

**COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET  
POWERDI® 5060-8**

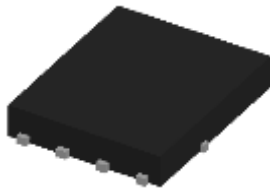
**Product Summary**

Device	V <sub>(BR)</sub> DSS	R <sub>DS(ON)</sub>	I <sub>D</sub> T <sub>A</sub> = +25°C
Q1	12V	17mΩ @ V <sub>GS</sub> = 4.5V	9.5A
		25mΩ @ V <sub>GS</sub> = 2.5V	7.8A
Q2	-12V	32mΩ @ V <sub>GS</sub> = -4.5V	-6.9A
		53mΩ @ V <sub>GS</sub> = -2.5V	-5.4A

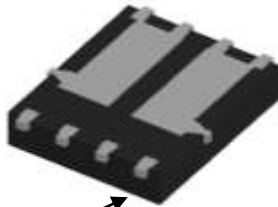
**Description and Applications**

This new generation Complementary Pair Enhancement Mode MOSFET has been designed to minimize R<sub>DS(on)</sub> and yet maintain superior switching performance. This device is ideal for use in Notebook battery power management and Loadswitch.

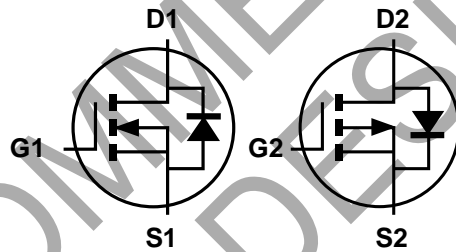
- Notebook Battery Power Management
- DC-DC Converters
- Loadswitch



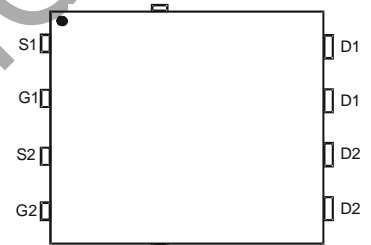
Top View



Pin1  
Bottom View



Q1 N-Channel MOSFET Q2 P-Channel MOSFET



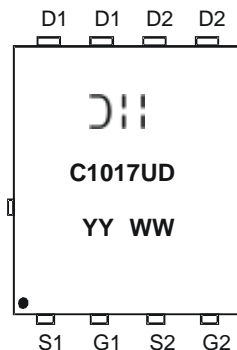
Top View  
Pin Configuration


**Ordering Information (Note 4)**

Part Number	Case	Packaging
DMC1017UPD-13	POWERDI5060-8	2500 / 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**



 = Manufacturer's Marking  
 C1017UD = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 13 = 2013)  
 WW = Week (01 - 53)

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

Characteristic			Symbol	Q1 Value	Q2 Value	Units
Drain-Source Voltage			V <sub>DSS</sub>	12	-12	V
Gate-Source Voltage			V <sub>GSS</sub>	±8	±8	V
Continuous Drain Current (Note 5) V <sub>GS</sub> = 4.5V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	9.5 7.6	-6.9 -5.5	A
	t < 10s	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	13.0 10.4	-9.4 -7.5	A
Maximum Body Diode Forward Current			I <sub>S</sub>	2	-2	A
Pulsed Drain Current (10μs pulse, duty cycle = 1%)			I <sub>DM</sub>	50	-35	A
Avalanche Current (Note 6) L = 0.1mH			I <sub>AS</sub>	9.7	-9.2	A
Avalanche Energy (Note 6) L = 0.1mH			E <sub>AS</sub>	4.7	4.3	mJ

