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	BV_{DSS}	$R_{DS(ON)}$ max	I_D max T_A = +25°C
Q1	30V	16mΩ @ V_{GS} = 10V	9.0A
		20mΩ @ V_{GS} = 4.5V	8.0A
Q2	-30V	28mΩ @ V_{GS} = -10V	-6.8A
		38mΩ @ V_{GS} = -4.5V	-5.8A

Description

This new generation MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) and yet maintain superior switching performance, making it ideal for high-efficiency power management applications.

Applications

- Power Management Functions
- Analog Switch

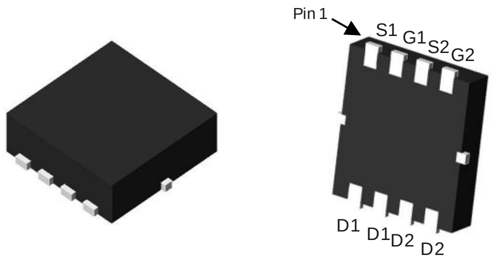
Features

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

Mechanical Data

- Case: POWERDI®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 ⓔ3
- Weight: 0.072 grams (Approximate)

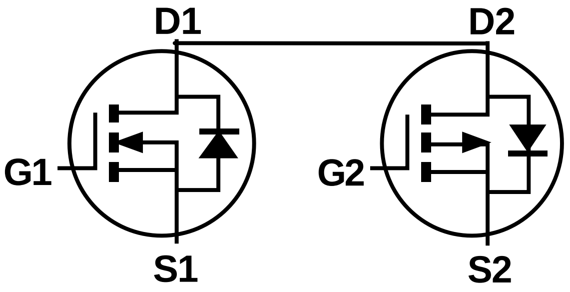
POWERDI®3333-8 (Type UXB)



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	Units
Drain-Source Voltage			V_{DSS}	30	V
Gate-Source Voltage			V_{GSS}	±20	V
Continuous Drain Current (Note 6) V_{GS} = 10V	Steady State	T_A = +25°C T_A = +70°C	I_D	9.0 7.1	A
Maximum Body Diode Forward Current (Note 6)			I_S	2	A
Pulsed Drain Current (380µs pulse, Duty cycle = 1%)			I_{DM}	55	A
Avalanche Current (L = 0.1mH) (Note 7)			I_{AS}	22	A
Avalanche Energy (L = 0.1mH) (Note 7)			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 (Note 6) V_{GS} = -10V	Steady State	T_A = +25°C T_A = +70°C	I_D	-6.8 -5.7	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 7)			I_{AS}	-22	A
Avalanche Energy (L = 0.1mH) (Note 7)			E_{AS}	24	mJ

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	1.3	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	98	°C/W
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	2.0	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	65	°C/W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	12	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
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 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	1.4	–	2.0	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	–	12	16	mΩ	V_{GS} = 10V, I_D = 7A
			16	20		V_{GS} = 4.5V, I_D = 7A
Diode Forward Voltage	V_{SD}	–	0.70	1.2	V	V_{GS} = 0V, I_S = 1A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	–	1184	–	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 P-CHANNEL – Q2 (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
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 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	-1.2	–	-2.4	V	V_{DS} = V_{GS}, I_D = -250μA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	–	22	28	mΩ	V_{GS} = -10V, I_D = -7A
			32	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 9)						
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:
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 1inch square copper plate.
7. I_{AS} and E_{AS} rating are based on low frequency and duty cycles to keep T_J = +25°C.
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

