



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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企业微信二维码



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Product Summary

Device	BV _{DSS}	R _{DS(ON)} Max	I _D
			T _A = +25°C
Q1 N-Channel	60V	40mΩ @ V _{GS} = 10V	6.5A
		55mΩ @ V _{GS} = 4.5V	5.6A
Q2 P-Channel	-60V	110mΩ @ V _{GS} = -10V	-3.9A
		130mΩ @ V _{GS} = -4.5V	-3.6A

Features and Benefits

- Low Input Capacitance
- Low On-Resistance
- Fast Switching Speed

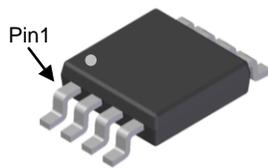
Description and Applications

This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

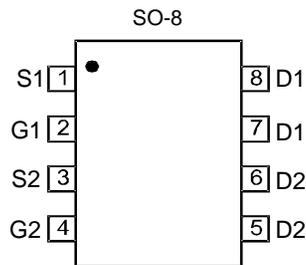
- DC-DC Converters
- Power Management Functions
- Backlighting

Mechanical Data

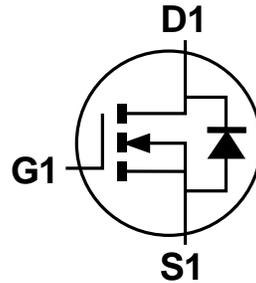
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Tin Finish Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 (B)
- Weight: 0.074 grams (Approximate)



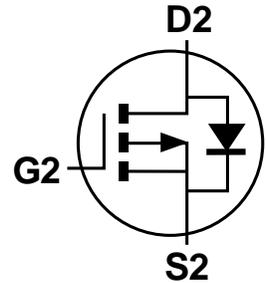
Top View



Top View
Pin Configuration



Q1 N-Channel MOSFET



Q2 P-Channel MOSFET

Maximum Ratings (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic			Symbol	Q1	Q2	Units
Drain-Source Voltage			V_{DS}	60	-60	V
Gate-Source Voltage			V_{GS}	± 20	± 20	V
Continuous Drain Current (Note 7) $V_{GS} = -10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	5.1 4.1	-3.1 -2.5	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	6.5 5.2	-3.9 -3.1	A
Maximum Body Diode Forward Current (Note 7)			I_S	2.1	-2.1	A
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)			I_{DM}	28	-19	A
Avalanche Current (Note 8) $L = 0.1\text{mH}$			I_{AS}	17.2	-17.6	A
Avalanche Energy (Note 8) $L = 0.1\text{mH}$			E_{AS}	14.7	15.4	mJ

Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$	P_D	1.24	W
	$T_A = +70^\circ\text{C}$		0.8	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	101	$^\circ\text{C/W}$
	$t < 10\text{s}$		61	
Total Power Dissipation (Note 7)	$T_A = +25^\circ\text{C}$	P_D	1.56	W
	$T_A = +70^\circ\text{C}$		1.0	
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	$R_{\theta JA}$	80	$^\circ\text{C/W}$
	$t < 10\text{s}$		49	
Thermal Resistance, Junction to Case (Note 7)		$R_{\theta JC}$	14.7	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

Electrical Characteristics – N-Channel Q1 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 9)						
Drain-Source Breakdown Voltage	BV_{DSS}	60	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	$V_{DS} = 48\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	3	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	33	40	m Ω	$V_{GS} = 10\text{V}, I_D = 8\text{A}$
		—	37	55		$V_{GS} = 4.5\text{V}, I_D = 5\text{A}$
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	$V_{GS} = 0\text{V}, I_S = 1\text{A}$
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{ISS}	—	1,130	—	pF	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	C_{OSS}	—	69	—		
Reverse Transfer Capacitance	C_{RSS}	—	42	—		
Gate Resistance	R_G	—	1.7	—	Ω	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Total Gate Charge ($V_{GS} = 10\text{V}$)	Q_G	—	20.8	—	nC	$V_{DS} = 30\text{V}, I_D = 4.3\text{A}$
Total Gate Charge ($V_{GS} = 4.5\text{V}$)	Q_G	—	9.4	—		
Gate-Source Charge	Q_{GS}	—	3.3	—		
Gate-Drain Charge	Q_{GD}	—	3.0	—		
Turn-On Delay Time	$t_{D(ON)}$	—	3.6	—	ns	$V_{GS} = 10\text{V}, V_{DD} = 30\text{V}, R_G = 6\Omega, I_D = 4.3\text{A}$
Turn-On Rise Time	t_R	—	1.8	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	20.1	—		
Turn-Off Fall Time	t_F	—	4.3	—		
Body Diode Reverse Recovery Time	t_{RR}	—	14.2	—	ns	$I_S = 4.3\text{A}, dI/dt = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	Q_{RR}	—	7.5	—	nC	$I_S = 4.3\text{A}, dI/dt = 100\text{A}/\mu\text{s}$

