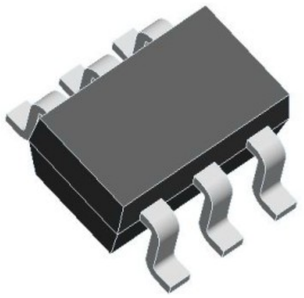
N and P-Channel Enhancement Mosfet



SOT-23-6

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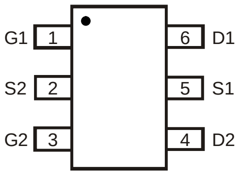
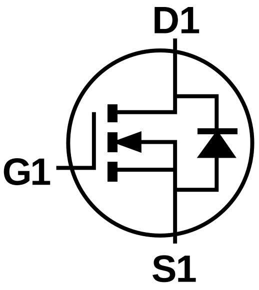
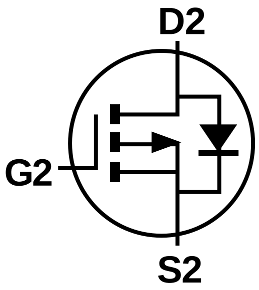


Top View



Q1 N-Channel MOSFET



Q2 P-Channel MOSFET

Device	**BV_{DSS}**	**$R_{DS(ON)}$**	**I_D** **T_A = +25°C**
N-Channel	30V	50mΩ @ V_{GS} = 10V	4.6A
		90mΩ @ V_{GS} = 4.5V	3.4A
P-Channel	-30V	95mΩ @ V_{GS} = -10V	-3.3A
		140mΩ @ V_{GS} = -4.5V	-2.7A

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

- Backlighting
- DC-DC Converters
- Power Management Functions

Features and Benefits

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

Mechanical Data

- Case: SOT-23-6
- Case Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.013 grams (Approximate)

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Q1 Value	Q2 Value	Unit
Drain-Source Voltage			V_{DSS}	30	-30	V
Gate-Source Voltage			V_{GSS}	±20	±20	V
Continuous Drain Current (Note 6) V_{GS} = 10V	Steady State	T_A = +25°C	I_D	4.6	-3.3	A
		T_A = +70°C		3.6	-2.6	
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	1.5	-1.3	A
Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%)			I_{DM}	20	-10	A

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	0.7	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	186	°C/W
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	1.1	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	117	°C/W
Thermal Resistance, Junction to Case		$R_{\theta JC}$	45	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	30	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1.0	µA	V_{DS} = 30V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	1.0	—	2.5	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	34	50	mΩ	V_{GS} = 10V, I_D = 3.5A
			44	90		V_{GS} = 4.5V, I_D = 2.0A
Diode Forward Voltage	V_{SD}	—	0.8	1.0	V	V_{GS} = 0V, I_S = 1A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	190	—	pF	V_{DS} = 15V, V_{GS} = 0V f = 1.0MHz
Output Capacitance	C_{oss}	—	36	—		
Reverse Transfer Capacitance	C_{rss}	—	26	—		
Gate Resistance	R_g	—	4.2	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	2.1	—	nC	V_{DS} = 15V, I_D = 4A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	4.5	—		
Gate-Source Charge	Q_{gs}	—	0.5	—		
Gate-Drain Charge	Q_{gd}	—	0.8	—		
Turn-On Delay Time	$t_{D(ON)}$	—	1.7	—	ns	V_{DS} = 15V, V_{GS} = 10V, R_G = 3Ω, I_D = 4A
Turn-On Rise Time	t_R	—	5.7	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	6.0	—		
Turn-Off Fall Time	t_F	—	1.6	—		
Reverse Recovery Time	t_{RR}	—	4.2	—	ns	I_F = 4A, di/dt = 100A/µs
Reverse Recovery Charge	Q_{RR}	—	0.5	—	nC	

