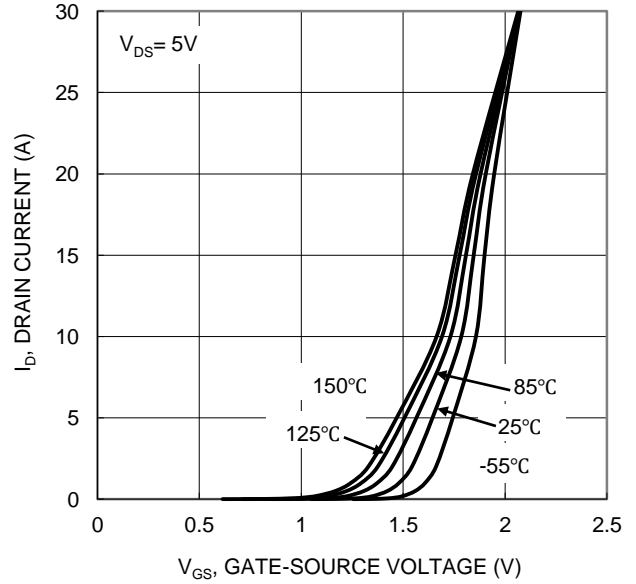


Figure 2. Typical Transfer Characteristic

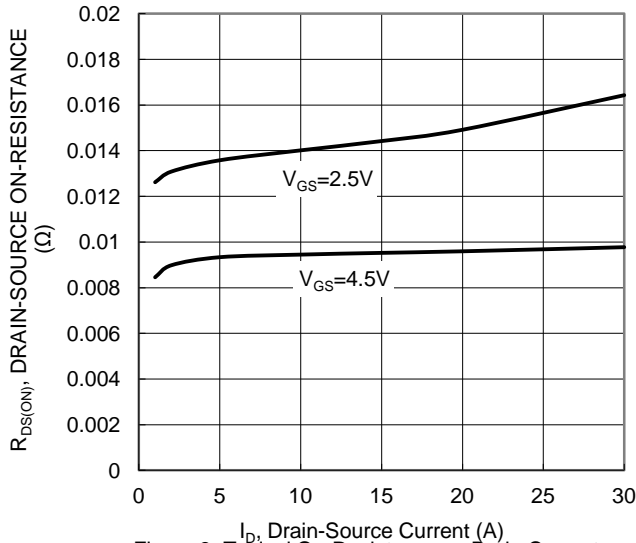


Figure 3. Typical On-Resistance vs Drain Current and Gate Voltage

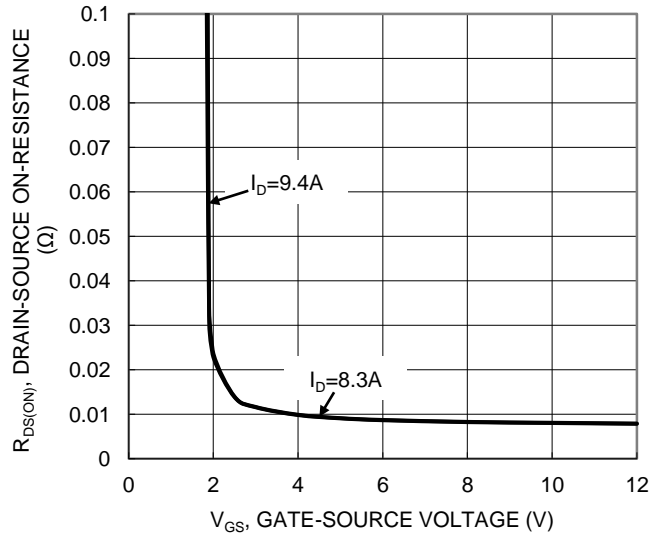


Figure 4. Typical Transfer Characteristic

