



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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## Features

- 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
- ESD Protected Gate

## Mechanical Data

- Case: SOT563
- Case Material: Molded Plastic, "Green" Molding Compound.  
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020D
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe.  
Solderable per MIL-STD-202, Method 208  $\text{E3}$
- Weight: 0.006 grams (Approximate)



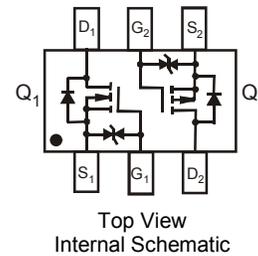
SOT563



Top View



Bottom View



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

Characteristic	Symbol	Value	Unit
Drain Source Voltage	$V_{DSS}$	20	V
Gate-Source Voltage	$V_{GSS}$	$\pm 6$	V
Drain Current (Note 5)	$I_D$	$T_A = +25^\circ\text{C}$	870
		$T_A = +85^\circ\text{C}$	630

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

Characteristic	Symbol	Value	Unit
Drain Source Voltage	$V_{DSS}$	-20	V
Gate-Source Voltage	$V_{GSS}$	$\pm 6$	V
Drain Current (Note 5)	$I_D$	$T_A = +25^\circ\text{C}$	-640
		$T_A = +85^\circ\text{C}$	-460

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

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	$P_D$	530	mW
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	235	$^\circ\text{C}/\text{W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

Note: 5. Device mounted on FR-4 PCB.

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 6)						
Drain-Source Breakdown Voltage	$BV_{DSS}$	20	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	100	nA	$V_{DS} = 20V, V_{GS} = 0V$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 1.0$	$\mu A$	$V_{GS} = \pm 4.5V, V_{DS} = 0V$
<b>ON CHARACTERISTICS</b> (Note 6)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.5	—	1.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	0.3	0.4	$\Omega$	$V_{GS} = 4.5V, I_D = 600mA$
		—	0.4	0.5		$V_{GS} = 2.5V, I_D = 500mA$
		—	0.5	0.7		$V_{GS} = 1.8V, I_D = 350mA$
Forward Transfer Admittance	$ Y_{FS} $	—	1.4	—	S	$V_{DS} = 10V, I_D = 400mA$
Diode Forward Voltage (Note 6)	$V_{SD}$	—	0.7	1.2	V	$V_{GS} = 0V, I_S = 150mA$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	—	60.67	—	pF	$V_{DS} = 16V, V_{GS} = 0V$ $f = 1.0MHz$
Output Capacitance	$C_{OSS}$	—	9.68	—	pF	
Reverse Transfer Capacitance	$C_{RSS}$	—	5.37	—	pF	
Total Gate Charge	$Q_G$	—	736.6	—	pC	$V_{GS} = 4.5V, V_{DS} = 10V,$ $I_D = 250mA$
Gate-Source Charge	$Q_{GS}$	—	93.6	—		
Gate-Drain Charge	$Q_{GD}$	—	116.6	—		
Turn-On Delay Time	$t_{D(ON)}$	—	5.1	—	ns	$V_{DD} = 10V, V_{GS} = 4.5V,$ $R_L = 47\Omega, R_G = 10\Omega,$ $I_D = 200mA$
Turn-On Rise Time	$t_R$	—	7.4	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	26.7	—		
Turn-Off Fall Time	$t_F$	—	12.3	—		

