

## Product Summary

Device	BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> Max T <sub>C</sub> = +25°C
Q1	12V	17mΩ @ V <sub>GS</sub> = 4.5V	31.3A
		25mΩ @ V <sub>GS</sub> = 2.5V	25.8A
Q2	-20V	38mΩ @ V <sub>GS</sub> = -4.5V	-20.9A
		53mΩ @ V <sub>GS</sub> = -2.5V	-17.7A

## Description and Applications

This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

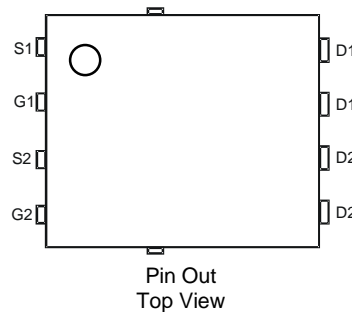
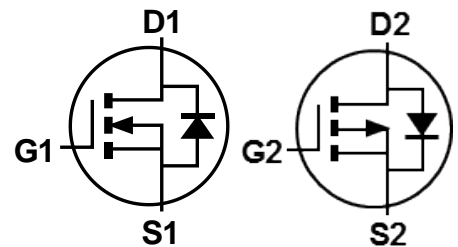
- Motor Control
- Power Management Functions
- DC-DC Converters

### PowerDI5060-8/SWP (Type UXD)



Top View

Bottom View


 Pin Out  
Top View


Equivalent Circuit

## Features and Benefits

- 100% Unclamped Inductive Switching, Test in Production— Ensures More Reliable and Robust End Application
- High Conversion Efficiency
- Low R<sub>DS(ON)</sub> – Minimizes On State Losses
- Low Input Capacitance
- Fast Switching Speed
- Wettable Flank for Improved Optical Inspection
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. “Green” Device (Note 3)**
- **The DMC1018UPDWQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

<https://www.diodes.com/quality/product-definitions/>

## Mechanical Data

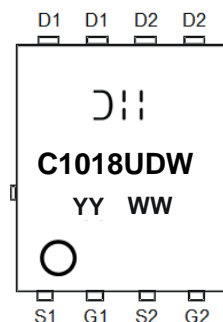
- Case: PowerDI<sup>®</sup>5060-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208.Ⓔ3
- Weight: 0.097 grams (Approximate)

## Ordering Information (Note 4)

Part Number	Case	Packaging
DMC1018UPDWQ-13	PowerDI5060-8/SWP (Type UXD)	2,500/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> 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 <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



⌋⌋⌋ = Manufacturer's Marking  
 C1018UDW = Product Type Marking Code  
 YYWW or YYWW = Date Code Marking  
 YY or YY = Year (ex: 21 = 2021)  
 WW = Week (01 to 53)

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

Characteristic	Symbol	Q1 Value	Q2 Value	Unit	
Drain-Source Voltage	V <sub>DSS</sub>	12	-20	V	
Gate-Source Voltage	V <sub>GSS</sub>	±8	±12	V	
Continuous Drain Current (Note 5)	I <sub>D</sub>	T <sub>A</sub> = +25°C	10	-6.7	A
		T <sub>A</sub> = +70°C	8	-5.4	
Continuous Drain Current (Note 6)	I <sub>D</sub>	T <sub>C</sub> = +25°C	31.3	-20.9	A
		T <sub>C</sub> = +70°C	25.0	-16.7	
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) (Note 6)	I <sub>DM</sub>	125	-80	A	
Maximum Continuous Body Diode Forward Current (Note 5)	I <sub>S</sub>	3.6	-3.2	A	
Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%) (Note 6)	I <sub>SM</sub>	125	-83.6	A	
Avalanche Current, L = 0.1mH	I <sub>AS</sub>	24.1	-16.4	A	
Avalanche Energy, L = 0.1mH	E <sub>AS</sub>	29	13.5	mJ	

**Thermal Characteristics**

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P <sub>D</sub>	2.6	W
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	48.3	°C/W
Total Power Dissipation (Note 6)	P <sub>D</sub>	25	W
Thermal Resistance, Junction to Case (Note 6)	R <sub>θJC</sub>	5.0	°C/W
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	0.8	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
		—	11.2	25	mΩ	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>	—	1525	—	pF	V <sub>DS</sub> = 6V, V <sub>GS</sub> = 0V, f = 1MHz
Output Capacitance	C <sub>oss</sub>	—	329	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	303	—	pF	
Gate Resistance	R <sub>g</sub>	—	1.6	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>g</sub>	—	17.1	—	nC	V <sub>DS</sub> = 6V, I <sub>D</sub> = 11.8A
Total Gate Charge (V <sub>GS</sub> = 8V)	Q <sub>g</sub>	—	30.4	—	nC	
Gate-Source Charge	Q <sub>gs</sub>	—	2.6	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	4.3	—	nC	
Turn-On Delay Time	t <sub>D(ON)</sub>	—	6.6	—	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>	—	5.7	—	ns	
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	41.5	—	ns	
Turn-Off Fall Time	t <sub>F</sub>	—	21.9	—	ns	
Body Diode Reverse Recovery Time	t <sub>RR</sub>	—	14.3	—	ns	I <sub>F</sub> = 11.8A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>	—	2.3	—	nC	I <sub>F</sub> = 11.8A, di/dt = 100A/µs

