

COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET PowerDI

Product Summary

Device	$V_{(BR)DSS}$	$R_{DS(ON)}$ Max	I_D Max $T_C = +25^\circ C$
Q1	30V	12m Ω @ $V_{GS} = 10V$	21A
		17m Ω @ $V_{GS} = 4.5V$	18A
Q2	-30V	25m Ω @ $V_{GS} = -10V$	-15A
		38m Ω @ $V_{GS} = -4.5V$	-12A

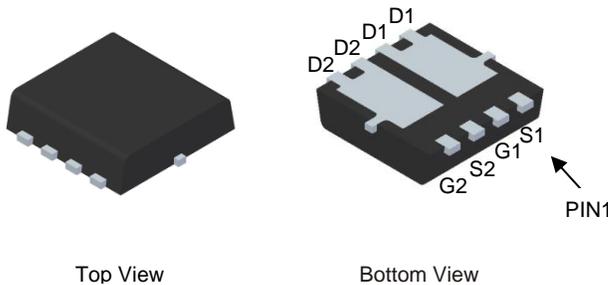
Description

This new generation 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

- Power Management Functions
- Analog Switch

PowerDI3333-8 (Type UXC)



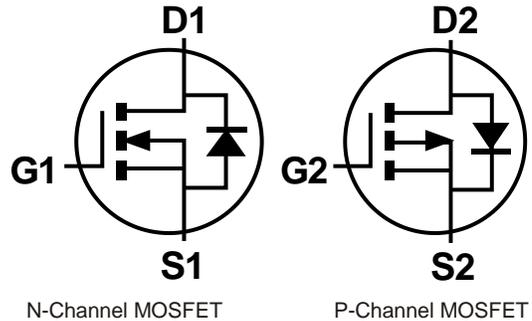
Features

- 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: PowerDI3333-8 (Type UXC)
- Case Material: Molded Plastic, "Green" Molding Compound.
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish — Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.072 grams (Approximate)

Equivalent Circuit

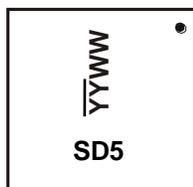


Ordering Information (Note 4)

Part Number	Case	Packaging
DMC3016LDV-7	PowerDI3333-8 (Type UXC)	2,000/Tape & Reel
DMC3016LDV-13	PowerDI3333-8 (Type UXC)	3,000/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 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



SD5 = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Last Digit of Year (ex: 16 for 2016)
 WW = Week Code (01 ~ 53)

Maximum Ratings Q1 – N-Channel (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V _{DSS}	30	V
Gate-Source Voltage			V _{GSS}	±20	V
Continuous Drain Current, V _{GS} = 10V (Note 7)	Steady State	T _C = +25°C	I _D	21	A
		T _C = +70°C		17	
Maximum Body Diode Forward Current (Note 6)			I _S	2	A
Pulsed Drain Current (380µs pulse, Duty cycle = 1%)			I _{DM}	70	A
Avalanche Current (L = 0.1mH) (Note 8)			I _{AS}	22	A
Avalanche Energy (L = 0.1mH) (Note 8)			E _{AS}	24	mJ

Maximum Ratings Q2 – P-Channel (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V _{DSS}	-30	V
Gate-Source Voltage			V _{GSS}	±20	V
Continuous Drain Current, V _{GS} = -10V (Note 7)	Steady State	T _C = +25°C	I _D	-15	A
		T _C = +70°C		-12	
Maximum Body Diode Forward Current (Note 6)			I _S	-2	A
Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)			I _{DM}	-40	A
Avalanche Current (L = 0.1mH) (Note 8)			I _{AS}	-22	A
Avalanche Energy (L = 0.1mH) (Note 8)			E _{AS}	24	mJ

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)		P _D	0.9	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R _{θJA}	136	°C/W
	t < 10s		78	
Total Power Dissipation (Note 6)		P _D	1.8	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	R _{θJA}	70	°C/W
	t < 10s		41	
Thermal Resistance, Junction to Case (Note 7)		R _{θJC}	15	
Operating and Storage Temperature Range		T _J , T _{STG}	-55 to +150	°C

- Notes:
5. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
 6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.
 7. Thermal resistance from junction to soldering point (on the exposed drain pad).
 8. I_{AS} and E_{AS} rating are based on low frequency and duty cycles to keep T_J = +25°C.