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	-30	—	—	V	V_{GS} = 0V, I_D = -250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	-1.0	µA	V_{DS} = -30V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	-1	—	-2.5	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	83 128	95 140	mΩ	V_{GS} = -10V, I_D = -3.8A V_{GS} = -4.5V, I_D = -3.0A
Diode Forward Voltage	V_{SD}	—	-0.8	-1.2	V	V_{GS} = 0V, I_S = -1A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	254	—	pF	V_{DS} = -15V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	14	—		
Reverse Transfer Capacitance	C_{rss}	—	7	—		
Gate Resistance	R_g	—	54	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = -4.5V)	Q_g	—	3.1	—	nC	V_{DS} = -15V, I_D = -3.8A
Total Gate Charge (V_{GS} = -10V)	Q_g	—	6.5	—		
Gate-Source Charge	Q_{gs}	—	0.8	—		
Gate-Drain Charge	Q_{gd}	—	1.4	—		
Turn-On Delay Time	$t_{D(ON)}$	—	3.5	—	ns	V_{GS} = -10V, V_{DS} = -15V, R_G = 6Ω, R_L = 15Ω
Turn-On Rise Time	t_R	—	6.2	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	21.8	—		
Turn-Off Fall Time	t_F	—	13.1	—		
Reverse Recovery Time	t_{RR}	—	9.6	—	ns	I_F = -1.0A, di/dt = -100A/μs
Reverse Recovery Charge	Q_{RR}	—	2.4	—	nC	I_F = -1.0A, di/dt = -100A/μs

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	-30	—	—	V	V_{GS} = 0V, I_D = -250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	-1.0	µA	V_{DS} = -30V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	-1	—	-2.5	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	83 128	95 140	mΩ	V_{GS} = -10V, I_D = -3.8A V_{GS} = -4.5V, I_D = -3.0A
Diode Forward Voltage	V_{SD}	—	-0.8	-1.2	V	V_{GS} = 0V, I_S = -1A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	254	—	pF	V_{DS} = -15V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	14	—		
Reverse Transfer Capacitance	C_{rss}	—	7	—		
Gate Resistance	R_g	—	54	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = -4.5V)	Q_g	—	3.1	—	nC	V_{DS} = -15V, I_D = -3.8A
Total Gate Charge (V_{GS} = -10V)	Q_g	—	6.5	—		
Gate-Source Charge	Q_{gs}	—	0.8	—		
Gate-Drain Charge	Q_{gd}	—	1.4	—		
Turn-On Delay Time	$t_{D(ON)}$	—	3.5	—	ns	V_{GS} = -10V, V_{DS} = -15V, R_G = 6Ω, R_L = 15Ω
Turn-On Rise Time	t_R	—	6.2	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	21.8	—		
Turn-Off Fall Time	t_F	—	13.1	—		
Reverse Recovery Time	t_{RR}	—	9.6	—	ns	I_F = -1.0A, di/dt = -100A/μs
Reverse Recovery Charge	Q_{RR}	—	2.4	—	nC	I_F = -1.0A, di/dt = -100A/μs

