

**40V P-CHANNEL ENHANCEMENT MODE MOSFET  
 POWERDI®**
**Product Summary**

$V_{(BR)DSS}$	$R_{DS(on) \max}$	$I_D \max$ $T_A = +25^\circ\text{C}$ (Notes 6)
-40V	25mΩ @ $V_{GS} = -10\text{V}$	- 7.2A
	45mΩ @ $V_{GS} = -4.5\text{V}$	- 5.4A

**Description**

This MOSFET has been designed to minimize the on-state resistance and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

**Applications**

- Motor Control
- Backlighting
- DC-DC Converters
- Printer Equipment

**Features**

- Low  $R_{DS(on)}$  – Minimizes conduction losses
- Fast switching speed – Minimizes switching losses
- **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**

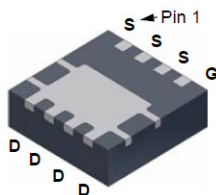
**Mechanical Data**

- Case: POWERDI3333-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See diagram below
- Terminals: Finish - Matte Tin annealed over Copper lead frame. Solderable per MIL-STD-202, Method 208 Ⓔ3
- Weight: 0.0172 grams (approximate)

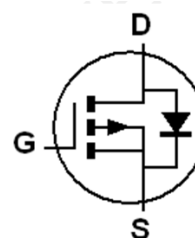
POWERDI3333-8



Top View



Bottom View

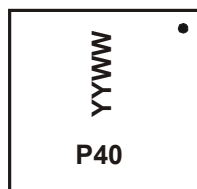


Device symbol

**Ordering Information** (Note 4)

Product	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
DMP4025SFG-7	P40	7	8	2,000
DMP4025SFG-13	P40	13	8	3,000

- 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**


P40 = Product marking code  
 YYWW = Date Code Marking  
 YY = Year (ex: 12 = 2012)  
 WW = Week (01 - 53)

## Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V <sub>DSS</sub>	-40	V
Gate-Source Voltage			V <sub>GSS</sub>	±20	
Continuous Drain Current	V <sub>GS</sub> = 10V	(Notes 6)	I <sub>D</sub>	-7.2	A
		T <sub>A</sub> = +70°C (Notes 6)		-5.77	
		(Notes 5)		-4.65	
Pulsed Drain Current	V <sub>GS</sub> = 10V	(Notes 7)	I <sub>DM</sub>	-26	

## Thermal Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Power Dissipation	(Note 5)	P <sub>D</sub>	0.81	W
Linear Derating Factor	(Note 6)		1.95	
Thermal Resistance, Junction to Ambient	(Note 5)	R <sub>θJA</sub>	155	°C/W
	(Note 6)		64	
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

- Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout
  6. For a device surface mounted on 25mm x 25mm FR4 PCB with 2oz copper, in still air conditions;
  7. Same as note (6), except the device is pulsed with D= 0.02 and pulse width 300μs.

