优尚

YOUSHANG SEMICONDUCTOR

设计研发新型功率器件

各类小信号开关

中低压及高压大电流等场效应管

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Product Summary

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

Features

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Complementary Pair MOSFET

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.

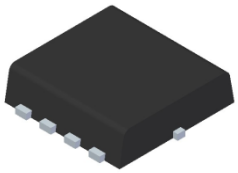
Applications

- Power Management Functions
- Analog Switch

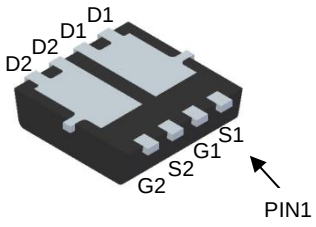
Mechanical Data

- 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)

PowerDI3333-8 (Type UXC)

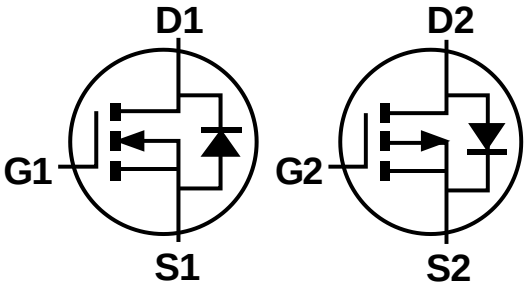


Top View



Bottom View

Equivalent Circuit



N-Channel MOSFET P-Channel MOSFET

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 T_C = +70°C	I_D	21 17	A
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 T_C = +70°C	I_D	-15 -12	A
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	$R_{\theta JA}$	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	$R_{\theta JA}$	70	°C/W
	t<10s		41	
Thermal Resistance, Junction to Case (Note 7)		$R_{\theta JC}$	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

