



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	$V_{(BR)DSS}$	$R_{DS(ON)}$ max	I_D max $T_A = +25^\circ\text{C}$
Q1	20V	$0.5\Omega @ V_{GS} = 4.5V$	1030mA
		$0.9\Omega @ V_{GS} = 1.8V$	740mA
Q2	-20V	$1.0\Omega @ V_{GS} = -4.5V$	-700mA
		$2.0\Omega @ V_{GS} = -1.8V$	-460mA

Description

This new generation MOSFET has been 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

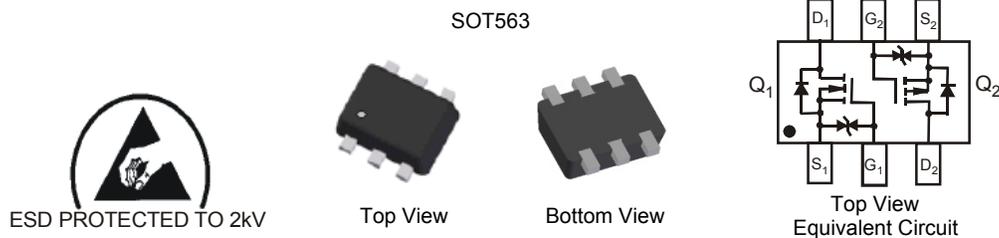
- Power management functions
- Battery Operated Systems and Solid-State Relays
- Load switch

Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage $V_{GS(th)} < 1V$
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Complementary Pair MOSFET
- Ultra-Small Surface Mount Package

Mechanical Data

- Case: SOT563
- 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 – Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 
- Weight: 0.003 grams (approximate)



Maximum Ratings - Q1 N-CHANNEL (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	20	V
Gate-Source Voltage			V_{GSS}	± 12	V
Continuous Drain Current (Note 6) $V_{GS} = 4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	1030 800	mA
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	1150 900	mA
Continuous Drain Current (Note 6) $V_{GS} = 1.8\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	740 570	mA
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	870 700	mA
Pulsed Drain Current (10 μs pulse, duty cycle = 1%)			I_{DM}	3	A
Maximum Body Diode Continuous Current			I_S	800	mA

Maximum Ratings - Q2 P-CHANNEL (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	-20	V
Gate-Source Voltage			V_{GSS}	± 8	V
Continuous Drain Current (Note 6) $V_{GS} = -4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	-700 -550	mA
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	-820 -640	mA
Continuous Drain Current (Note 6) $V_{GS} = -1.8\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	-460 -350	mA
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	-550 -420	mA
Pulsed Drain Current (10 μs pulse, duty cycle = 1%)			I_{DM}	-2	A
Maximum Body Diode Continuous Current			I_S	-800	mA

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)		P_D	0.45	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	$R_{\theta JA}$	281	$^\circ\text{C/W}$
	$t < 10\text{s}$		210	$^\circ\text{C/W}$
Total Power Dissipation (Note 6)		P_D	1	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	$R_{\theta JA}$	129	$^\circ\text{C/W}$
	$t < 10\text{s}$		97	$^\circ\text{C/W}$
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	20	—	—	V	$V_{GS} = 0V, I_D = 1mA$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	I_{DSS}	—	—	100	nA	$V_{DS} = 20V, V_{GS} = 0V$
Gate-Source Leakage	I_{GSS}	—	—	± 1	μA	$V_{GS} = \pm 5V, V_{DS} = 0V$
		—	—	± 4.0		$V_{GS} = \pm 8V, V_{DS} = 0V$
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(th)}$	0.5	—	0.9	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	0.3	0.48	Ω	$V_{GS} = 5.0V, I_D = 200mA$
		—	0.35	0.5		$V_{GS} = 4.5V, I_D = 200mA$
		—	0.45	0.7		$V_{GS} = 2.5V, I_D = 200mA$
		—	0.55	0.9		$V_{GS} = 1.8V, I_D = 100mA$
		—	0.65	1.5		$V_{GS} = 1.5V, I_D = 50mA$
		—	2	—		$V_{GS} = 1.2V, I_D = 1mA$
Forward Transfer Admittance	$ Y_{fs} $	—	1.4	—	S	$V_{DS} = 3V, I_D = 200mA$
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	$V_{GS} = 0V, I_S = 500mA$
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	37.1	—	pF	$V_{DS} = 10V, V_{GS} = 0V,$ $f = 1.0MHz$
Output Capacitance	C_{oss}	—	6.5	—		
Reverse Transfer Capacitance	C_{rss}	—	4.8	—		
Gate Resistance	R_g	—	68	—	Ω	$V_{DS} = 0V, V_{GS} = 0V,$
Total Gate Charge	Q_g	—	0.5	—	nC	$V_{GS} = 4.5V, V_{DS} = 10V,$ $I_D = 250mA$
Gate-Source Charge	Q_{gs}	—	0.07	—		
Gate-Drain Charge	Q_{gd}	—	0.1	—		
Turn-On Delay Time	$t_{D(on)}$	—	4.06	—	ns	$V_{DD} = 10V, V_{GS} = 4.5V,$ $R_L = 47\Omega, R_G = 10\Omega,$ $I_D = 200mA$
Turn-On Rise Time	t_r	—	7.28	—		
Turn-Off Delay Time	$t_{D(off)}$	—	13.74	—		
Turn-Off Fall Time	t_f	—	10.54	—		