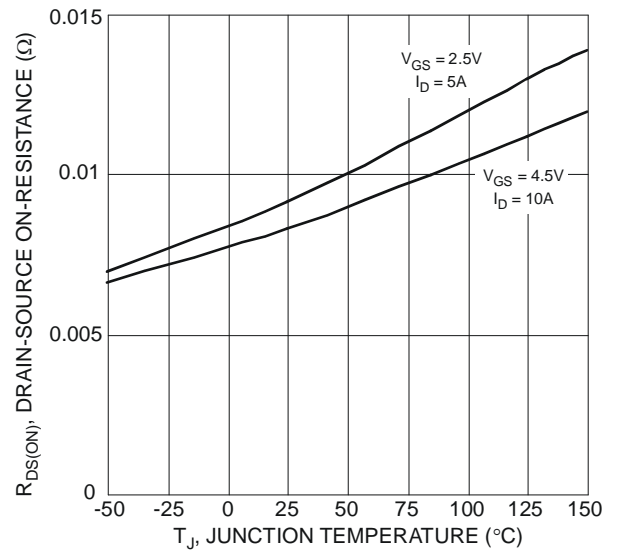
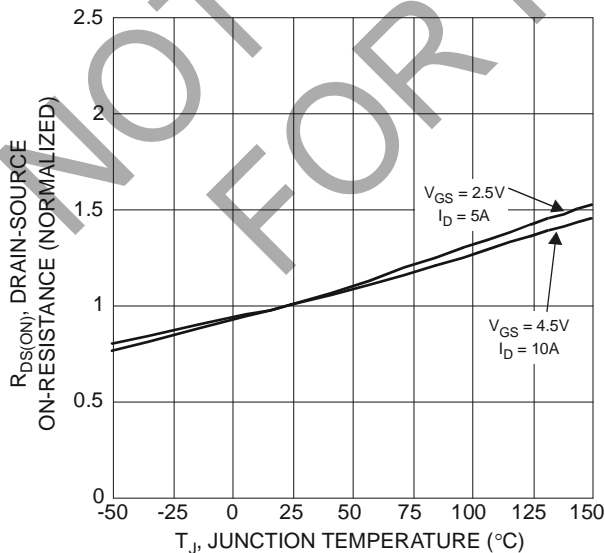
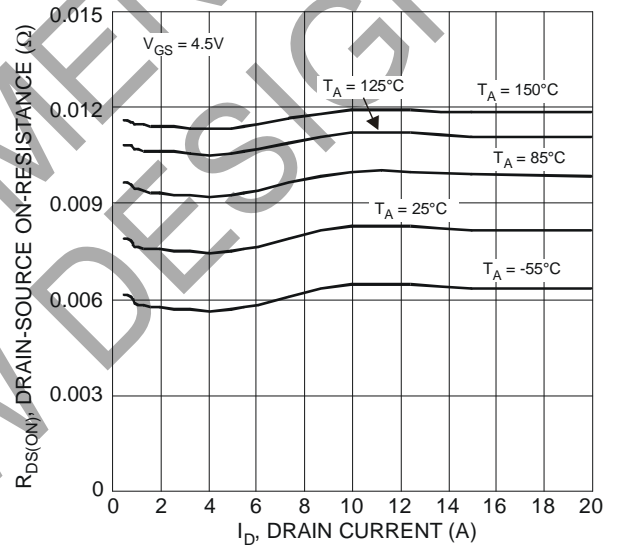
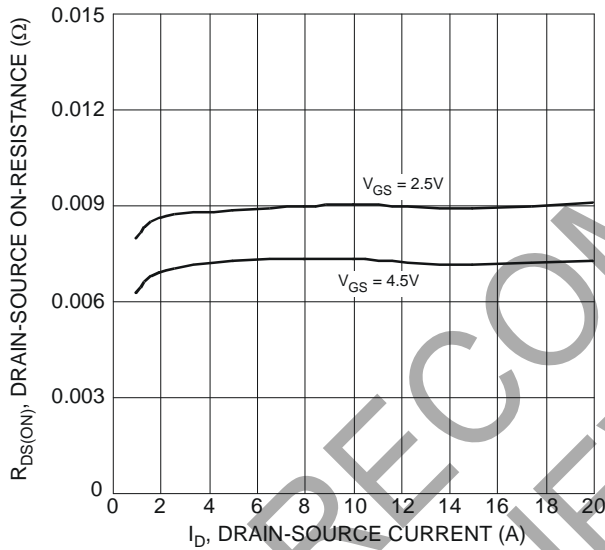
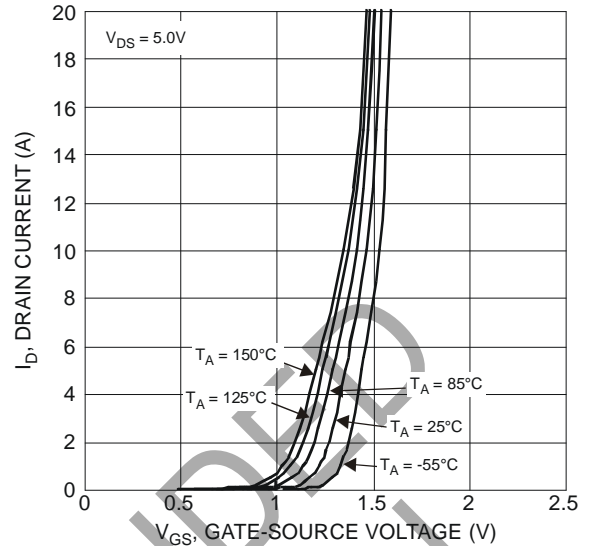
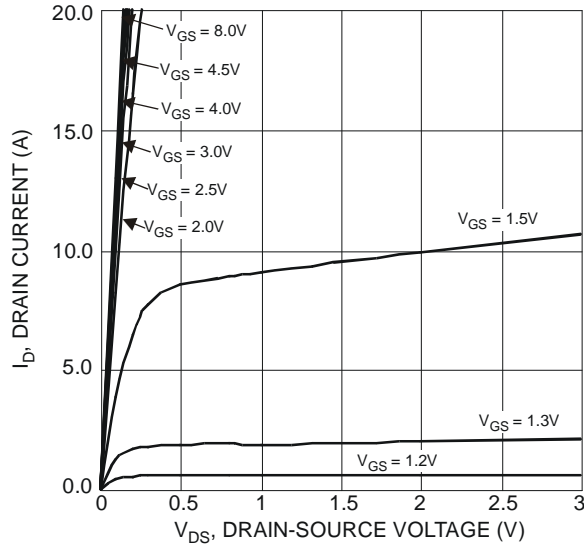
**Thermal Characteristics**