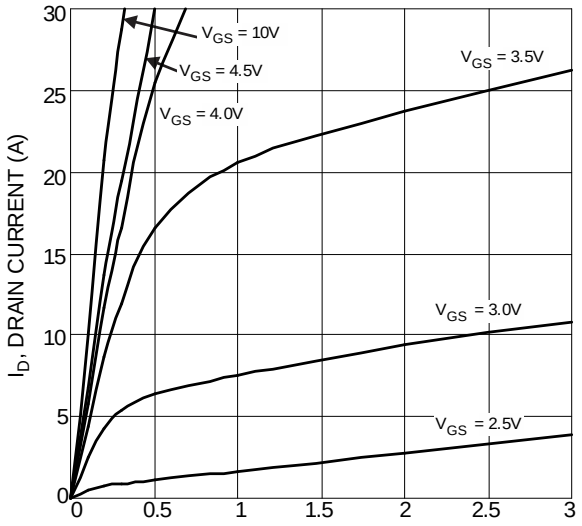


Figure 1 Typical Output Characteristic

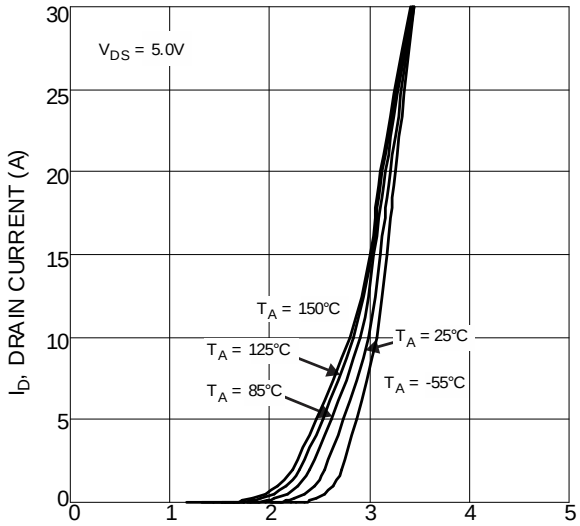


Figure 2 Typical Transfer Characteristics

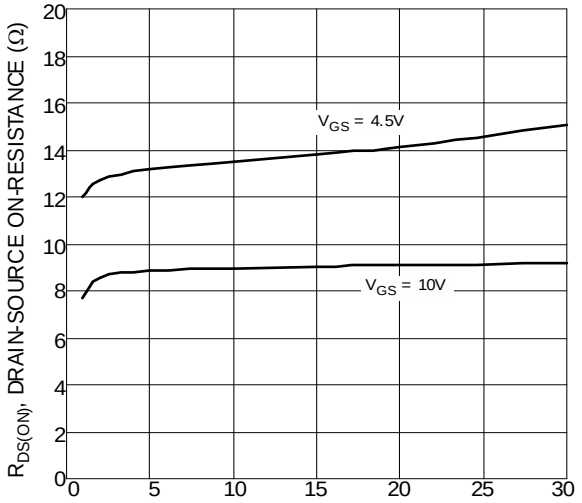


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

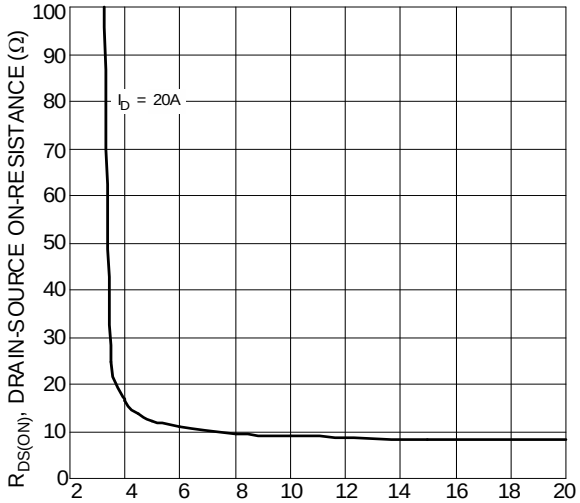


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

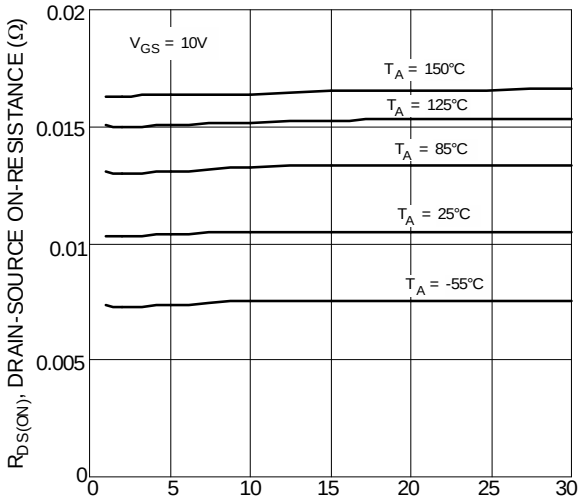


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

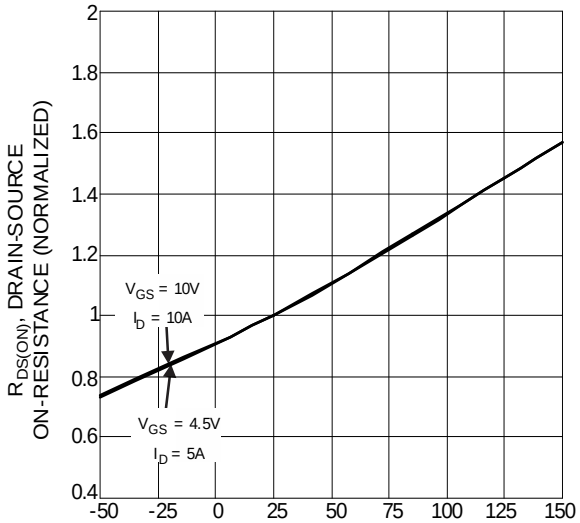


Figure 6 On-Resistance Variation with Temperature

Q1 – N-Channel (Continued)