Typical Characteristics

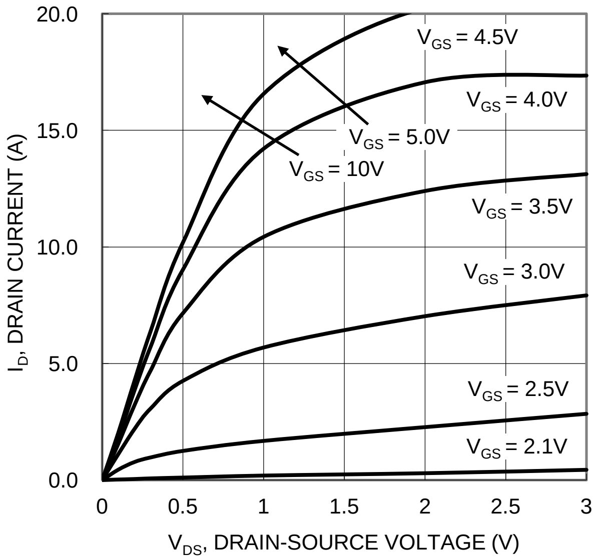


Figure 1. Typical Output Characteristic

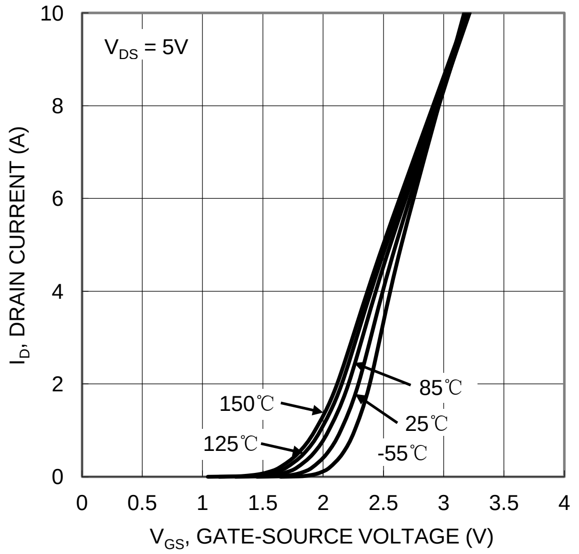


Figure 2. Typical Transfer Characteristic

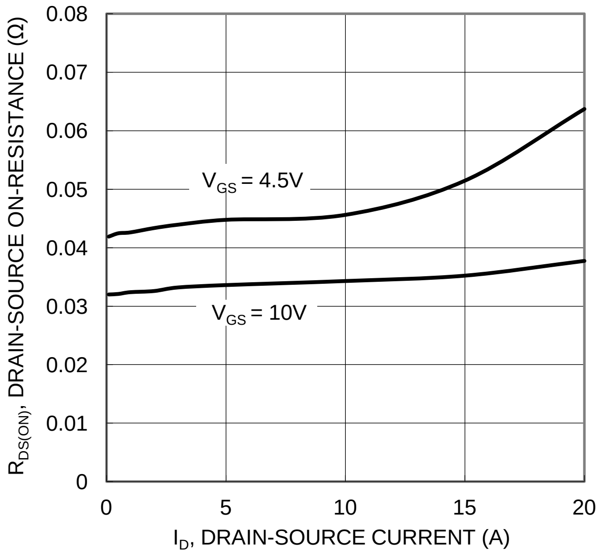


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

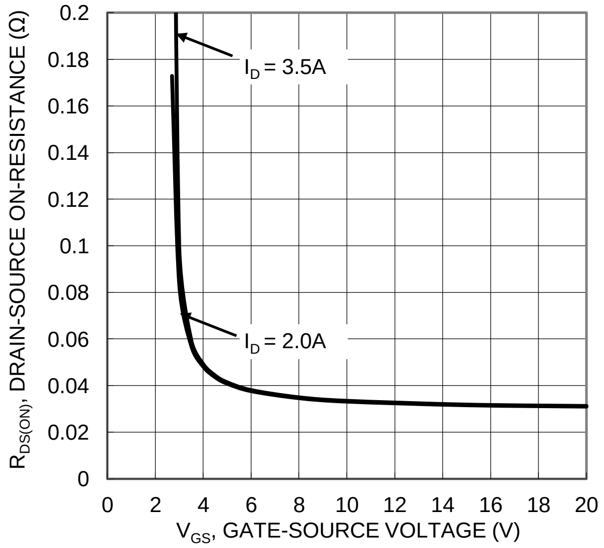


Figure 4. Typical Transfer Characteristic

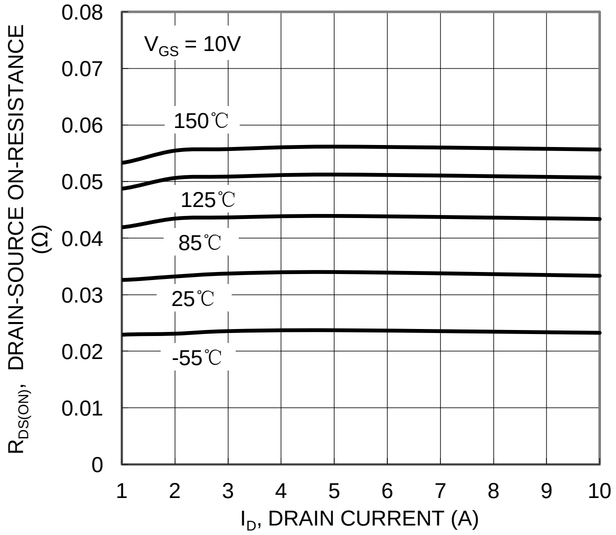


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

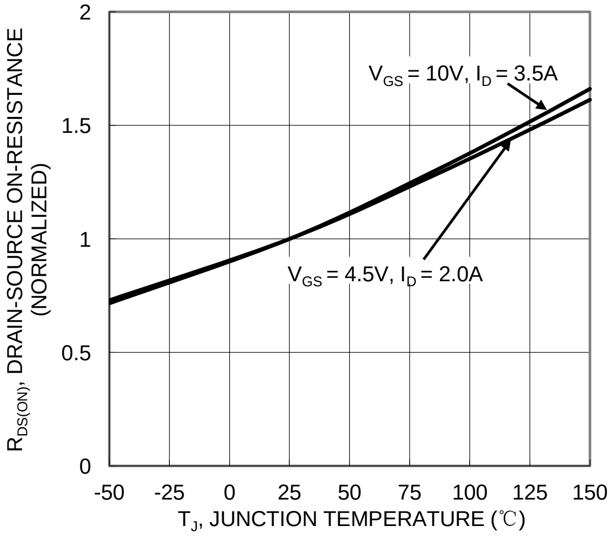


Figure 6. On-Resistance Variation with Junction Temperature

Typical Characteristics - N-CHANNEL (Cont.)