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T <sub>A</sub> = +25°C	P <sub>D</sub>	2.3	W
	T <sub>A</sub> = +70°C		1.5	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	R <sub>θJA</sub>	54	°C/W
	t < 10s		29	
Thermal Resistance, Junction to Case (Note 5)		R <sub>θJC</sub>	4.1	
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**Electrical Characteristics Q1 N-Channel** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	12	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	1	μA	V <sub>DS</sub> = 12V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	0.6	—	1.5	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	9.6	17	mΩ	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 11.8A
		—	11	25		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 9.8A
Diode Forward Voltage	V <sub>SD</sub>	—	0.7	1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 2.9A
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	—	1787	—	pF	V <sub>DS</sub> = 6V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	297	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	265	—		
Gate Resistance	R <sub>G</sub>	—	1.6	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>g</sub>	—	18.6	—	nC	V <sub>DS</sub> = 6V, I <sub>D</sub> = 11.8A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	—	35.4	—		
Gate-Source Charge	Q <sub>gs</sub>	—	2.7	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	3.8	—		
Turn-On Delay Time	t <sub>p(on)</sub>	—	6.9	—	nS	V <sub>DD</sub> = 6V, R <sub>L</sub> = 6Ω V <sub>GS</sub> = 4.5V, R <sub>G</sub> = 6Ω, I <sub>D</sub> = 1A
Turn-On Rise Time	t <sub>r</sub>	—	10.9	—		
Turn-Off Delay Time	t <sub>p(off)</sub>	—	70.3	—		
Turn-Off Fall Time	t <sub>f</sub>	—	31.8	—		
Body Diode Reverse Recovery Time	t <sub>rr</sub>	—	13.1	—	nS	I <sub>F</sub> = 11.8A, di/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	—	2.2	—	nC	I <sub>F</sub> = 11.8A, di/dt = 100A/μs

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
  - I<sub>AS</sub> and E<sub>AS</sub> rating are based on low frequency and duty cycles to keep T<sub>J</sub> = 25°C.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.