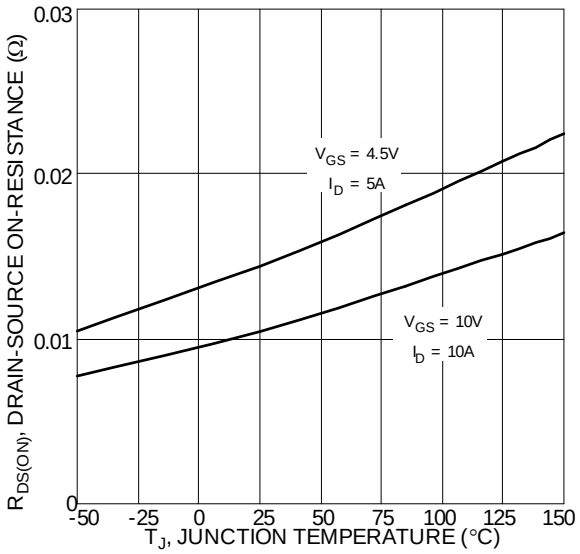


Figure 7 On-Resistance Variation with Temperature

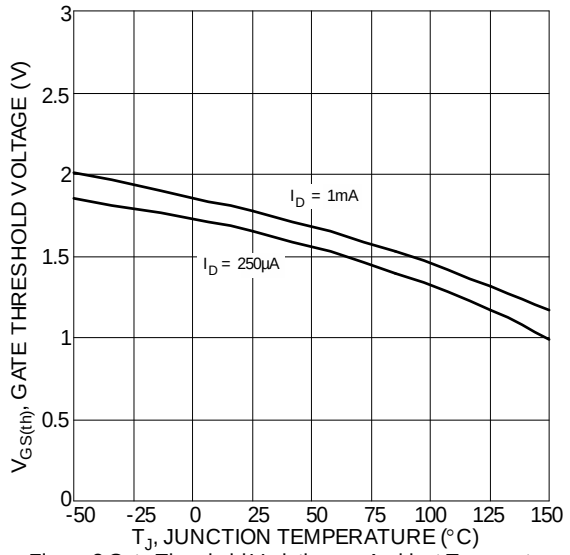


Figure 8 Gate Threshold Variation vs. Ambient Temperature

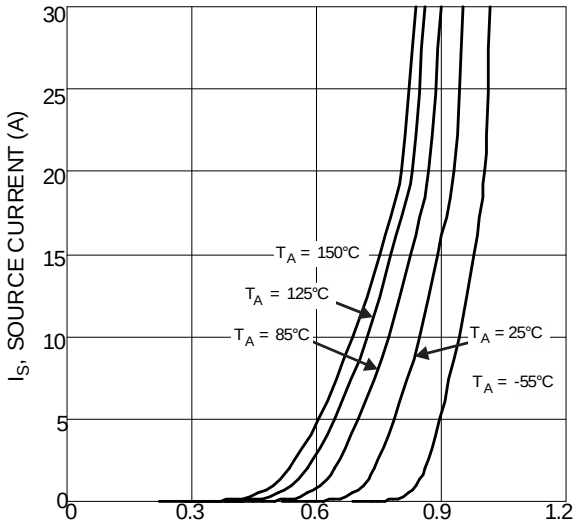


Figure 9 Diode Forward Voltage vs. Current

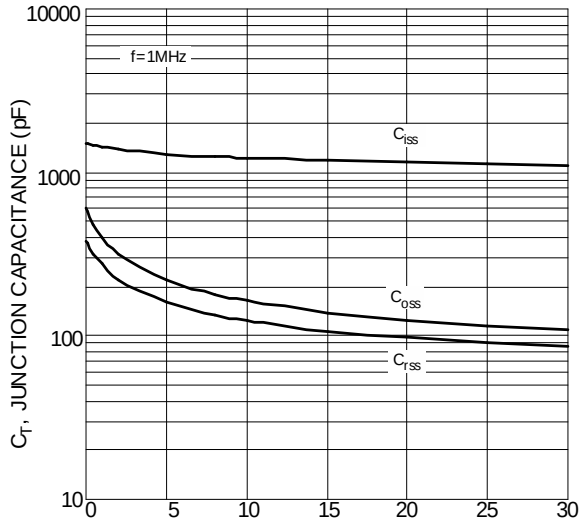


Figure 10 Typical Junction Capacitance