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

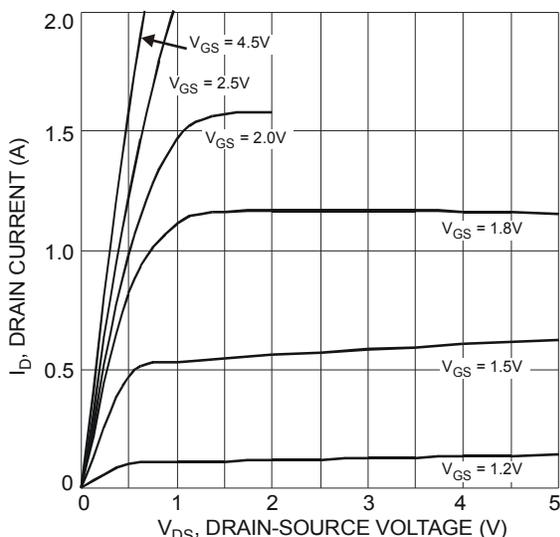


Fig. 1 Typical Output Characteristics

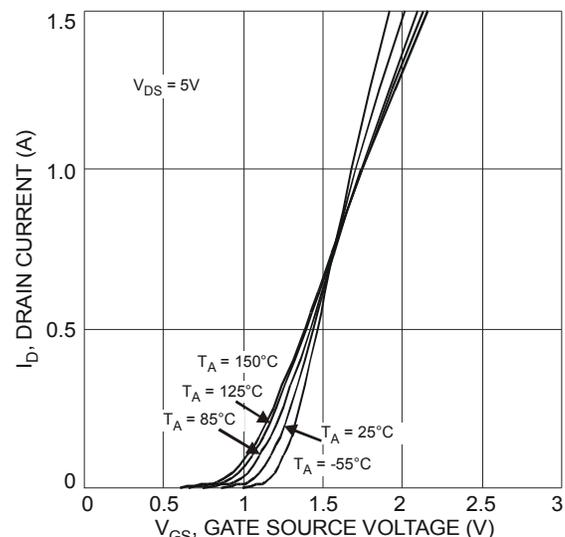


Fig. 2 Typical Transfer Characteristics

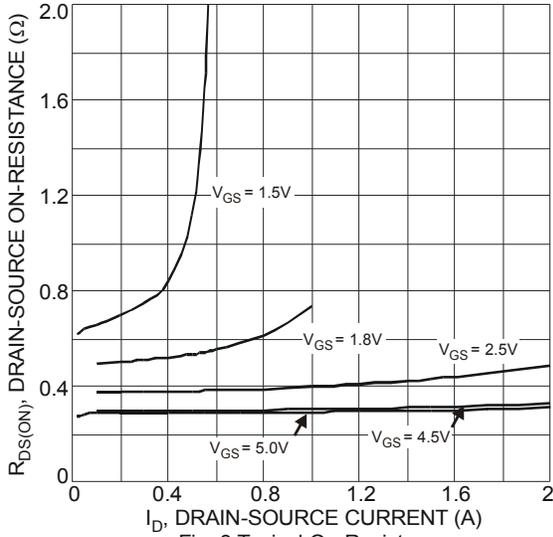


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

