

**COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET  
POWERDI**
**Product Summary**

Device	BV <sub>DSS</sub>	R <sub>DS(ON)</sub> max	I <sub>D</sub> max T <sub>A</sub> = +25°C
Q1	30V	16mΩ @ V <sub>GS</sub> = 10V	9.0A
		20mΩ @ V <sub>GS</sub> = 4.5V	8.0A
Q2	-30V	28mΩ @ V <sub>GS</sub> = -10V	-6.8A
		38mΩ @ V <sub>GS</sub> = -4.5V	-5.8A

**Description**

This new generation MOSFET is designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) and yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

**Applications**

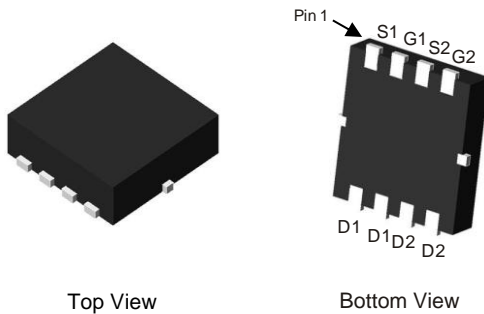
- Power Management Functions
- Analog Switch

**Features**

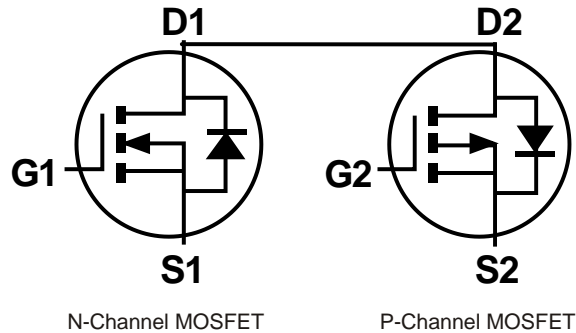
- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Complementary Pair MOSFET
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

**Mechanical Data**

- Case: POWERDI<sup>®</sup>3333-8 (Type UXB)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: Waiting Update
- Terminal: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 <sup>Ⓢ</sup>
- Weight: 0.072 grams (Approximate)

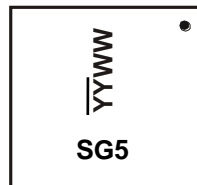
 POWERDI<sup>®</sup>3333-8 (Type UXB)


Equivalent Circuit


**Ordering Information** (Note 4)

Part Number	Case	Packaging
DMC3016LNS-7	POWERDI <sup>®</sup> 3333-8 (Type UXB)	2000/Tape & Reel
DMC3016LNS-13	POWERDI <sup>®</sup> 3333-8 (Type UXB)	3000/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**


SG5 = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last Two Digits of Year (ex: 16 for 2016)  
 WW = Week Code (01 to 53)

**Maximum Ratings Q1 N-CHANNEL** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V <sub>DSS</sub>	30	V
Gate-Source Voltage			V <sub>GSS</sub>	±20	V
Continuous Drain Current (Note 6) V <sub>GS</sub> = 10V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	9.0	A
		T <sub>A</sub> = +70°C		7.1	
Maximum Body Diode Forward Current (Note 6)			I <sub>S</sub>	2	A
Pulsed Drain Current (380µs pulse, Duty cycle = 1%)			I <sub>DM</sub>	55	A
Avalanche Current (L = 0.1mH) (Note 7)			I <sub>AS</sub>	22	A
Avalanche Energy (L = 0.1mH) (Note 7)			E <sub>AS</sub>	24	mJ

**Maximum Ratings Q2 P-CHANNEL** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V <sub>DSS</sub>	-30	V
Gate-Source Voltage			V <sub>GSS</sub>	±20	V
Continuous Drain Current (Note 6) V <sub>GS</sub> = -10V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	-6.8	A
		T <sub>A</sub> = +70°C		-5.7	
Maximum Body Diode Forward Current (Note 6)			I <sub>S</sub>	-2	A
Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)			I <sub>DM</sub>	-40	A
Avalanche Current (L = 0.1mH) (Note 7)			I <sub>AS</sub>	-22	A
Avalanche Energy (L = 0.1mH) (Note 7)			E <sub>AS</sub>	24	mJ

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T <sub>A</sub> = +25°C	P <sub>D</sub>	1.3	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R <sub>θJA</sub>	98	°C/W
Total Power Dissipation (Note 6)	T <sub>A</sub> = +25°C	P <sub>D</sub>	2.0	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	R <sub>θJA</sub>	65	°C/W
Thermal Resistance, Junction to Case (Note 6)		R <sub>θJC</sub>	12	°C/W
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	30	–	–	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
Zero Gate Voltage Drain Current T <sub>J</sub> = +25°C	I <sub>DSS</sub>	–	–	1	μA	V <sub>DS</sub> = 30V, 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 (Note 8)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	1.4	–	2.0	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	16	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 7A
			16	20		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 7A
Diode Forward Voltage	V <sub>SD</sub>	–	0.70	1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 1A
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iss</sub>	–	1184	–	pF	V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	–	137	–		
Reverse Transfer Capacitance	C <sub>rss</sub>	–	107	–		
Gate Resistance	R <sub>g</sub>	–	3.0	–	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>	–	9.5	–	nC	V <sub>DS</sub> = 15V, I <sub>D</sub> = 12A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	–	21	–		
Gate-Source Charge	Q <sub>gs</sub>	–	3.8	–		
Gate-Drain Charge	Q <sub>gd</sub>	–	4.1	–		
Turn-On Delay Time	t <sub>D(ON)</sub>	–	4.5	–	ns	V <sub>DD</sub> = 15V, V <sub>GS</sub> = 10V, R <sub>L</sub> = 1.5Ω, R <sub>G</sub> = 3Ω
Turn-On Rise Time	t <sub>R</sub>	–	3.3	–		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	–	14	–		
Turn-Off Fall Time	t <sub>F</sub>	–	3.6	–		
Reverse Recovery Time	t <sub>RR</sub>	–	9.3	–	ns	I <sub>F</sub> = 12A, di/dt = 500A/μs
Reverse Recovery Charge	Q <sub>RR</sub>	–	2.5	–	nC	