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 6)						
Drain-Source Breakdown Voltage	$BV_{DSS}$	-20	—	—	V	$V_{GS} = 0V, I_D = -250\mu A$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	-100	nA	$V_{DS} = -20V, V_{GS} = 0V$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 2.0$	$\mu A$	$V_{GS} = \pm 4.5V, V_{DS} = 0V$
<b>ON CHARACTERISTICS</b> (Note 6)						
Gate Threshold Voltage	$V_{GS(TH)}$	-0.5	—	-1.0	V	$V_{DS} = V_{GS}, I_D = -250\mu A$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	0.5	0.7	$\Omega$	$V_{GS} = -4.5V, I_D = -430mA$
		—	0.7	0.9		$V_{GS} = -2.5V, I_D = -300mA$
		—	1.0	1.3		$V_{GS} = -1.8V, I_D = -150mA$
Forward Transfer Admittance	$ Y_{FS} $	—	-0.9	—	S	$V_{DS} = 10V, I_D = -250mA$
Diode Forward Voltage (Note 6)	$V_{SD}$	—	-0.8	-1.2	V	$V_{GS} = 0V, I_S = -150mA$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	—	59.76	—	pF	$V_{DS} = -16V, V_{GS} = 0V$ $f = 1.0MHz$
Output Capacitance	$C_{OSS}$	—	12.07	—	pF	
Reverse Transfer Capacitance	$C_{RSS}$	—	6.36	—	pF	
Total Gate Charge	$Q_G$	—	622.4	—	pC	$V_{GS} = -4.5V, V_{DS} = -10V,$ $I_D = -250mA$
Gate-Source Charge	$Q_{GS}$	—	100.3	—		
Gate-Drain Charge	$Q_{GD}$	—	132.2	—		
Turn-On Delay Time	$t_{D(ON)}$	—	5.1	—	ns	$V_{DD} = -10V, V_{GS} = -4.5V,$ $R_L = 47\Omega, R_G = 10\Omega,$ $I_D = -200mA$
Turn-On Rise Time	$t_R$	—	8.1	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	28.4	—		
Turn-Off Fall Time	$t_F$	—	20.7	—		

Note: 6. Short duration pulse test used to minimize self-heating effect.