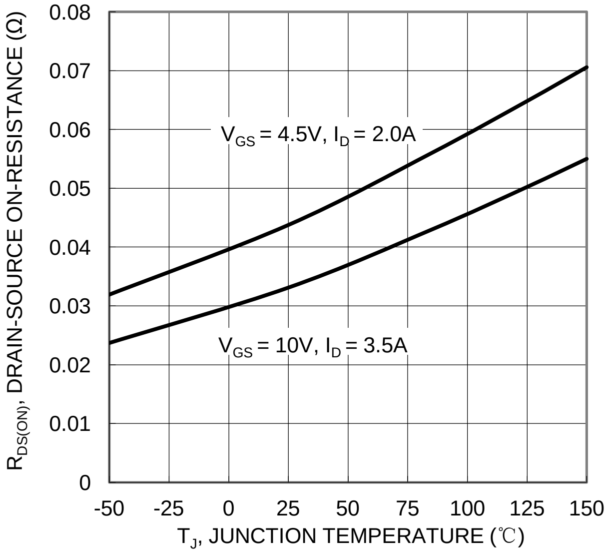


Figure 7. On-Resistance Variation with Junction Temperature

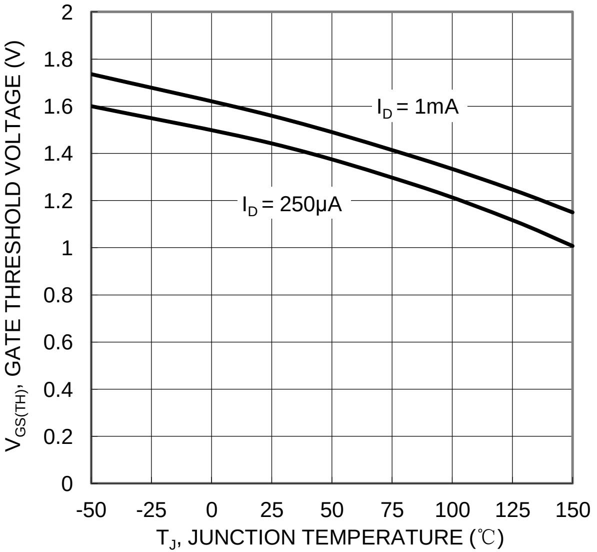


Figure 8. Gate Threshold Variation vs. Junction Temperature

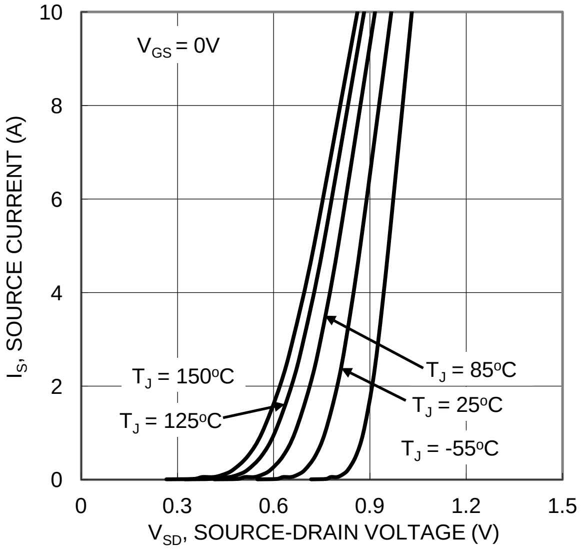


Figure 9. Diode Forward Voltage vs. Current

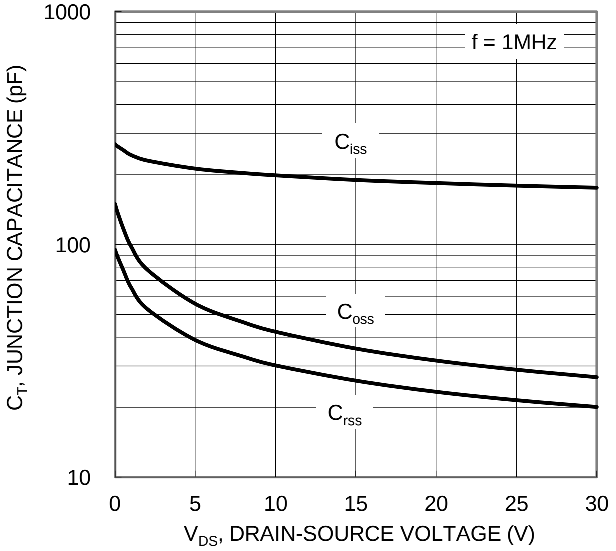


Figure 10. Typical Junction Capacitance