## Thermal Characteristics

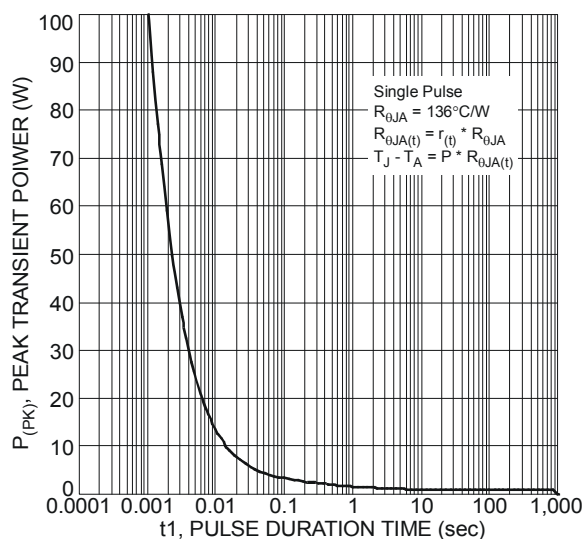


Figure 1 Single Pulse Maximum Power Dissipation

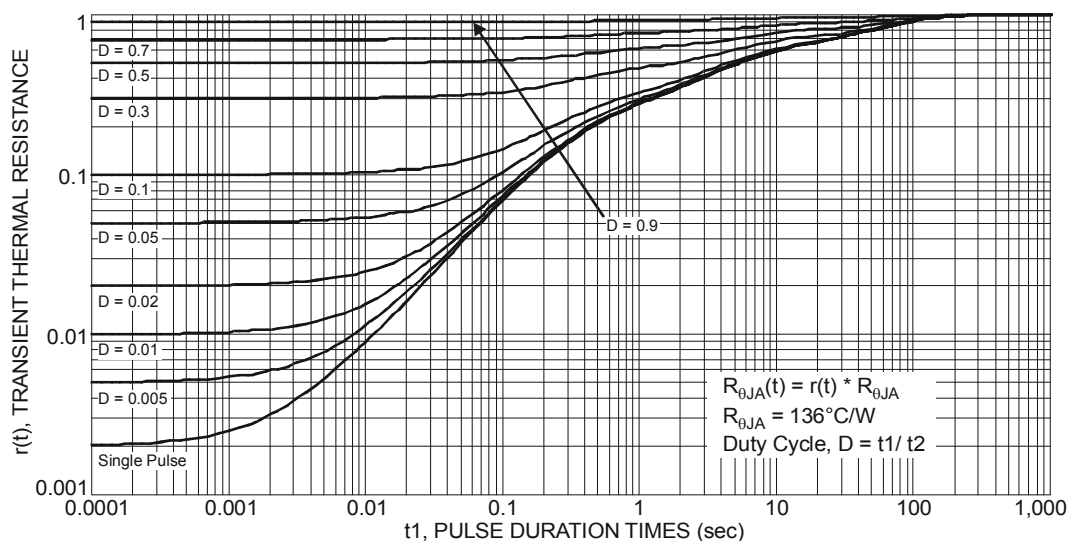
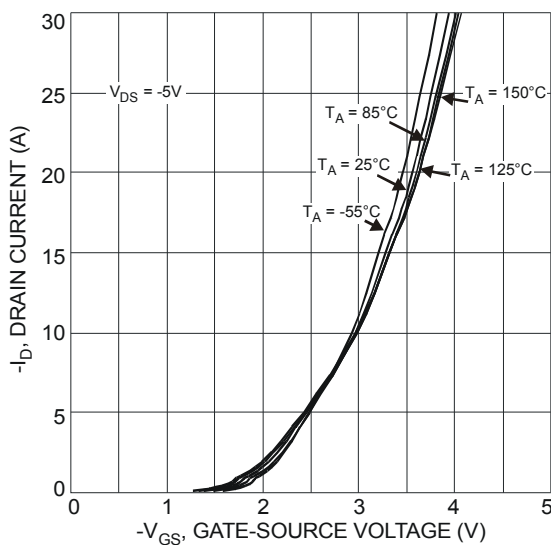
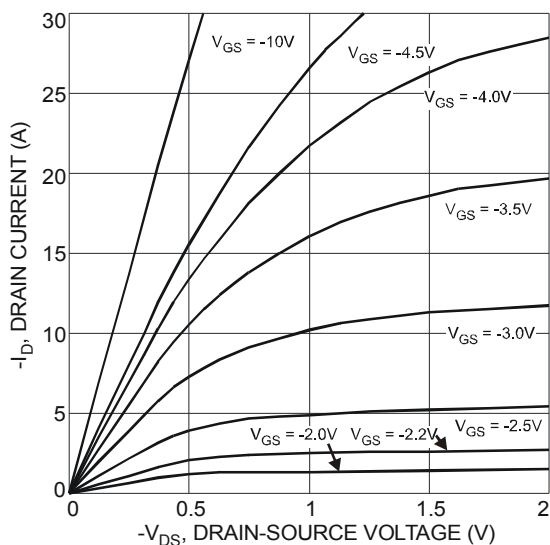