**N-CHANNEL – Q1**

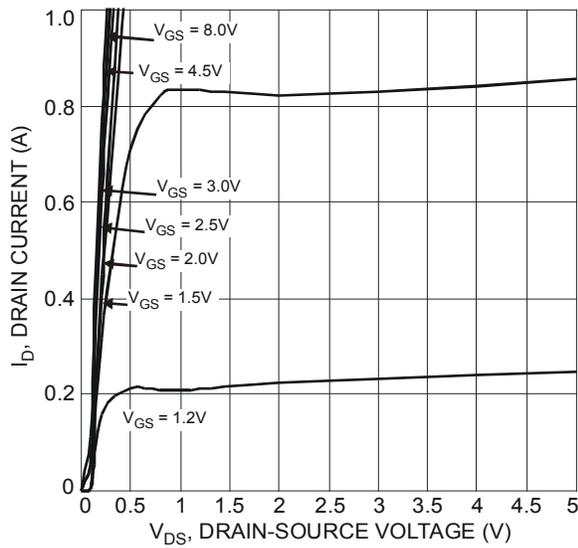


Fig. 1 Typical Output Characteristic

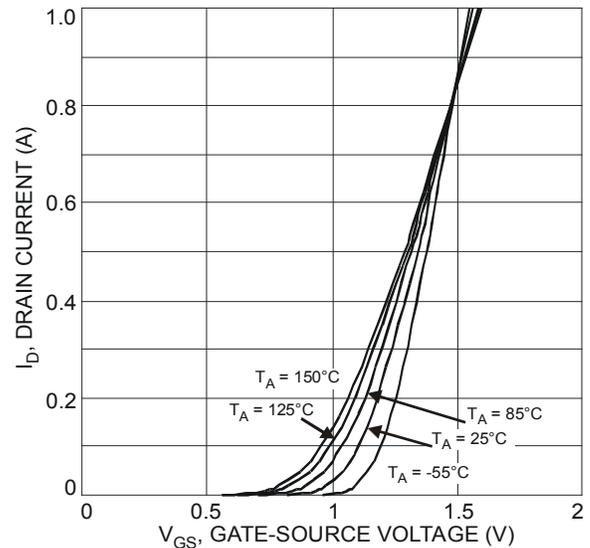


Fig. 2 Typical Transfer Characteristic

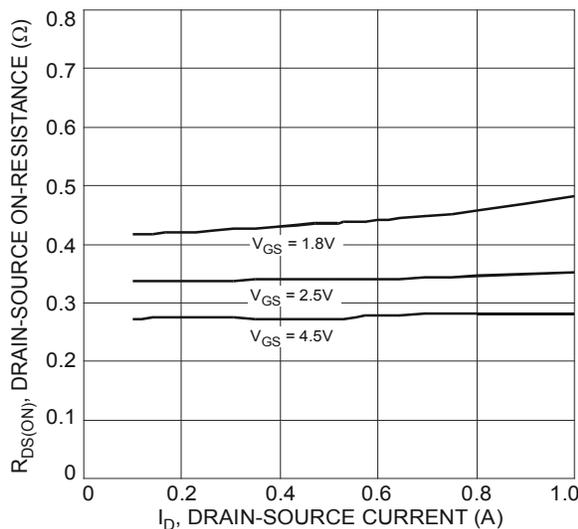


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

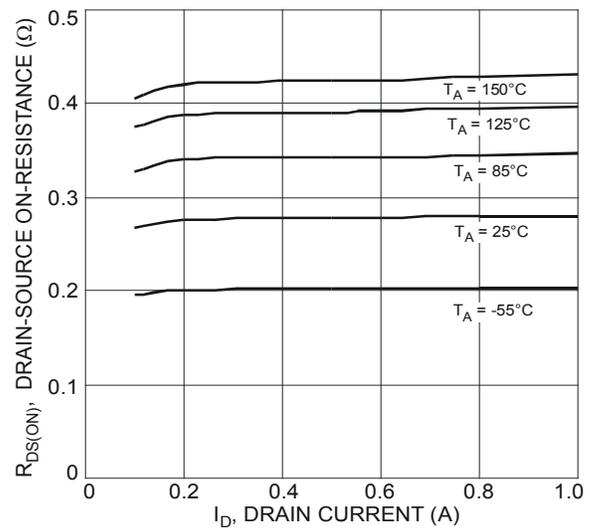


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

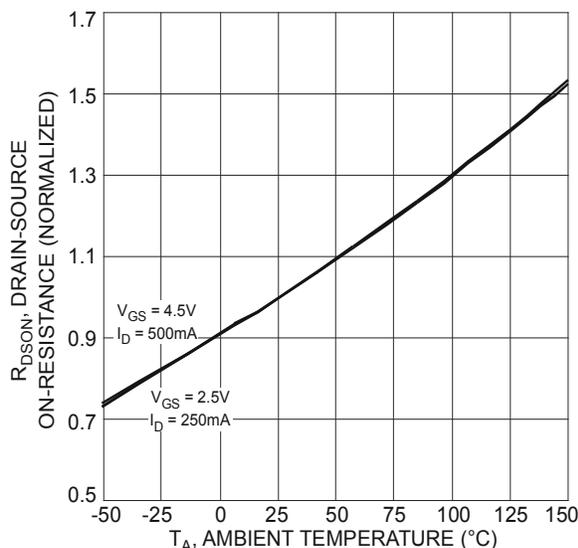