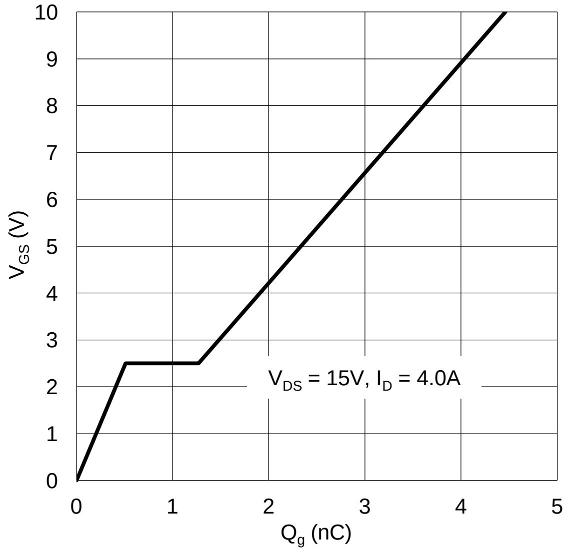


Figure 11. Gate Charge

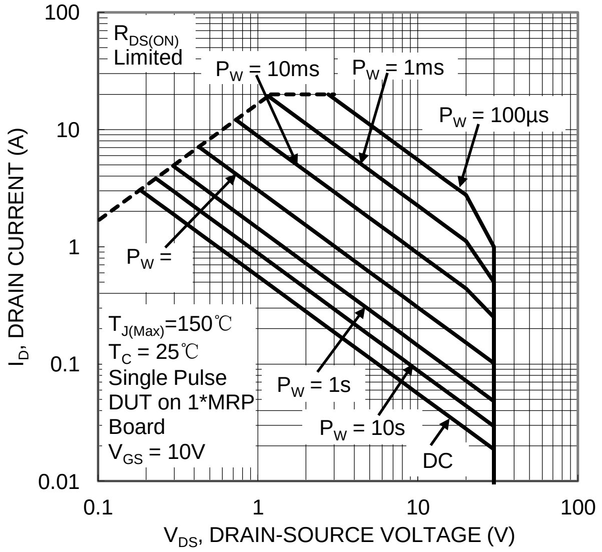


Figure 12. SOA, Safe Operation Area

Typical Characteristics - P-CHANNEL

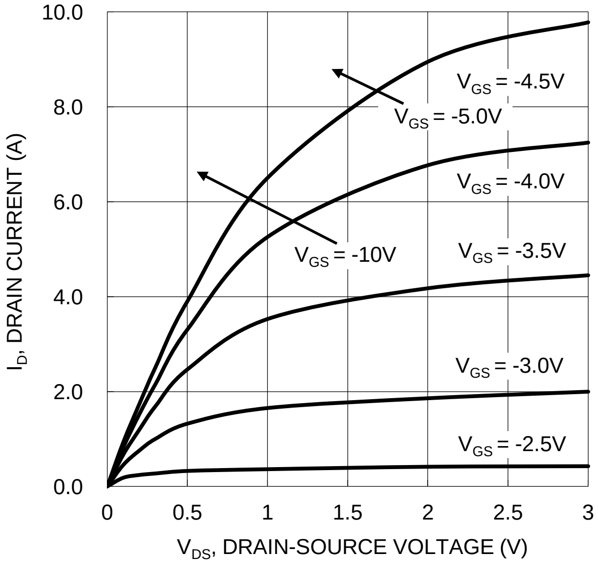


Figure 13. Typical Output Characteristic

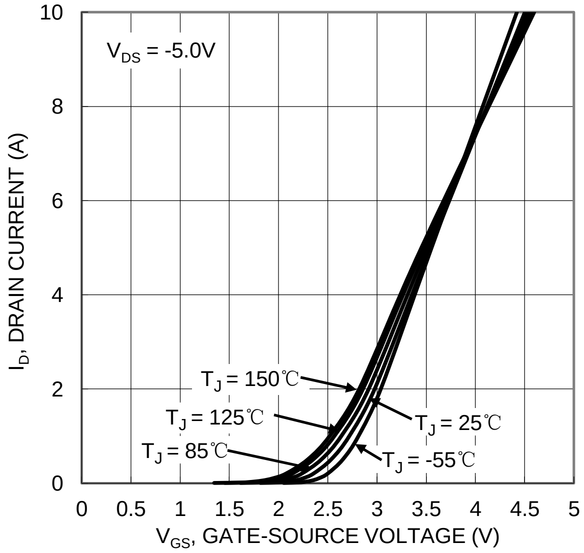


Figure 14. Typical Transfer Characteristic

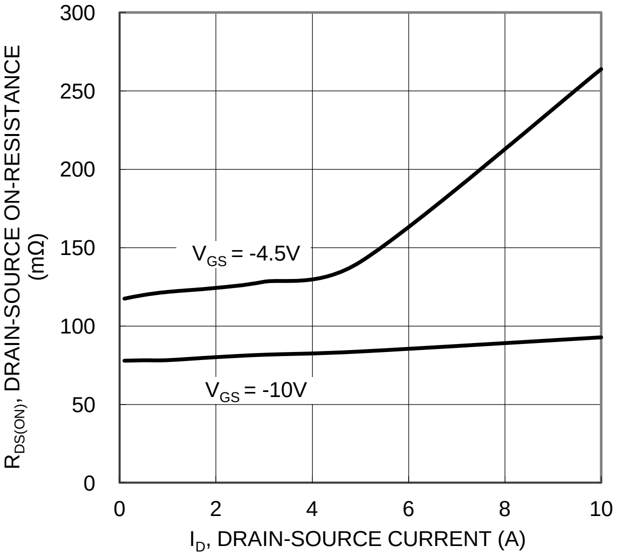