Figure 2 Transient Thermal Resistance

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-40	—	—	V	I <sub>D</sub> = -250μA, V <sub>GS</sub> = 0V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-1.0	μA	V <sub>DS</sub> = -40V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-0.8	-1.3	-1.8	V	I <sub>D</sub> = -250μA, V <sub>DS</sub> = V <sub>GS</sub>
Static Drain-Source On-Resistance (Note 8)	R <sub>DS(on)</sub>	—	18	25	mΩ	V <sub>GS</sub> = -10V, I <sub>D</sub> = -3A
			30	45		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -3A
Forward Transconductance (Notes 8 & 9)	g <sub>fs</sub>	—	16.6	—	S	V <sub>DS</sub> = -5V, I <sub>D</sub> = -3A
Diode Forward Voltage (Note 8)	V <sub>SD</sub>	—	-0.7	-1.0	V	I <sub>S</sub> = -1A, V <sub>GS</sub> = 0V
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iss</sub>	—	1643	—	pF	V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V f = 1MHz
Output Capacitance	C <sub>oss</sub>	—	179	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	128	—		
Gate Resistance	R <sub>g</sub>	—	6.43	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (Note 10)	Q <sub>g</sub>	—	14.0	—	nC	V <sub>DS</sub> = -20V I <sub>D</sub> = -3A
Total Gate Charge (Note 10)	Q <sub>g</sub>	—	33.7	—		
Gate-Source Charge (Note 10)	Q <sub>gs</sub>	—	5.5	—		
Gate-Drain Charge (Note 10)	Q <sub>gd</sub>	—	7.3	—		
Turn-On Delay Time (Note 10)	t <sub>D(on)</sub>	—	6.9	—	ns	V <sub>DD</sub> = -20V, V <sub>GS</sub> = -10V I <sub>D</sub> = -3A
Turn-On Rise Time (Note 10)	t <sub>r</sub>	—	14.7	—		
Turn-Off Delay Time (Note 10)	t <sub>D(off)</sub>	—	53.7	—		
Turn-Off Fall Time (Note 10)	t <sub>f</sub>	—	30.9	—		

- Notes:
8. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%
  9. For design aid only, not subject to production testing.
  10. Switching characteristics are independent of operating junction temperatures.