Electrical Characteristics Q1 – N-Channel (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 9)						
Drain-Source Breakdown Voltage	BV _{DSS}	30	—	—	V	V _{GS} = 0V, I _D = 250μA
Zero Gate Voltage Drain Current T _J = +25°C	I _{DSS}	—	—	1	μA	V _{DS} = 30V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	V _{GS(TH)}	1.4	—	2.0	V	V _{DS} = V _{GS} , I _D = 250μA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	9.5	12	mΩ	V _{GS} = 10V, I _D = 7A
			14	17		V _{GS} = 4.5V, I _D = 7A
Diode Forward Voltage	V _{SD}	—	0.70	1.0	V	V _{GS} = 0V, I _S = 1A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C _{ISS}	—	1,184	—	pF	V _{DS} = 15V, V _{GS} = 0V, f = 1.0MHz
Output Capacitance	C _{OSS}	—	137	—		
Reverse Transfer Capacitance	C _{RSS}	—	107	—		
Gate Resistance	R _G	—	3.0	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1.0MHz
Total Gate Charge (V _{GS} = 4.5V)	Q _G	—	9.5	—	nC	V _{DS} = 15V, I _D = 12A
Total Gate Charge (V _{GS} = 10V)	Q _G	—	21	—		
Gate-Source Charge	Q _{GS}	—	3.8	—		
Gate-Drain Charge	Q _{GD}	—	4.1	—		
Turn-On Delay Time	t _{D(ON)}	—	4.5	—	ns	V _{DD} = 15V, V _{GS} = 10V, R _L = 1.5Ω, R _G = 3Ω
Turn-On Rise Time	t _R	—	3.3	—		
Turn-Off Delay Time	t _{D(OFF)}	—	14	—		
Turn-Off Fall Time	t _F	—	3.6	—		
Reverse Recovery Time	t _{RR}	—	9.3	—	ns	I _F = 12A, di/dt = 500A/μs
Reverse Recovery Charge	Q _{RR}	—	2.5	—	nC	

Electrical Characteristics Q2 – P-Channel (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 9)						
Drain-Source Breakdown Voltage	BV _{DSS}	-30	—	—	V	V _{GS} = 0V, I _D = -250μA
Zero Gate Voltage Drain Current T _J = +25°C	I _{DSS}	—	—	-1	μA	V _{DS} = -30V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	V _{GS(TH)}	-1.2	—	-2.4	V	V _{DS} = V _{GS} , I _D = -250μA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	21	25	mΩ	V _{GS} = -10V, I _D = -7A
			31	38		V _{GS} = -4.5V, I _D = -6.2A
Diode Forward Voltage	V _{SD}	—	-0.7	-1.2	V	V _{GS} = 0V, I _S = -2.1A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C _{ISS}	—	1,188	—	pF	V _{DS} = -15V, V _{GS} = 0V, f = 1MHz
Output Capacitance	C _{OSS}	—	154	—		
Reverse Transfer Capacitance	C _{RSS}	—	116	—		
Gate Resistance	R _G	—	9	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = -4.5V)	Q _G	—	9.5	—	nC	V _{DS} = -15V, I _D = -7A
Total Gate Charge (V _{GS} = -10V)	Q _G	—	19.7	—		
Gate-Source Charge	Q _{GS}	—	3.1	—		
Gate-Drain Charge	Q _{GD}	—	3.2	—		
Turn-On Delay Time	t _{D(ON)}	—	3.7	—	ns	V _{GS} = -10V, V _{DS} = -15V, R _G = 6Ω, I _D = -7A
Turn-On Rise Time	t _R	—	2.6	—		
Turn-Off Delay Time	t _{D(OFF)}	—	36	—		
Turn-Off Fall Time	t _F	—	22	—		
Reverse Recovery Time	t _{RR}	—	10.4	—	ns	I _F = -7A, di/dt = 100A/μs
Reverse Recovery Charge	Q _{RR}	—	3.2	—	nC	