Fig. 5 On-Resistance Variation with Temperature

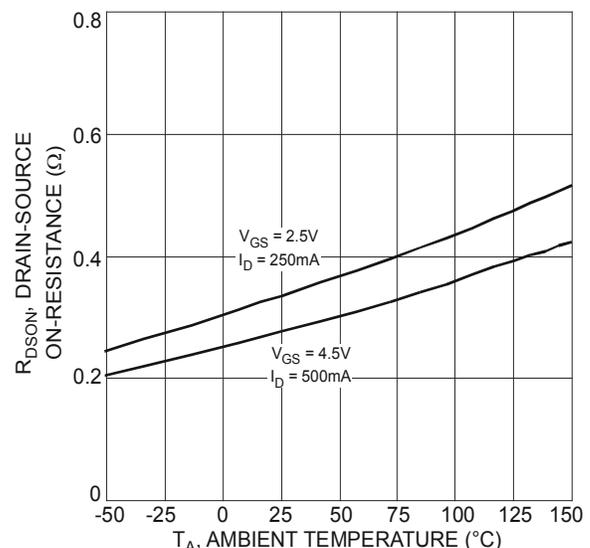


Fig. 6 On-Resistance Variation with Temperature

**N-CHANNEL – Q1** (continued)

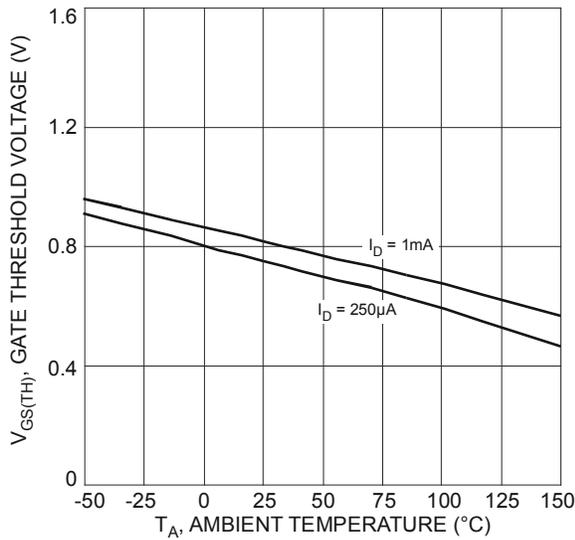


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

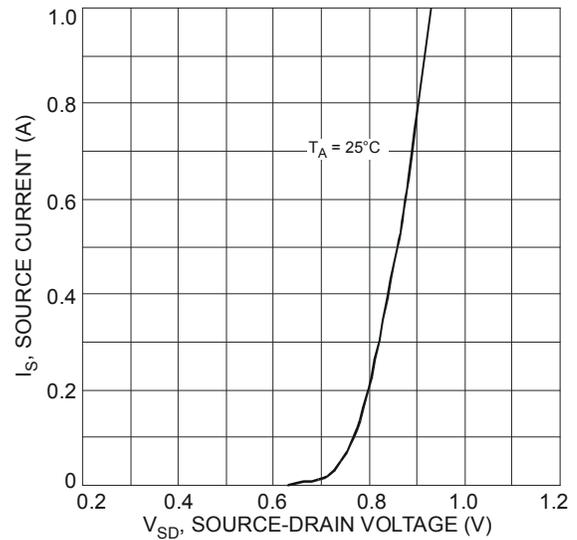


Fig. 8 Diode Forward Voltage vs. Current

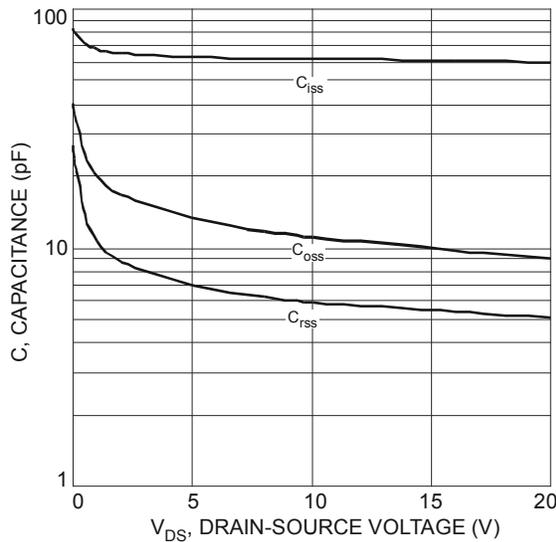


Fig. 9 Typical Total Capacitance