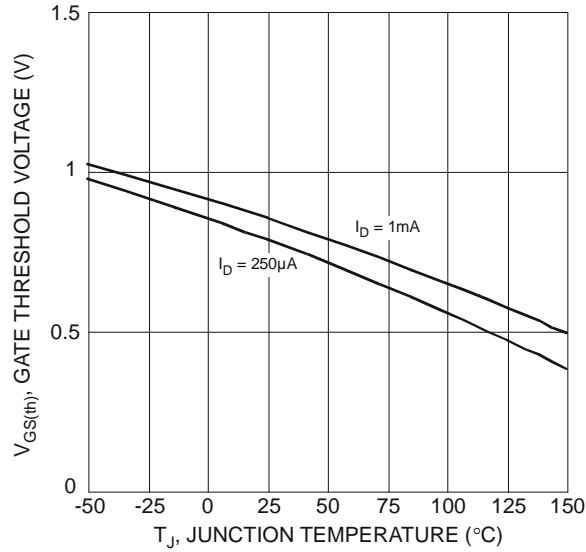


Figure 7 Gate Threshold Variation vs. Ambient Temperature

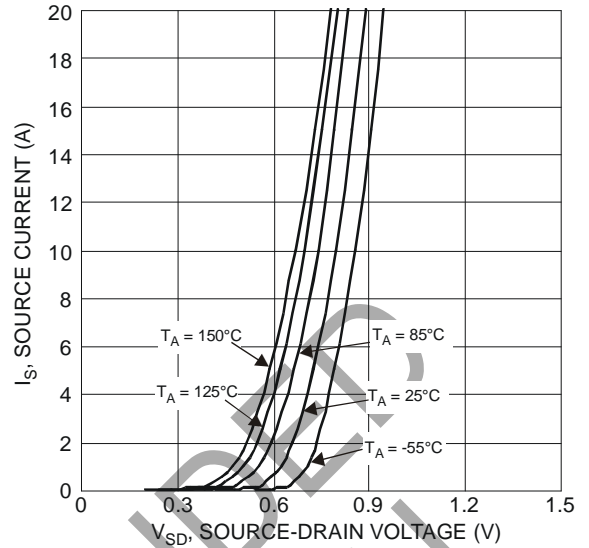


Figure 8 Diode Forward Voltage vs. Current

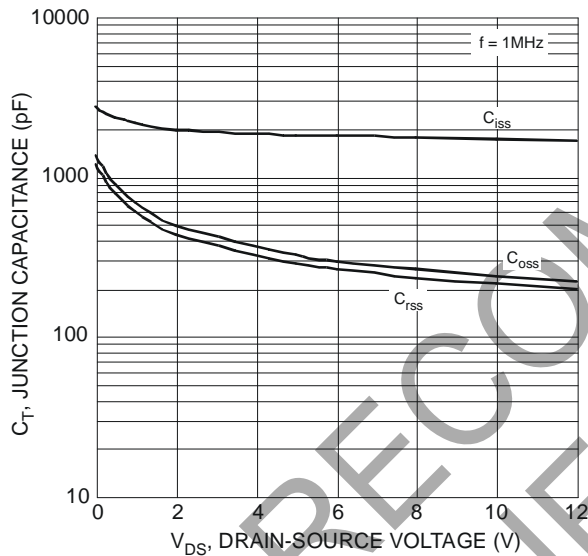


Figure 9 Typical Junction Capacitance

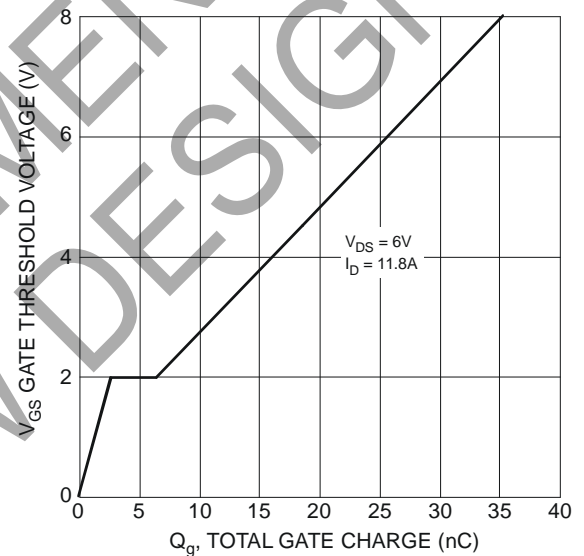
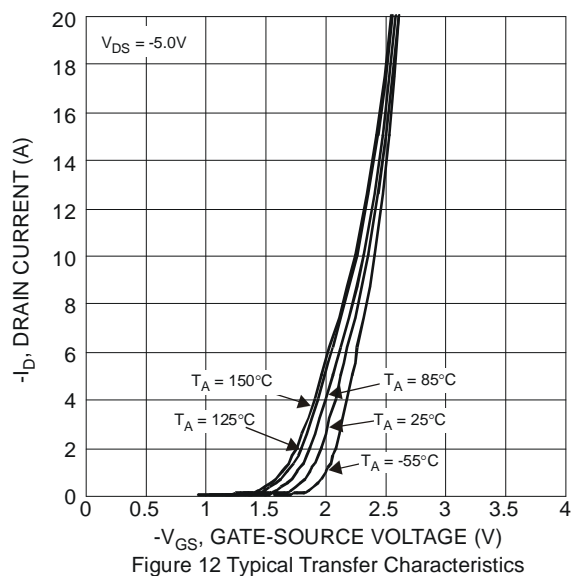
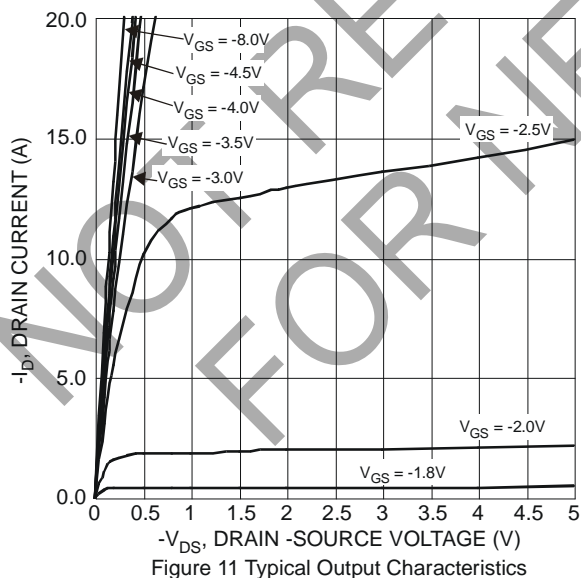