Typical Characteristics - N-CHANNEL

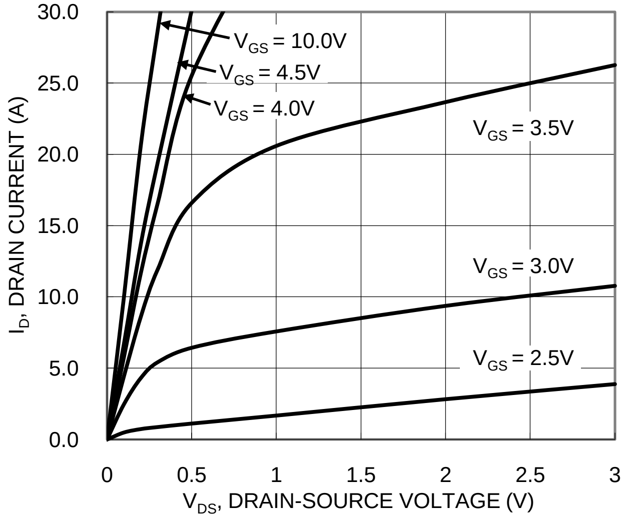


Figure 1. Typical Output Characteristic

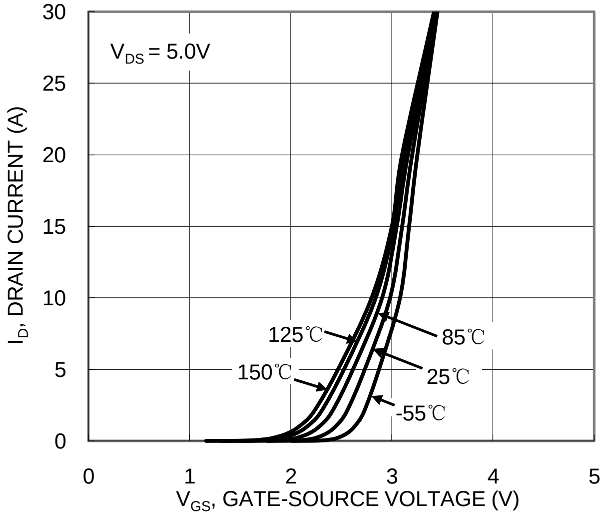


Figure 2. Typical Transfer Characteristic

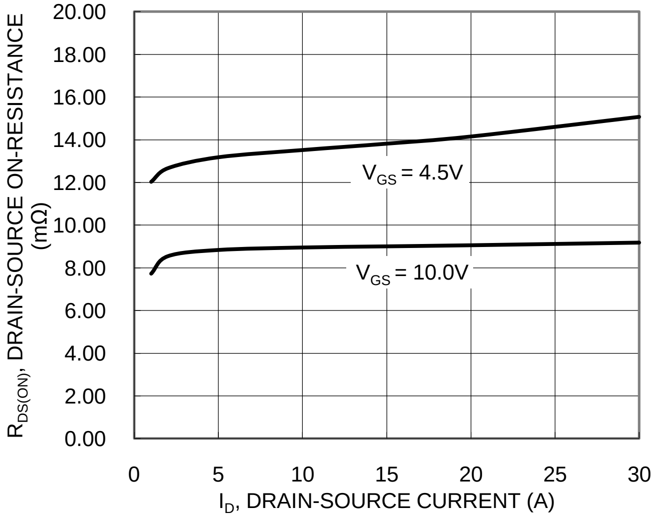


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

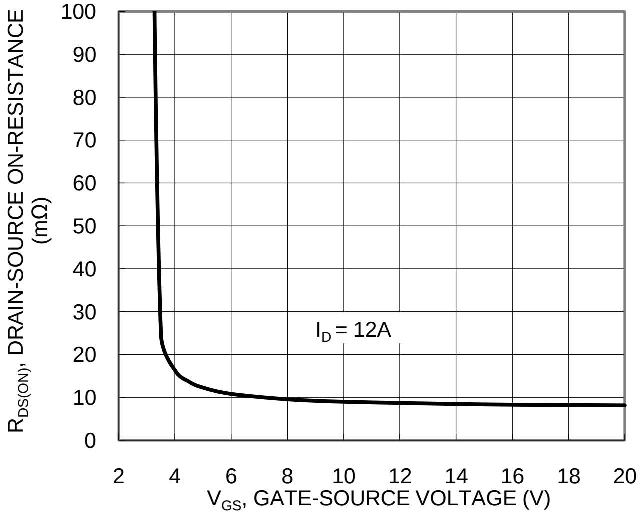


Figure 4. Typical Transfer Characteristic