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-30	–	–	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA
Zero Gate Voltage Drain Current T <sub>J</sub> = +25°C	I <sub>DSS</sub>	–	–	-1	μA	V <sub>DS</sub> = -30V, 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 (Note 8)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	-1.2	–	-2.4	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	–	22	28	mΩ	V <sub>GS</sub> = -10V, I <sub>D</sub> = -7A
			32	38		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -6.2A
Diode Forward Voltage	V <sub>SD</sub>	–	-0.7	-1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -2.1A
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iss</sub>	–	1,188	–	pF	V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V, f = 1MHz
Output Capacitance	C <sub>oss</sub>	–	154	–		
Reverse Transfer Capacitance	C <sub>rss</sub>	–	116	–		
Gate Resistance	R <sub>G</sub>	–	9	–	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>	–	9.5	–	nC	V <sub>DS</sub> = -15V, I <sub>D</sub> = -7A
Total Gate Charge (V <sub>GS</sub> = -10V)	Q <sub>g</sub>	–	19.7	–		
Gate-Source Charge	Q <sub>gs</sub>	–	3.1	–		
Gate-Drain Charge	Q <sub>gd</sub>	–	3.2	–		
Turn-On Delay Time	t <sub>D(ON)</sub>	–	3.7	–	ns	V <sub>GS</sub> = -10V, V <sub>DS</sub> = -15V, R <sub>G</sub> = 6Ω, I <sub>D</sub> = -7A
Turn-On Rise Time	t <sub>R</sub>	–	2.6	–		
Turn-Off Delay Time	t <sub>D(OFF)</sub>	–	36	–		
Turn-Off Fall Time	t <sub>F</sub>	–	22	–		
Reverse Recovery Time	t <sub>RR</sub>	–	10.4	–	ns	I <sub>F</sub> = -7A, di/dt = 100A/μs
Reverse Recovery Charge	Q <sub>RR</sub>	–	3.2	–	nC	

- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 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.