Figure 10 Gate Charge

**Electrical Characteristics Q2 P-Channel** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 6)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-12	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-1	μA	V <sub>DS</sub> = -12V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 6)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-0.6	—	-1.5	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	—	21	32	mΩ	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -8.9A
		—	41	53		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -6.9A
Diode Forward Voltage	V <sub>SD</sub>	—	-0.7	-1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -2.9A
<b>DYNAMIC CHARACTERISTICS (Note 7)</b>						
Input Capacitance	C <sub>iss</sub>	—	2100	—	pF	V <sub>DS</sub> = -6V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	872	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	626	—		
Gate Resistance	R <sub>G</sub>	—	23.1	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz
Total Gate Charge (V <sub>GS</sub> = -4.5V)	Q <sub>g</sub>	—	23.7	—	nC	V <sub>DS</sub> = -6V, I <sub>D</sub> = -8.9A
Total Gate Charge (V <sub>GS</sub> = -8V)	Q <sub>g</sub>	—	38.8	—		
Gate-Source Charge	Q <sub>gs</sub>	—	5.3	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	9.8	—		
Turn-On Delay Time	t <sub>D(on)</sub>	—	10.6	—	nS	V <sub>DD</sub> = -6V, R <sub>L</sub> = 6Ω V <sub>GS</sub> = -4.5V, R <sub>G</sub> = 6Ω, I <sub>D</sub> = -1A
Turn-On Rise Time	t <sub>r</sub>	—	25.5	—		
Turn-Off Delay Time	t <sub>D(off)</sub>	—	144	—		
Turn-Off Fall Time	t <sub>f</sub>	—	129	—		
Body Diode Reverse Recovery Time	t <sub>rr</sub>	—	48.9	—	nS	I <sub>F</sub> = -8.9A, di/dt = -100A/μs
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	—	15.3	—	nC	I <sub>F</sub> = -8.9A, di/dt = -100A/μs

Notes: 6. I<sub>AS</sub> and E<sub>AS</sub> rating are based on low frequency and duty cycles to keep T<sub>J</sub> = 25°C.  
7. Short duration pulse test used to minimize self-heating effect.