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz. copper, with thermal bias to bottom layer 1inch square copper plate.
  - Thermal resistance from junction to soldering point (on the exposed drain pad).
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

**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 7)</b>						
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	μA	V <sub>DS</sub> = -16V, 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 (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	-0.6	-0.85	-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>	—	30	38	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>	—	-0.8	-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>	—	866	—	pF	V <sub>DS</sub> = -6V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	167	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	131	—		
Gate Resistance	R <sub>G</sub>	—	4.9	—	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>	—	8.6	—	nC	V <sub>DS</sub> = -6V, I <sub>D</sub> = -8.9A
Total Gate Charge (V <sub>GS</sub> = -8V)	Q <sub>g</sub>	—	19	—		
Gate-Source Charge	Q <sub>gs</sub>	—	1.5	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	2.5	—		
Turn-On Delay Time	t <sub>D(ON)</sub>	—	5.8	—	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>	—	7.2	—		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	—	28.1	—		
Turn-Off Fall Time	t <sub>F</sub>	—	14.6	—		
Body Diode Reverse Recovery Time	t <sub>RR</sub>	—	9.8	—	ns	I <sub>F</sub> = -8.9A, di/dt = -100A/μs
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>	—	2.7	—	nC	I <sub>F</sub> = -8.9A, di/dt = -100A/μs

Notes: 7. Short duration pulse test used to minimize self-heating effect.  
8. Guaranteed by design. Not subject to product testing.

