



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

$BV_{DSS}$	$R_{DS(on)}$ max	$I_D$ $T_A = +25^\circ C$
60V	50m $\Omega$ @ $V_{GS} = 10V$	6.7A
	70m $\Omega$ @ $V_{GS} = 4.5V$	5.7A

## 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

- DC-DC converters
- Power management functions
- Backlighting

## Features and Benefits

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

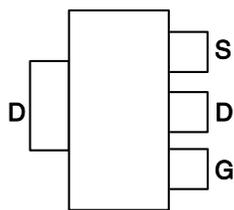
## Mechanical Data

- Package: SOT223 (Type DN)
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 
- Weight: 0.112 grams (Approximate)

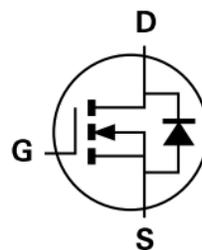
SOT223 (Type DN)



Top View



Pin Out - Top View



Equivalent Circuit

**Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V <sub>DSS</sub>	60	V
Gate-Source Voltage			V <sub>GSS</sub>	±20	V
Continuous Drain Current, V <sub>GS</sub> = 10V	Steady State	T <sub>A</sub> = +25°C (Note 6)	I <sub>D</sub>	6.7	A
		T <sub>A</sub> = +70°C (Note 6)		5.4	
		T <sub>A</sub> = +25°C (Note 5)		4.8	
Maximum Body Diode Forward Current (Note 6)			I <sub>S</sub>	5.7	A
Pulsed Drain Current (Note 7)			I <sub>DM</sub>	28.5	A
Pulsed Source Current (Note 7)			I <sub>SM</sub>	28.5	A

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

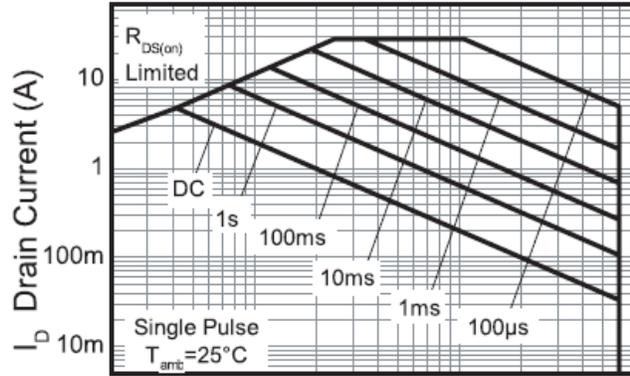
Characteristic		Symbol	Value	Units
Total Power Dissipation	T <sub>A</sub> = +25°C (Note 5)	P <sub>D</sub>	2	W
Linear Derating Factor			16	mW/°C
Total Power Dissipation	T <sub>A</sub> = +25°C (Note 6)	P <sub>D</sub>	3.9	W
Linear Derating Factor			31	mW/°C
Thermal Resistance, Junction to Ambient	Steady state (Note 5)	R <sub>θJA</sub>	62.5	°C/W
	Steady state (Note 6)		32	°C/W
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