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
 - UIS in production with $L = 0.1\text{mH}$, starting $T_A = +25^\circ\text{C}$.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

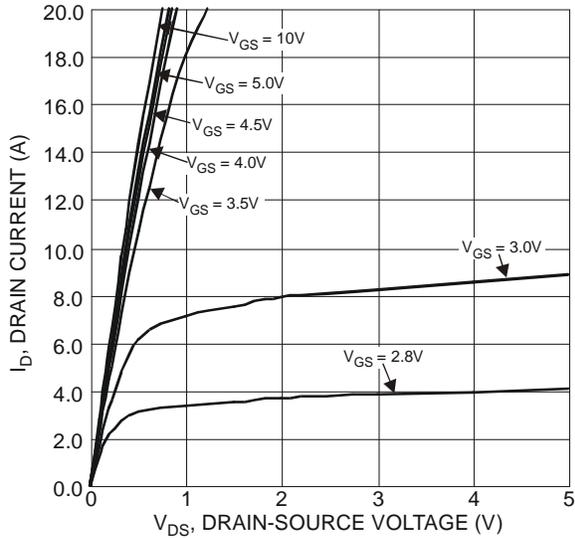


Figure 1 Typical Output Characteristics

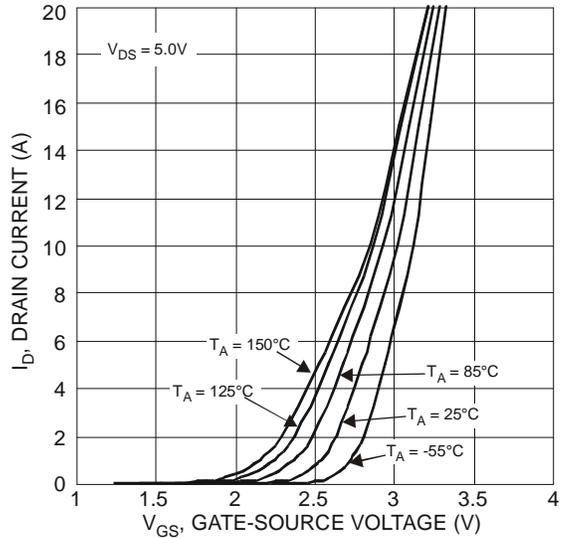


Figure 2 Typical Transfer Characteristics

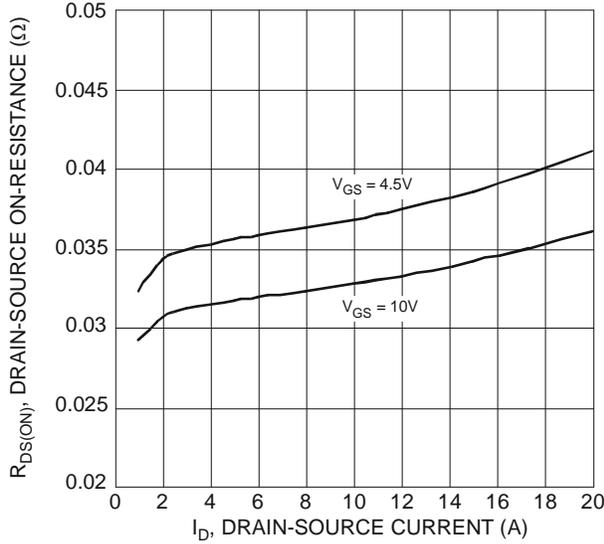