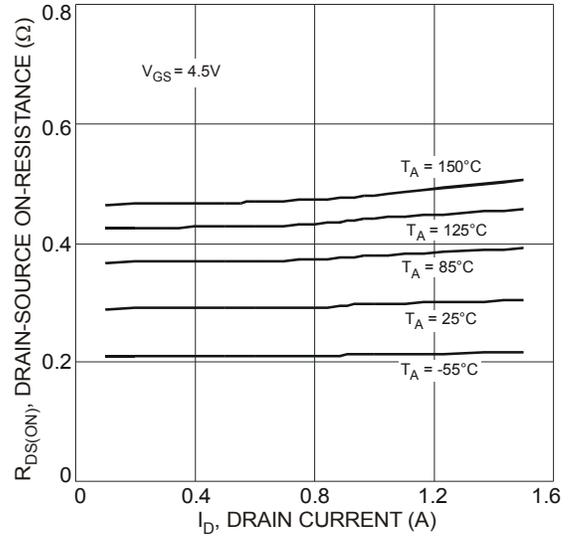


Fig. 4 Typical Drain-Source On-Resistance vs. Drain Current and Temperature

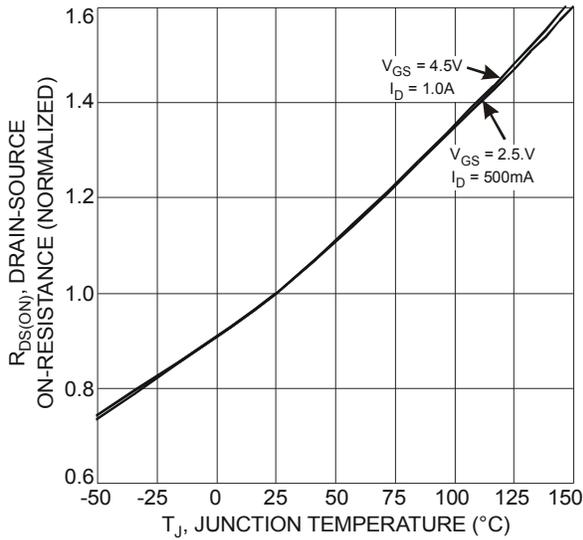


Fig. 5 On-Resistance Variation with Temperature

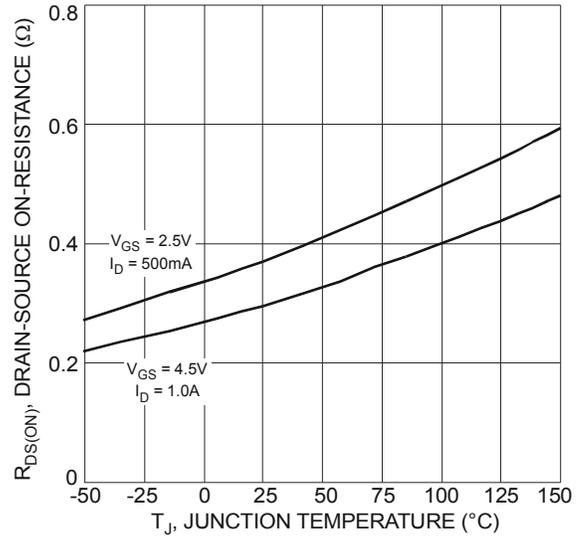


Fig. 6 On-Resistance Variation with Temperature