Figure 15. Typical On-Resistance vs. Drain Current and Gate Voltage

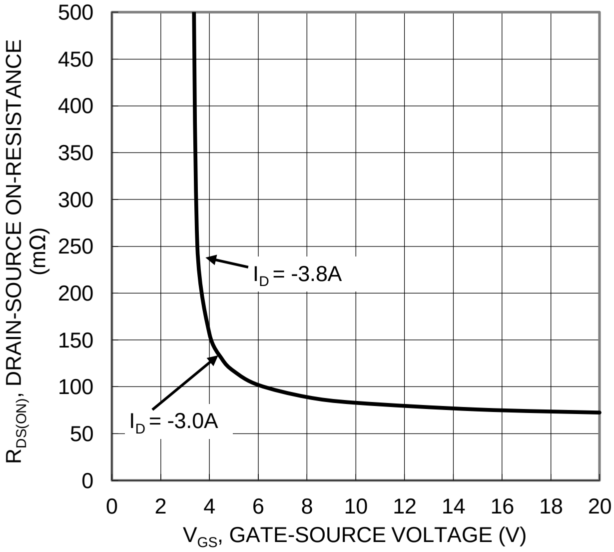


Figure 16. Typical Transfer Characteristic

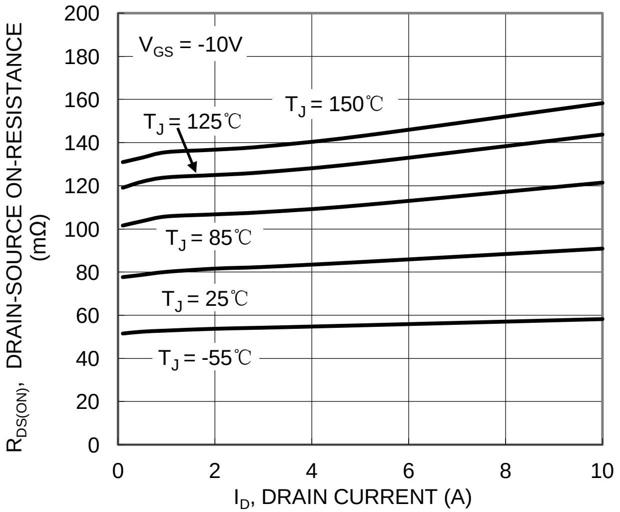


Figure 17. Typical On-Resistance vs. Drain Current and Temperature

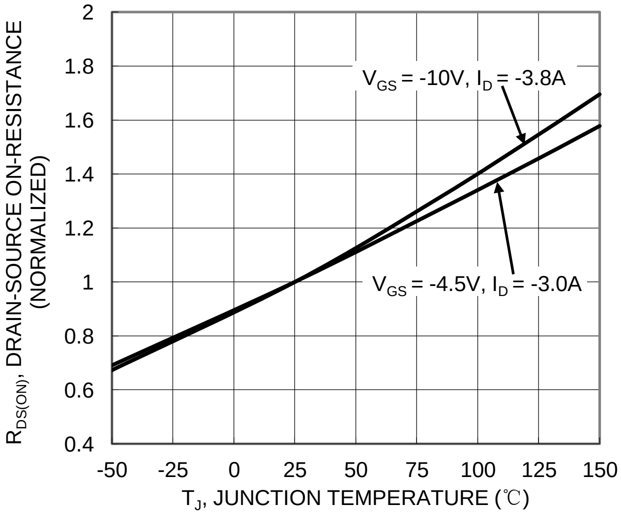


Figure 18. On-Resistance Variation with Temperature

Typical Characteristics - P-CHANNEL (Cont.)