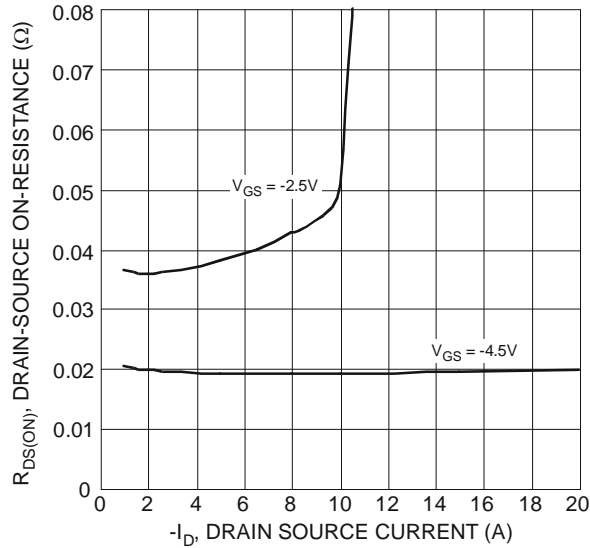


Figure 13 Typical On-Resistance vs. Drain Current and Gate Voltage

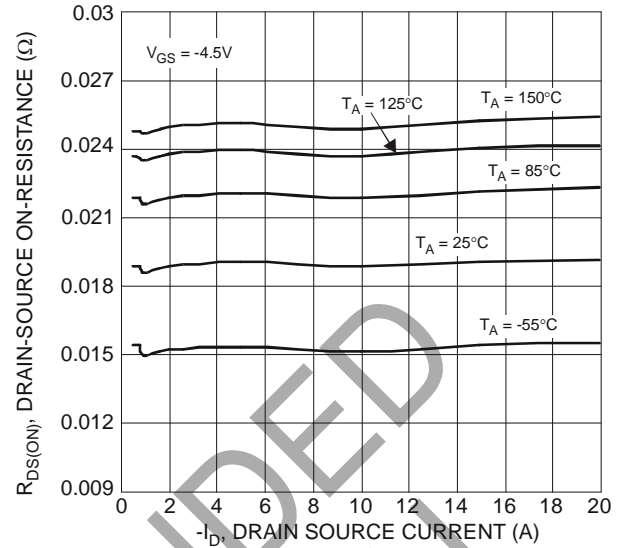


Figure 14 Typical On-Resistance vs. Drain Current and Temperature

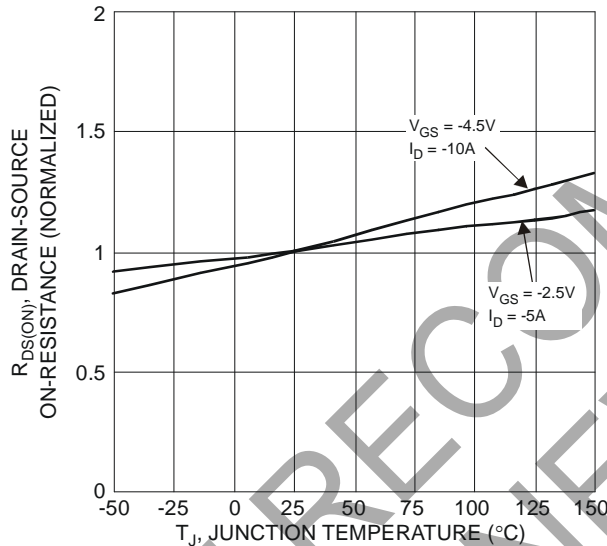


Figure 15 On-Resistance Variation with Temperature

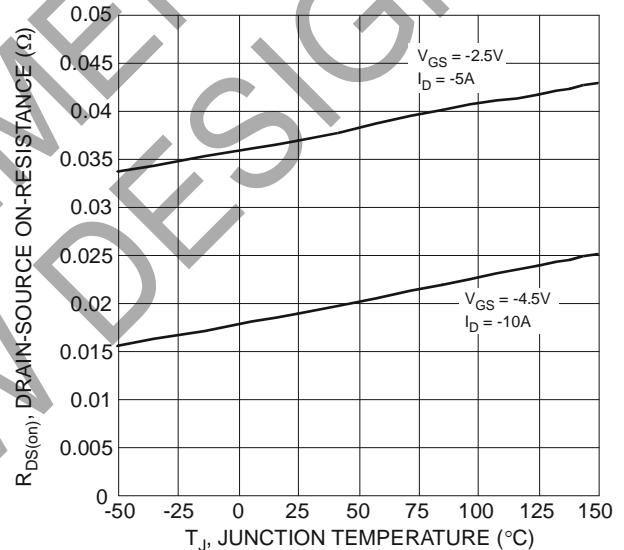