**Typical Characteristics - N-CHANNEL**

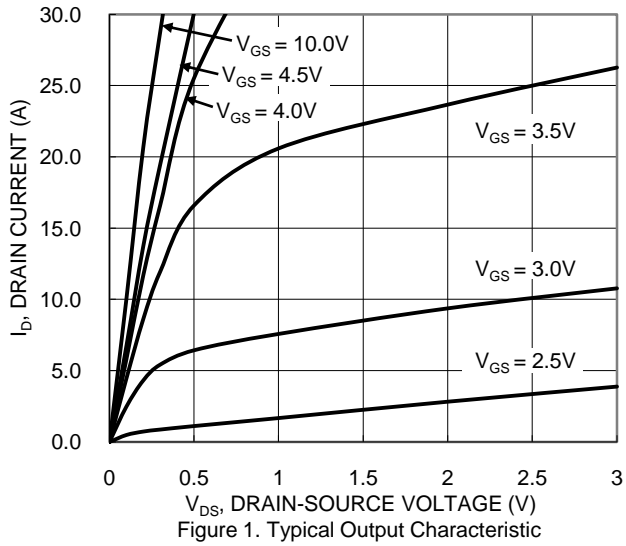


Figure 1. Typical Output Characteristic

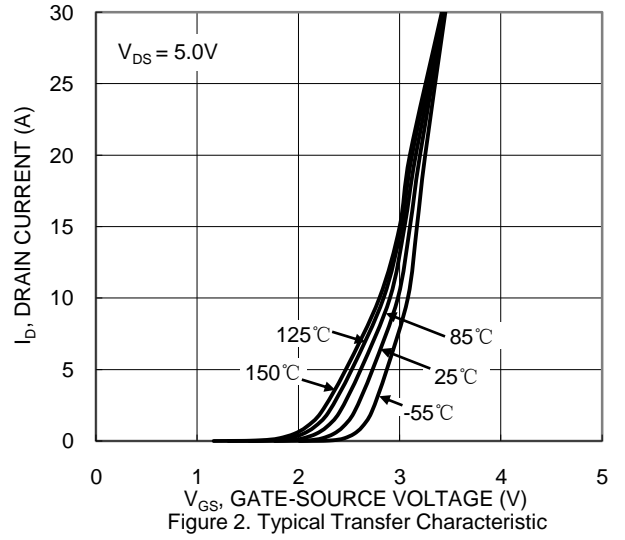


Figure 2. Typical Transfer Characteristic

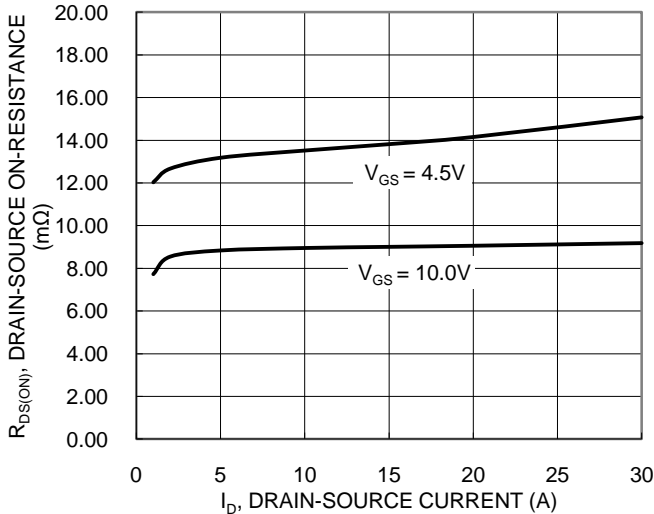


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

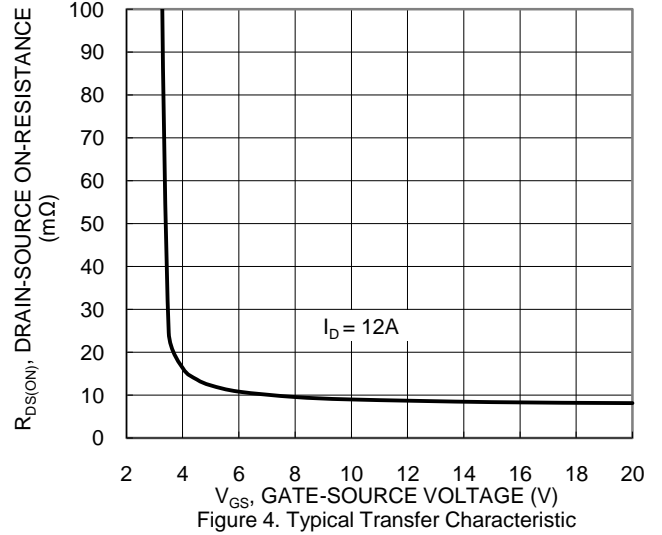


Figure 4. Typical Transfer Characteristic

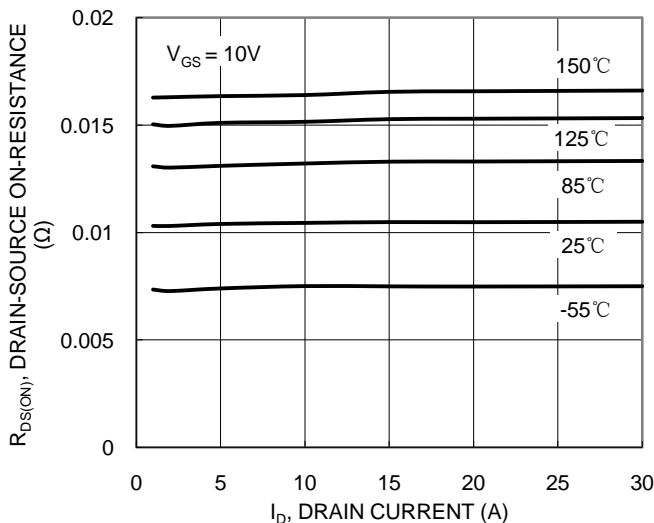


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

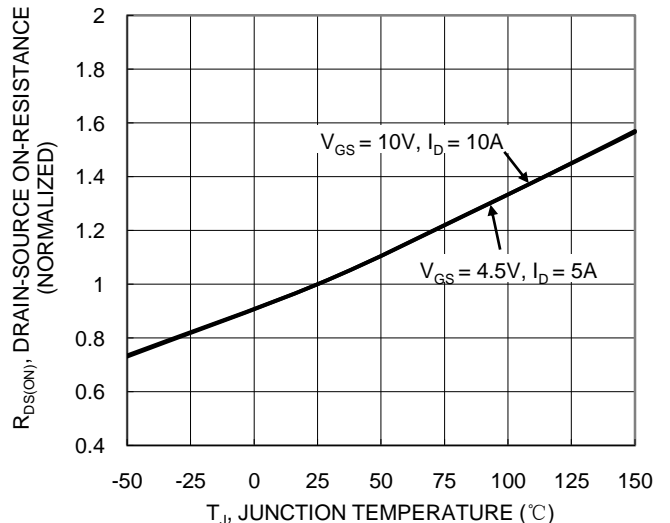