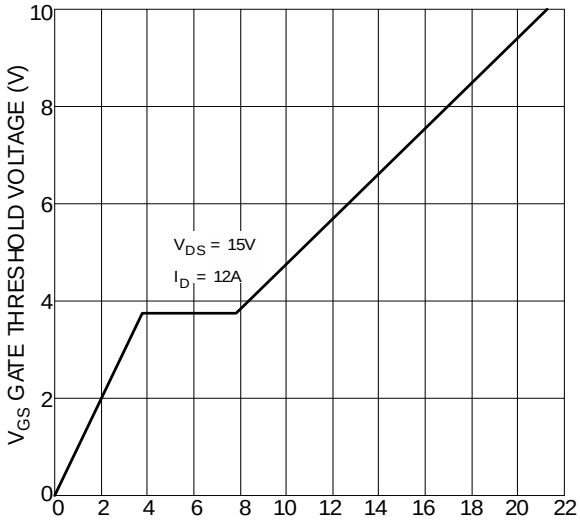


Figure 11 Gate Charge

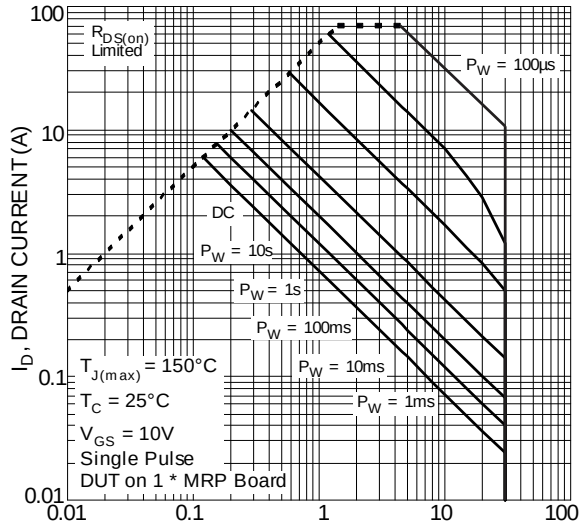


Figure 12 SOA, Safe Operation Area

Q2 – P-Channel

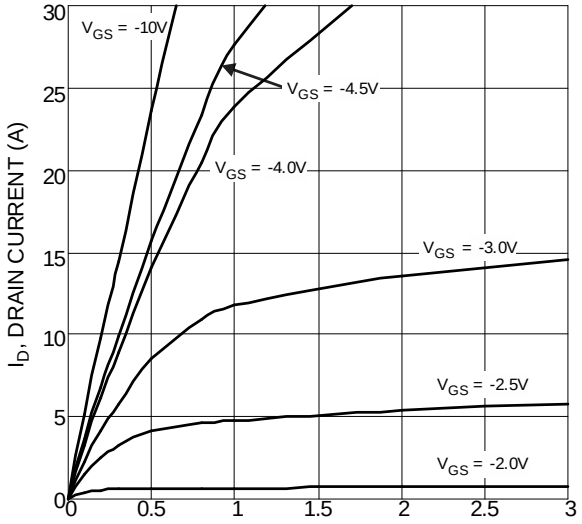


Figure 13 Typical Output Characteristics

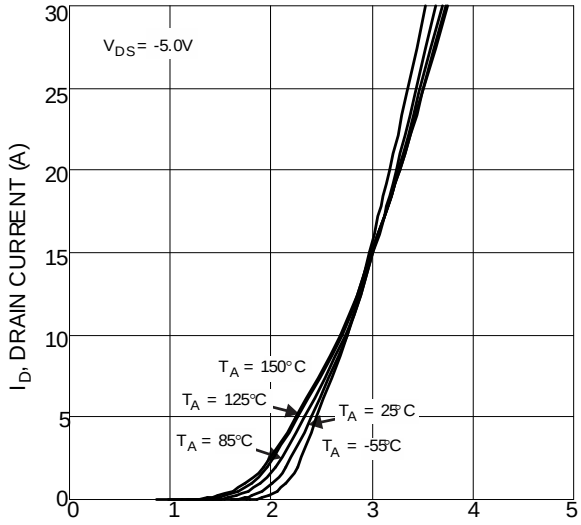


Figure 14 Typical Transfer Characteristics

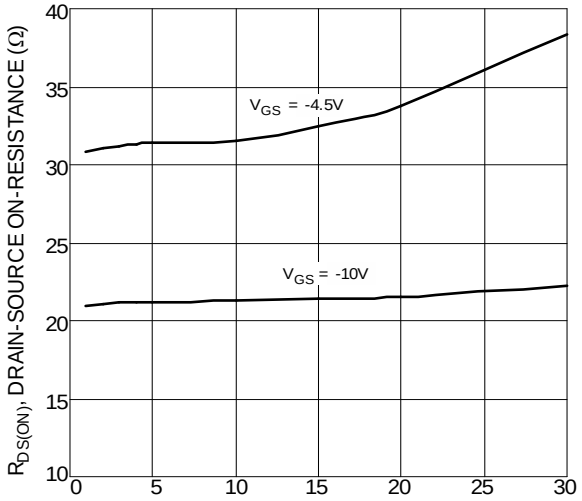