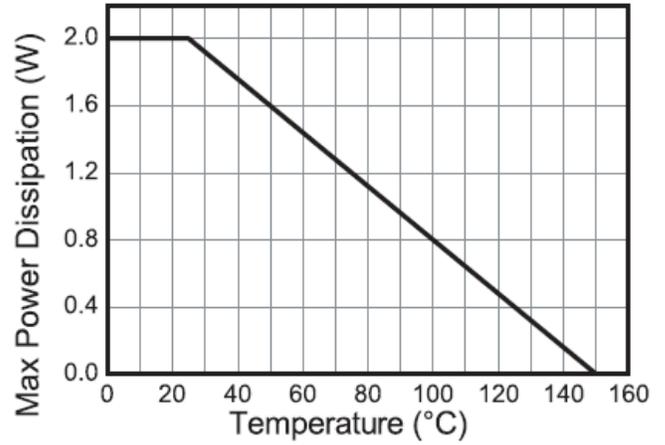
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 9)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	60	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	1.0	μA	V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 9)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	1.0	—	—	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance (Note 8)	R <sub>DS(on)</sub>	—	—	50	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 3.6A
		—	—	70		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 3.0A
Diode Forward Voltage (Note 8)	V <sub>SD</sub>	—	0.85	0.95	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 5.5A
Forward Transconductance (Note 8 & 10)	g <sub>fs</sub>	—	10.2	—	S	V <sub>DS</sub> = 15V, I <sub>D</sub> = 4.5A
<b>DYNAMIC CHARACTERISTICS (Note 10)</b>						
Input Capacitance	C <sub>iss</sub>	—	1,063	—	pF	V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	104	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	64	—		
Total Gate Charge (V <sub>GS</sub> = 5.0V)	Q <sub>g</sub>	—	11	—	nC	V <sub>DS</sub> = 30V, I <sub>D</sub> = 1.4A,
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	—	20.4	—		
Gate-Source Charge	Q <sub>gs</sub>	—	4.1	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	5.1	—		
Turn-On Delay Time	t <sub>D(on)</sub>	—	3.8	—	nS	V <sub>GS</sub> = 10V, V <sub>DD</sub> = 30V, R <sub>G</sub> = 6.0Ω, I <sub>D</sub> = 1.0A
Turn-On Rise Time	t <sub>r</sub>	—	4.0	—		
Turn-Off Delay Time	t <sub>D(off)</sub>	—	26.2	—		
Turn-Off Fall Time	t <sub>f</sub>	—	10.6	—		
Body Diode Reverse Recovery Time	t <sub>rr</sub>	—	22	—	nS	I <sub>F</sub> = 2.2A, dI/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	—	21.4	—	nC	

- Notes:
5. For a device surface mounted on 25mm x 25mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions
  6. For a device surface mounted on FR4 PCB measured at t ≤ 10 secs.
  7. Repetitive rating 25mm x 25mm FR4 PCB, D = 0.02, pulse width 300μs - pulse width limited by maximum junction temperature.
  8. Measured under pulsed conditions. Width=300μs. Duty cycle ≤ 2%.
  9. Short duration pulse test used to minimize self-heating effect.
  10. Guaranteed by design. Not subject to product testing.