Figure 6. On-Resistance Variation with Temperature

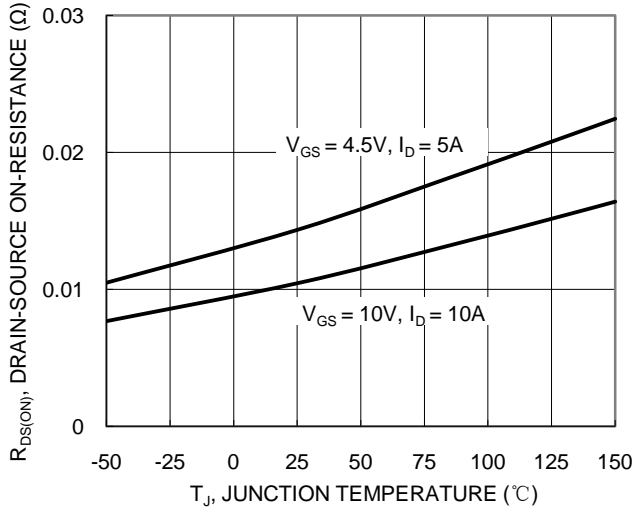


Figure 7. On-Resistance Variation with Temperature

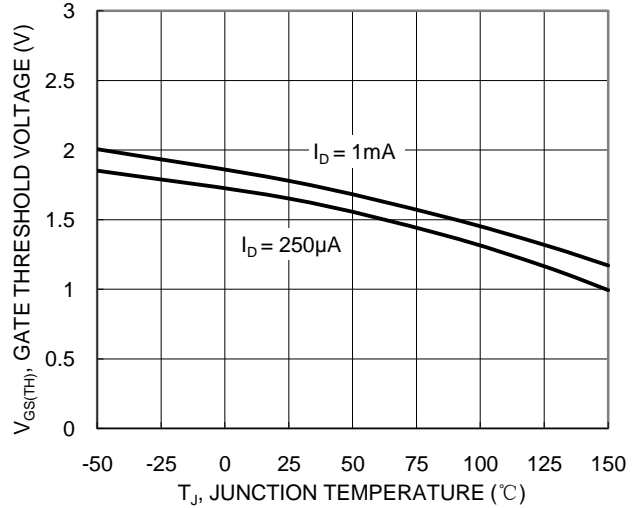


Figure 8. Gate Threshold Variation vs. Junction Temperature

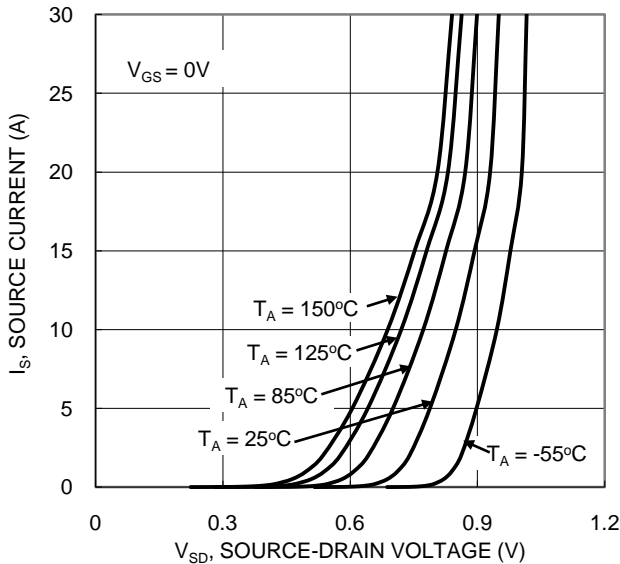


Figure 9. Diode Forward Voltage vs. Current

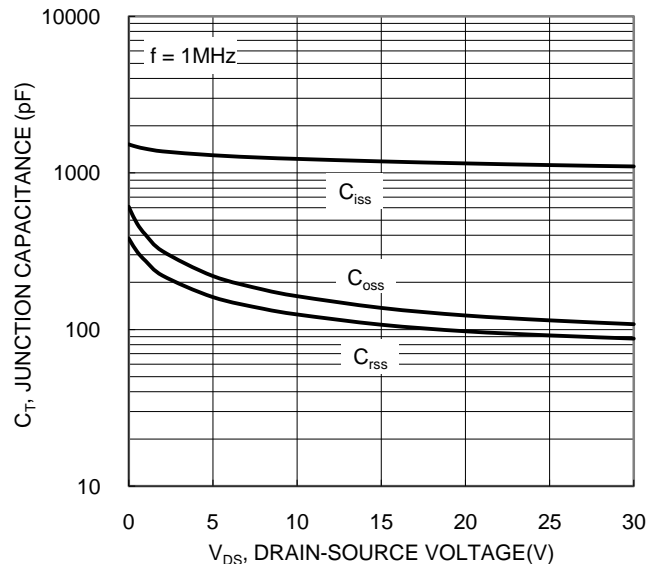


Figure 10. Typical Junction Capacitance

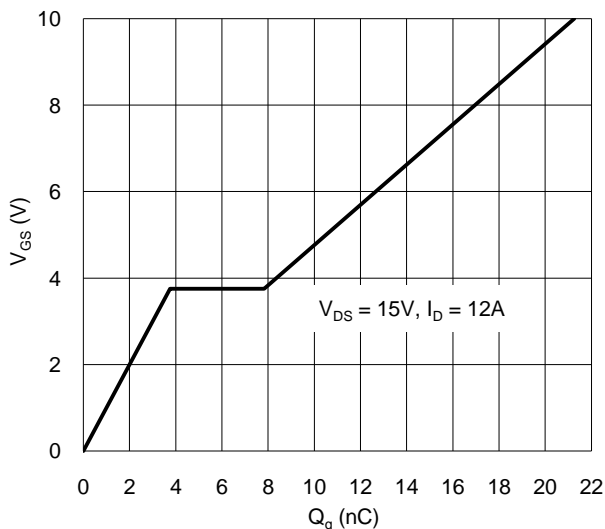


Figure 11. Gate Charge

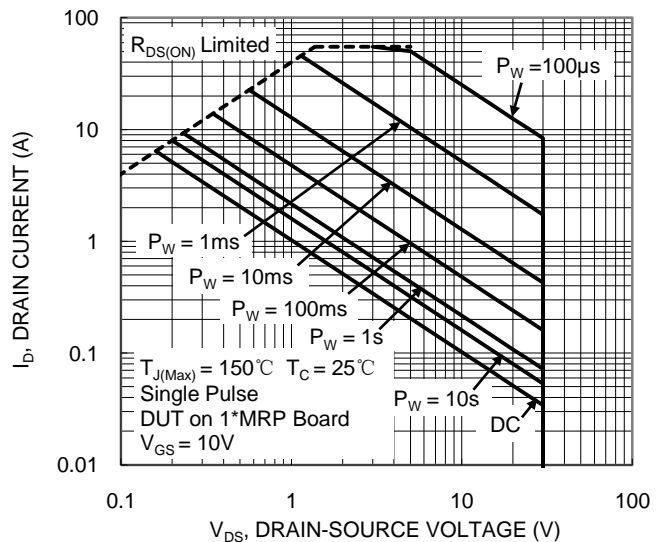