Figure 15 Typical On-Resistance vs. Drain Current and Gate Voltage

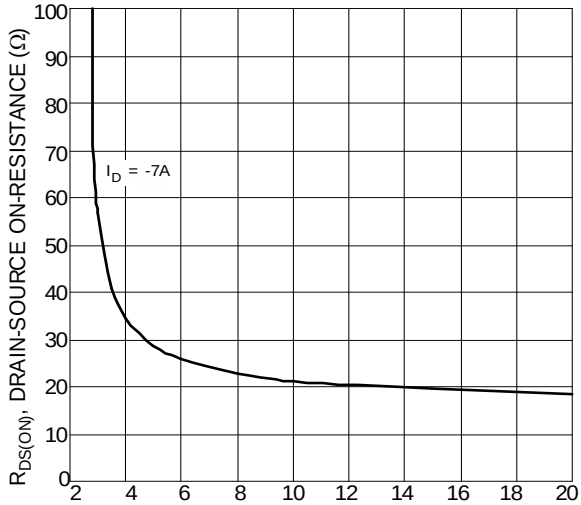


Figure 16 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

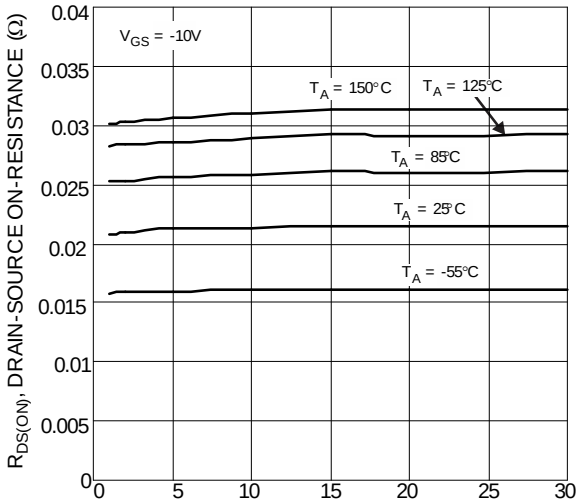


Figure 17 Typical On-Resistance vs. Drain Current and Temperature

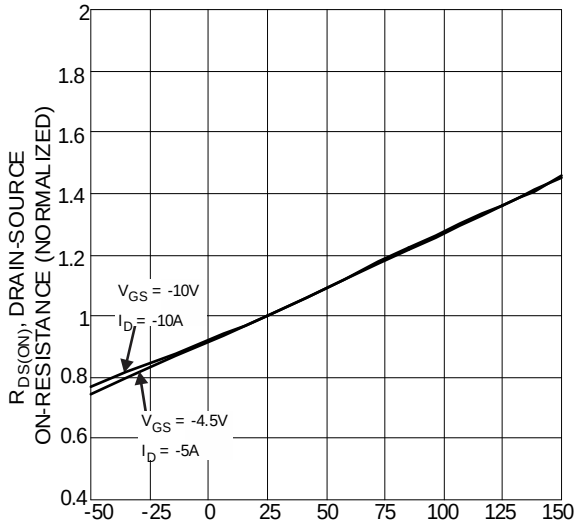


Figure 18 On-Resistance Variation with Temperature

Q2 – P-Channel (Continued)