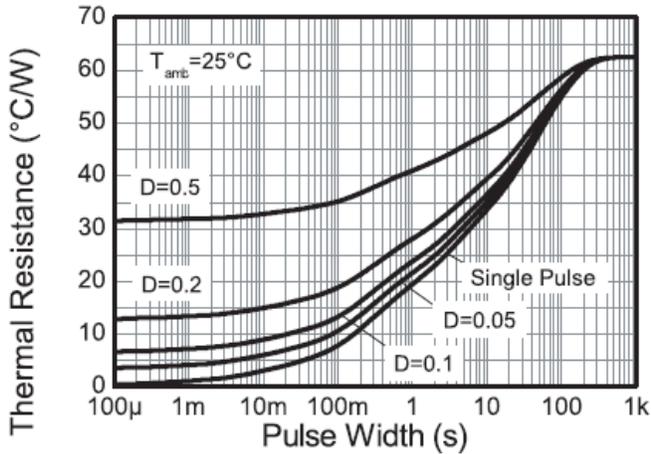
Typical Characteristics



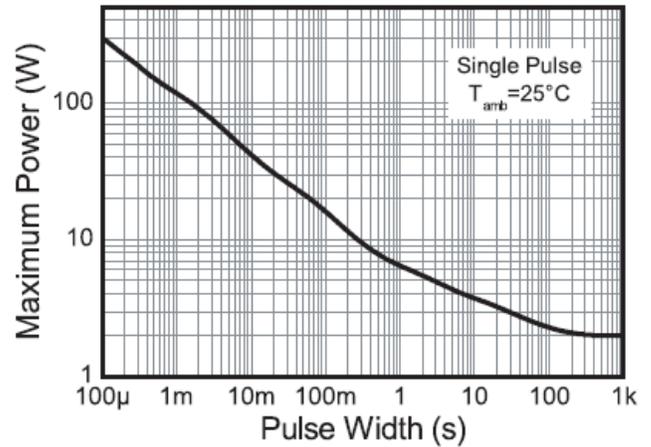
**Safe Operating Area**



**Derating Curve**

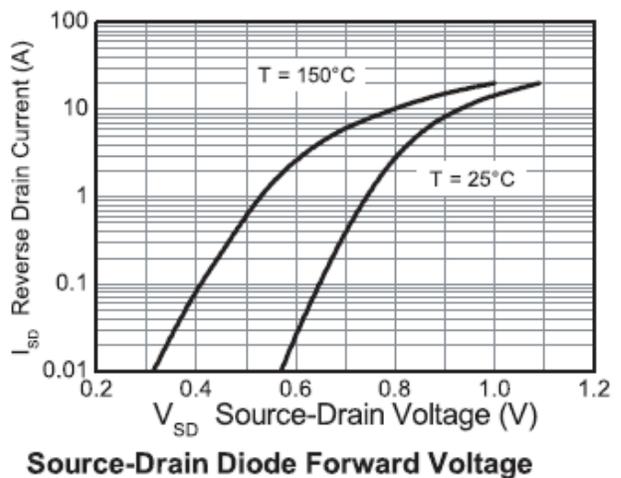
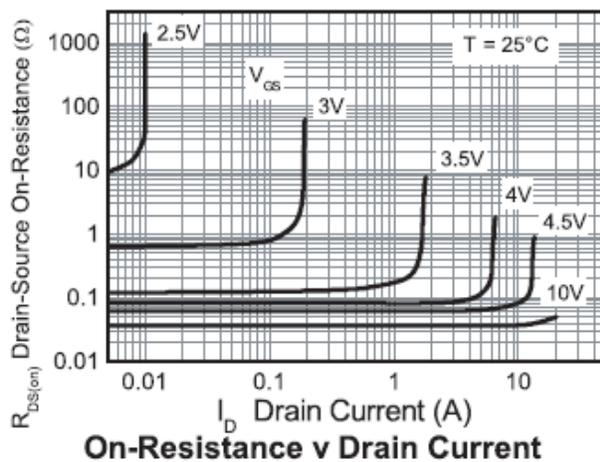
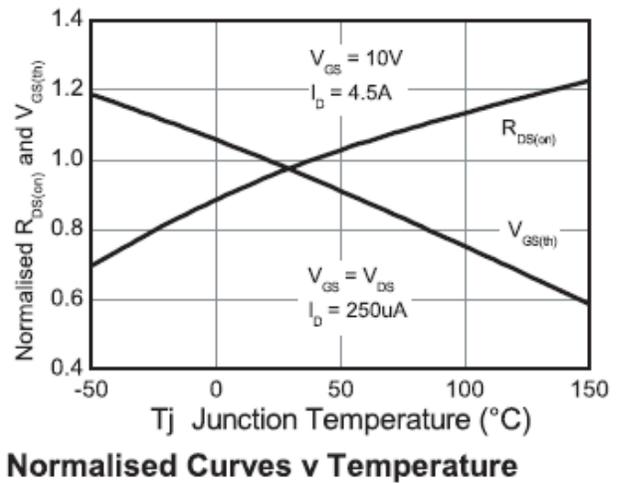
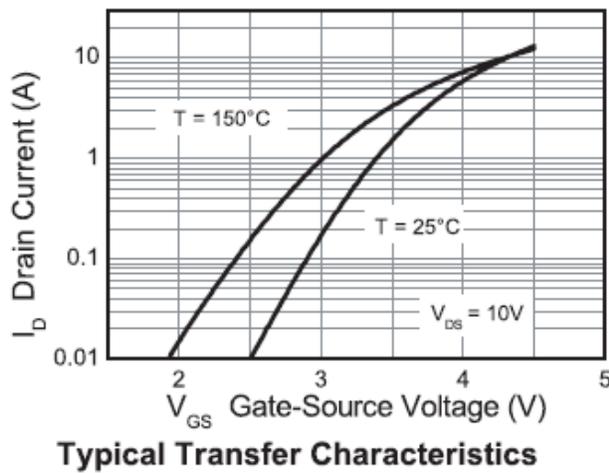
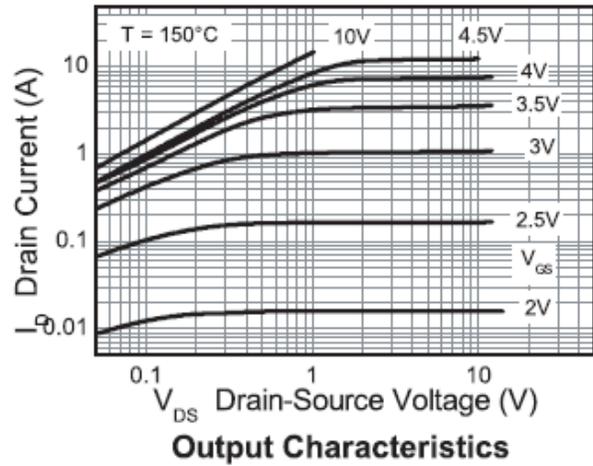
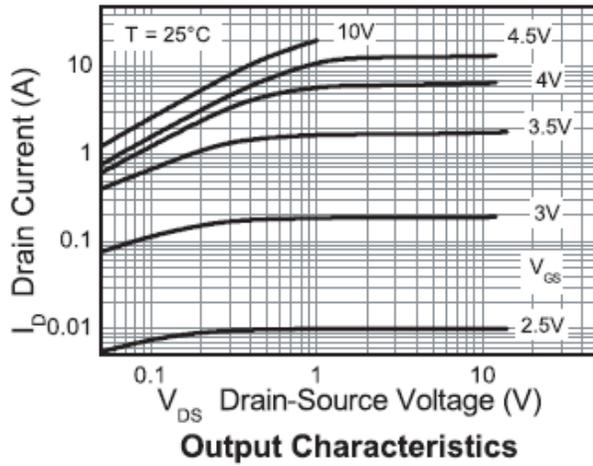