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

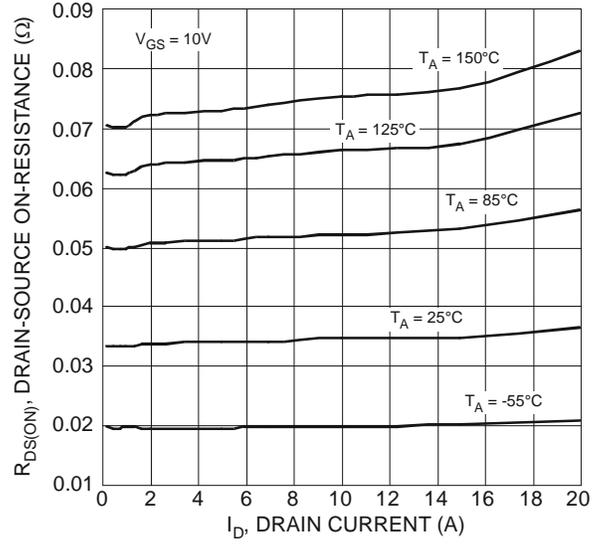


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

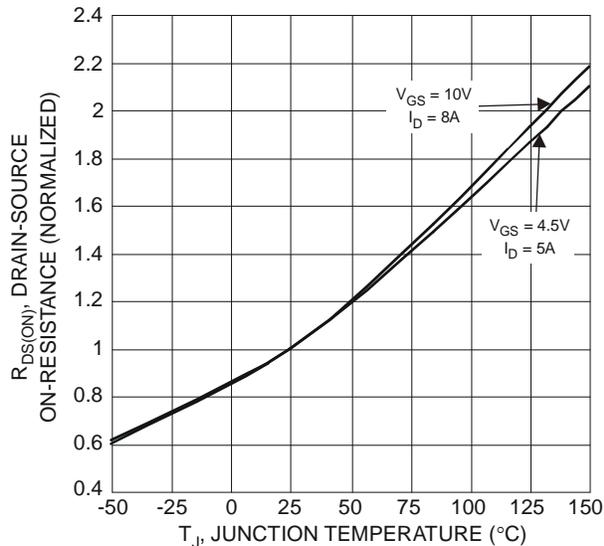


Figure 5 On-Resistance Variation with Temperature

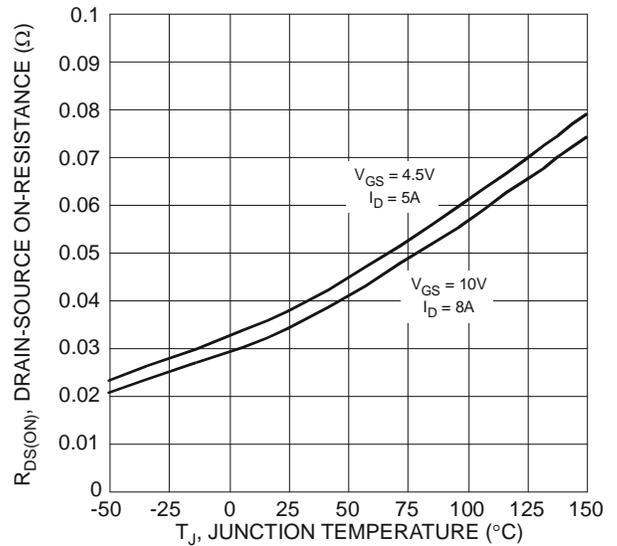


Figure 6 On-Resistance Variation with Temperature

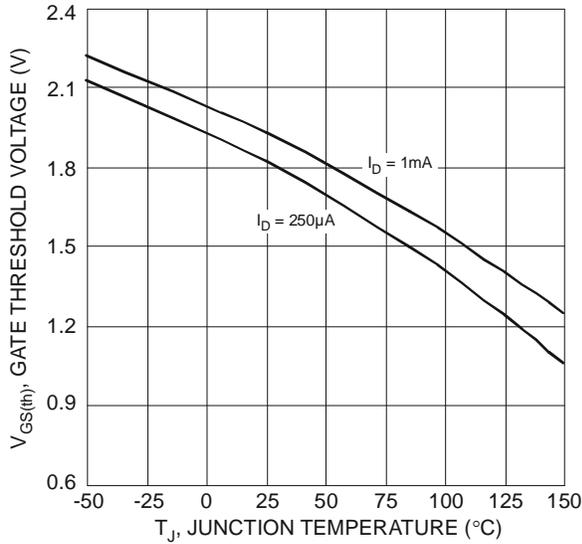