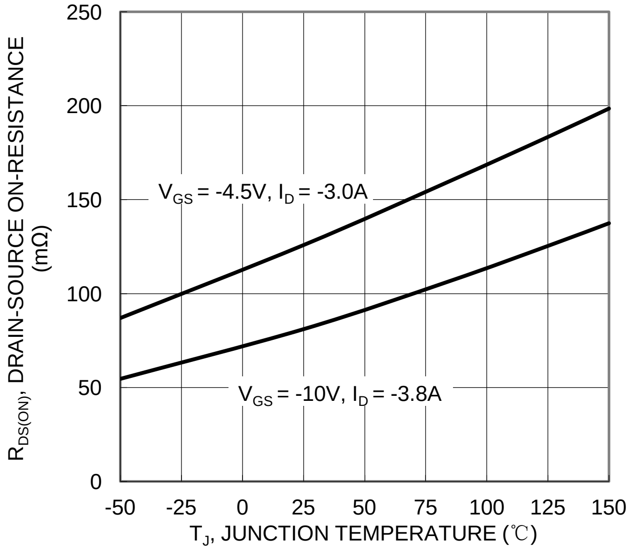


Figure 19. On-Resistance Variation with Temperature

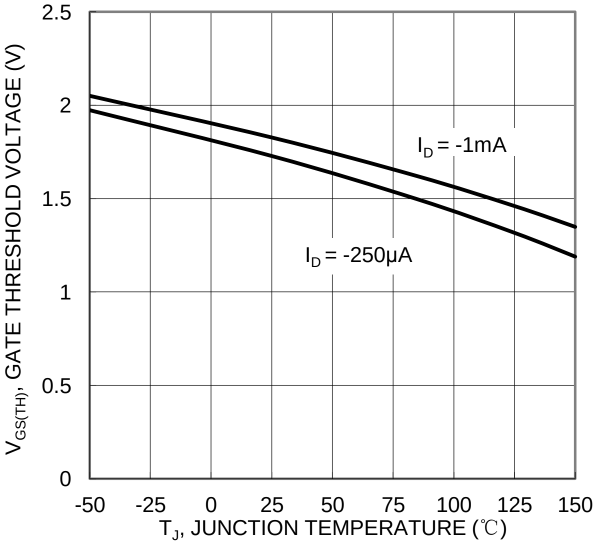


Figure 20. Gate Threshold Variation vs. Junction Temperature

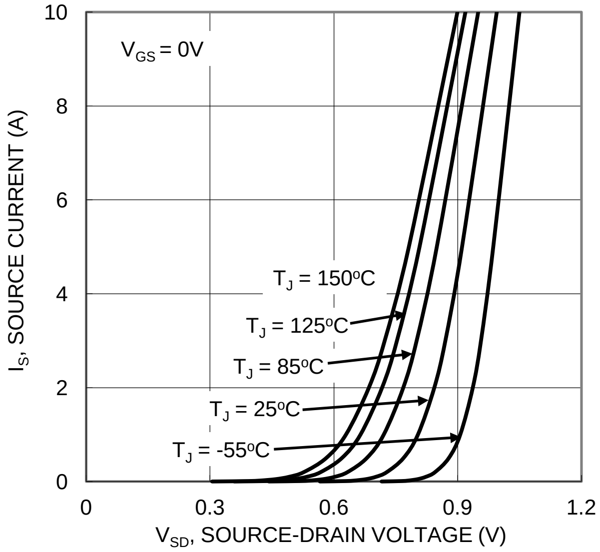