**Transient Thermal Impedance**

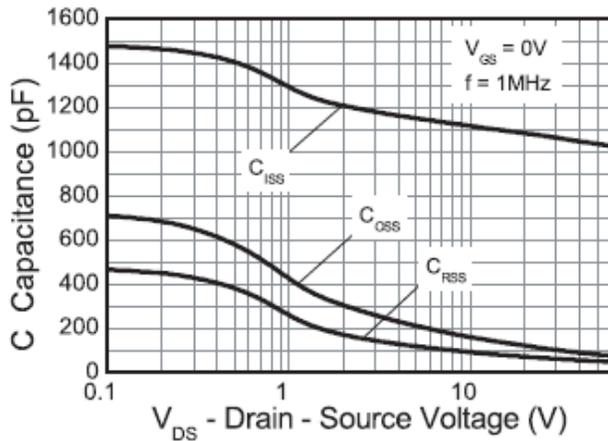


**Pulse Power Dissipation**

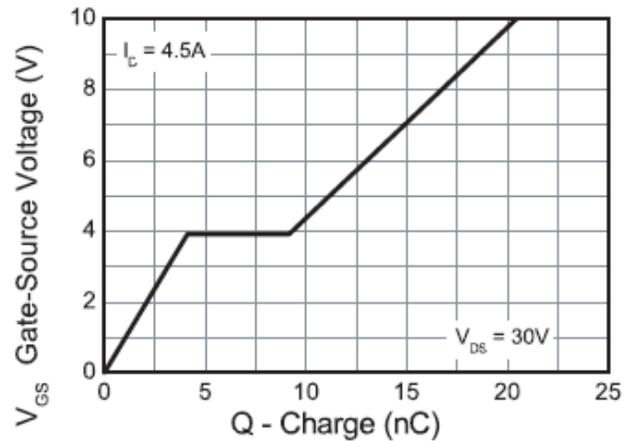
Typical Characteristics (continued)



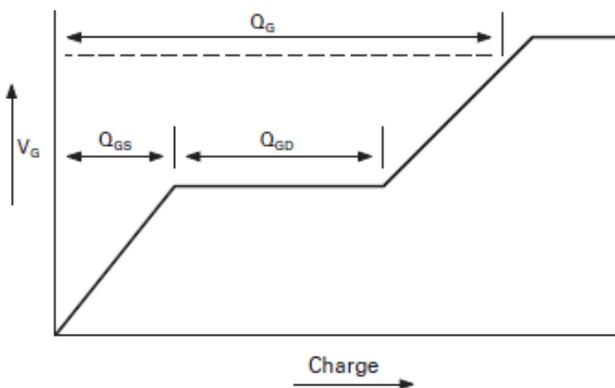
**Typical Characteristics** (continued)