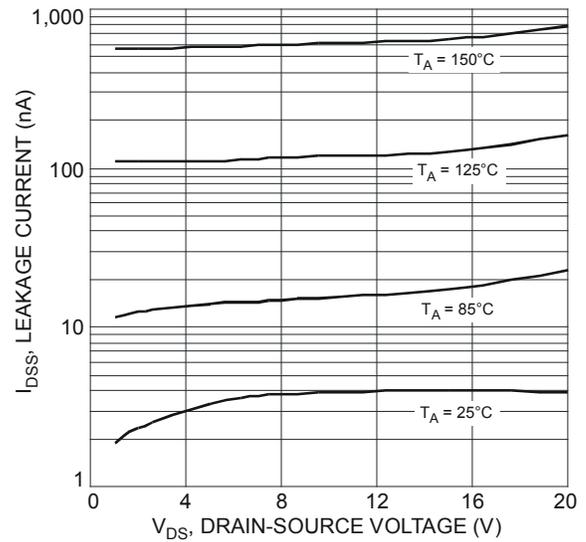


Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

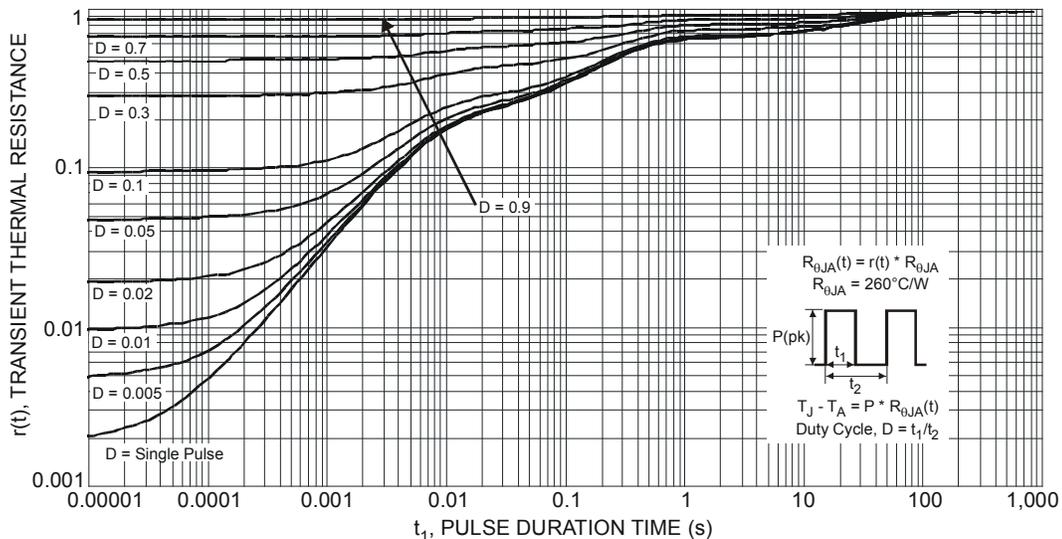


Fig. 11 Transient Thermal Response

**P-CHANNEL – Q2**

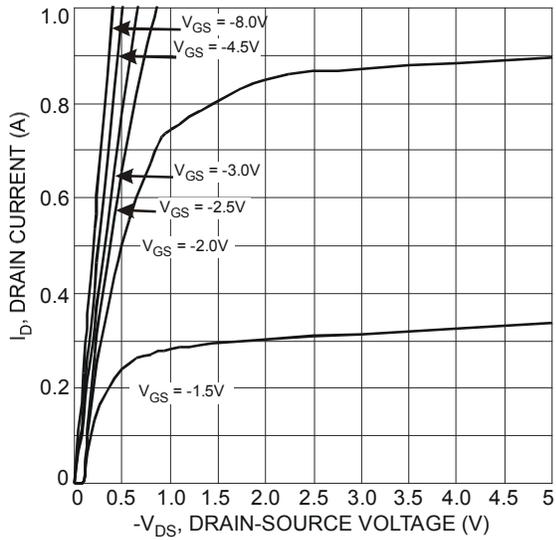


Fig. 12 Typical Output Characteristic

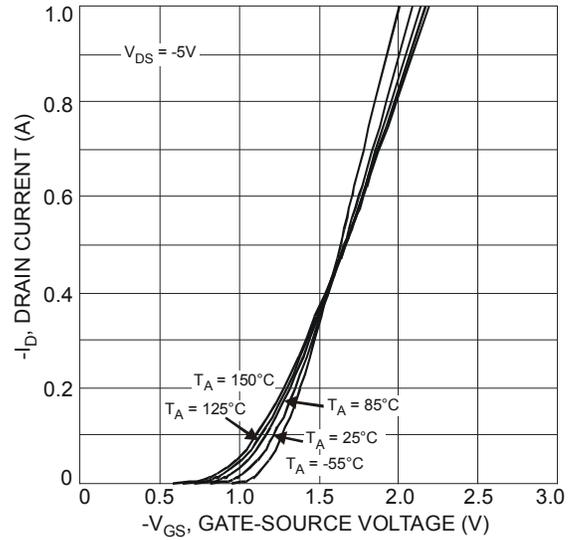


Fig. 13 Typical Transfer Characteristic

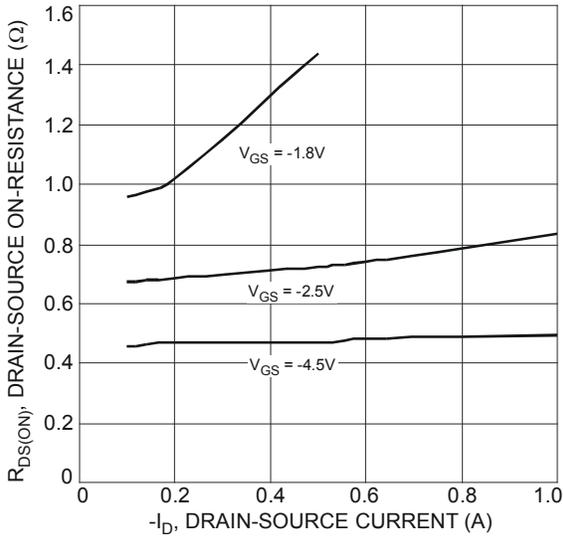