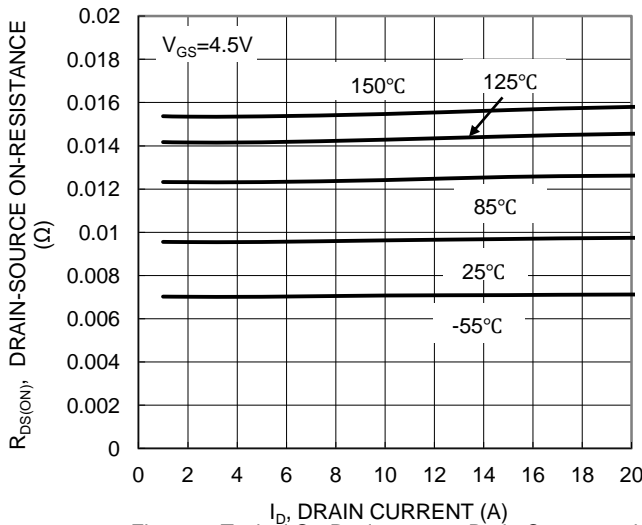


Figure 5. Typical On-Resistance vs Drain Current and Junction Temperature

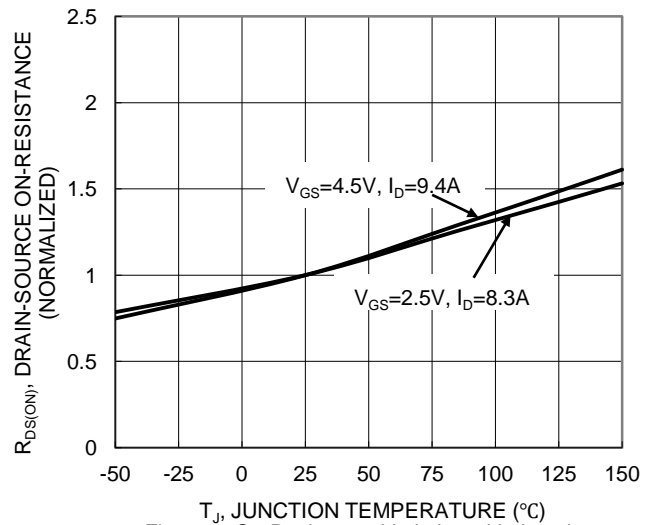


Figure 6. On-Resistance Variation with Junction Temperature

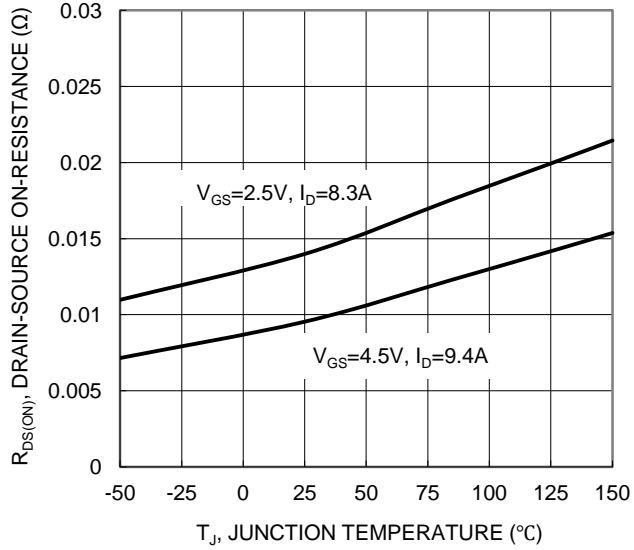