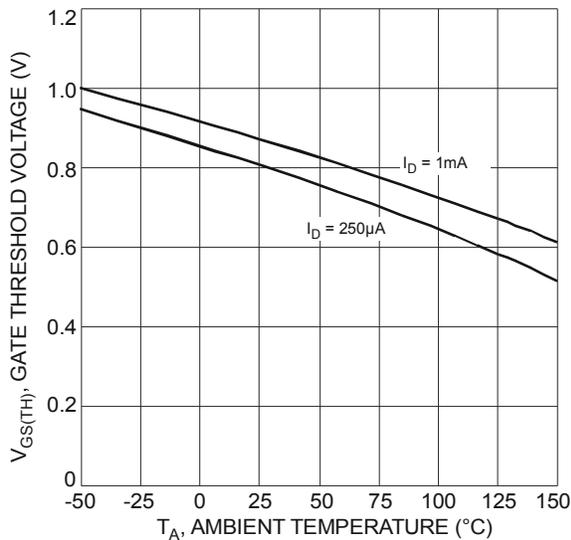


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

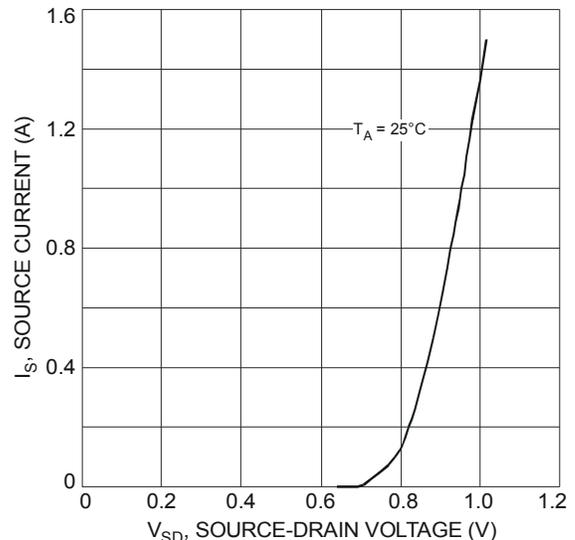
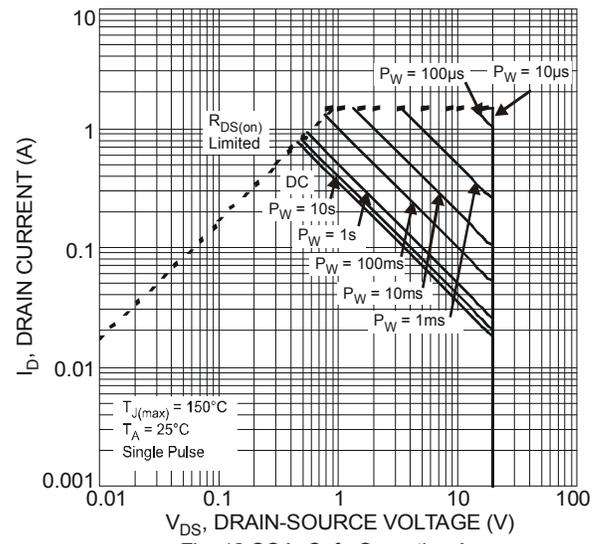
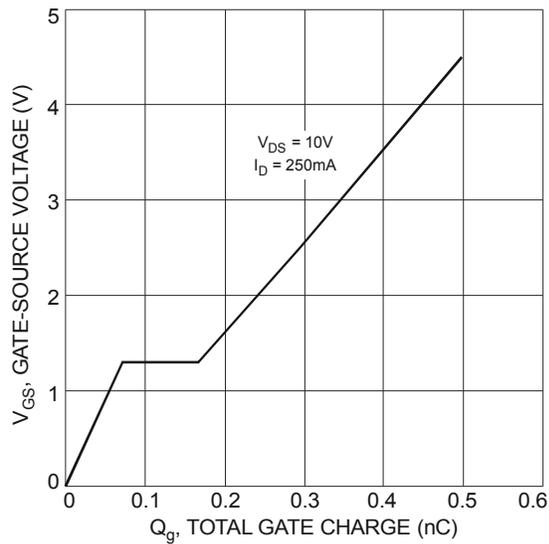
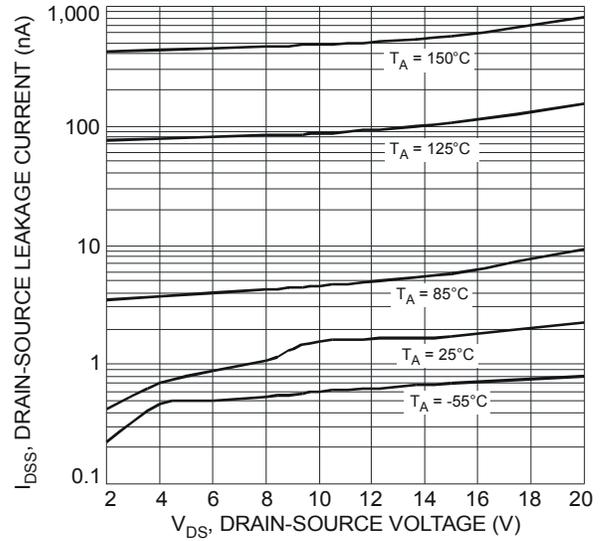
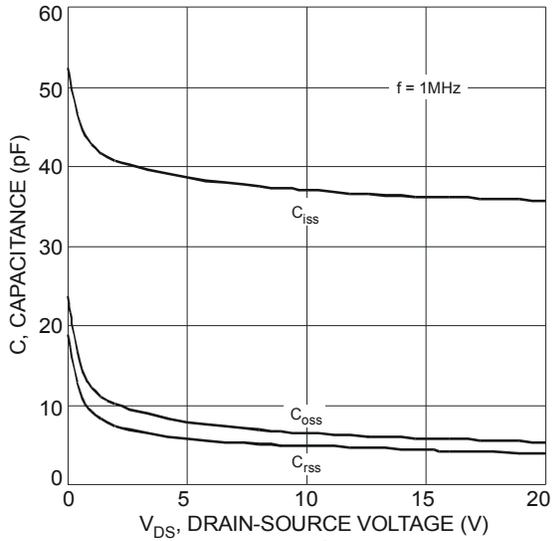