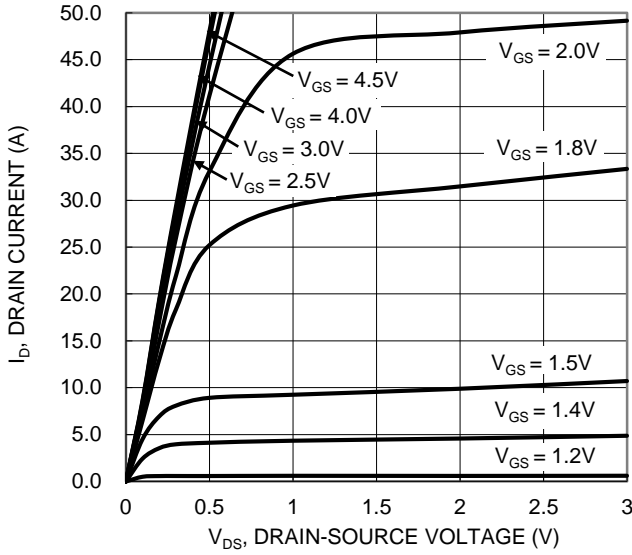


Figure 1. Typical Output Characteristic

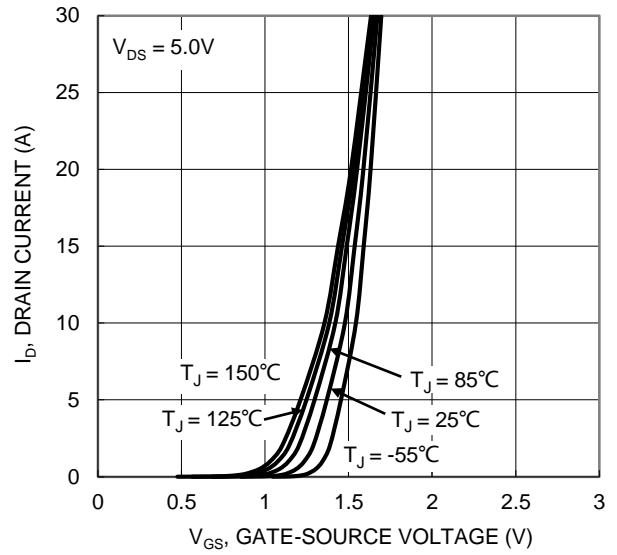


Figure 2. Typical Transfer Characteristic

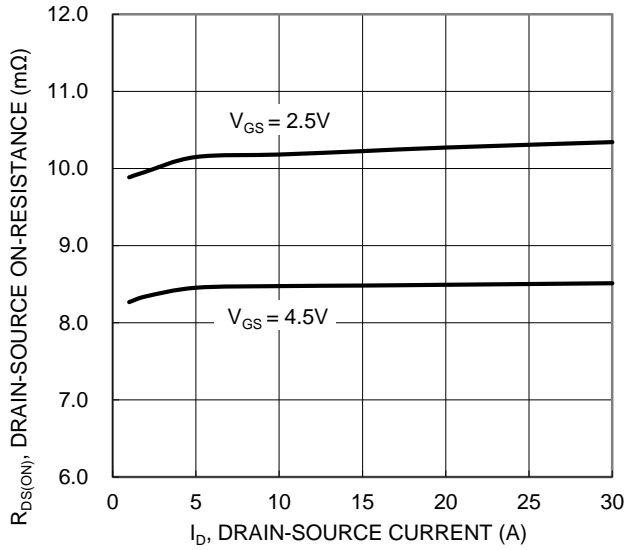


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

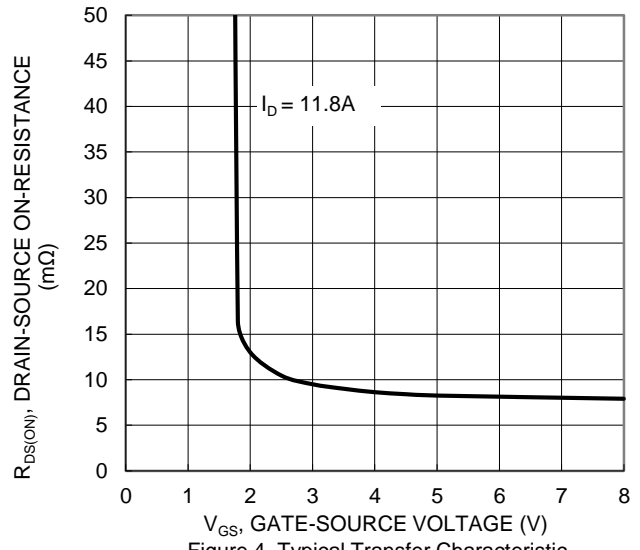


Figure 4. Typical Transfer Characteristic

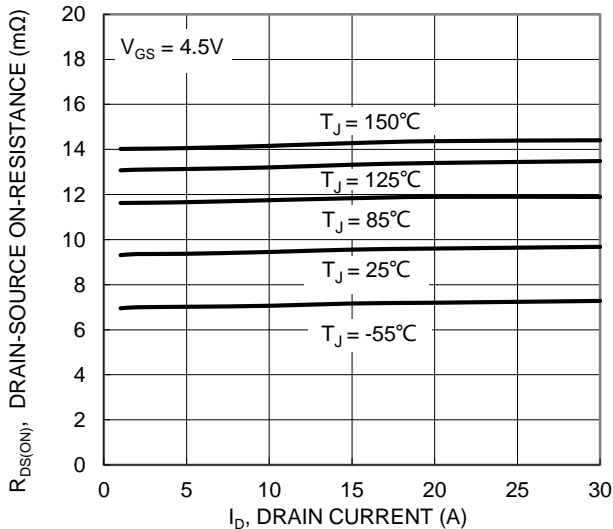


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

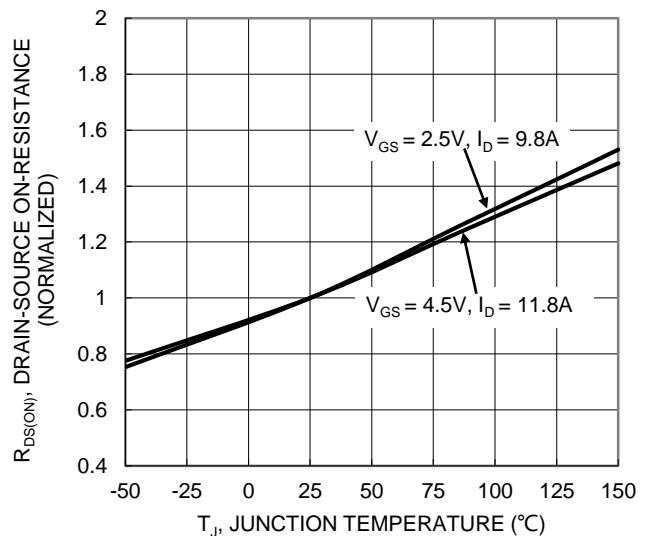


Figure 6. On-Resistance Variation with Junction Temperature