Fig. 14 Typical On-Resistance vs. Drain Current and Gate Voltage

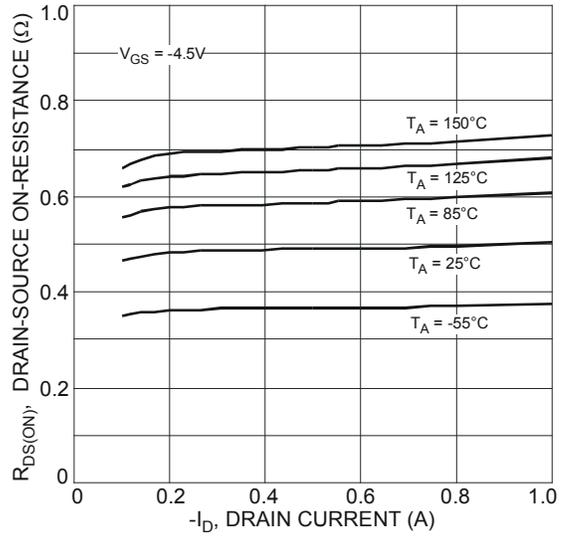


Fig. 15 Typical On-Resistance vs. Drain Current and Temperature

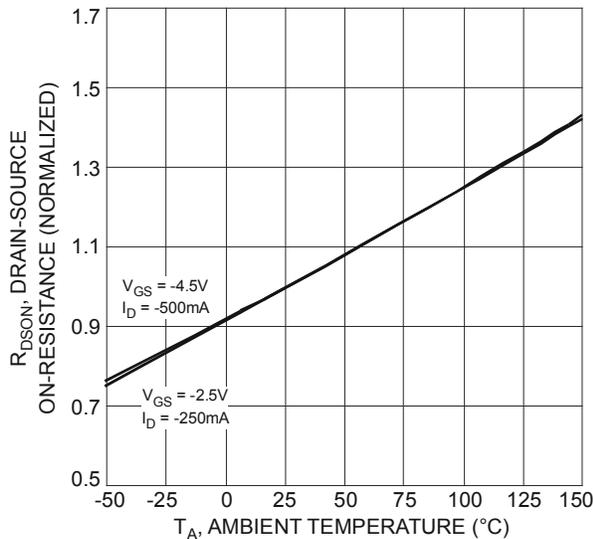


Fig. 16 On-Resistance Variation with Temperature

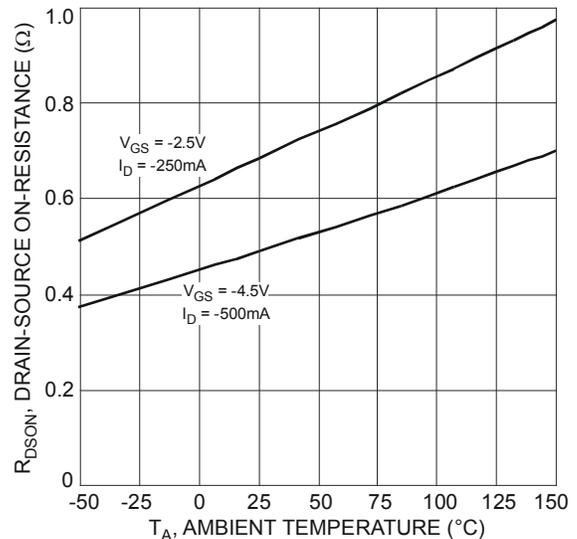


Fig. 17 On-Resistance Variation with Temperature

**P-CHANNEL – Q2** (continued)

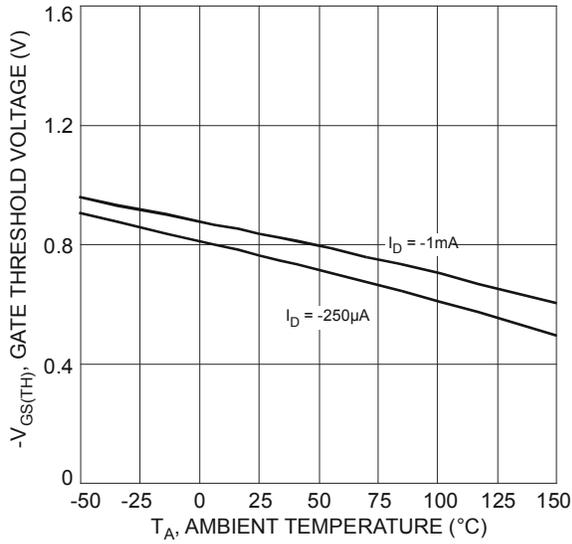