Figure 7. On-Resistance Variation with Junction Temperature

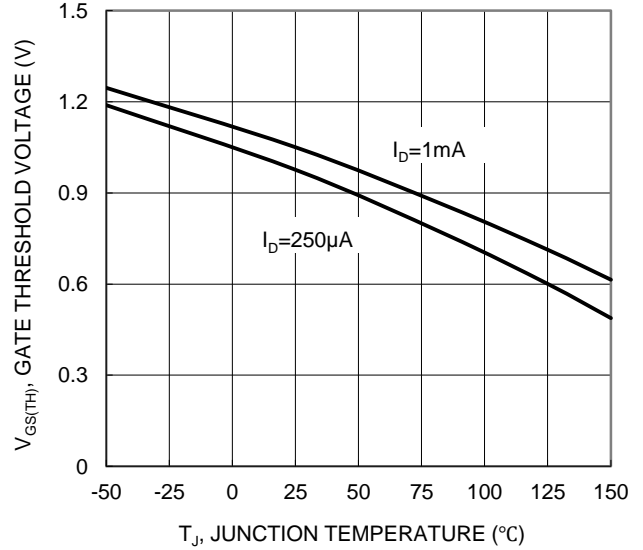


Figure 8. Gate Threshold Variation vs Junction Temperature

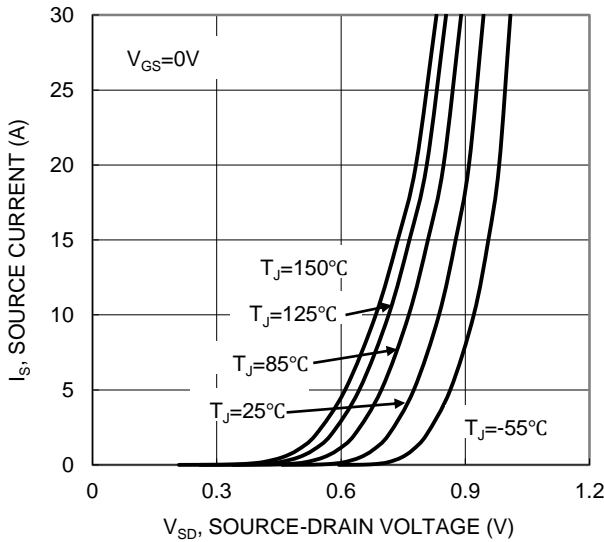


Figure 9. Diode Forward Voltage vs Current

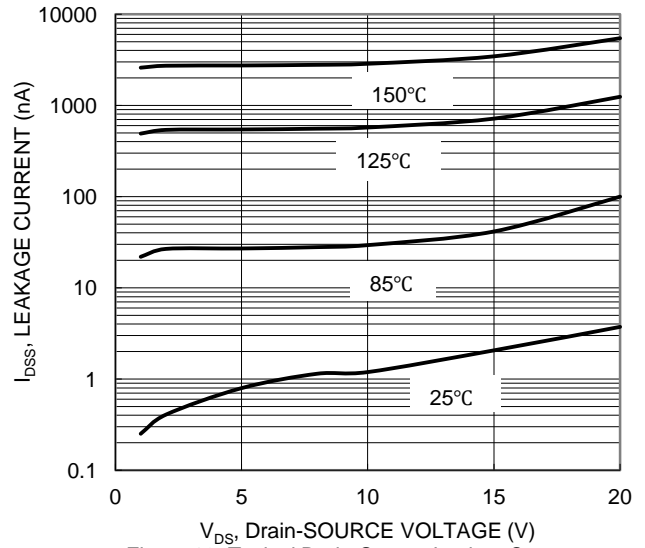