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

Q1 – N-Channel

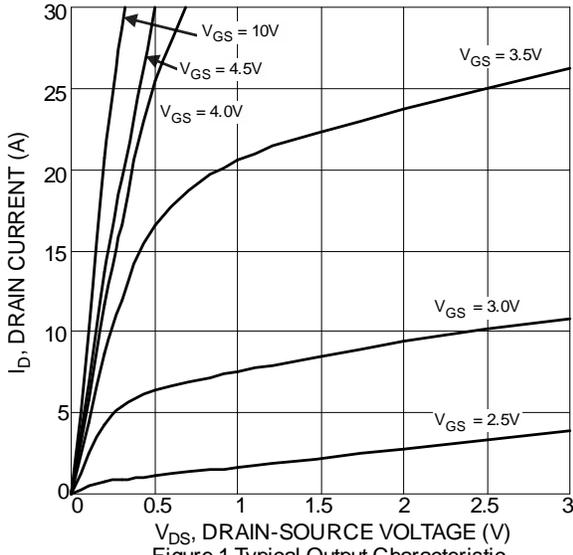


Figure 1 Typical Output Characteristic

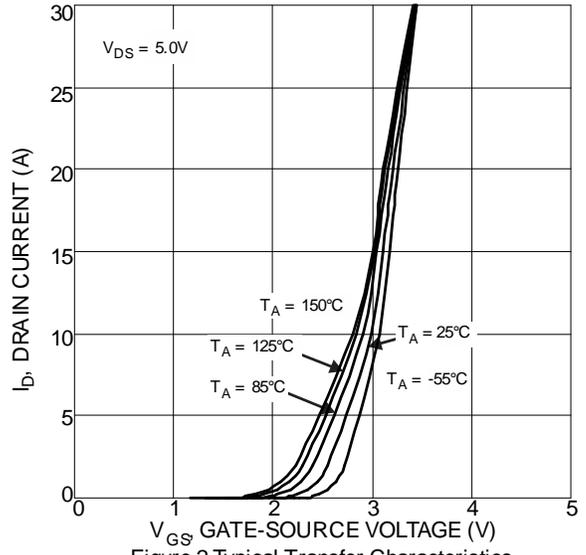


Figure 2 Typical Transfer Characteristics

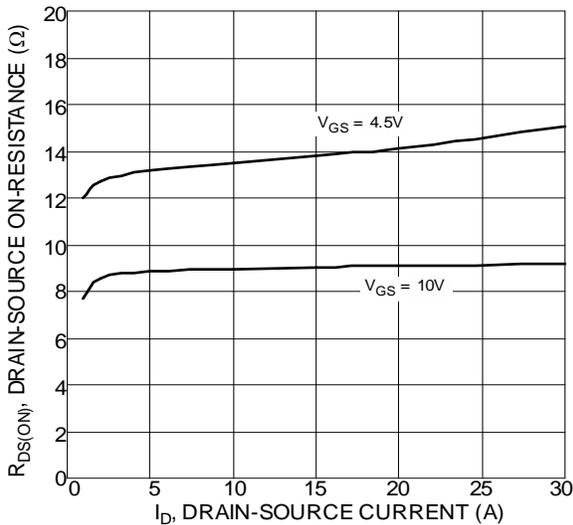


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

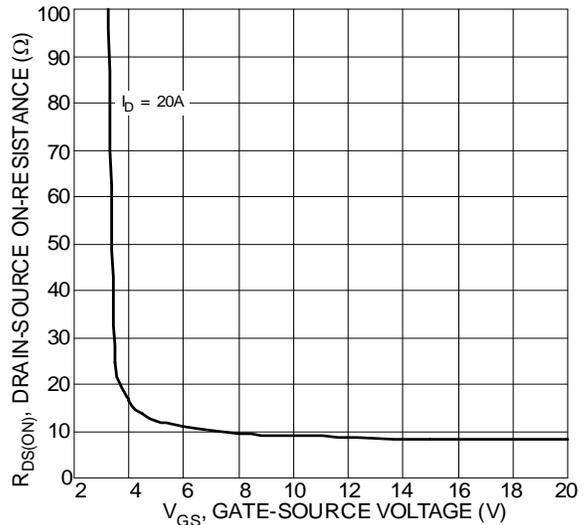


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

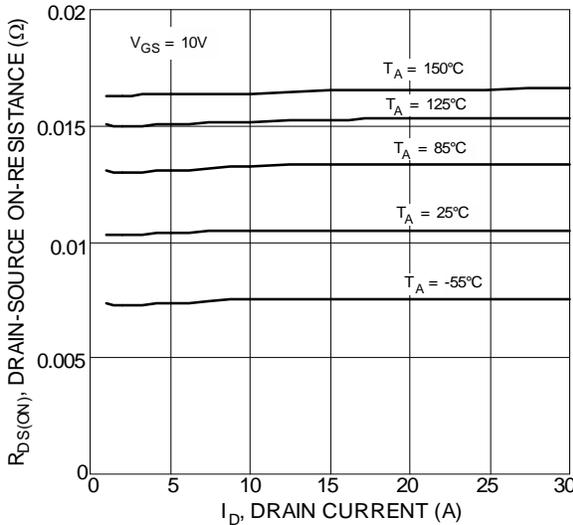


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

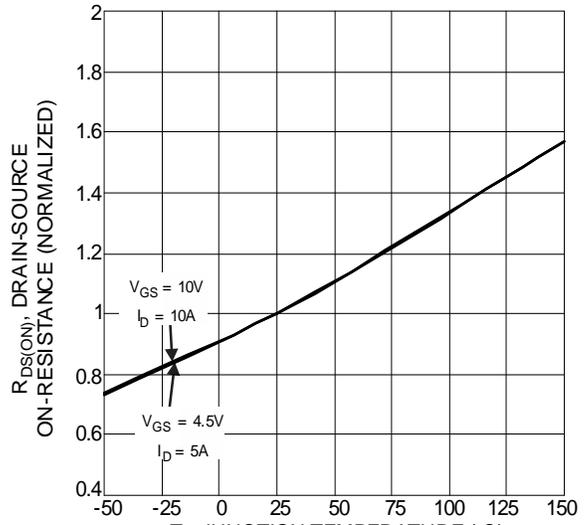


Figure 6 On-Resistance Variation with Temperature

Q1 – N-Channel (Continued)