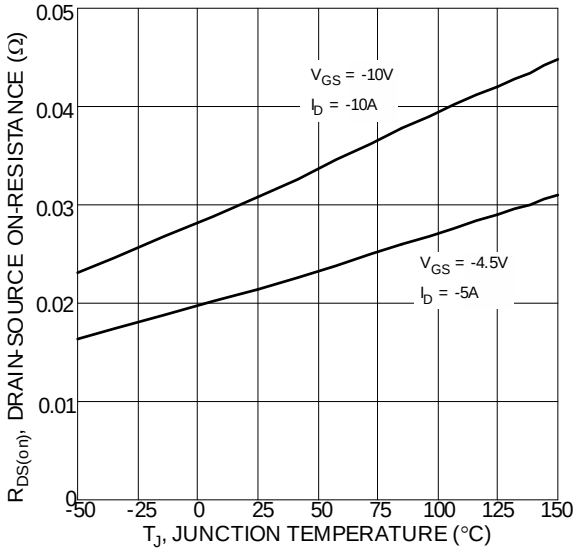


Figure 19 On-Resistance Variation with Temperature

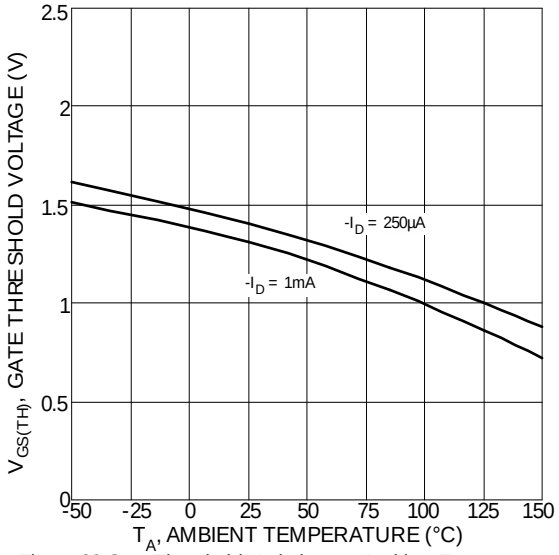


Figure 20 Gate Threshold Variation vs. Ambient Temperature

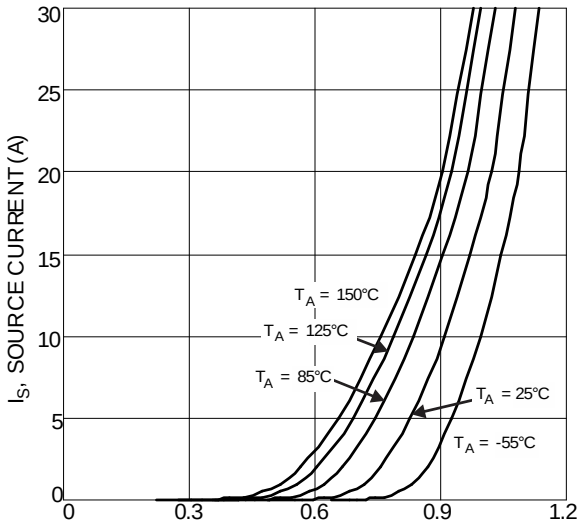


Figure 21 Diode Forward Voltage vs. Current