**Typical Characteristics**


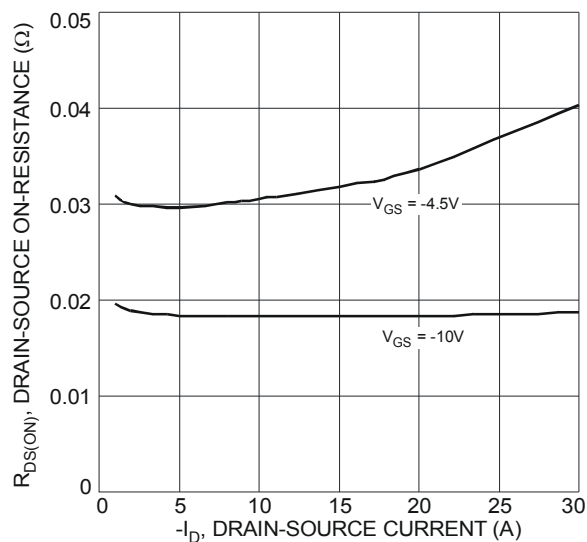


Figure 5 Typical On-Resistance  
vs. Drain Current and Gate Voltage

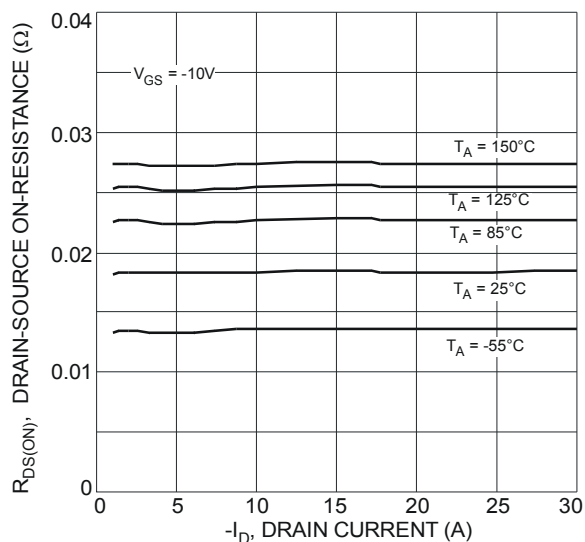


Figure 6 Typical On-Resistance  
vs. Drain Current and Temperature

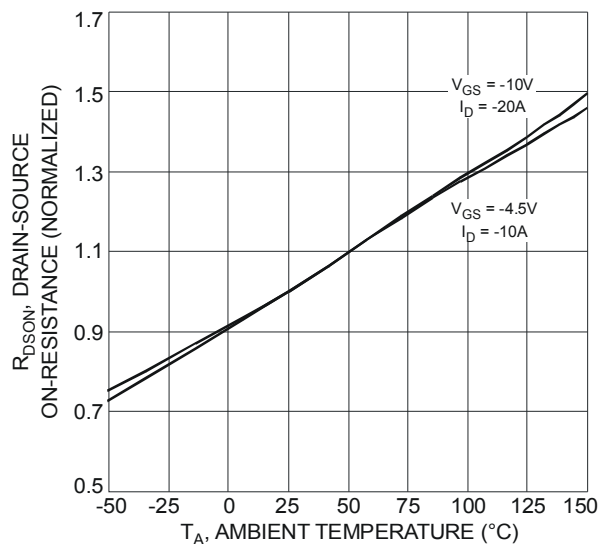


Figure 7 On-Resistance Variation with Temperature

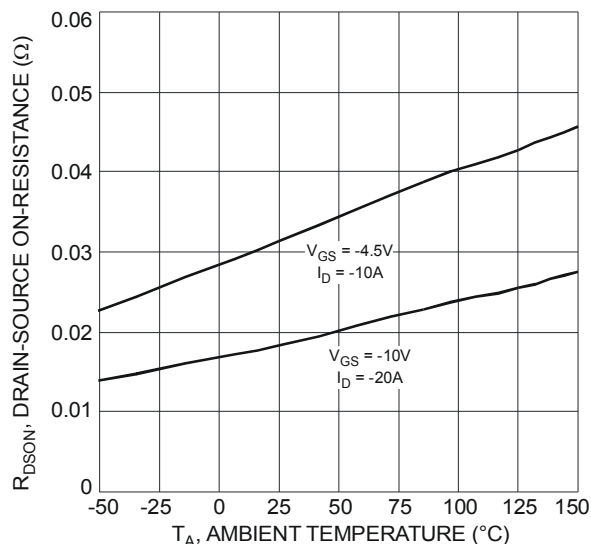


Figure 8 On-Resistance Variation with Temperature

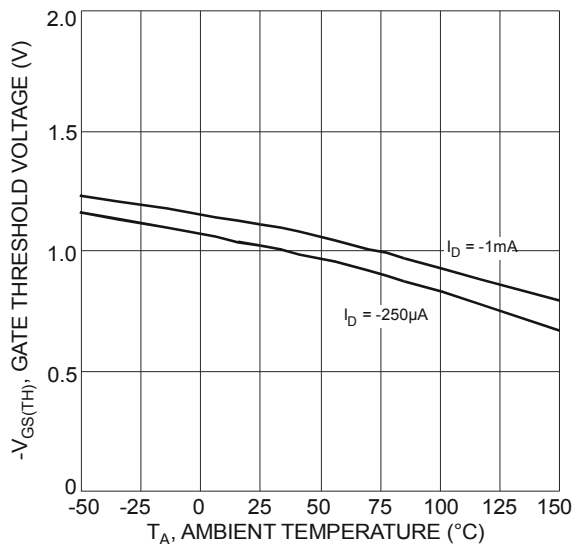


Figure 9 Gate Threshold Variation vs. Ambient Temperature

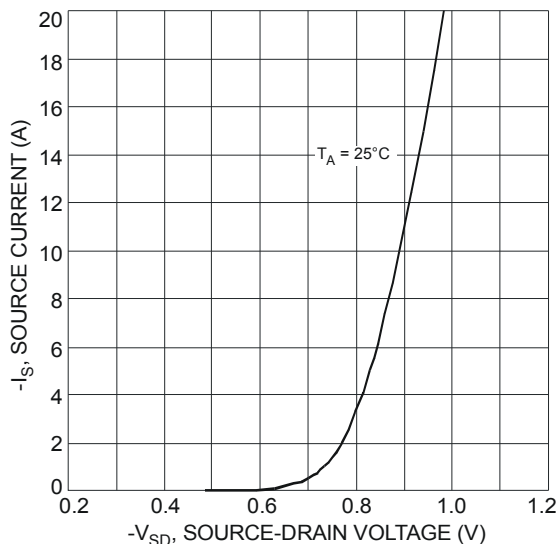


Figure 10 Diode Forward Voltage vs. Current

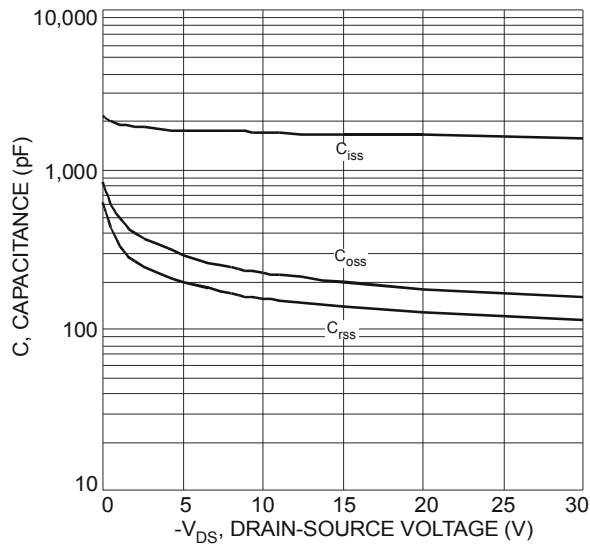


Figure 11 Typical Total Capacitance

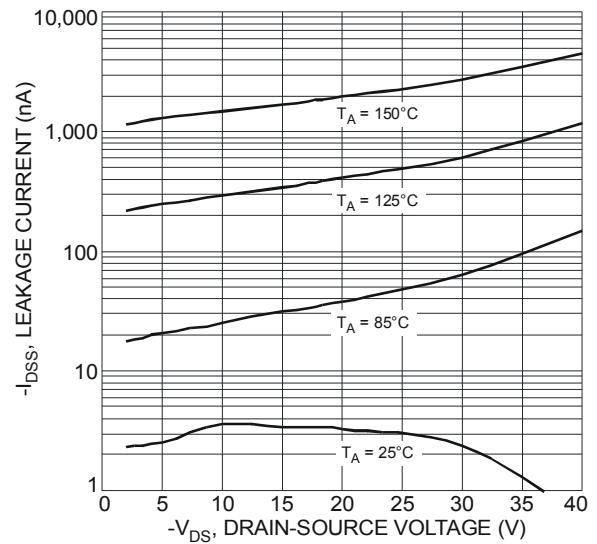