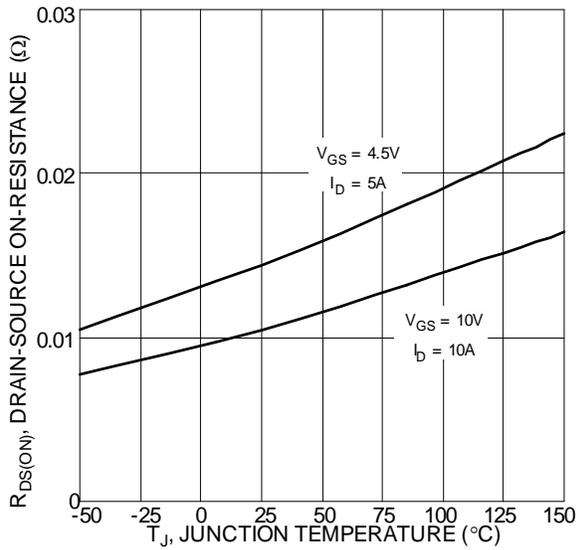


Figure 7 On-Resistance Variation with Temperature

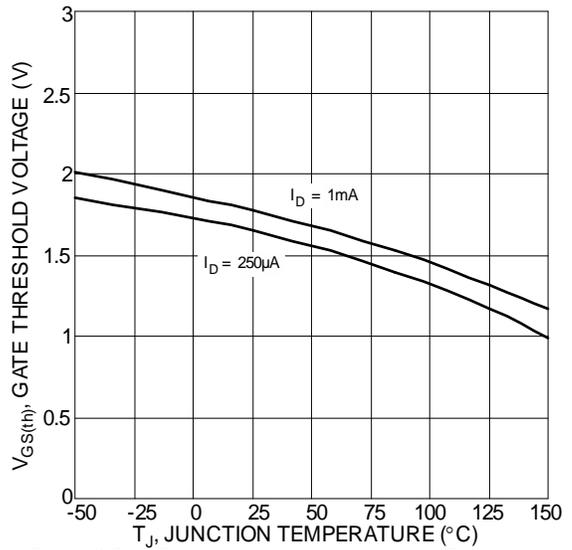


Figure 8 Gate Threshold Variation vs. Ambient Temperature

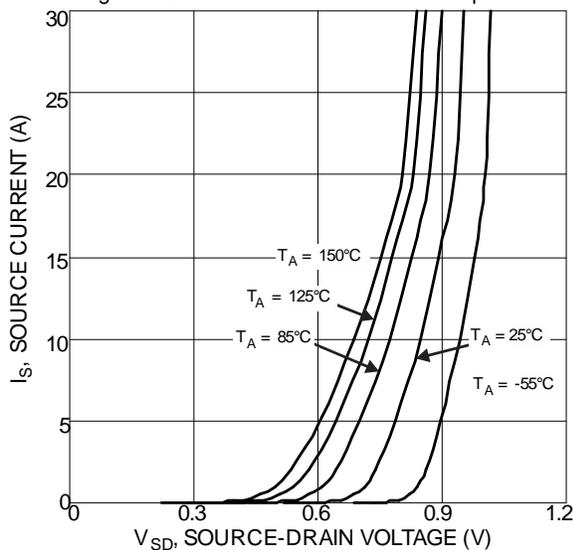


Figure 9 Diode Forward Voltage vs. Current

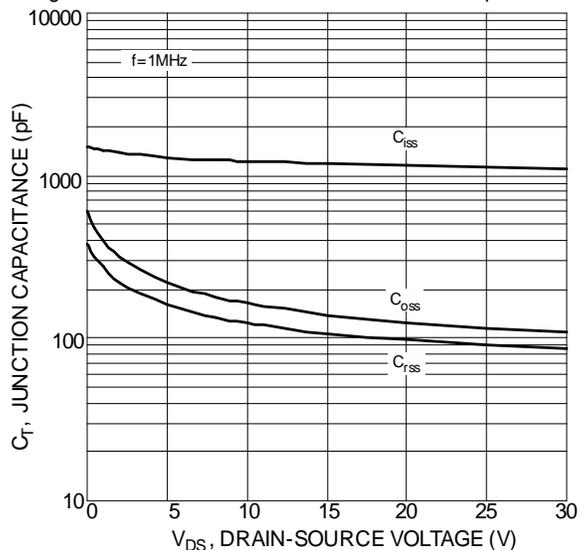


Figure 10 Typical Junction Capacitance