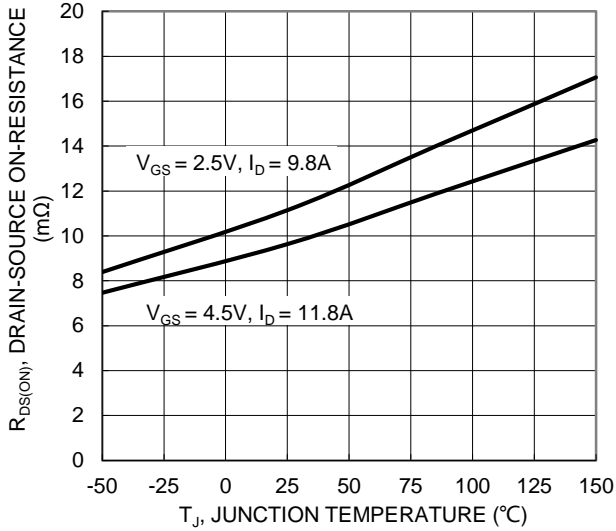


Figure 7. On-Resistance Variation with Junction Temperature

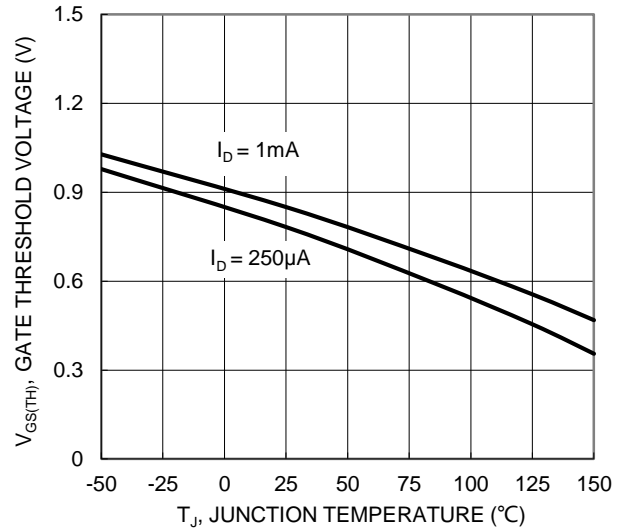


Figure 8. Gate Threshold Variation vs. Junction Temperature

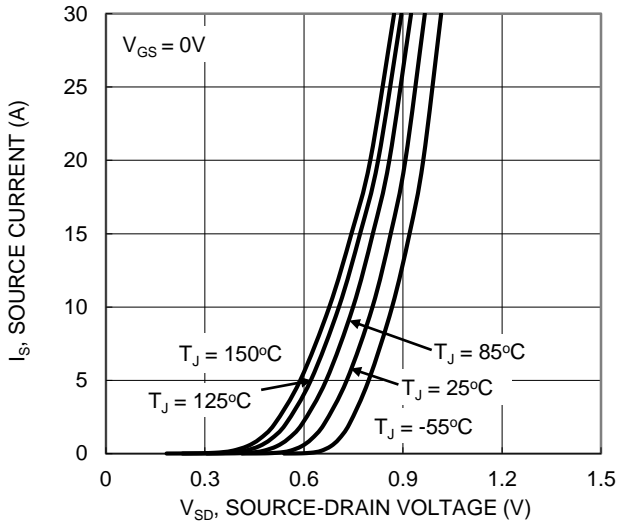


Figure 9. Diode Forward Voltage vs. Current

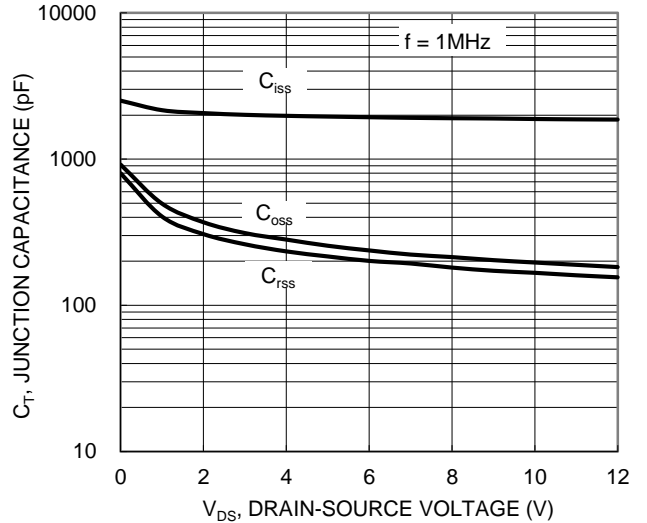


Figure 10. Typical Junction Capacitance

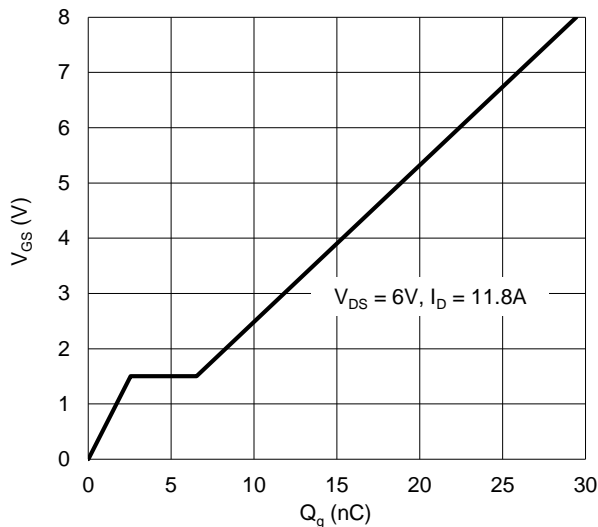


Figure 11. Gate Charge

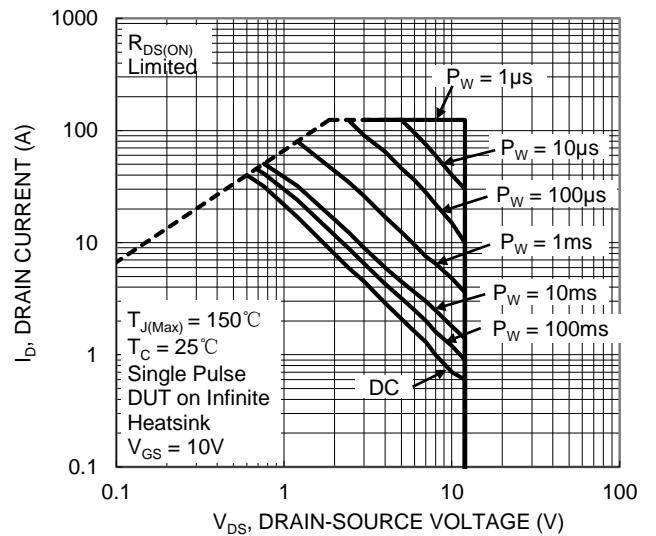


Figure 12. SOA, Safe Operation Area