Figure 10. Typical Drain-Source Leakage Current vs Voltage

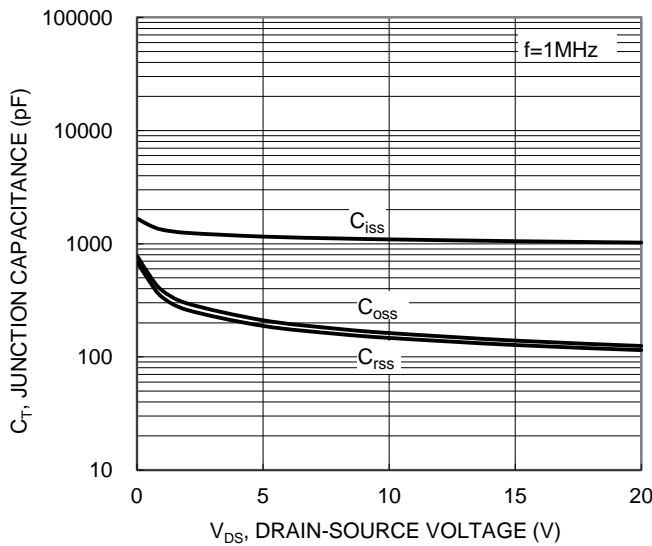


Figure 11. Typical Junction Capacitance

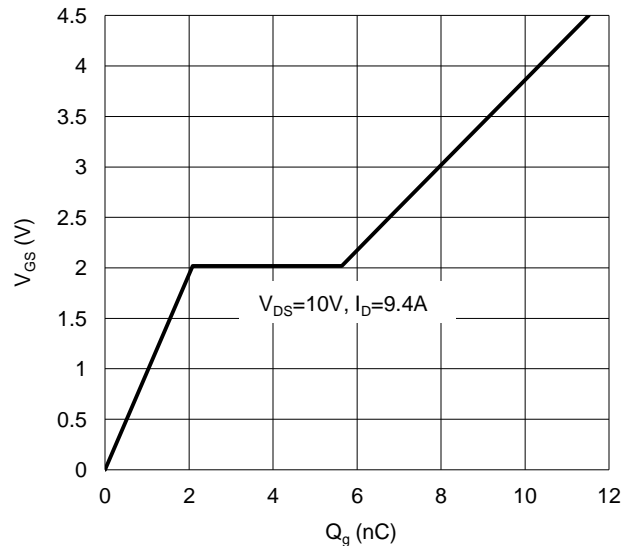
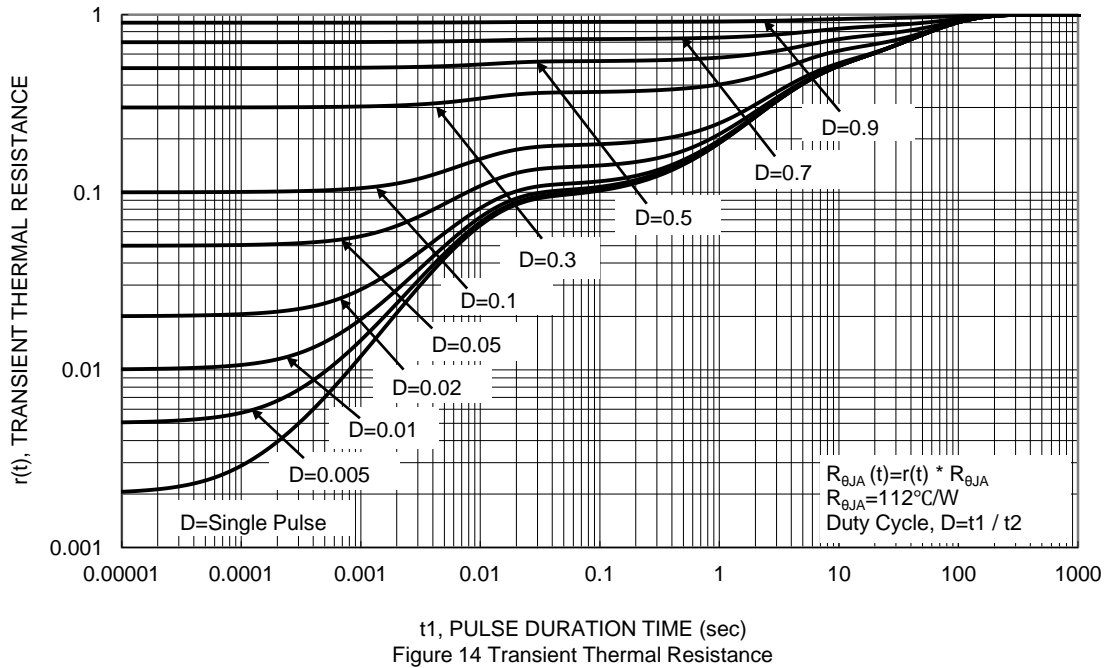
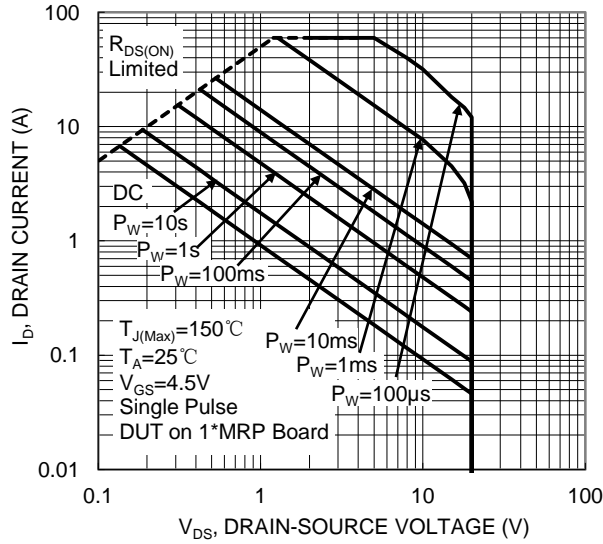