Fig. 8 Diode Forward Voltage vs. Current



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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 6)						
Drain-Source Breakdown Voltage	BV_{DSS}	-20	—	—	V	$V_{GS} = 0V, I_D = -1mA$
Zero Gate Voltage Drain Current $T_J = 25^\circ\text{C}$	I_{DSS}	—	—	-100	nA	$V_{DS} = -20V, V_{GS} = 0V$
Gate-Source Leakage	I_{GSS}	—	—	± 1.0	μA	$V_{GS} = \pm 5V, V_{DS} = 0V$
		—	—	± 5.0		$V_{GS} = \pm 8V, V_{DS} = 0V$
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$V_{GS(th)}$	-0.5	—	-1.0	V	$V_{DS} = V_{GS}, I_D = -250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(on)}$	—	0.67	0.97	Ω	$V_{GS} = -5V, I_D = -100mA$
		—	0.7	1.0		$V_{GS} = -4.5V, I_D = -100mA$
		—	0.9	1.5		$V_{GS} = -2.5V, I_D = -80mA$
		—	1.2	2.0		$V_{GS} = -1.8V, I_D = -40mA$
		—	1.5	3.0		$V_{GS} = -1.5V, I_D = -30mA$
		—	5	—		$V_{GS} = -1.2V, I_D = -1mA$
Forward Transfer Admittance	$ Y_{fs} $	—	0.7	—	S	$V_{DS} = -3V, I_D = -100mA$
Diode Forward Voltage	V_{SD}	—	-0.75	-1.2	V	$V_{GS} = 0V, I_S = -330mA$
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C_{iss}	—	46.1	—	pF	$V_{DS} = 10V, V_{GS} = 0V,$ $f = 1.0MHz$
Output Capacitance	C_{oss}	—	7.2	—		
Reverse Transfer Capacitance	C_{rss}	—	4.9	—		
Gate Resistance	R_g	—	14.3	—	Ω	$V_{DS} = 0V, V_{GS} = 0V,$
Total Gate Charge $V_{GS} = -4.5V$	Q_g	—	0.5	—	nC	$V_{DS} = -10V, I_D = -250mA$
Total Gate Charge $V_{GS} = -10V$	Q_g	—	0.85	—		
Gate-Source Charge	Q_{gs}	—	0.09	—		
Gate-Drain Charge	Q_{gd}	—	0.09	—		
Turn-On Delay Time	$t_{D(on)}$	—	8.5	—	ns	$V_{DD} = -3V, V_{GS} = -2.5V,$ $R_L = 300\Omega, R_G = 25\Omega,$ $I_D = -100mA$
Turn-On Rise Time	t_r	—	4.3	—		
Turn-Off Delay Time	$t_{D(off)}$	—	20.2	—		
Turn-Off Fall Time	t_f	—	19.2	—		