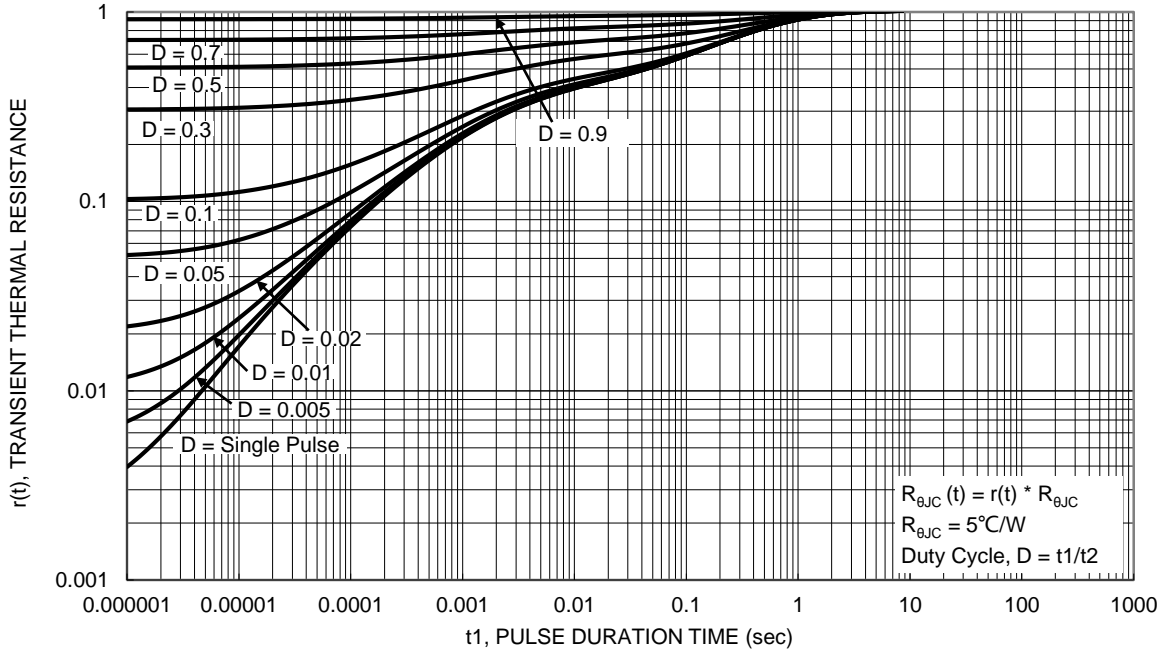


Figure 13. Transient Thermal Resistance

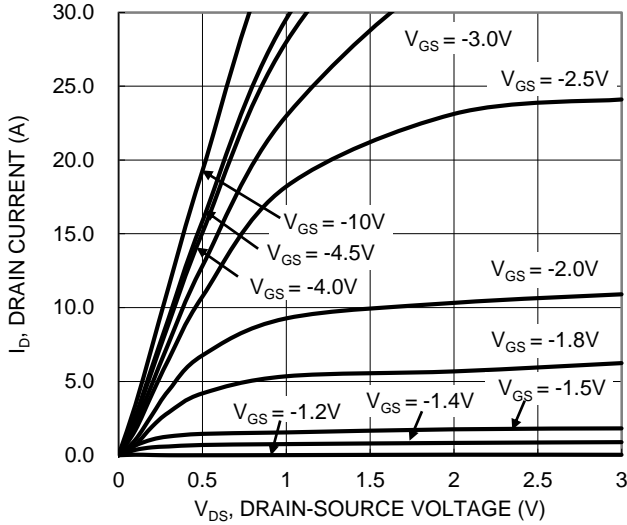


Figure 14. Typical Output Characteristic

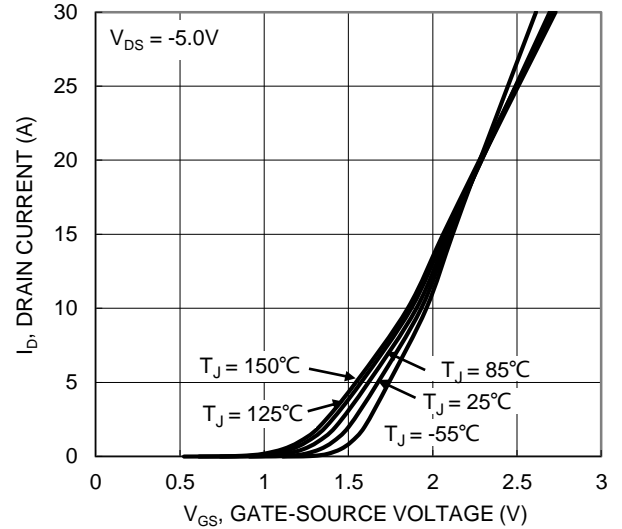


Figure 15. Typical Transfer Characteristic

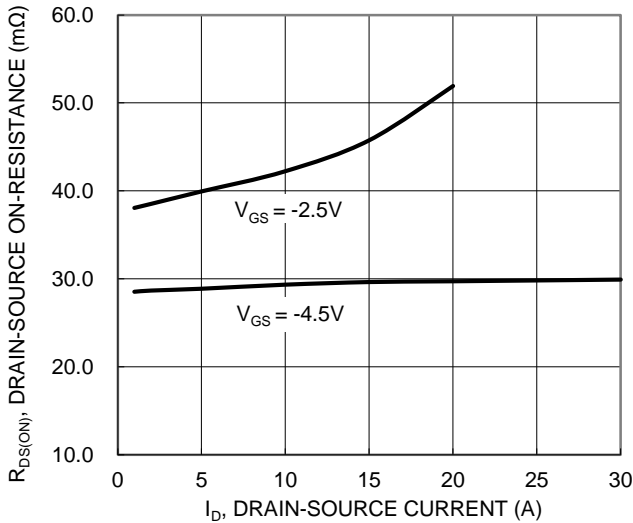


Figure 16. Typical On-Resistance vs. Drain Current and Gate Voltage

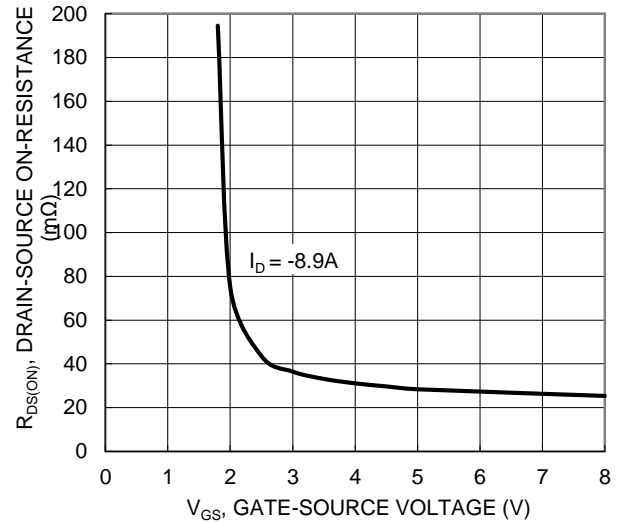


Figure 17. Typical Transfer Characteristic

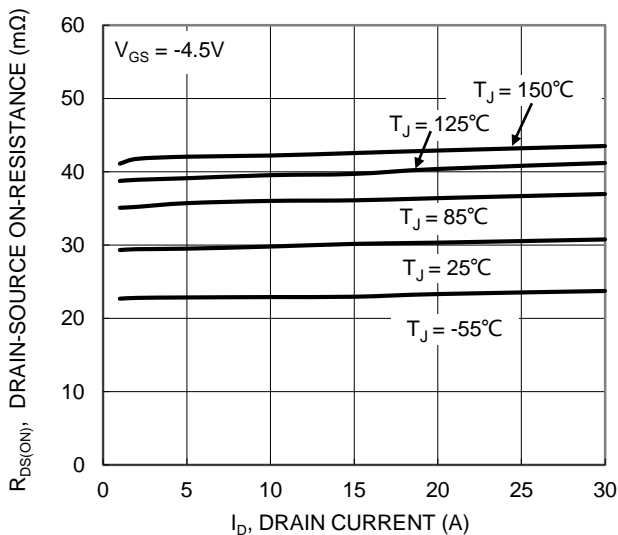