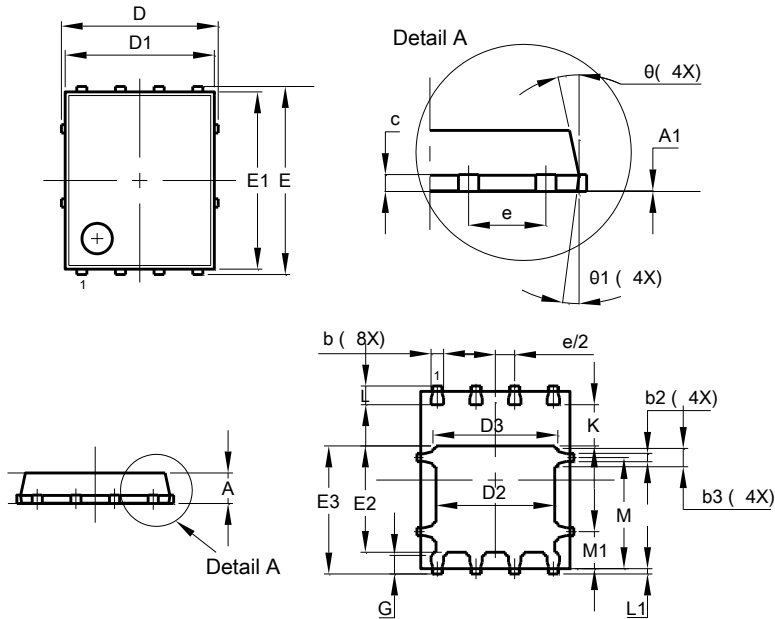
Figure 12. Gate Charge



**Package Outline Dimensions**

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

**POWERDI5060-8**

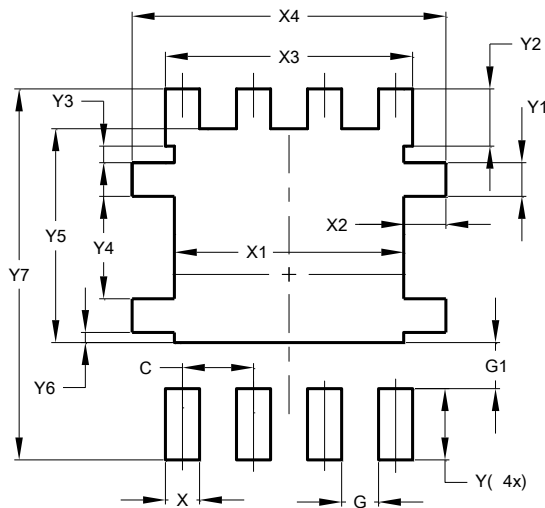


POWERDI5060-8			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0.00	0.05	—
b	0.33	0.51	0.41
b2	0.200	0.350	0.273
b3	0.40	0.80	0.60
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.70	4.10	3.90
D3	3.90	4.30	4.10
E	6.15 BSC		
E1	5.60	6.00	5.80
E2	3.28	3.68	3.48
E3	3.99	4.39	4.19
e	1.27 BSC		
G	0.51	0.71	0.61
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°
$\theta_1$	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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