Fig. 18 Gate Threshold Variation vs. Ambient Temperature

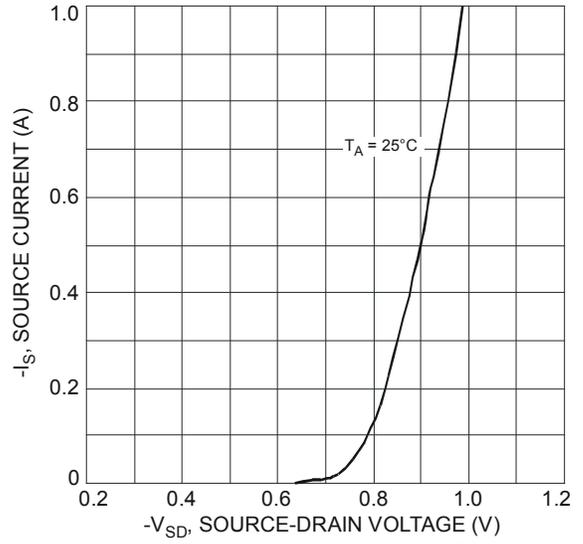


Fig. 19 Diode Forward Voltage vs. Current

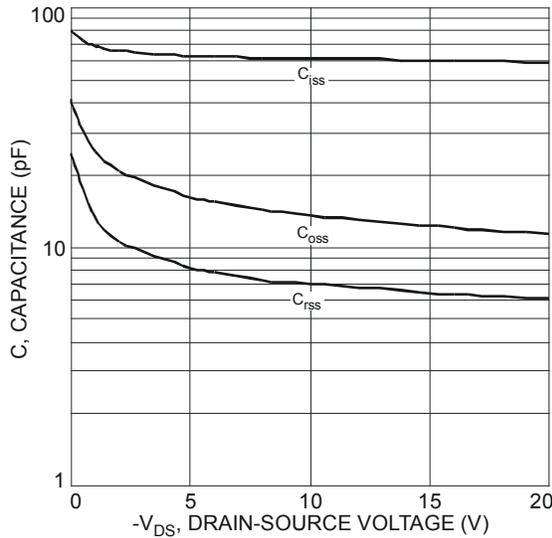


Fig. 20 Typical Total Capacitance

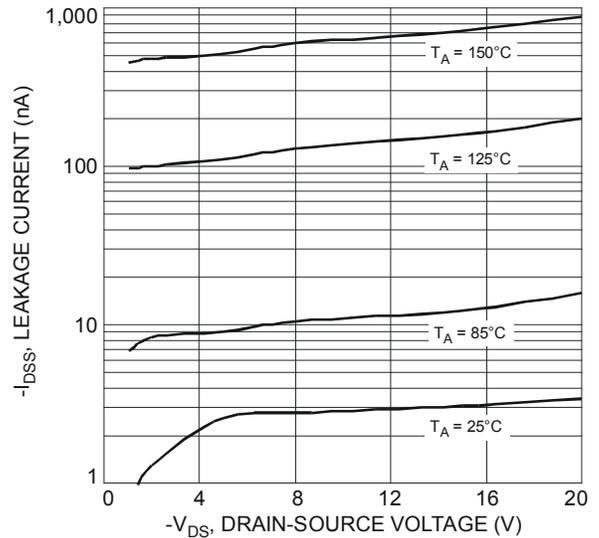


Fig. 21 Typical Leakage Current vs. Drain-Source Voltage

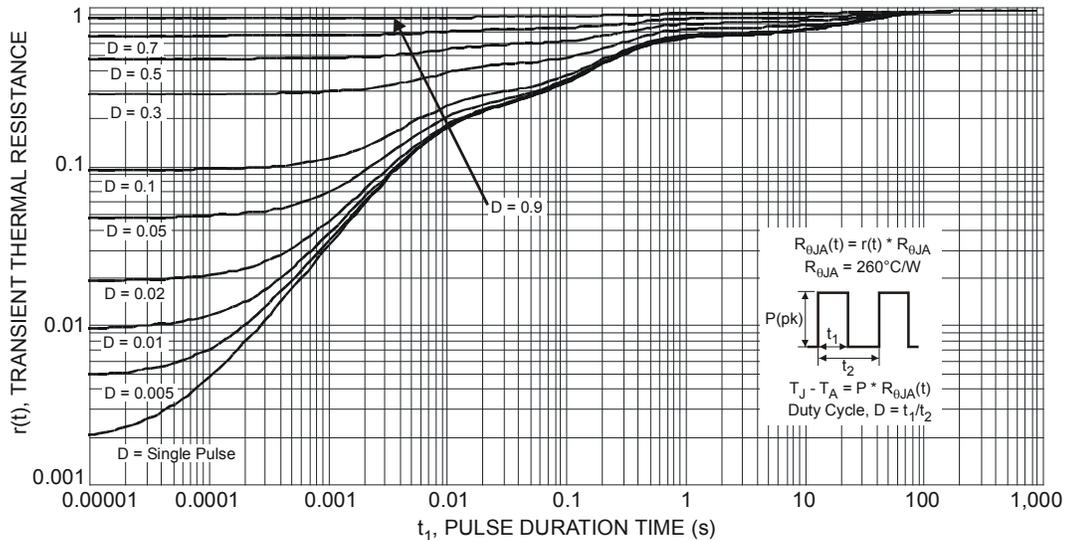
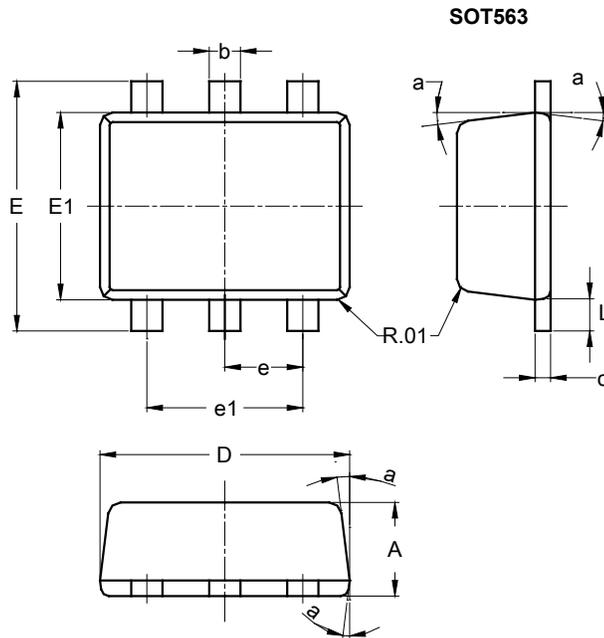


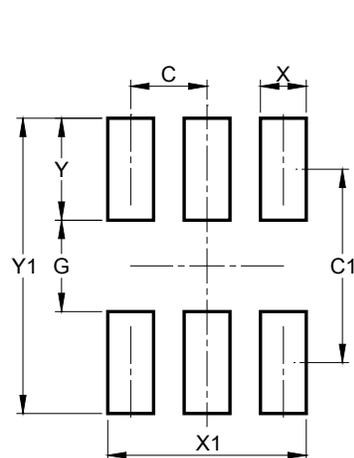
Fig. 22 Transient Thermal Response

### Package Outline Dimensions



SOT563			
Dim	Min	Max	Typ
A	0.55	0.60	--
b	0.15	0.30	0.20
c	0.10	0.18	0.11
D	1.50	1.70	1.60
E	1.55	1.70	1.60
E1	1.10	1.25	1.20
e	--	--	0.50
e1	0.90	1.10	1.00
L	0.10	0.30	0.20
a	8°	9°	7°
All Dimensions in mm			

### Suggested Pad Layout



Dimensions	Value (in mm)
C	0.500
C1	1.270
G	0.600
X	0.300
X1	1.300
Y	0.670
Y1	1.940