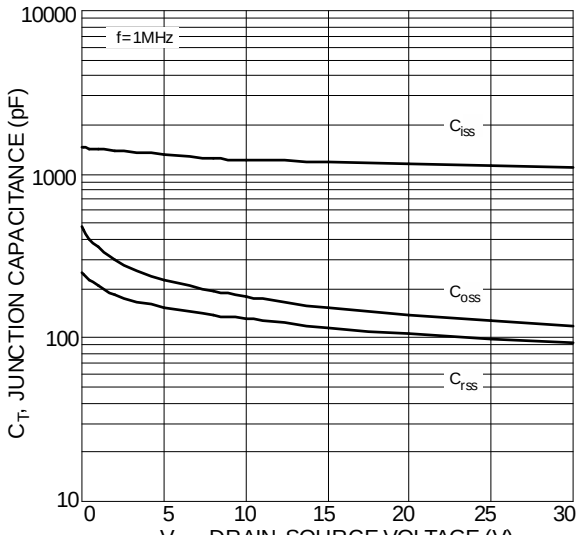


Figure 22 Typical Junction Capacitance

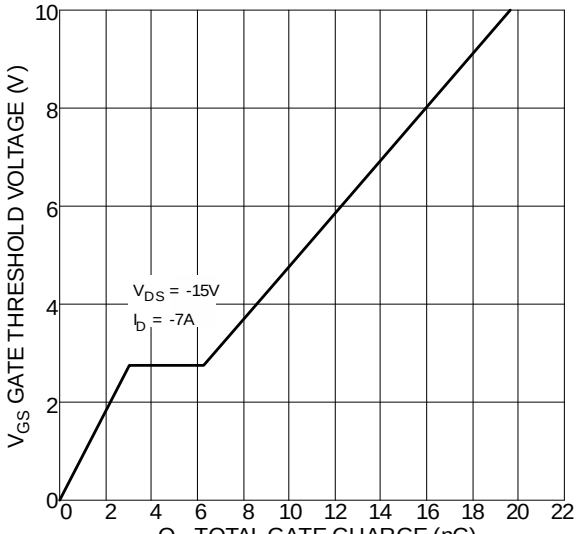


Figure 23 Gate Charge

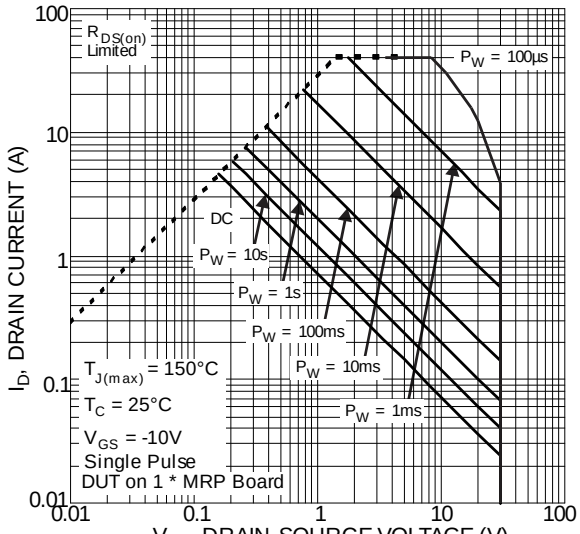


Figure 24 SOA, Safe Operation Area

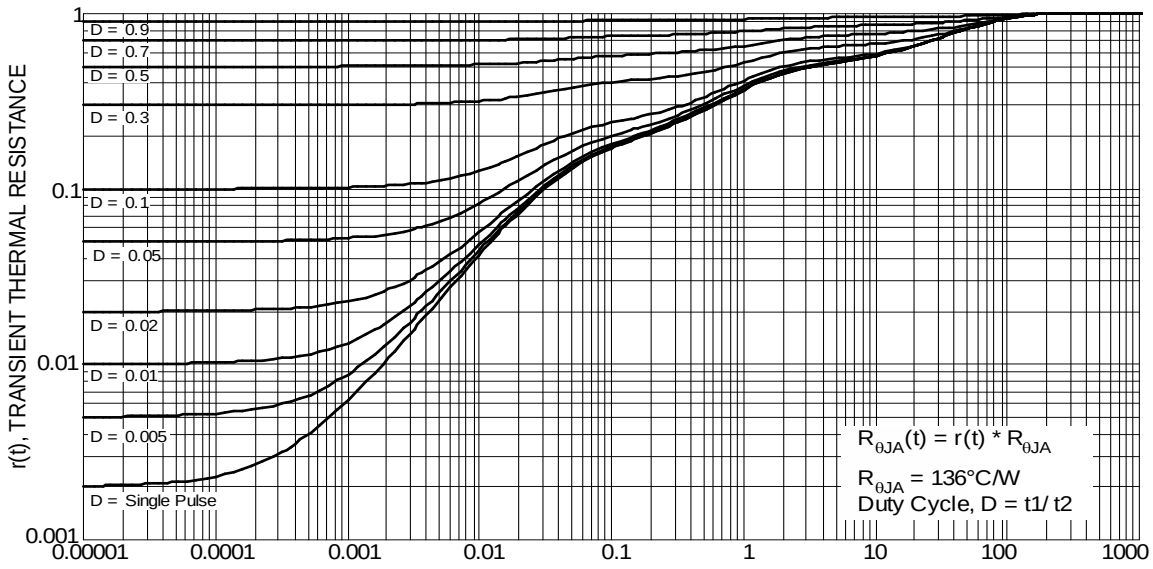