Figure 16 On-Resistance Variation with Temperature

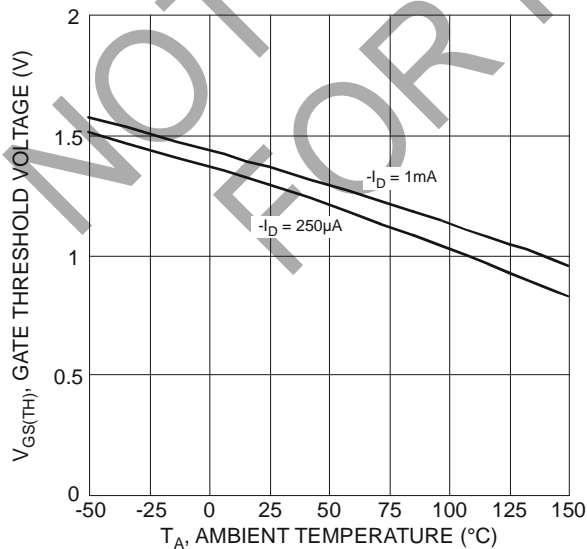


Figure 17 Gate Threshold Variation vs. Ambient Temperature

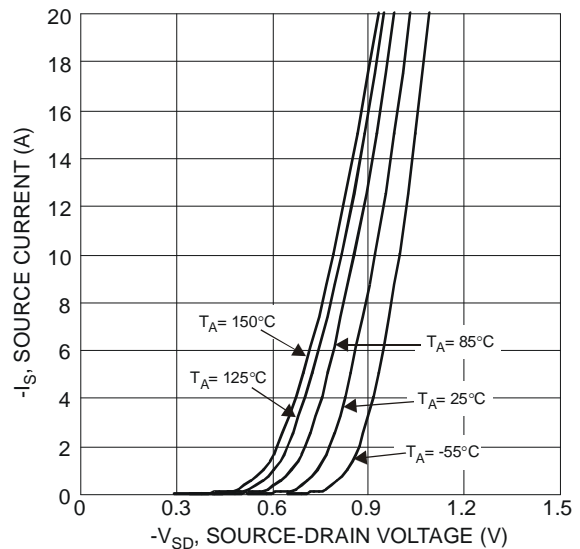
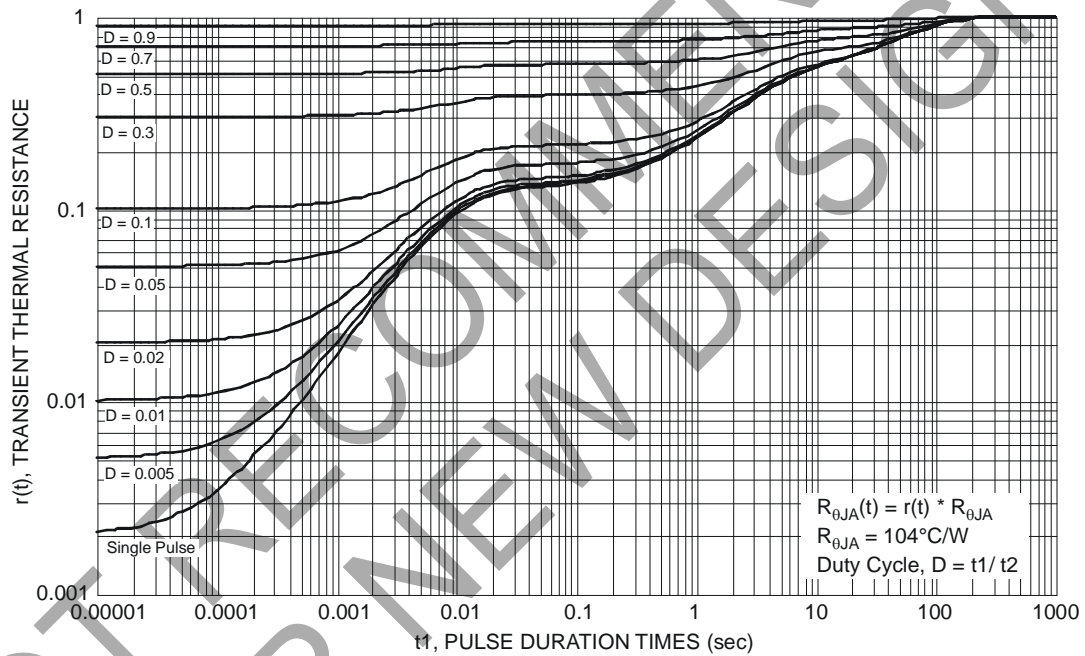
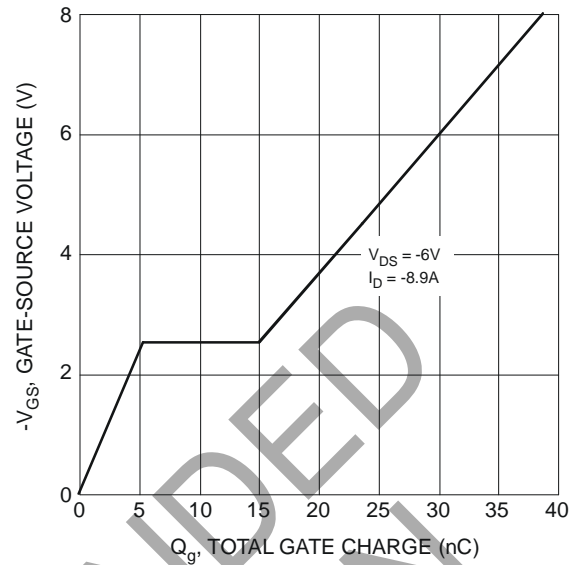
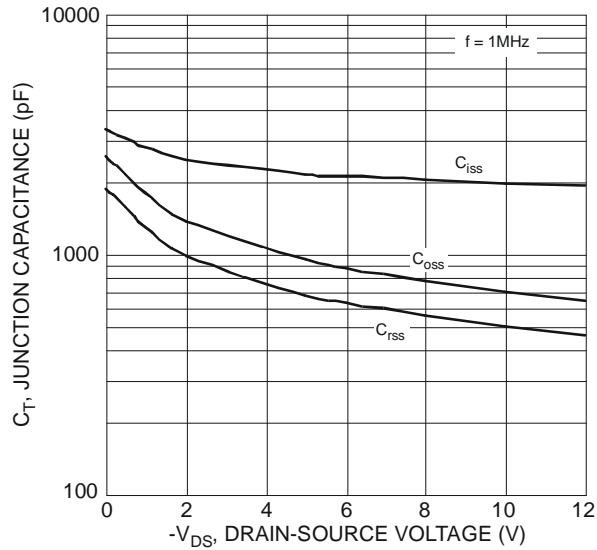
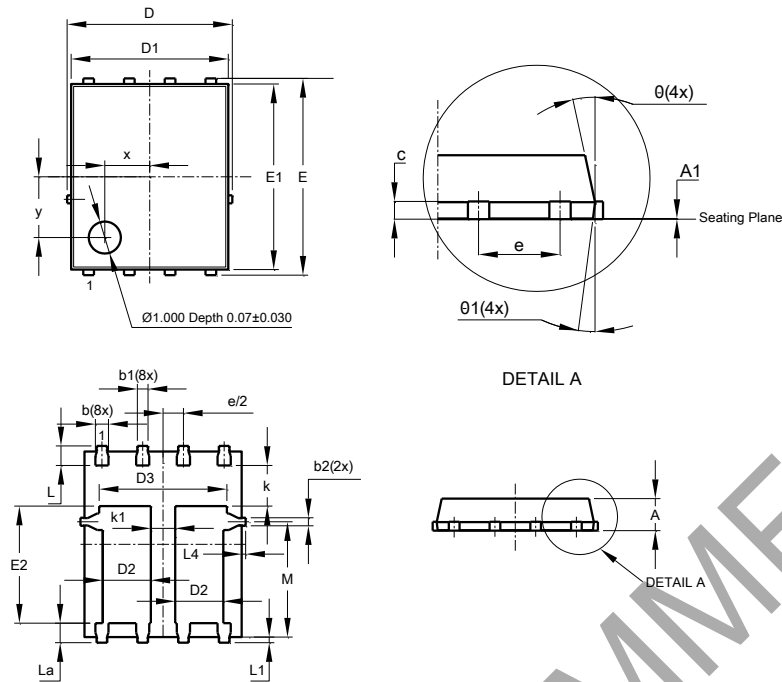