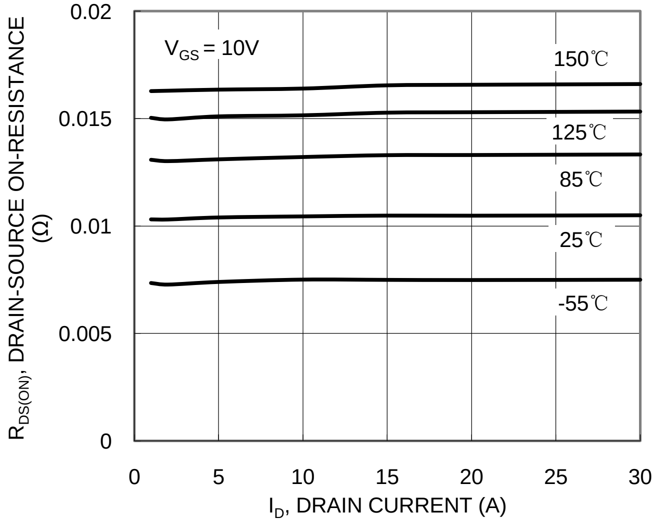


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

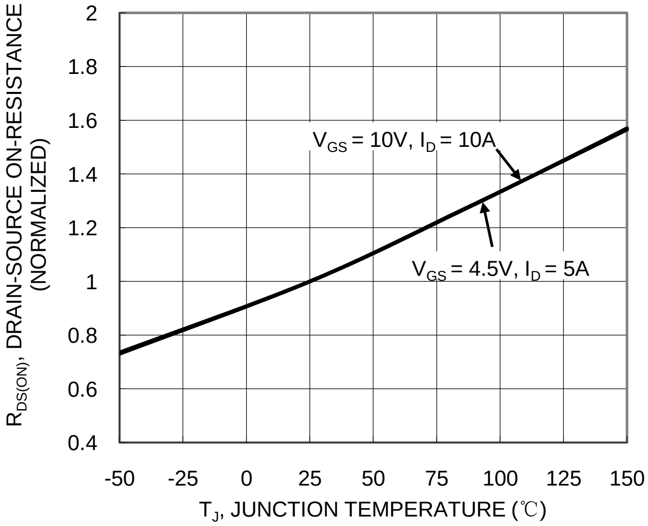


Figure 6. On-Resistance Variation with Temperature

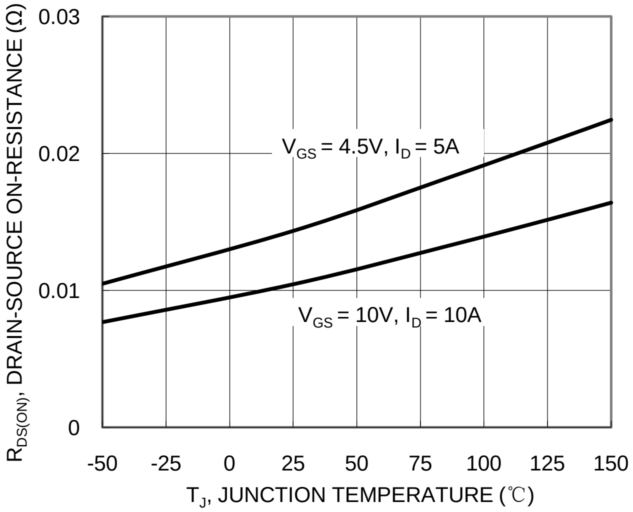


Figure 7. On-Resistance Variation with Temperature

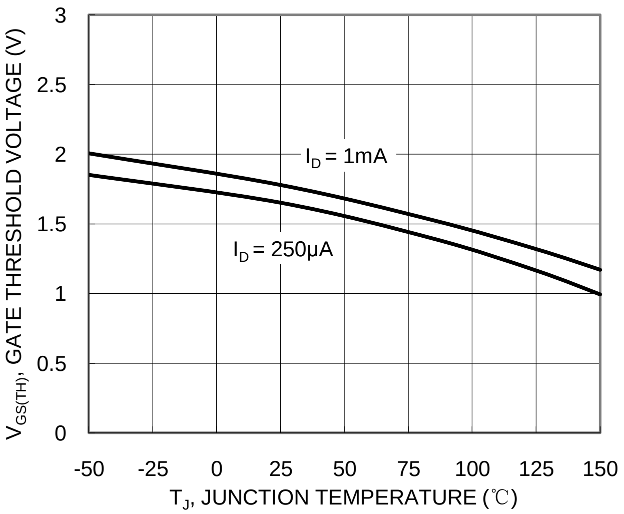


Figure 8. Gate Threshold Variation vs. Junction Temperature