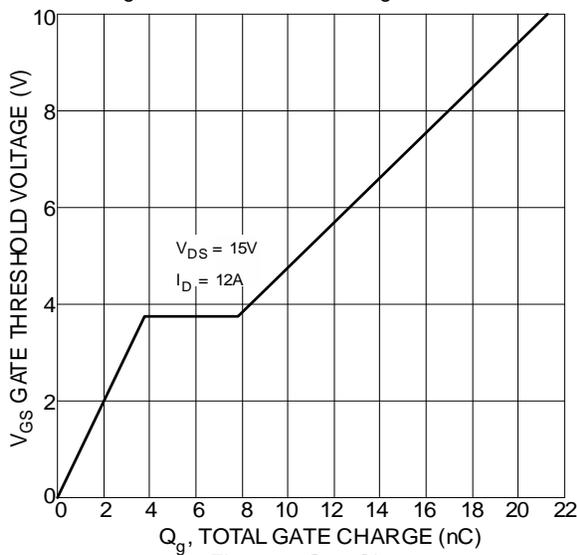


Figure 11 Gate Charge

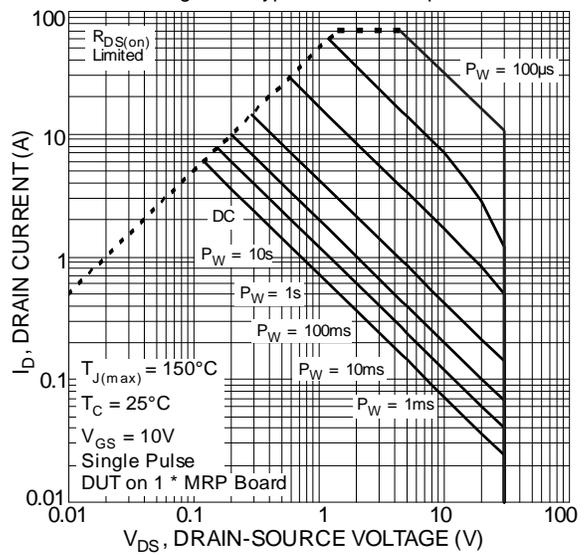


Figure 12 SOA, Safe Operation Area

Q2 – P-Channel

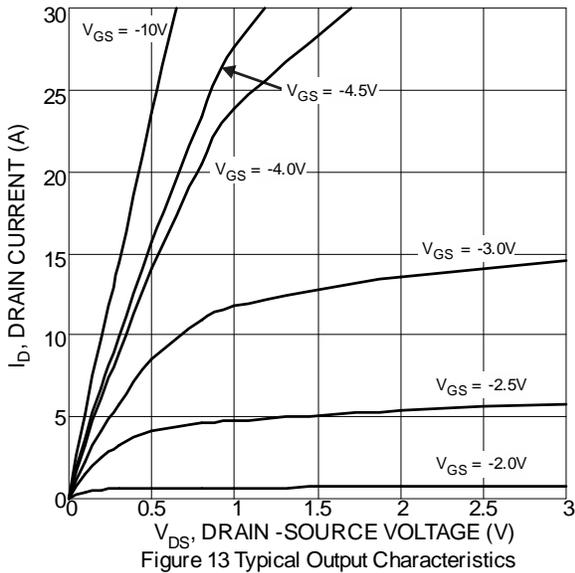


Figure 13 Typical Output Characteristics

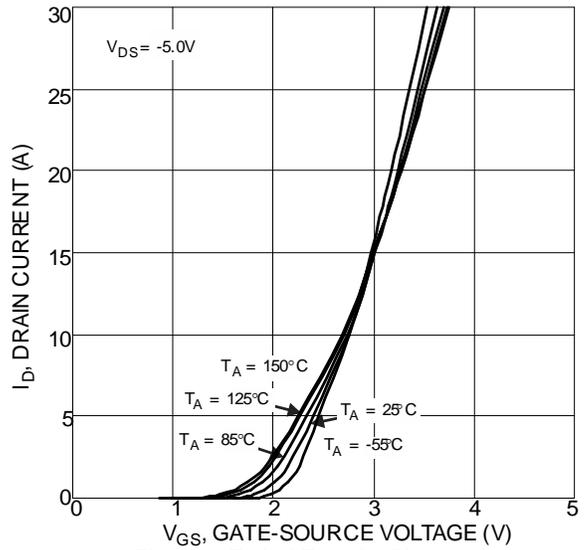


Figure 14 Typical Transfer Characteristics

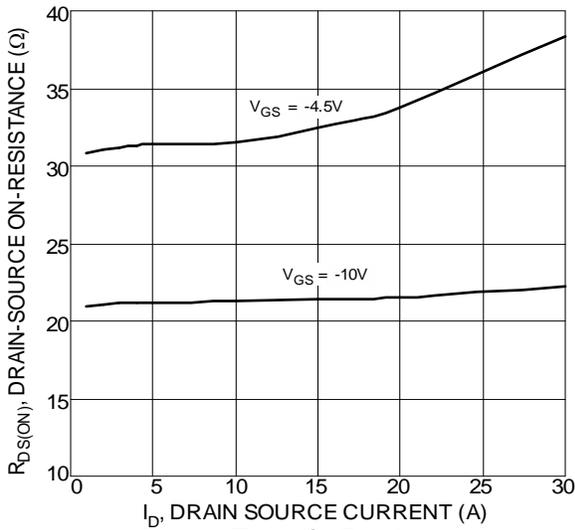