Figure 7 Gate Threshold Variation vs. Ambient Temperature

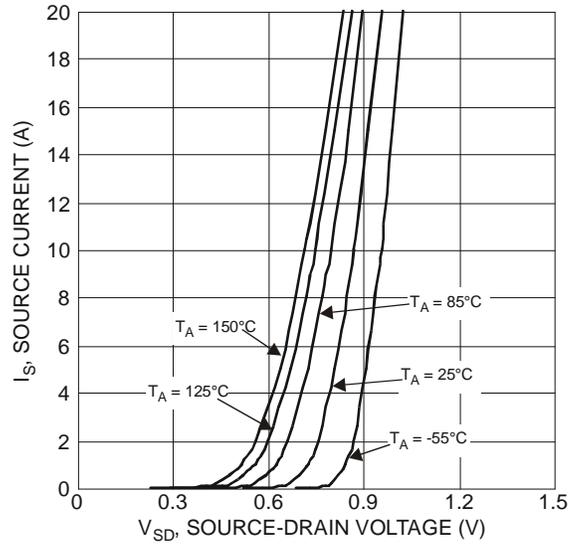


Figure 8 Diode Forward Voltage vs. Current

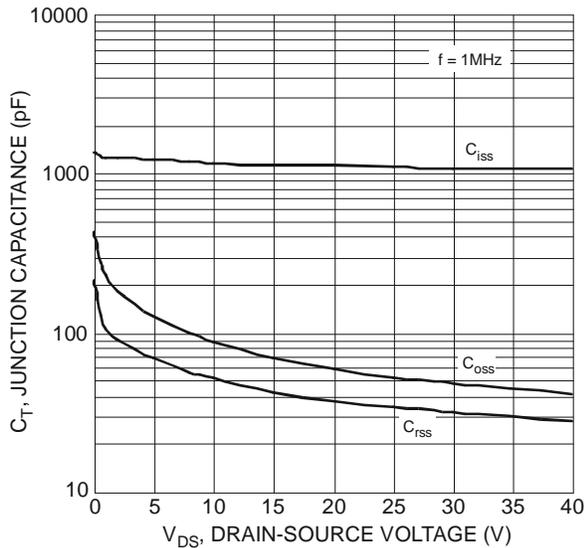


Figure 9 Typical Junction Capacitance

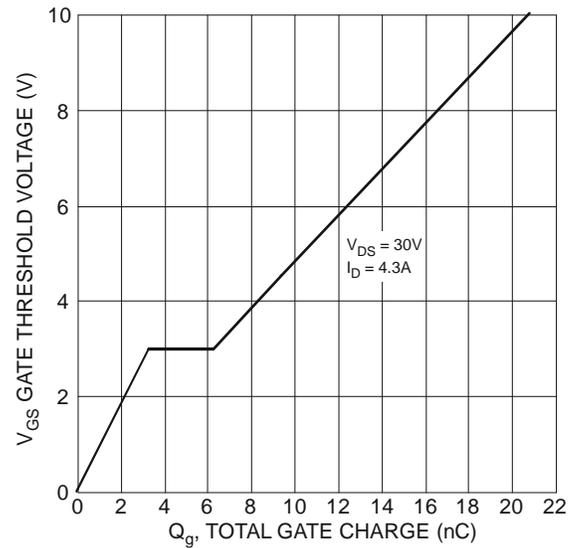


Figure 10 Gate Charge

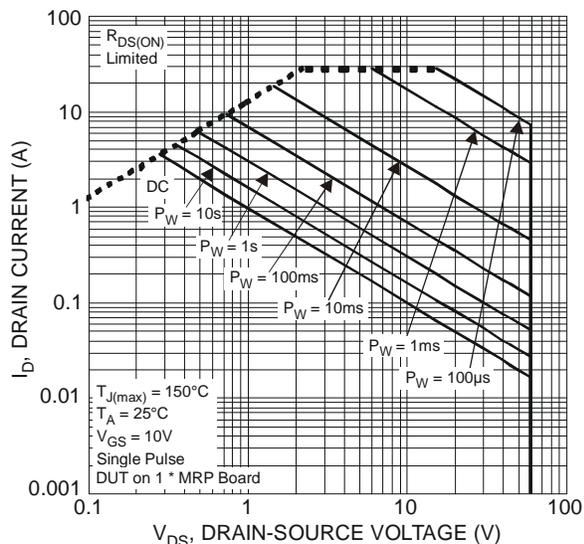
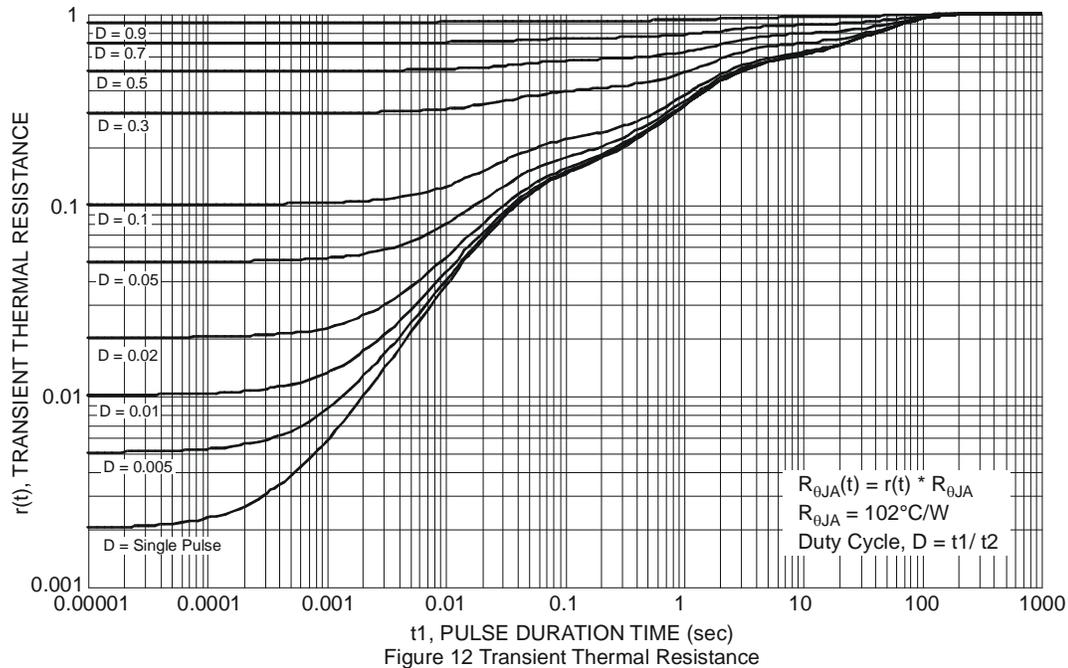