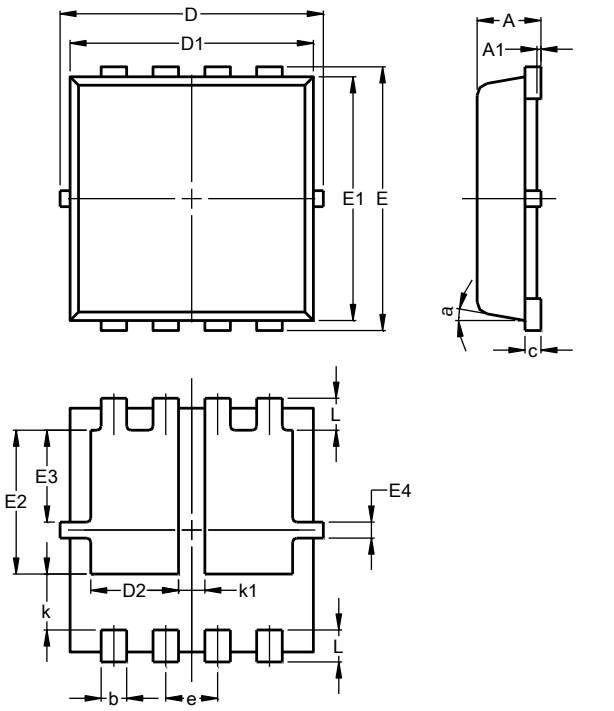


Figure 25 Transient Thermal Resistance

Package Outline Dimensions

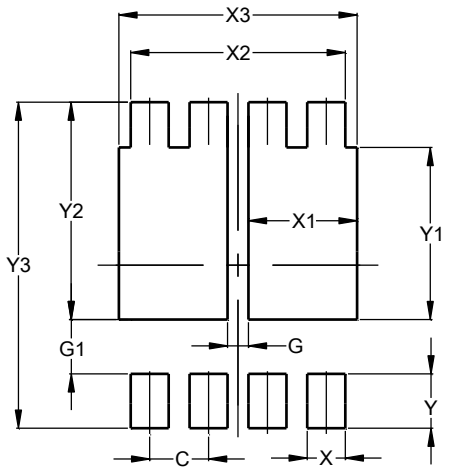
PowerDI3333-8 (Type UXC)



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

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