Figure 15 Typical On-Resistance vs. Drain Current and Gate Voltage

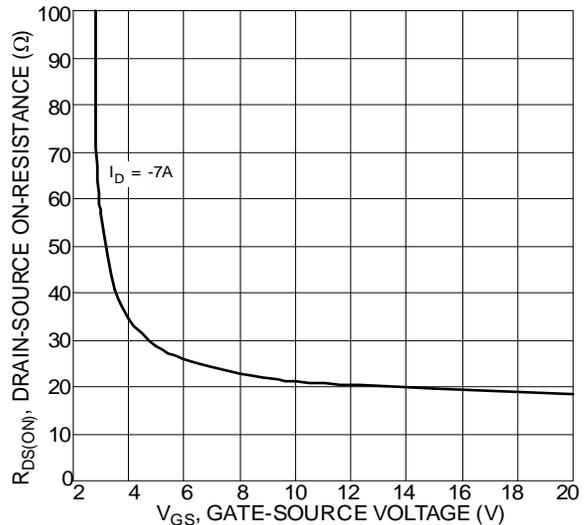


Figure 16 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

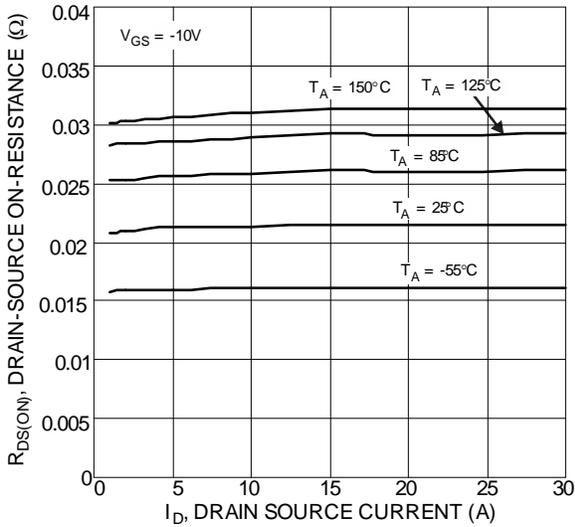


Figure 17 Typical On-Resistance vs. Drain Current and Temperature

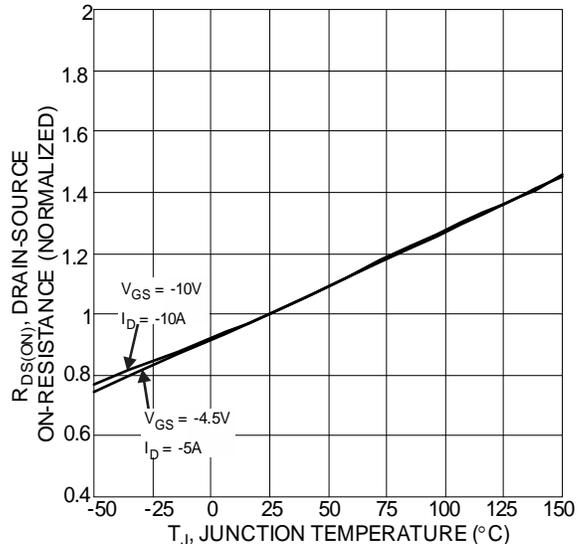


Figure 18 On-Resistance Variation with Temperature

Q2 – P-Channel (Continued)