Figure 12. SOA, Safe Operation Area

**Typical Characteristics - P-CHANNEL**

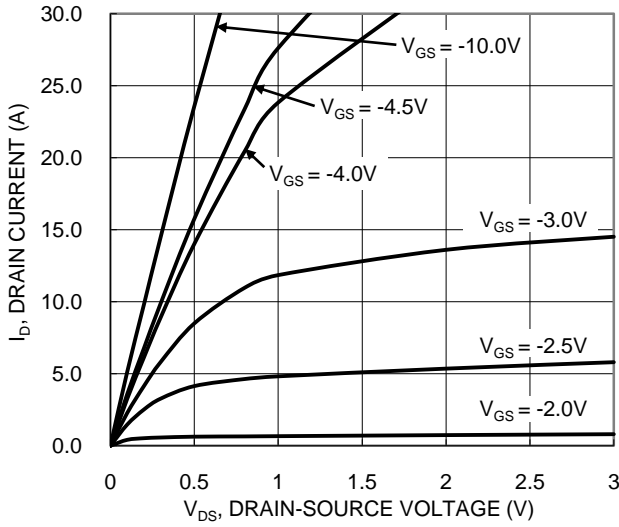


Figure 13. Typical Output Characteristic

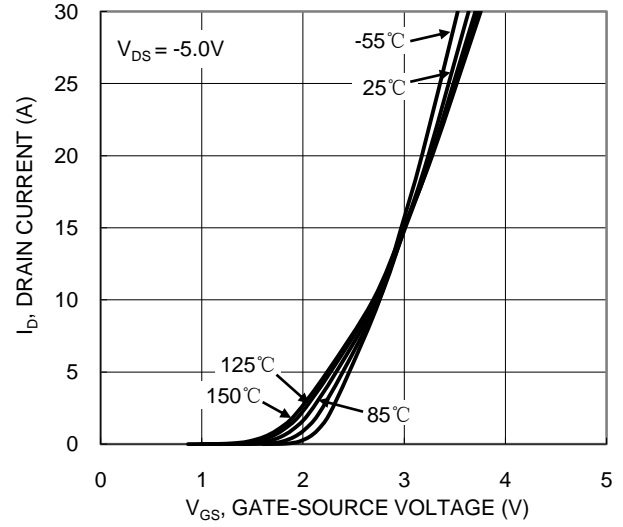


Figure 14. Typical Transfer Characteristic

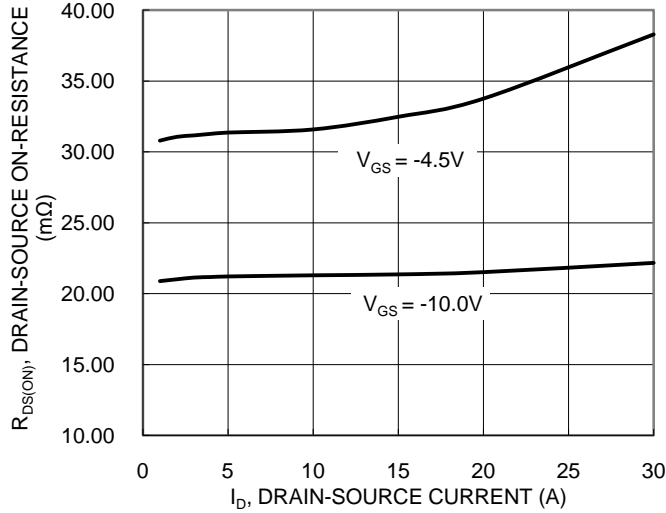


Figure 15. Typical On-Resistance vs. Drain Current and Gate Voltage

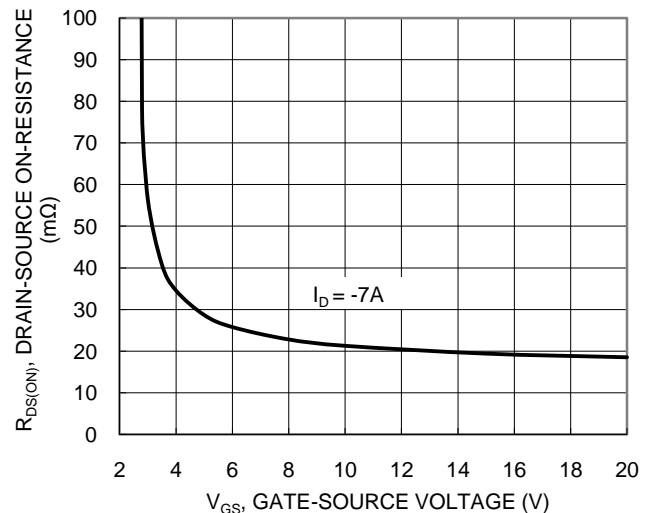


Figure 16. Typical Transfer Characteristic

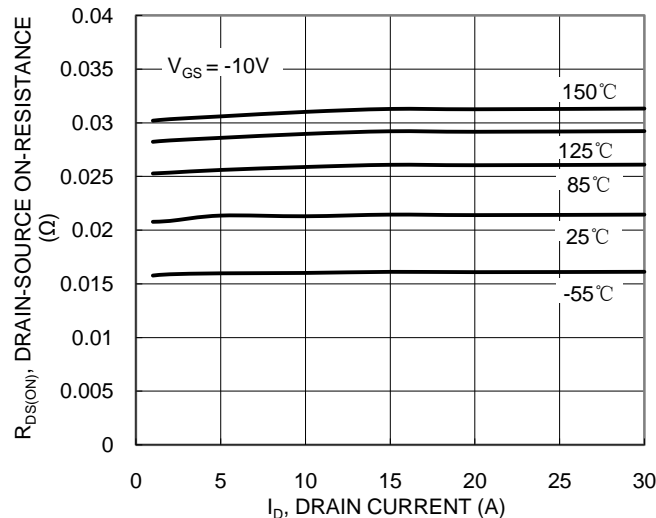


Figure 17. Typical On-Resistance vs. Drain Current and Temperature