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

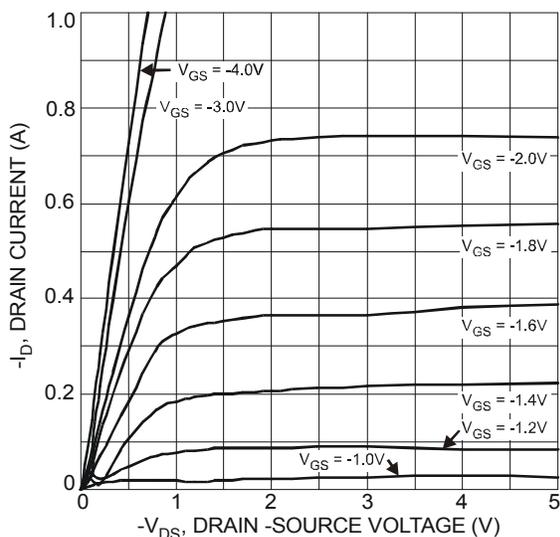


Fig. 13 Typical Output Characteristics

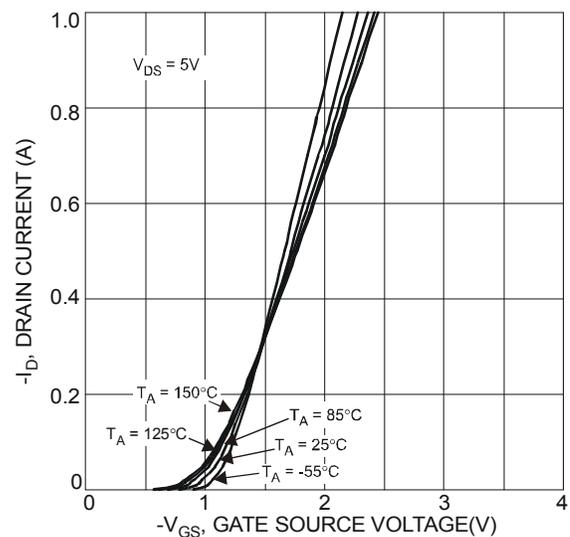


Fig. 14 Typical Transfer Characteristics

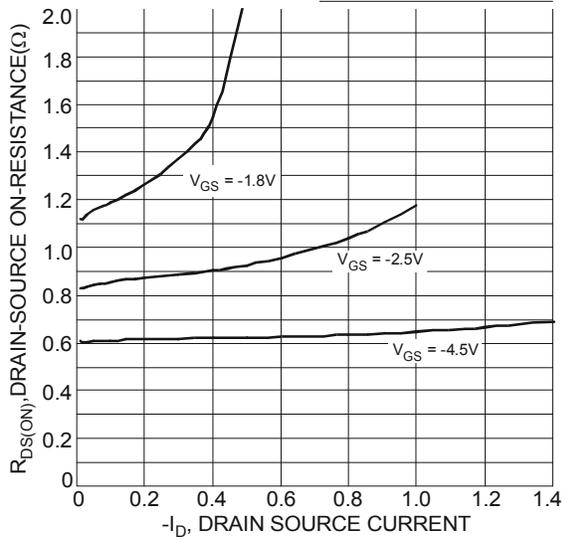


Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

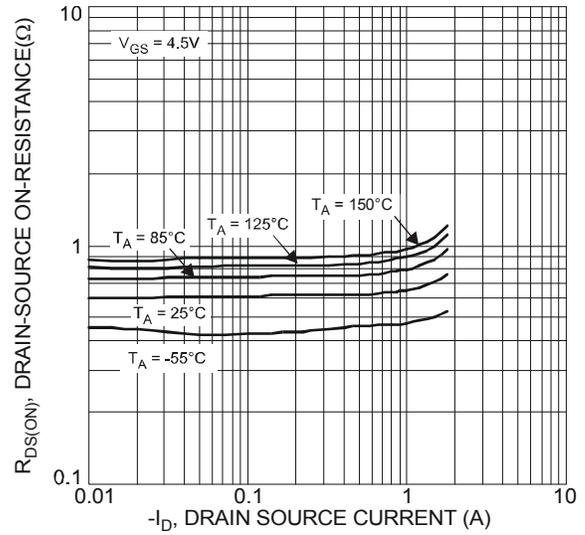


Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

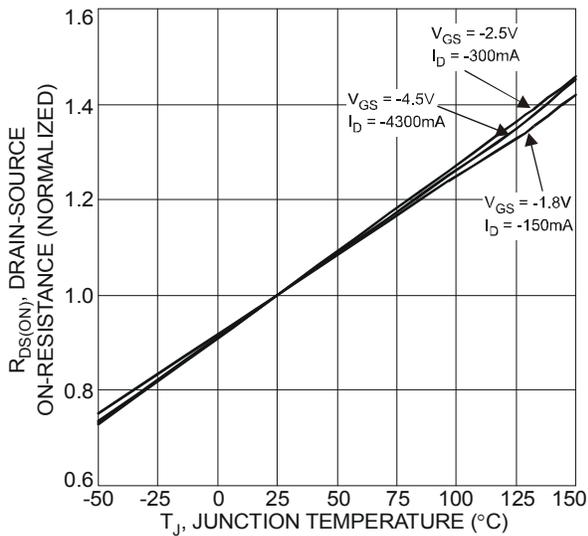


Fig. 17 On-Resistance Variation with Temperature