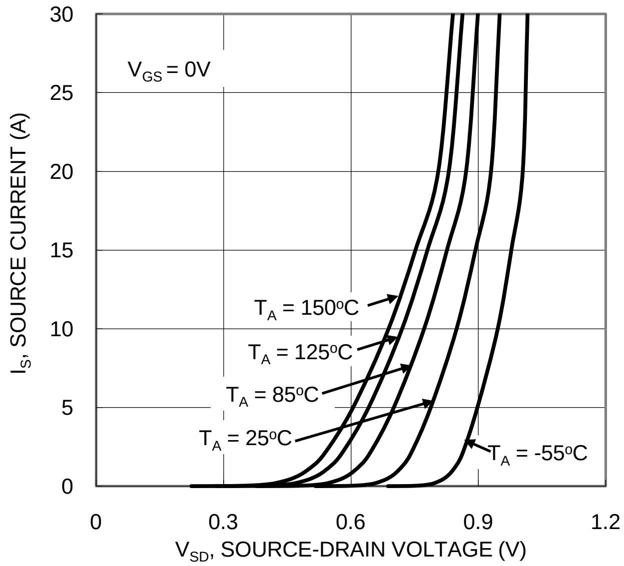


Figure 9. Diode Forward Voltage vs. Current

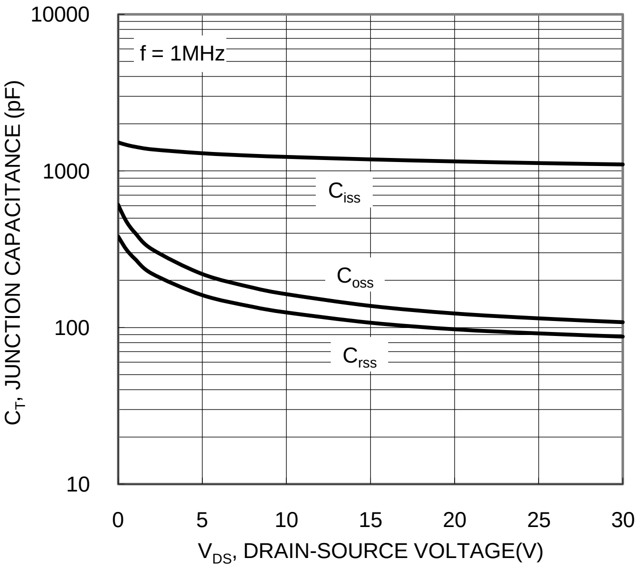


Figure 10. Typical Junction Capacitance

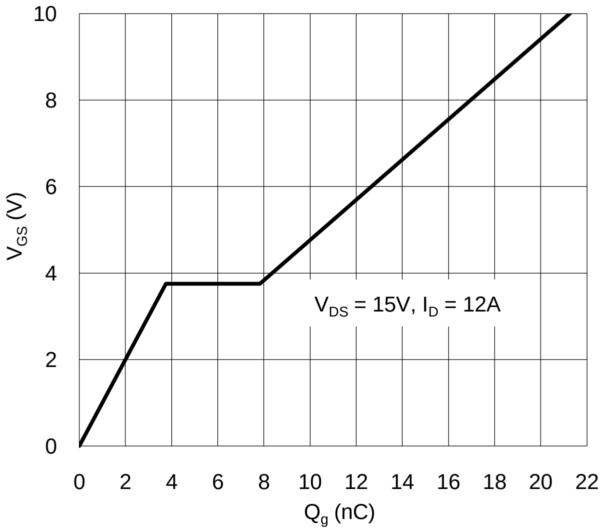


Figure 11. Gate Charge

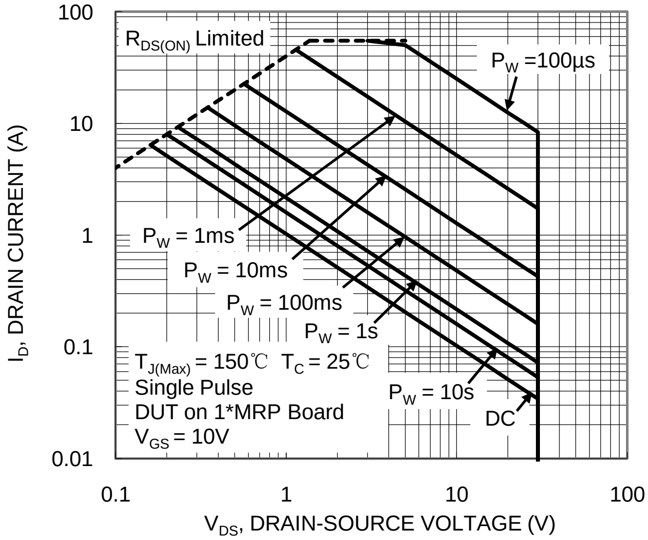


Figure 12. SOA, Safe Operation Area

Typical Characteristics - P-CHANNEL