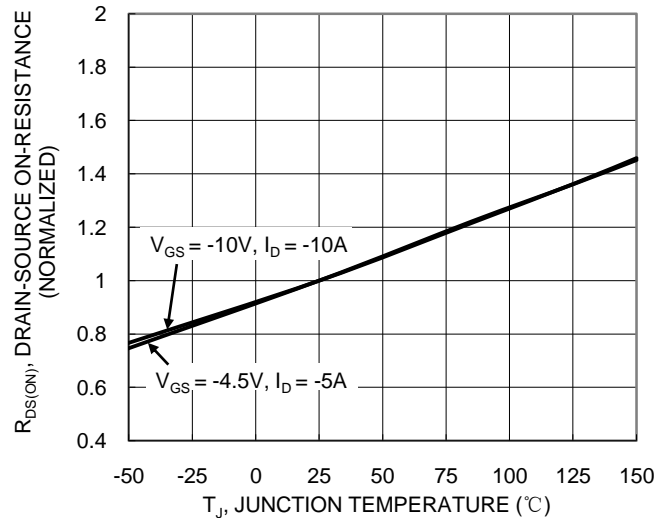


Figure 18. On-Resistance Variation with Temperature

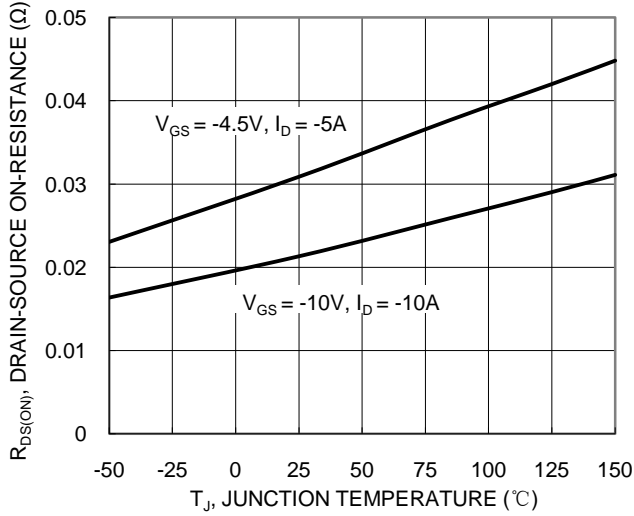


Figure 19. On-Resistance Variation with Temperature

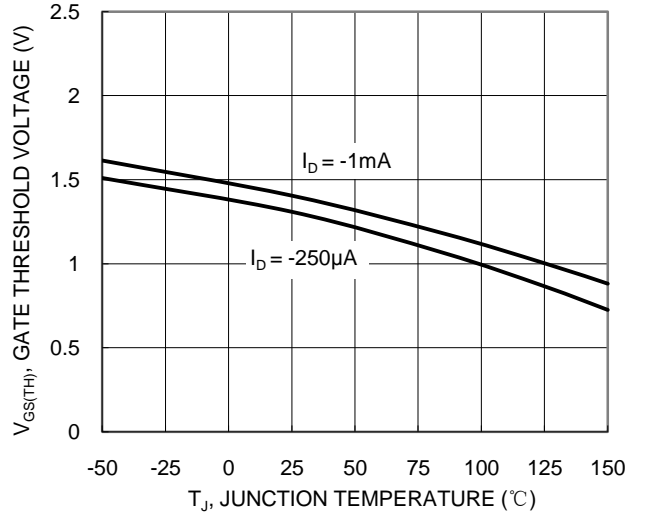


Figure 20. Gate Threshold Variation vs. Junction Temperature

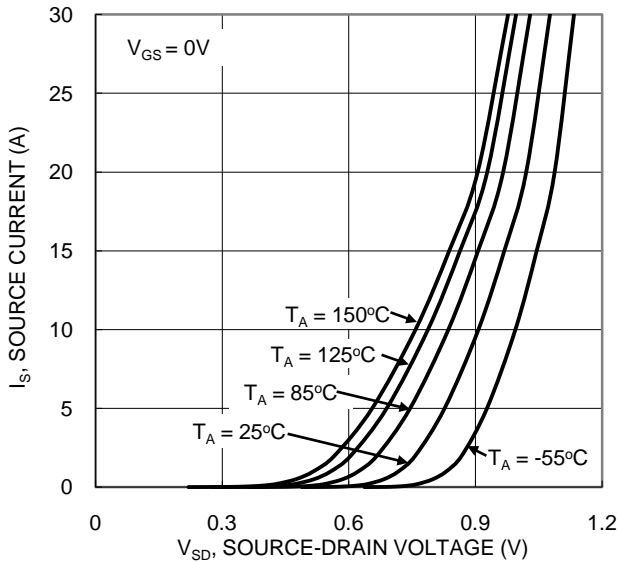


Figure 21. Diode Forward Voltage vs. Current

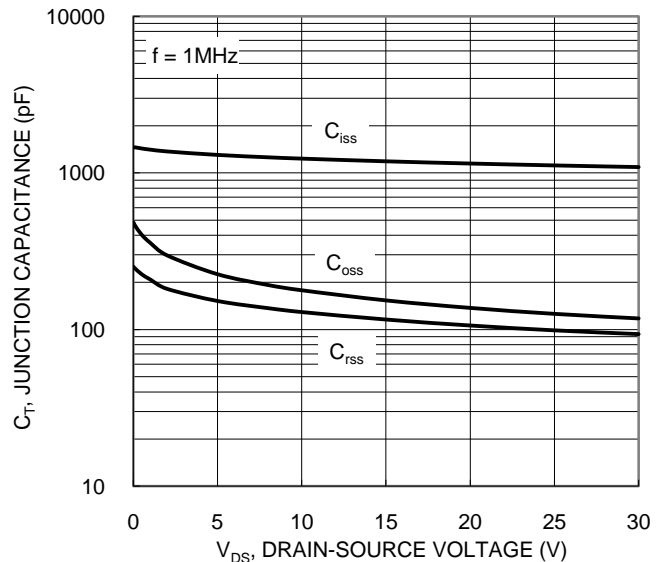


Figure 22. Typical Junction Capacitance

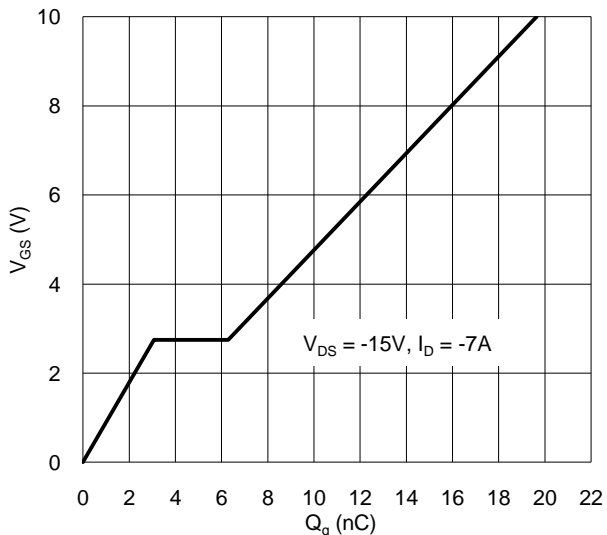