Figure 11 SOA, Safe Operation Area


Electrical Characteristics – P-Channel Q2 (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 9)						
Drain-Source Breakdown Voltage	BV_{DSS}	-60	—	—	V	$V_{GS} = 0V, I_D = -250\mu A$
Zero Gate Voltage Drain Current	I_{DSS}	—	—	-1	μA	$V_{DS} = -48V, V_{GS} = 0V$
Gate-Source Leakage	I_{GSS}	—	—	100	nA	$V_{GS} = \pm 16V, V_{DS} = 0V$
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	-1	—	-3	V	$V_{DS} = V_{GS}, I_D = -250\mu A$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	91	110	m Ω	$V_{GS} = -10V, I_D = -4.5A$
		—	110	130		$V_{GS} = -4.5V, I_D = -3.5A$
Diode Forward Voltage	V_{SD}	—	-0.7	-1.2	V	$V_{GS} = 0V, I_S = -1A$
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{ISS}	—	1,030	—	pF	$V_{DS} = -30V, V_{GS} = 0V, f = 1.0MHz$
Output Capacitance	C_{OSS}	—	49.1	—		
Reverse Transfer Capacitance	C_{RSS}	—	38.7	—		
Gate Resistance	R_G	—	13.6	—	Ω	$V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz$
Total Gate Charge ($V_{GS} = -4.5V$)	Q_G	—	9.5	—	nC	$V_{DS} = -30V, I_D = -5A$
Total Gate Charge ($V_{GS} = -10V$)	Q_G	—	19.4	—		
Gate-Source Charge	Q_{GS}	—	2.3	—		
Gate-Drain Charge	Q_{GD}	—	3.6	—		
Turn-On Delay Time	$t_{D(ON)}$	—	3.7	—	ns	$V_{GS} = -10V, V_{DS} = -30V, R_{GEN} = 6\Omega, I_D = -5A$
Turn-On Rise Time	t_R	—	6.3	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	58.7	—		
Turn-Off Fall Time	t_F	—	26.1	—		
Body Diode Reverse Recovery Time	t_{RR}	—	14.85	—	ns	$I_S = -5A, di/dt = 100A/\mu s$
Body Diode Reverse Recovery Charge	Q_{RR}	—	8.8	—	nC	$I_S = -5A, di/dt = 100A/\mu s$