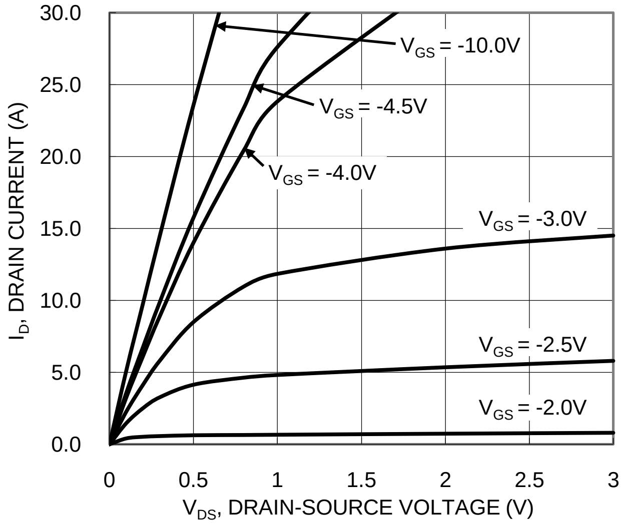


Figure 13. Typical Output Characteristic

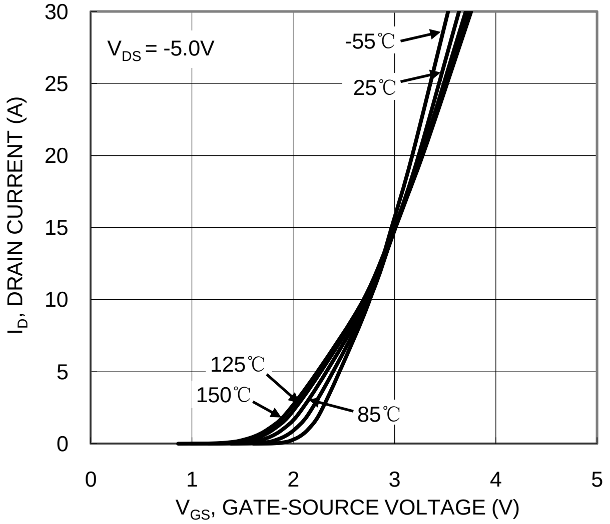


Figure 14. Typical Transfer Characteristic

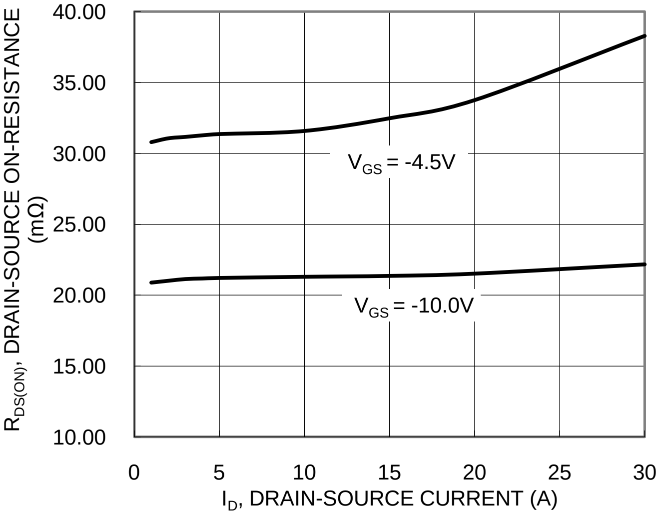


Figure 15. Typical On-Resistance vs. Drain Current and Gate Voltage

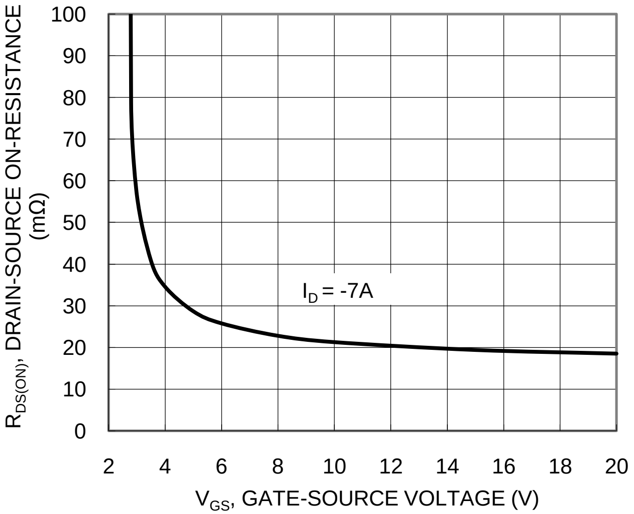


Figure 16. Typical Transfer Characteristic