Figure 12 Typical Leakage Current vs. Drain-Source Voltage

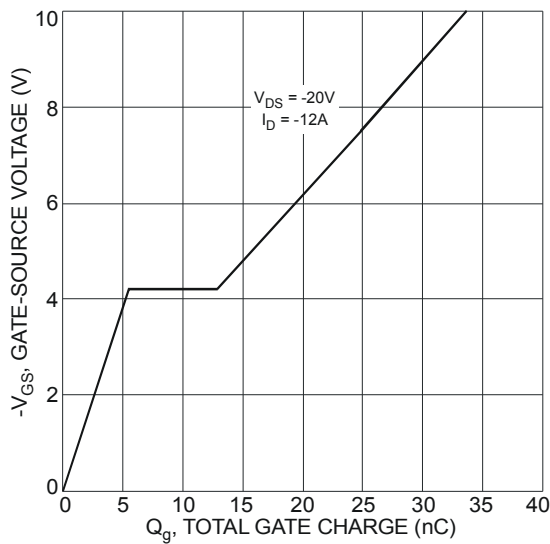
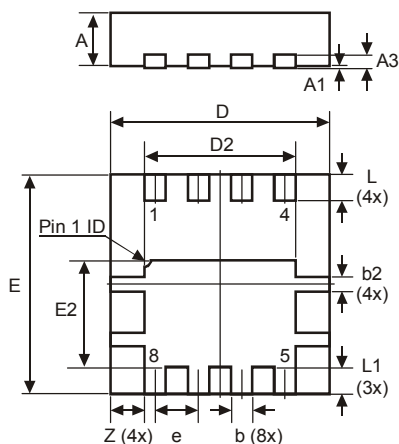


Figure 13 Gate-Charge Characteristics

## Package Outline Dimensions

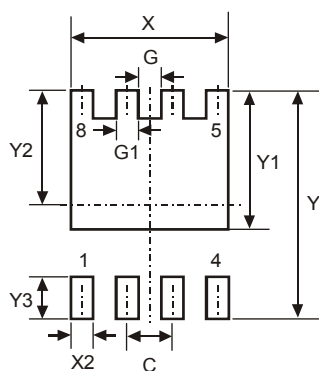
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



POWERDI®3333-8			
Dim	Min	Max	Typ
D	3.25	3.35	3.30
E	3.25	3.35	3.30
D2	2.22	2.32	2.27
E2	1.56	1.66	1.61
A	0.75	0.85	0.80
A1	0	0.05	0.02
A3	—	—	0.203
b	0.27	0.37	0.32
b2	—	—	0.20
L	0.35	0.45	0.40
L1	—	—	0.39
e	—	—	0.65
Z	—	—	0.515
All Dimensions in mm			

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



Dimensions	Value (in mm)
C	0.650
G	0.230
G1	0.420
Y	3.700
Y1	2.250
Y2	1.850
Y3	0.700
X	2.370
X2	0.420

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