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

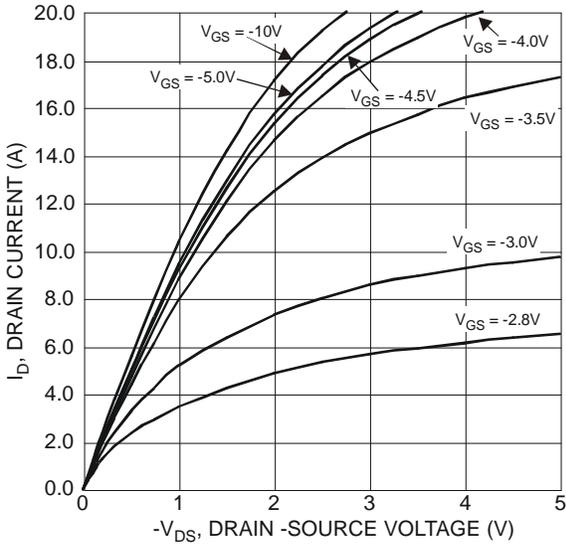


Figure 13 Typical Output Characteristics

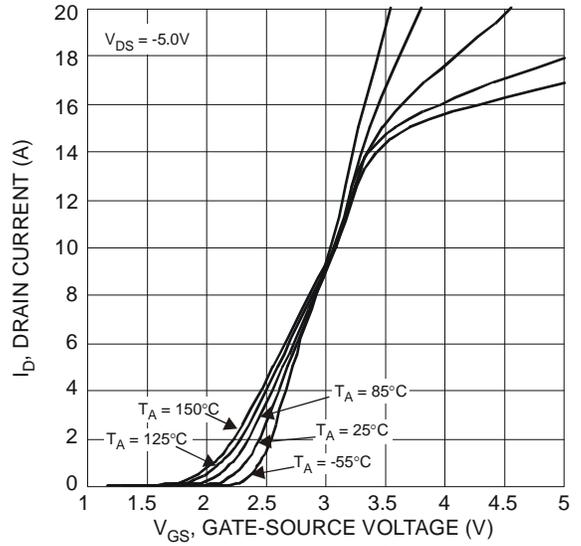


Figure 14 Typical Transfer Characteristics

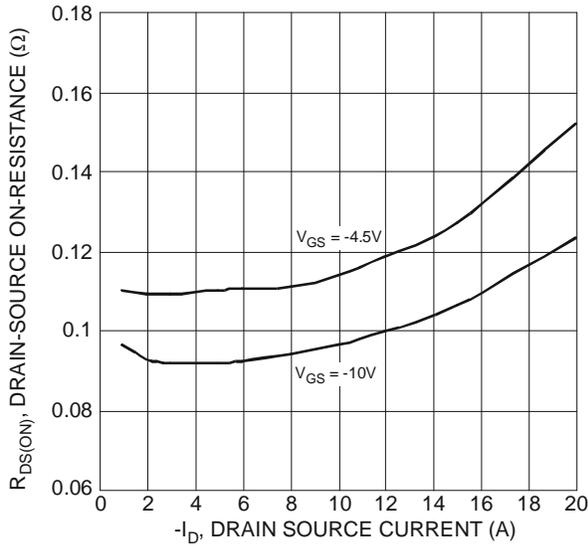


Figure 15 Typical On-Resistance vs. Drain Current and Gate Voltage

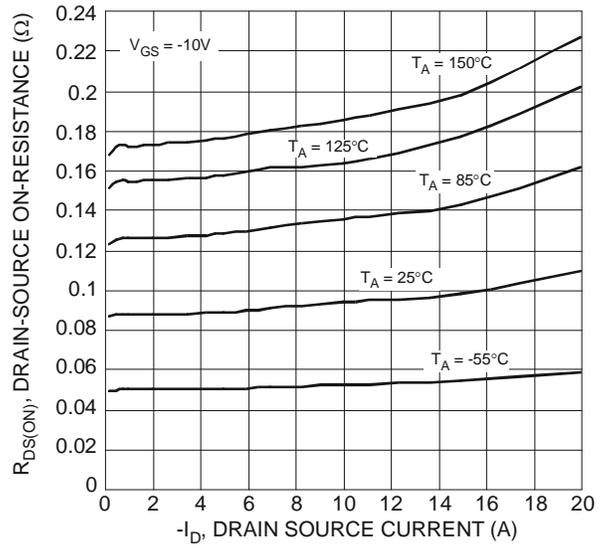


Figure 16 Typical On-Resistance vs. Drain Current and Temperature

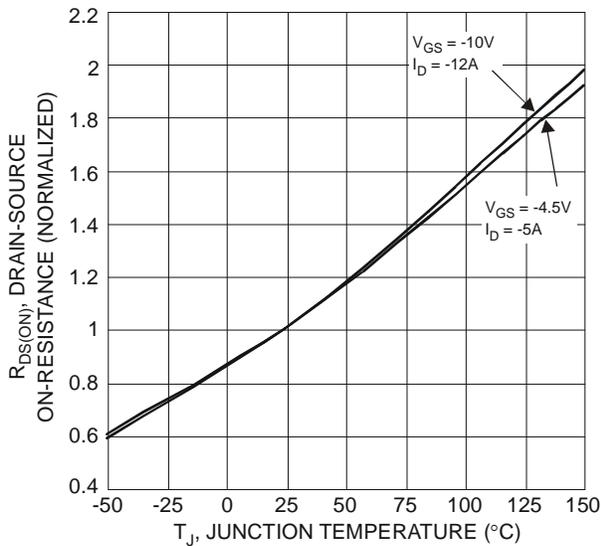