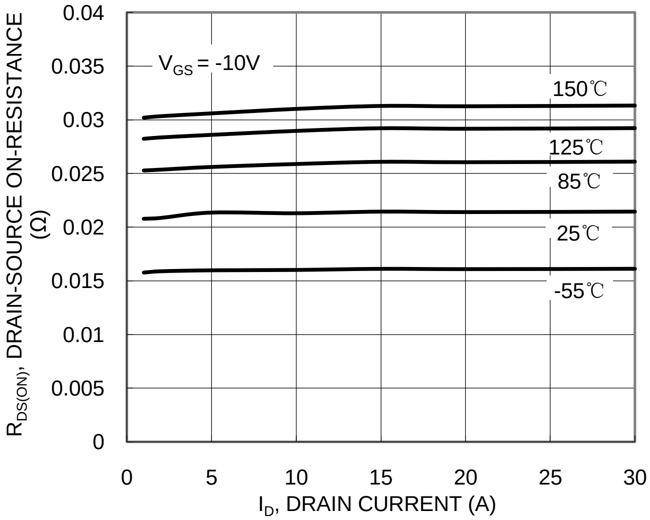


Figure 17. Typical On-Resistance vs. Drain Current and Temperature

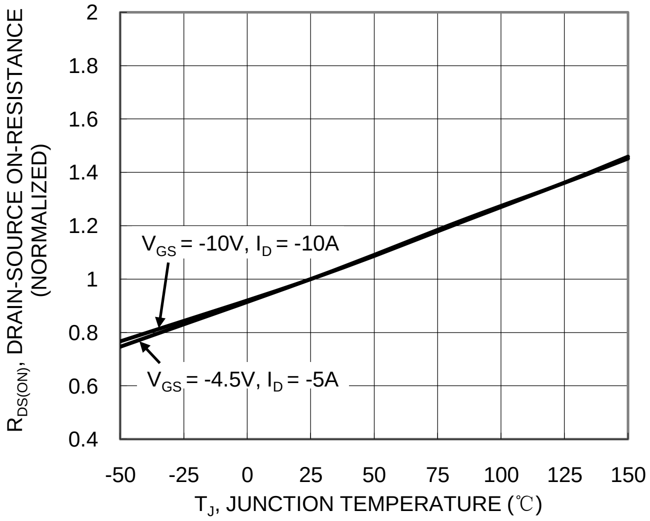


Figure 18. On-Resistance Variation with Temperature

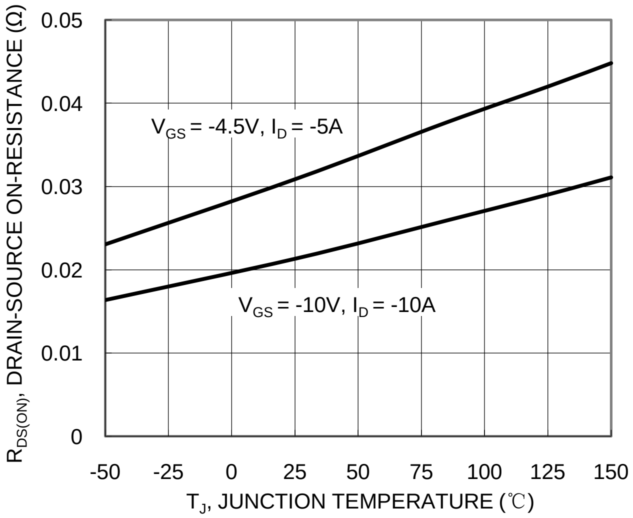


Figure 19. On-Resistance Variation with Temperature

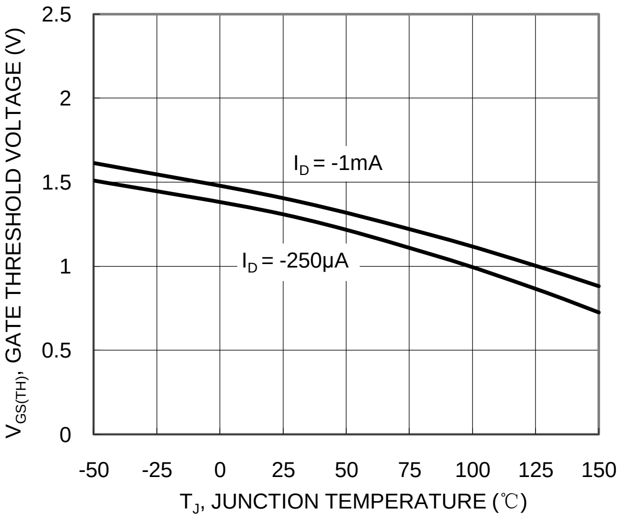


Figure 20. Gate Threshold Variation vs. Junction Temperature