Figure 18 Diode Forward Voltage vs. Current



## Package Outline Dimensions

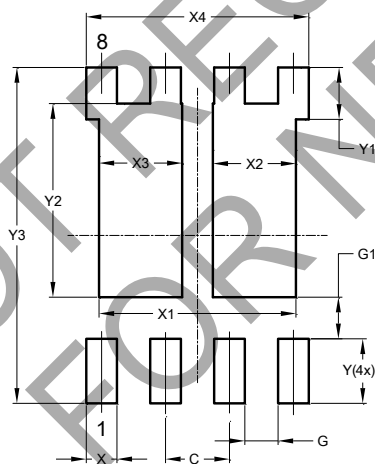
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



PowerDI5060-8			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0	0.05	0.02
b	0.33	0.51	0.41
b1	0.300	0.366	0.333
b2	0.20	0.35	0.25
c	0.23	0.33	0.277
D	5.15 BSC		
D1	4.85	4.95	4.90
D2	1.40	1.60	1.50
D3	-	-	3.98
E	6.15 BSC		
E1	5.75	5.85	5.80
E2	3.56	3.76	3.66
e	1.27 BSC		
k	-	-	1.27
k1	0.56	-	-
L	0.51	0.71	0.61
La	0.51	0.71	0.61
L1	0.05	0.20	0.175
L4	-	-	0.125
M	3.50	3.71	3.605
x	-	-	1.400
y	-	-	1.900
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 latest version.



Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	3.910
X2	1.650
X3	1.650
X4	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610



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