Figure 18. Typical On-Resistance vs. Drain Current and Temperature

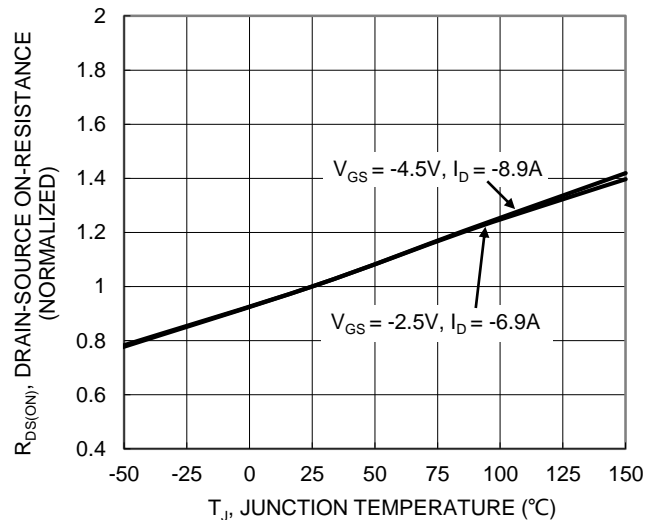


Figure 19. On-Resistance Variation with Junction Temperature

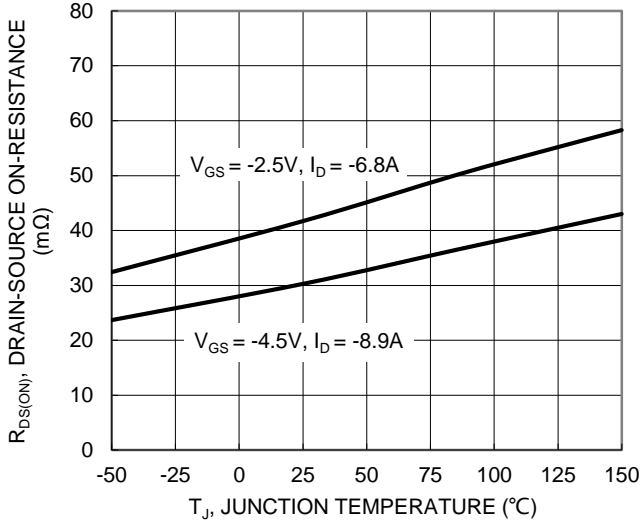


Figure 20. On-Resistance Variation with Temperature

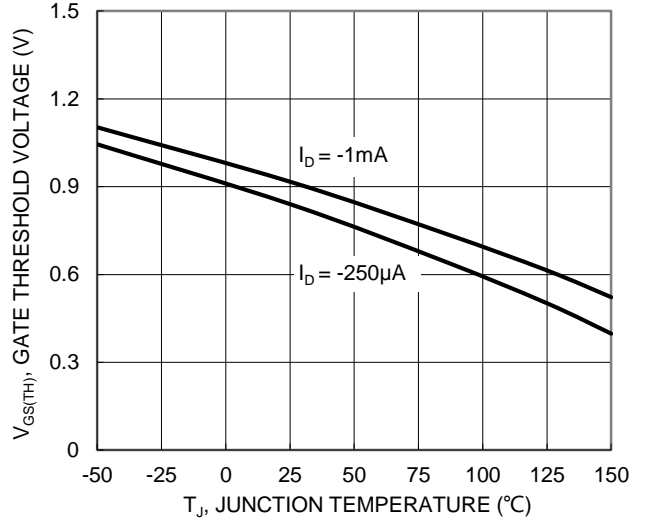


Figure 21. Gate Threshold Variation vs. Junction Temperature

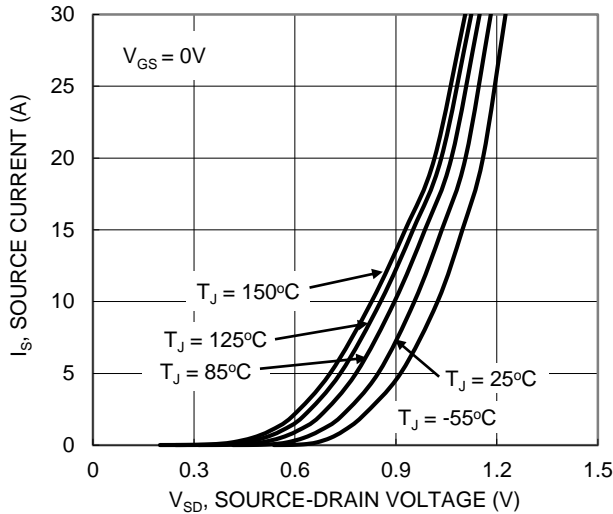


Figure 22. Diode Forward Voltage vs. Current

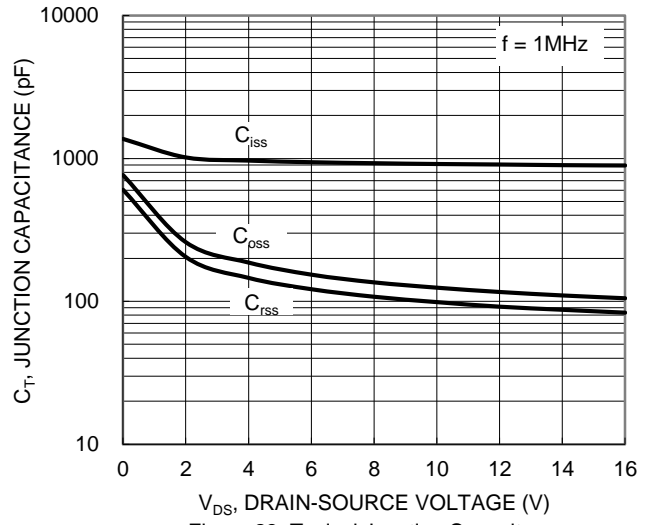


Figure 23. Typical Junction Capacitance