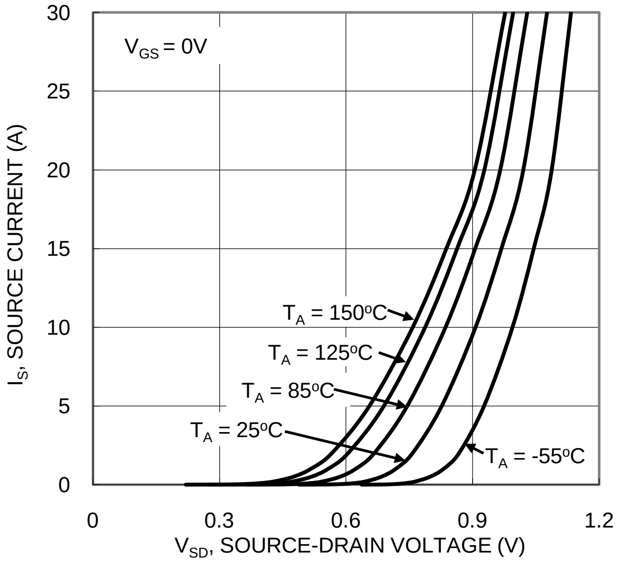


Figure 21. Diode Forward Voltage vs. Current

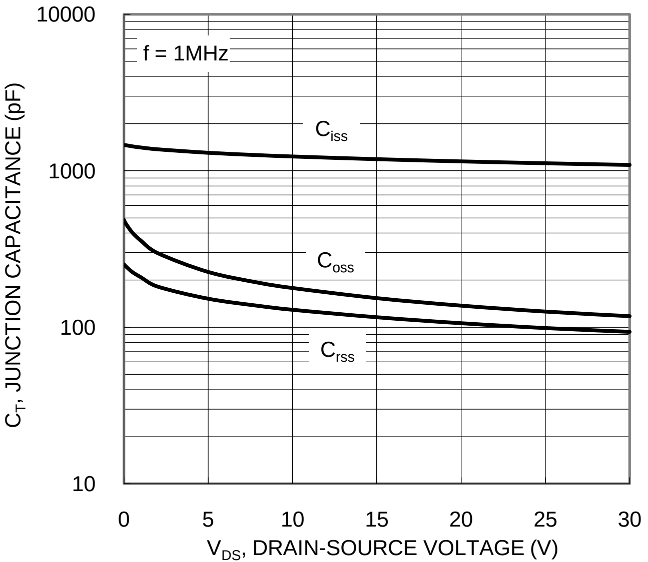


Figure 22. Typical Junction Capacitance

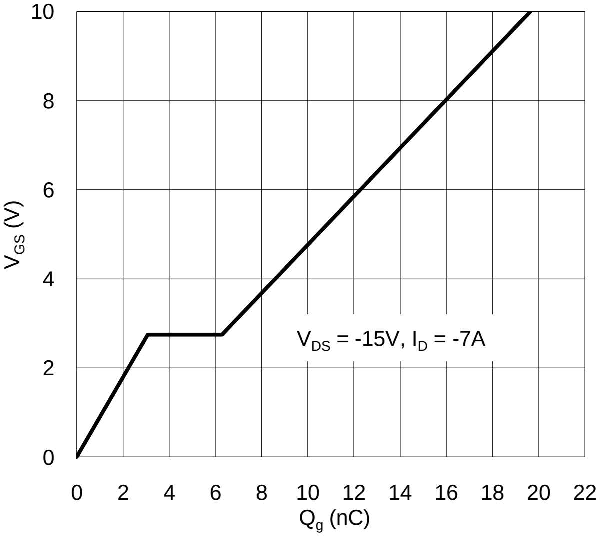


Figure 23. Gate Charge

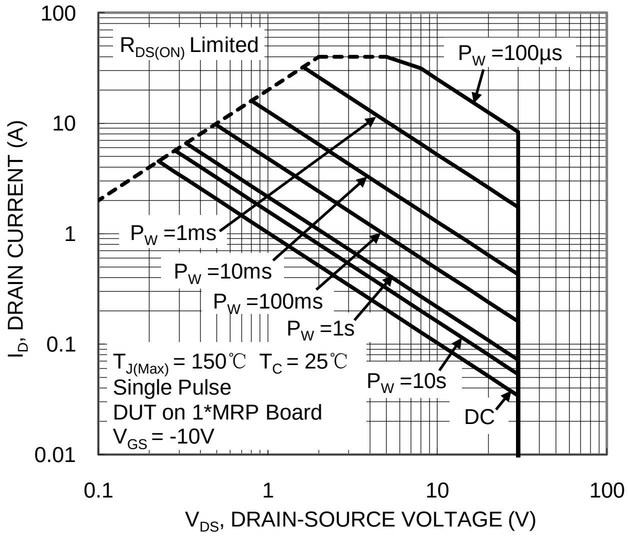


Figure 24. SOA, Safe Operation Area

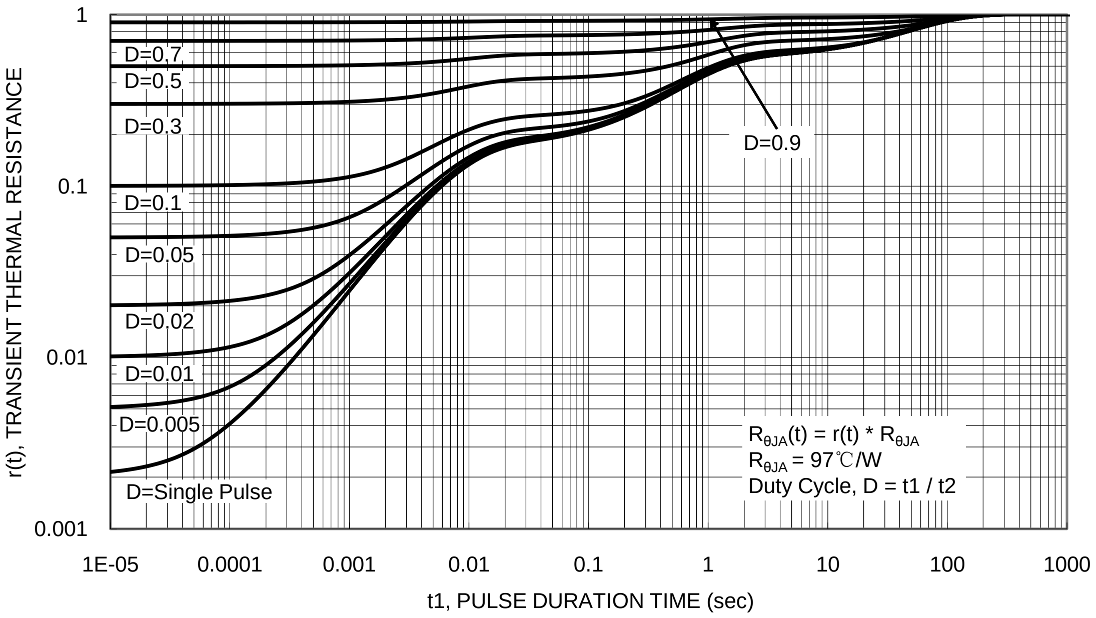