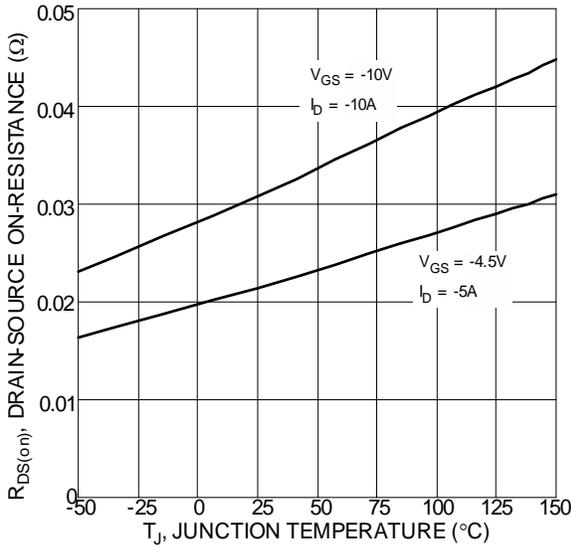


Figure 19 On-Resistance Variation with Temperature

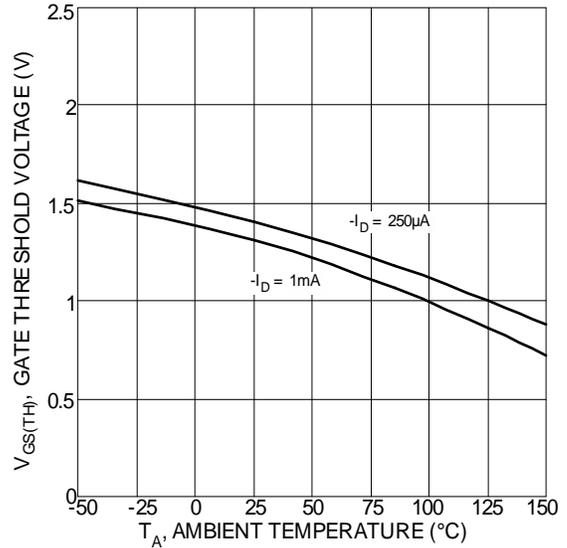


Figure 20 Gate Threshold Variation vs. Ambient Temperature

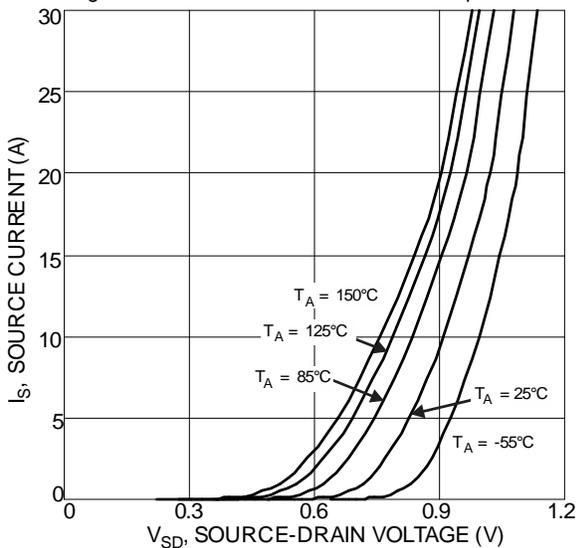


Figure 21 Diode Forward Voltage vs. Current

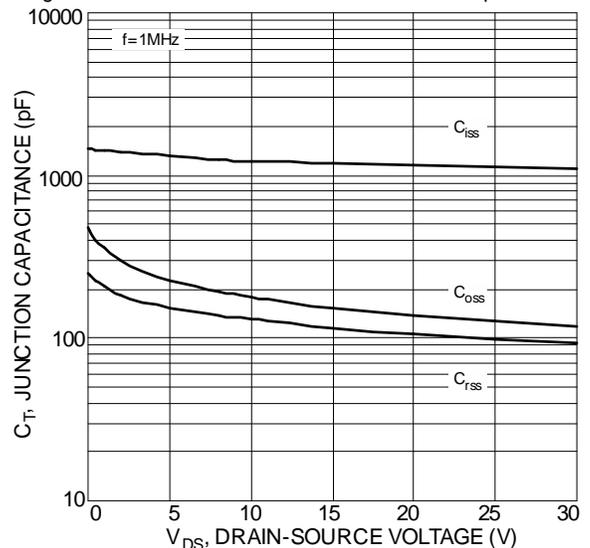


Figure 22 Typical Junction Capacitance

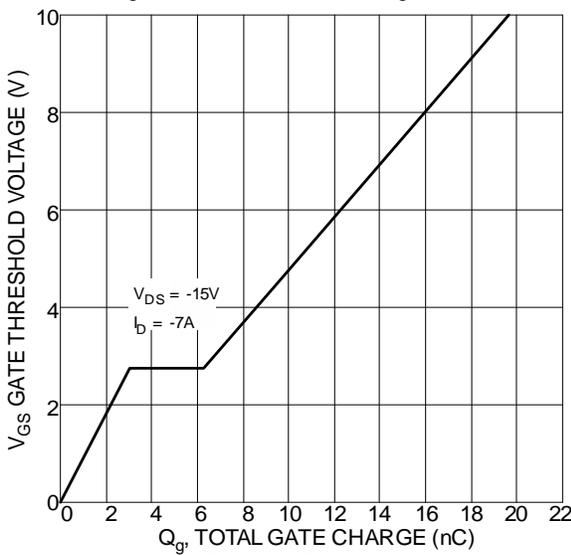


Figure 23 Gate Charge

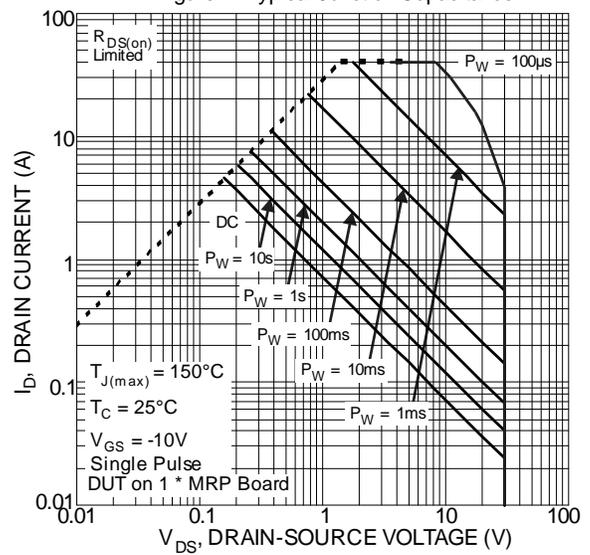
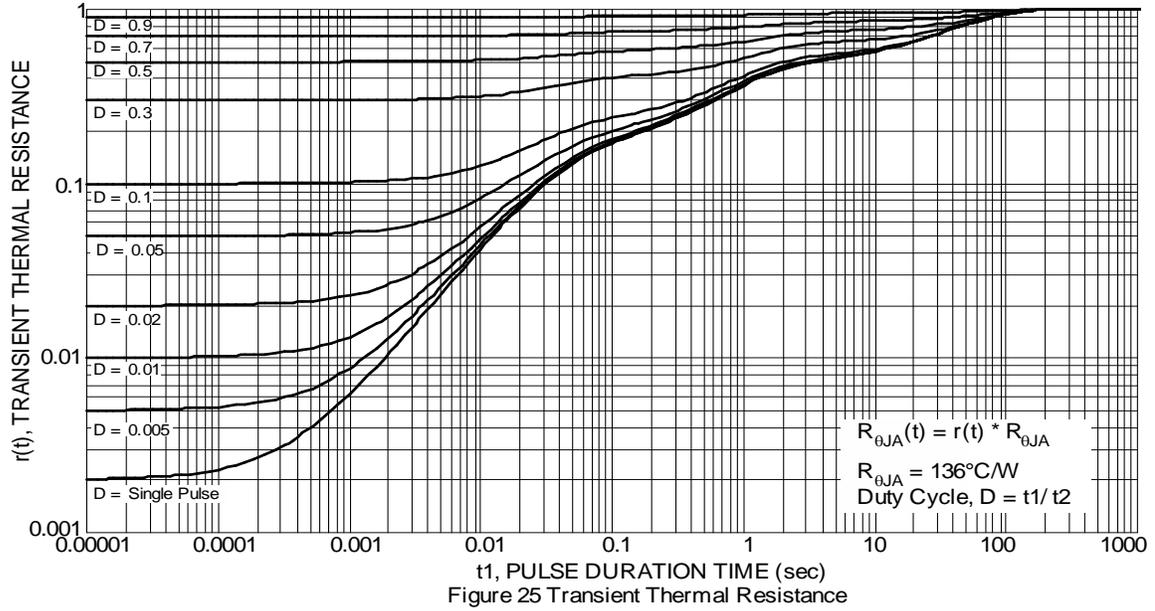


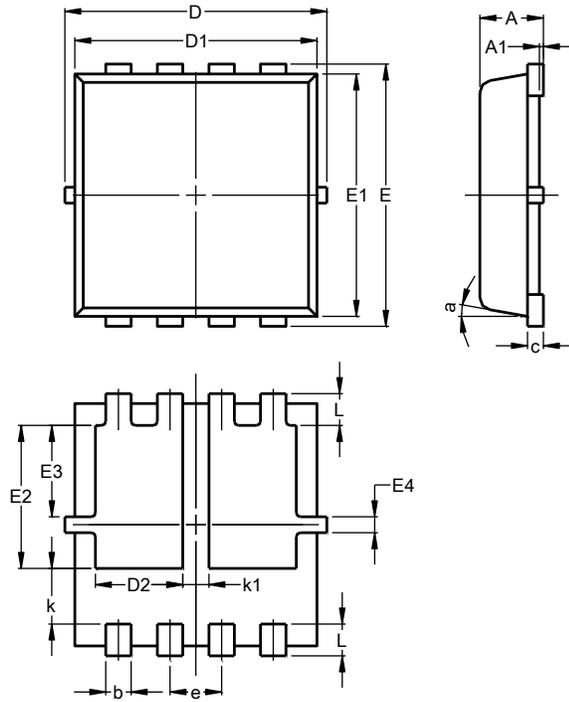
Figure 24 SOA, Safe Operation Area



Package Outline Dimensions

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