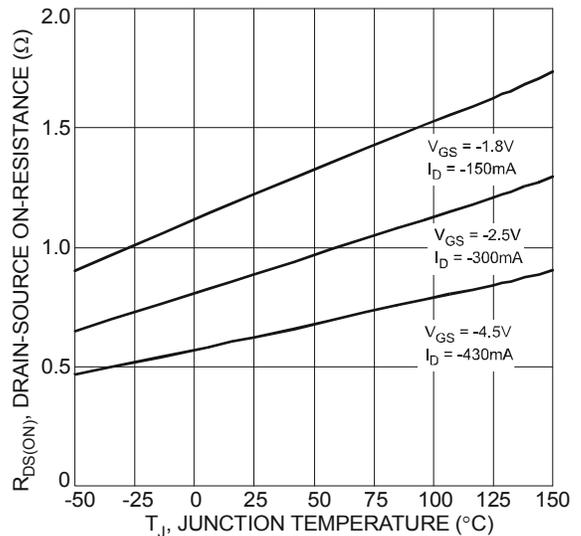


Fig. 18 On-Resistance vs. Temperature

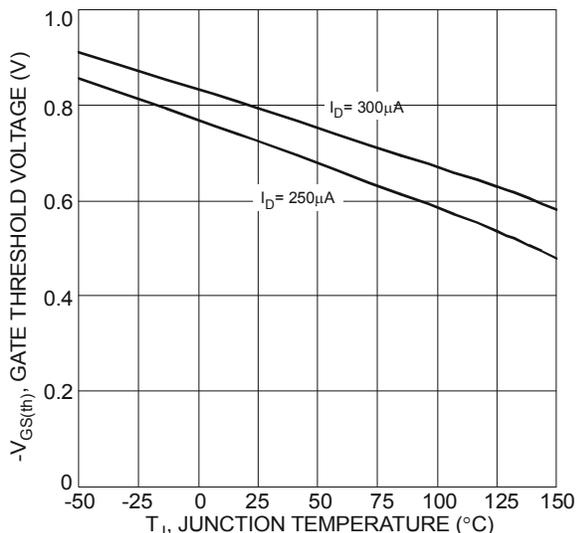


Fig. 19 Gate Threshold Variation vs. Ambient Temperature

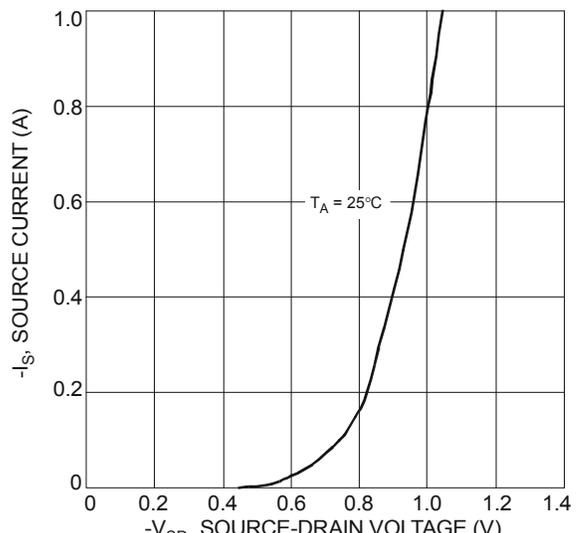


Fig. 20 Diode Forward Voltage vs. Current

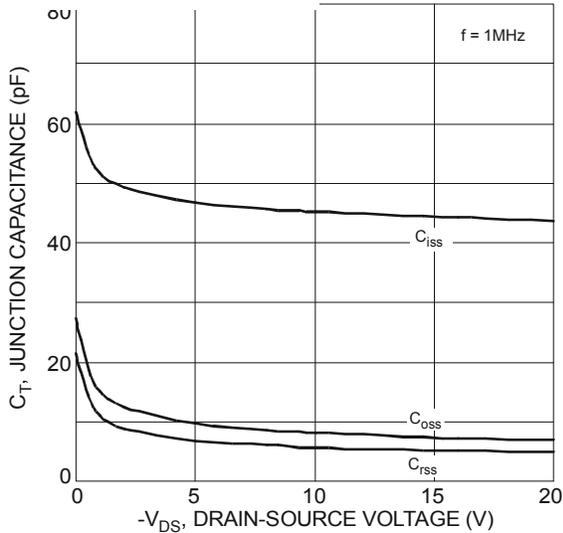


Fig. 21 Typical Junction Capacitance

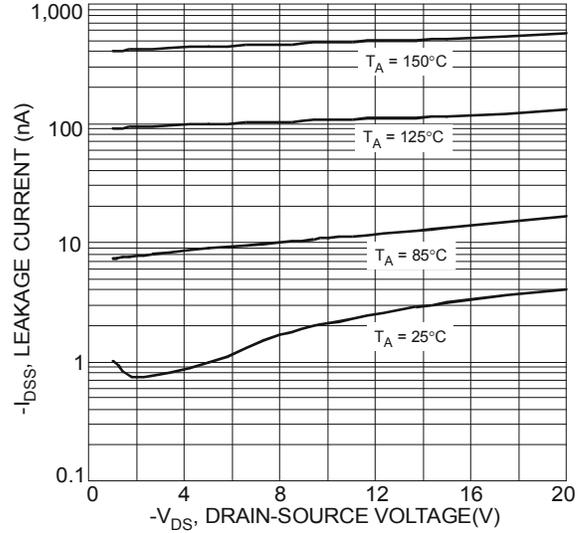


Fig. 22 Typical Drain-Source Leakage Current vs. Voltage

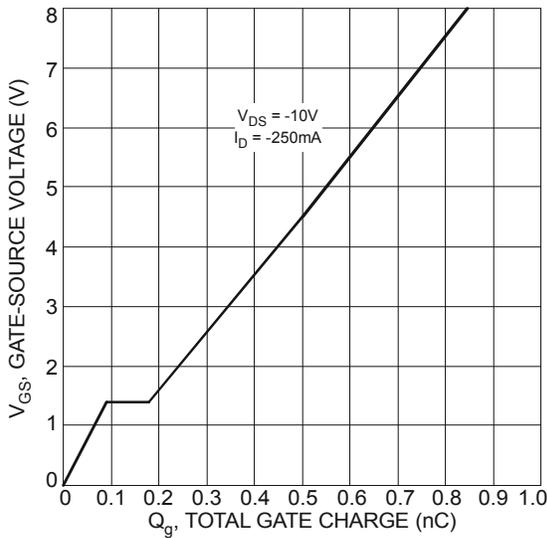


Fig. 23 Gate-Charge Characteristics

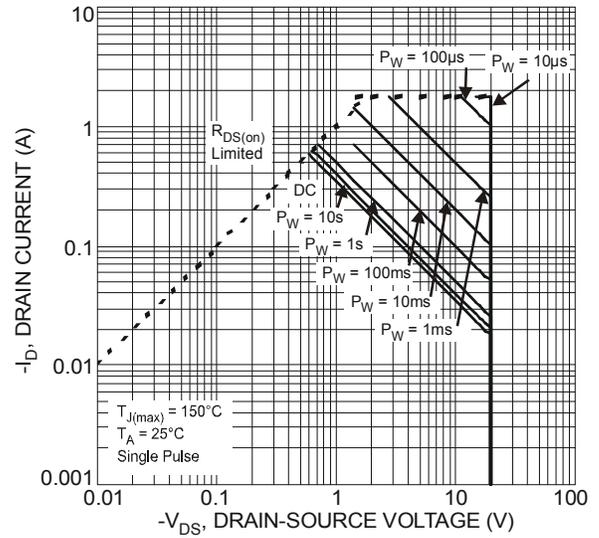