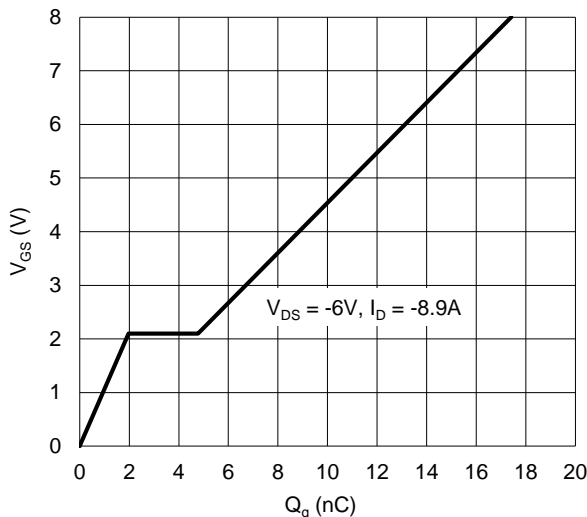


Figure 24. Gate Charge

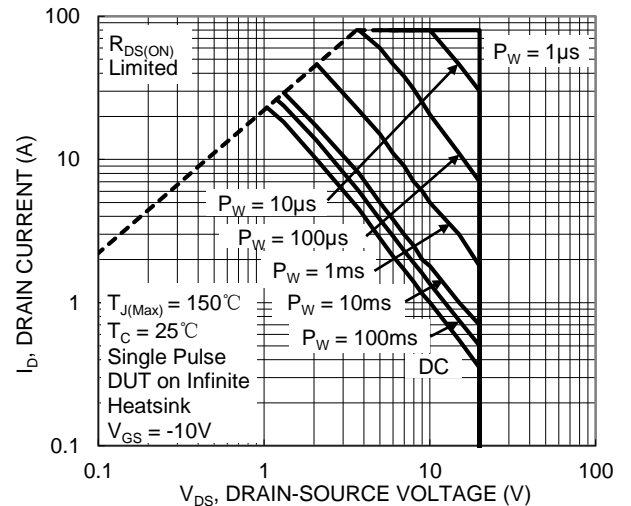
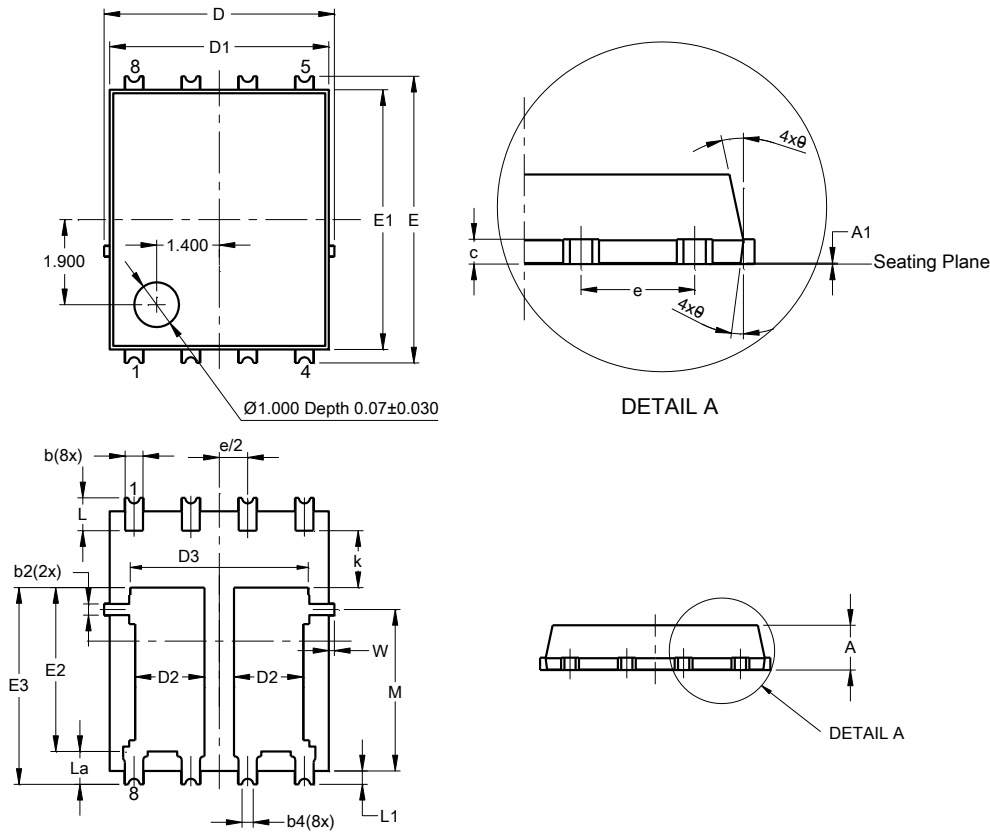


Figure 25. SOA, Safe Operation Area

**Package Outline Dimensions**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**PowerDI5060-8/SWP (Type UXD)**

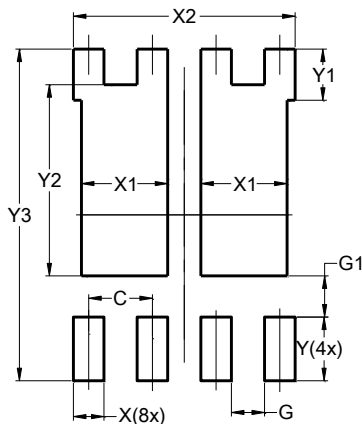


PowerDI5060-8/SWP (Type UXD)			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0.00	0.05	--
b	0.30	0.50	0.41
b2	0.20	0.35	0.25
b4	0.25REF		
c	0.230	0.330	0.277
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	1.46	1.66	1.55
D3	3.78	4.18	3.98
E	6.40 BSC		
E1	5.60	6.00	5.80
E2	3.46	3.86	3.66
E2a	4.195	4.595	4.395
e	1.27BSC		
k	1.05	--	--
L	0.635	0.835	0.735
La	0.635	0.835	0.735
L1	0.200	0.400	0.300
M	3.205	4.005	3.605
W	0.025	0.225	0.125
θ	10°	12°	11°
θ1	6°	8°	7°
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**PowerDI5060-8/SWP (Type UXD)**



Dimensions	Value (in mm)
C	1.270
G	0.660
G1	0.820
X	0.610
X1	1.720
X2	4.420
Y	1.270
Y1	1.020
Y2	3.810
Y3	6.610

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