PowerDI3333-8 (Type UXC)

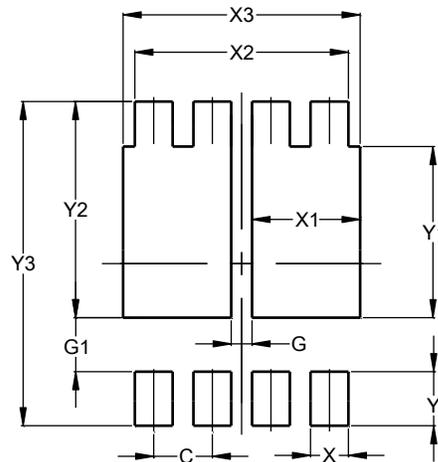


PowerDI3333-8 (Type UXC)			
Dim	Min	Max	Typ
A	0.75	0.85	0.80
A1	0.00	0.05	--
b	0.25	0.40	0.32
c	0.10	0.25	0.15
D	3.20	3.40	3.30
D1	2.95	3.15	3.05
D2	0.90	1.30	1.10
E	3.20	3.40	3.30
E1	2.95	3.15	3.05
E2	1.60	2.00	1.80
E3	0.95	1.35	1.15
E4	0.10	0.30	0.20
e	--	--	0.65
L	0.30	0.50	0.40
k	0.50	0.90	0.70
k1	0.13	0.53	0.33
a	0°	12°	10°
All Dimensions in mm			

Suggested Pad Layout

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

PowerDI3333-8 (Type UXC)



Dimensions	Value (in mm)
C	0.650
G	0.230
G1	0.600
X	0.420
X1	1.200
X2	2.370
X3	2.630
Y	0.600
Y1	1.900
Y2	2.400
Y3	3.600

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