Fig. 17 On-Resistance Variation with Temperature

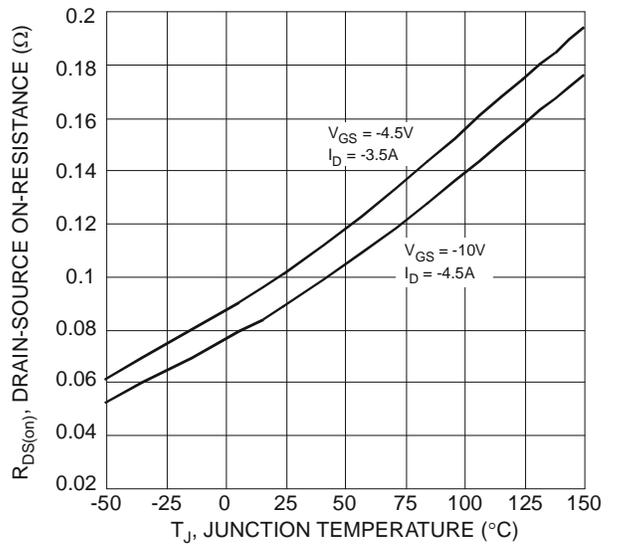


Figure 18 On-Resistance Variation with Temperature

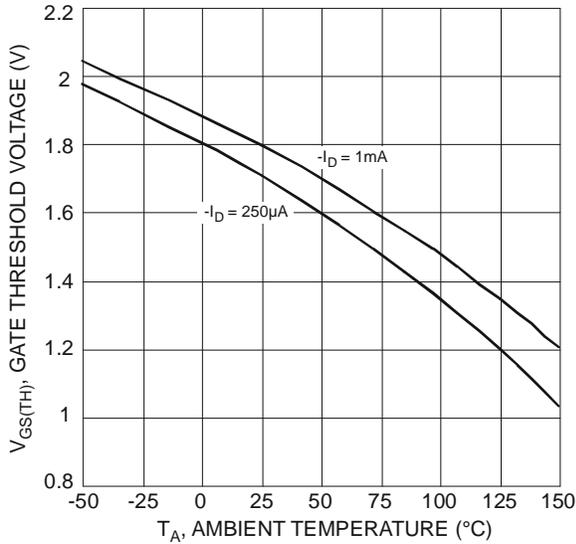


Figure 19 Gate Threshold Variation vs. Ambient Temperature

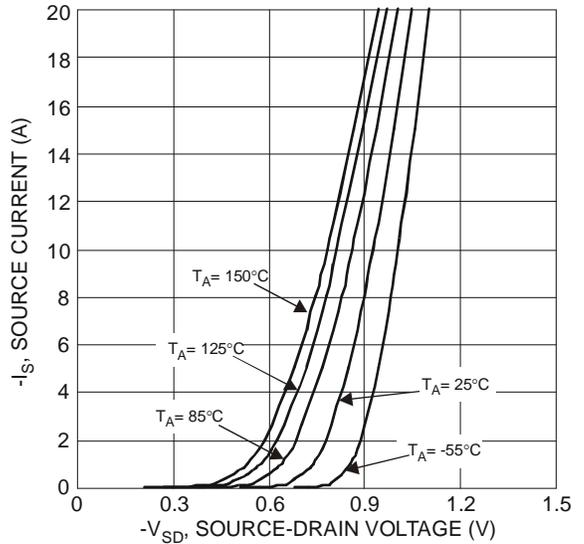


Figure 20 Diode Forward Voltage vs. Current

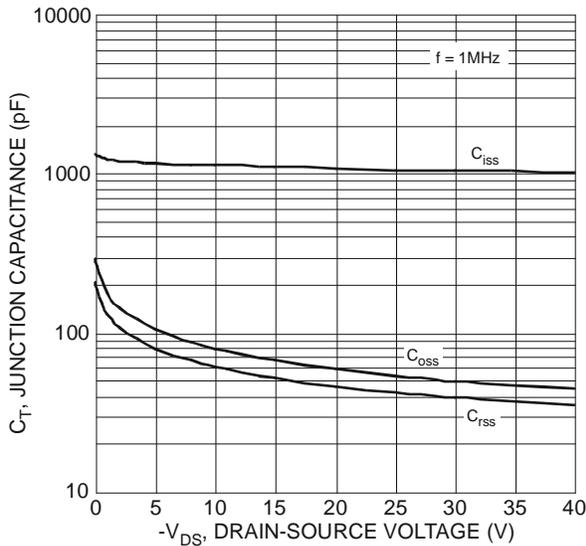


Figure 21 Typical Junction Capacitance

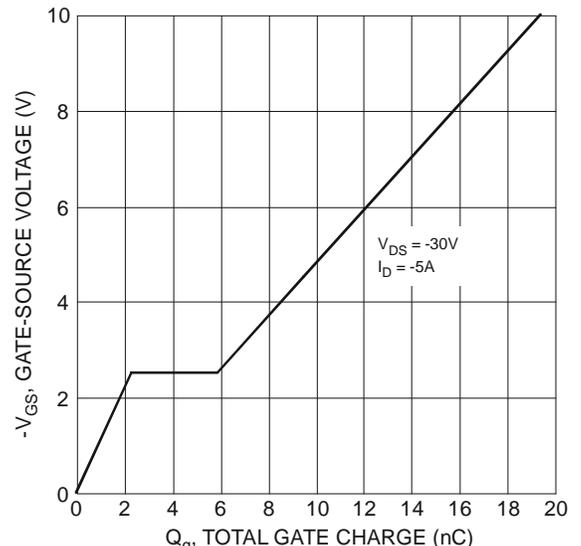