Figure 23. Gate Charge

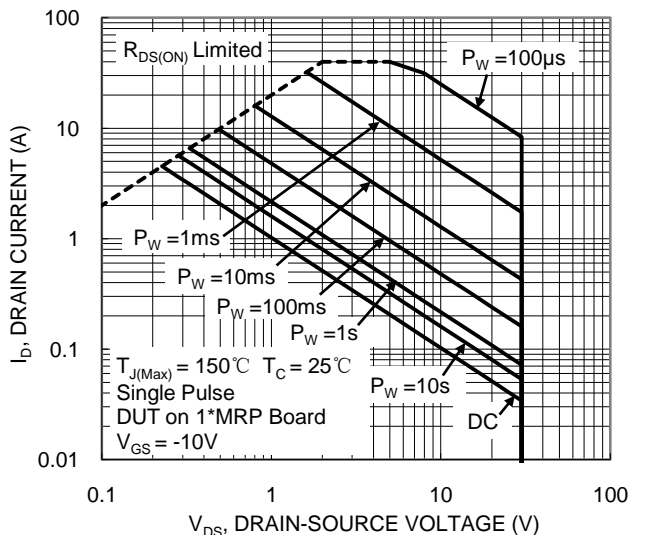


Figure 24. SOA, Safe Operation Area

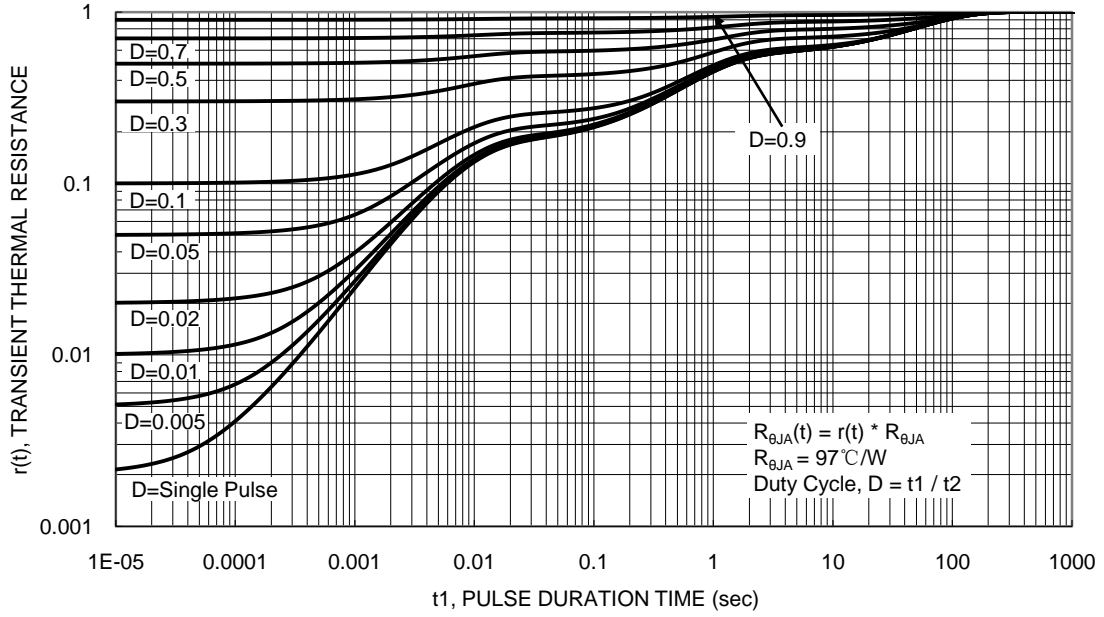


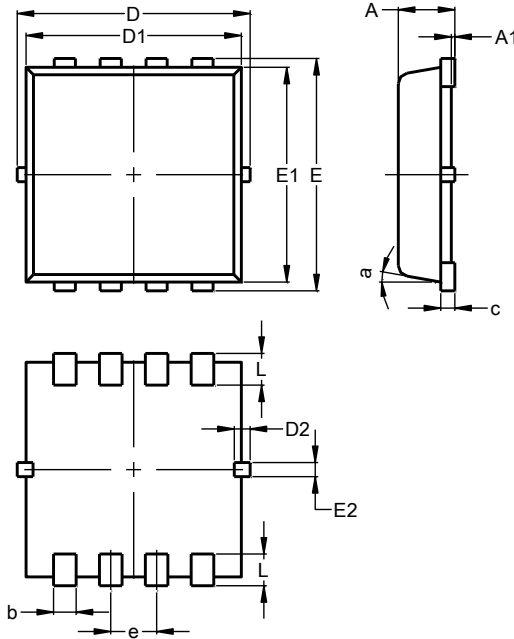
Figure 25. Transient Thermal Resistance



**Package Outline Dimensions**

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

**POWERDI<sup>®</sup>3333-8 (Type UXB)**

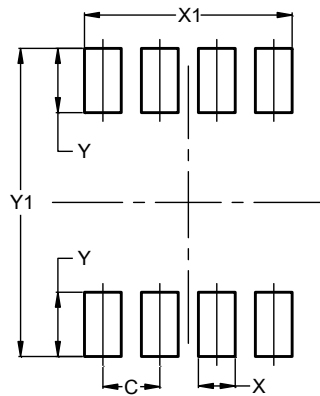


POWERDI <sup>®</sup> 3333-8 (Type UXB)			
Dim	Min	Max	Typ
A	0.75	0.85	0.80
A1	0.00	0.05	--
b	0.25	0.40	0.32
c	0.10	0.25	0.15
D	3.20	3.40	3.30
D1	2.95	3.15	3.05
D2	0.10	0.35	0.23
E	3.20	3.40	3.30
E1	2.95	3.15	3.05
E2	0.10	0.30	0.20
e	--	--	0.65
L	0.35	0.55	0.45
a	0°	12°	10°
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

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

**POWERDI<sup>®</sup>3333-8 (Type UXB)**



Dimensions	Value (in mm)
C	0.650
X	0.420
X1	2.370
Y	0.730
Y1	3.500

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2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

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