Figure 21. Diode Forward Voltage vs. Current

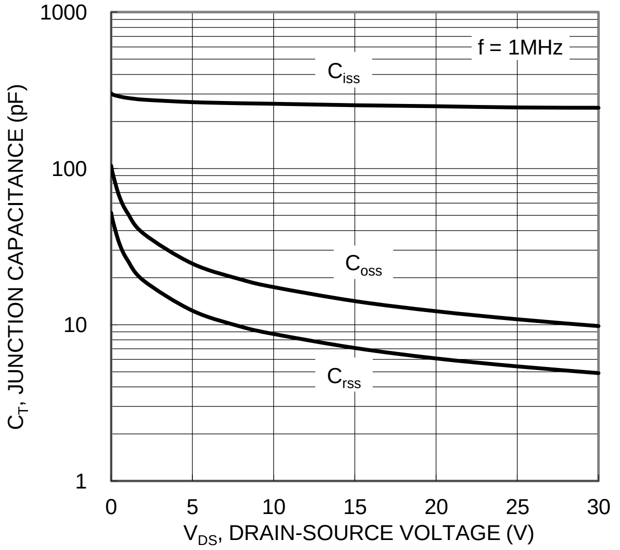


Figure 22. Typical Junction Capacitance

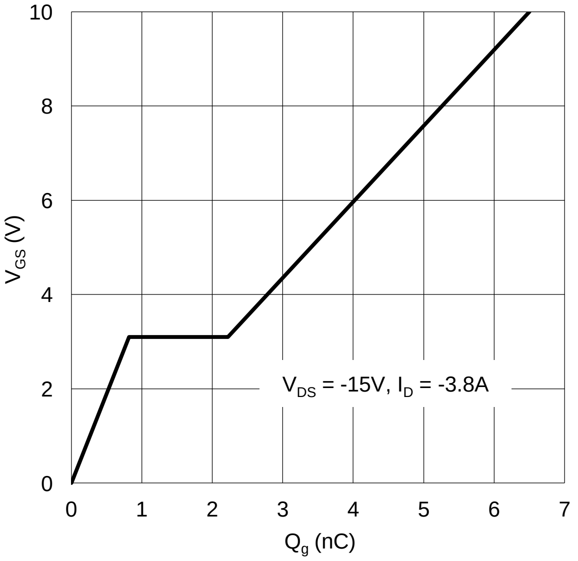


Figure 23. Gate Charge

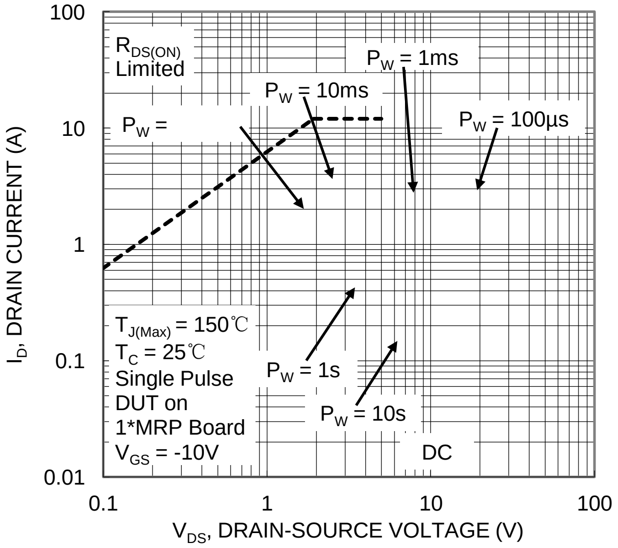


Figure 24. SOA, Safe Operation Area