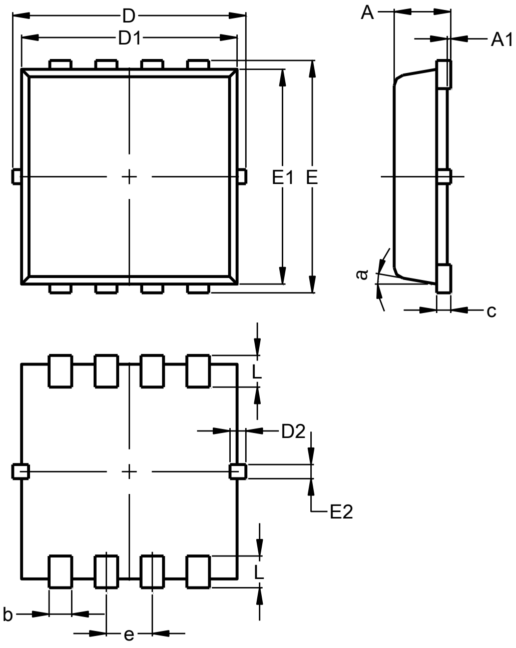


Figure 25. Transient Thermal Resistance

Package Outline Dimensions

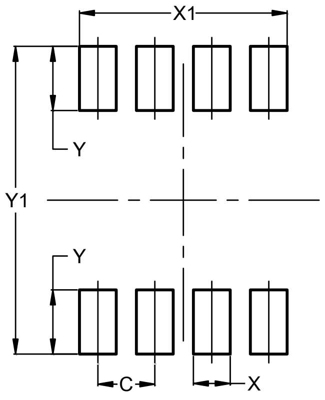
POWERDI®3333-8 (Type UXB)



POWERDI®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°
All Dimensions in mm			

Suggested Pad Layout

POWERDI®3333-8 (Type UXB)



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