Fig. 24 SOA, Safe Operation Area

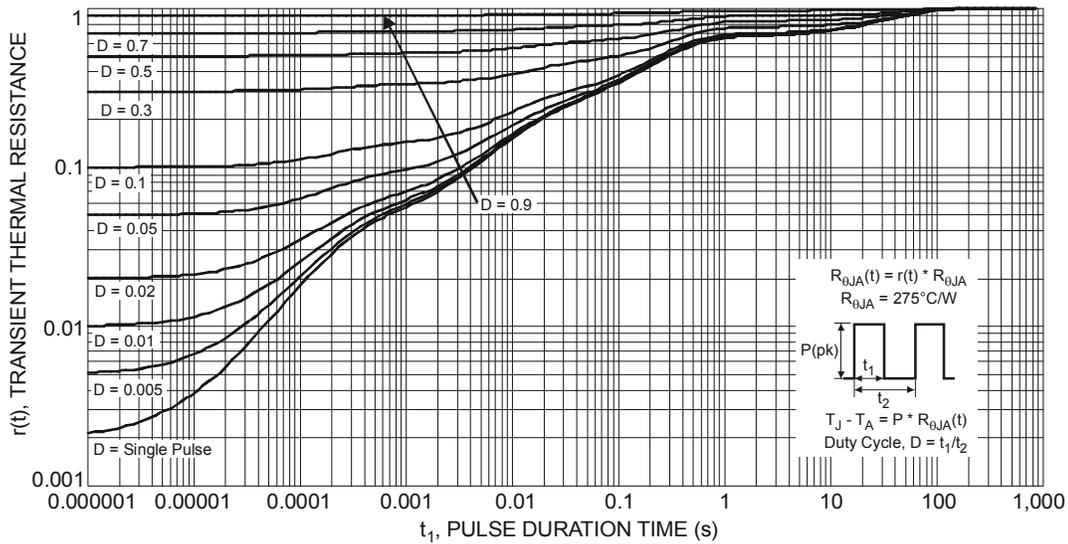
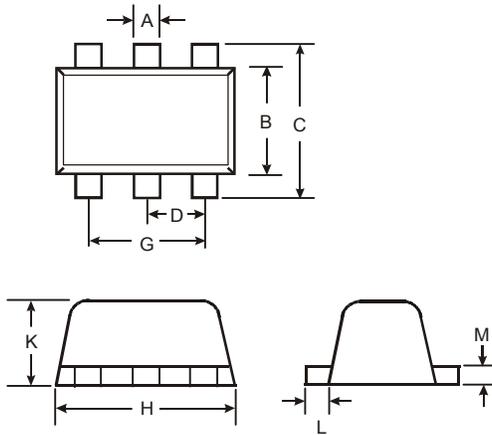


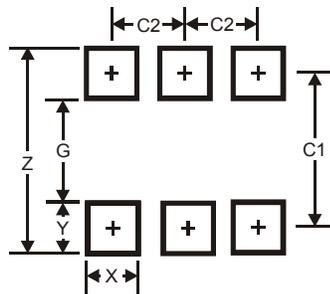
Fig. 25 Transient Thermal Response

Package Outline Dimensions



SOT563			
Dim	Min	Max	Typ
A	0.15	0.30	0.20
B	1.10	1.25	1.20
C	1.55	1.70	1.60
D	-	-	0.50
G	0.90	1.10	1.00
H	1.50	1.70	1.60
K	0.55	0.60	0.60
L	0.10	0.30	0.20
M	0.10	0.18	0.11
All Dimensions in mm			

Suggested Pad Layout



Dimensions	Value (in mm)
Z	2.2
G	1.2
X	0.375
Y	0.5
C1	1.7
C2	0.5