Figure 22 Gate-Charge Characteristics

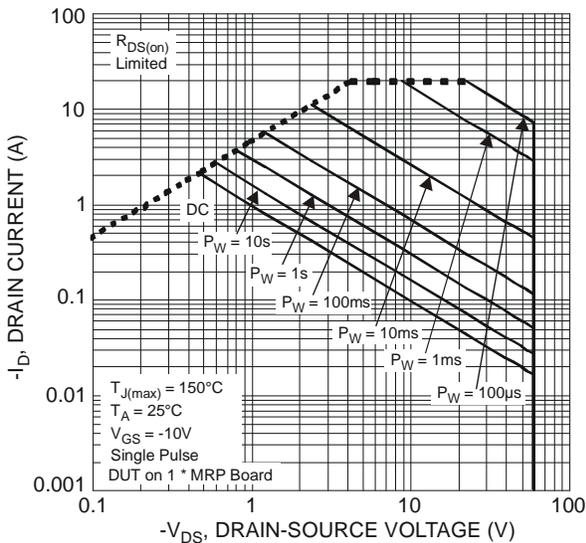
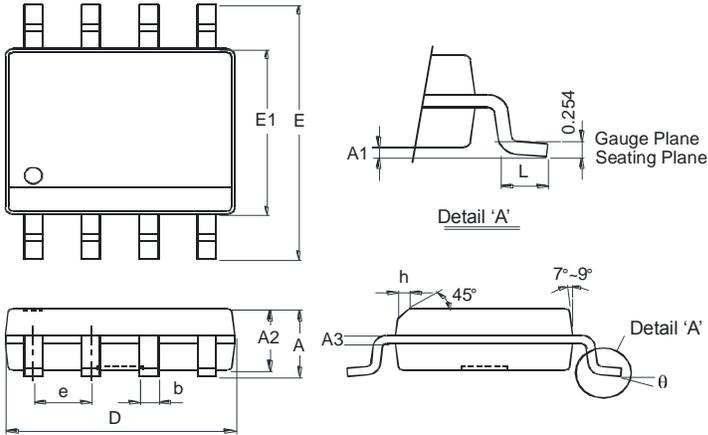


Figure 23 SOA, Safe Operation Area

Package Outline Dimensions

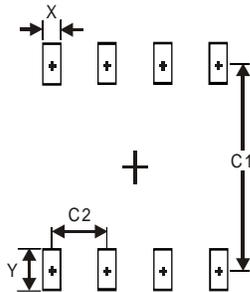
SO-8



SO-8		
Dim	Min	Max
A	–	1.75
A1	0.10	0.20
A2	1.30	1.50
A3	0.15	0.25
b	0.3	0.5
D	4.85	4.95
E	5.90	6.10
E1	3.85	3.95
e	1.27 Typ	
h	–	0.35
L	0.62	0.82
θ	0°	8°
All Dimensions in mm		

Suggested Pad Layout

SO-8



Dimensions	Value (in mm)
X	0.60
Y	1.55
C1	5.4
C2	1.27