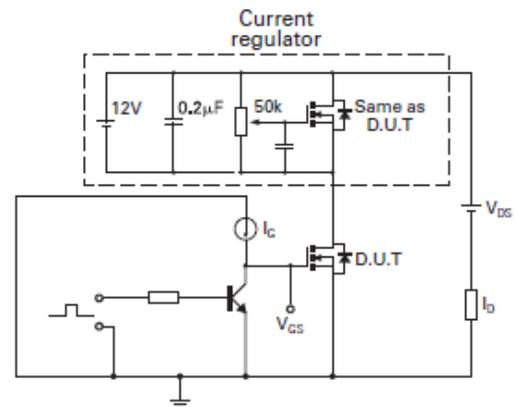
**Capacitance v Drain-Source Voltage**



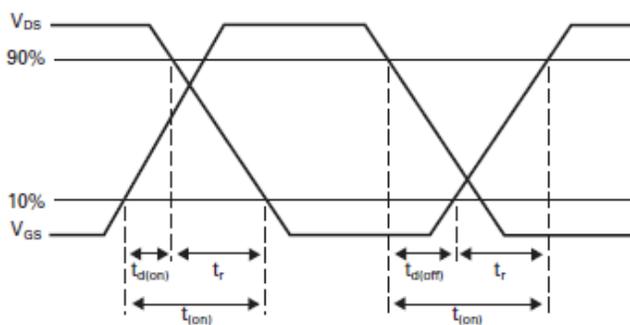
**Gate-Source Voltage v Gate Charge**



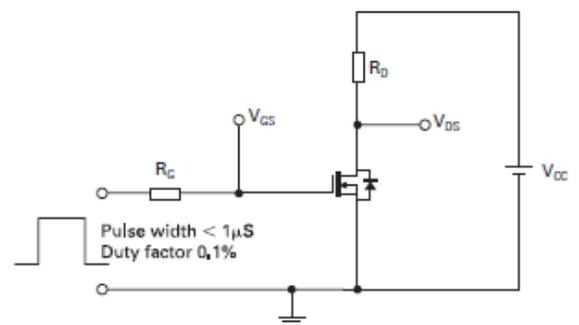
**Basic gate charge waveform**



**Gate charge test circuit**



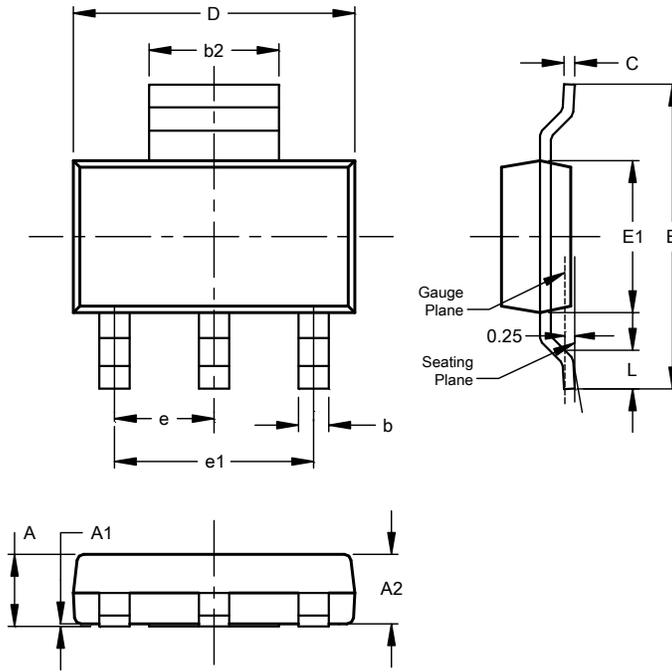
**Switching time waveforms**



**Switching time test circuit**

### Package Outline Dimensions

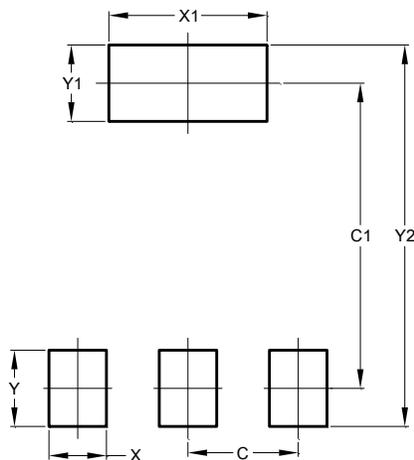
SOT223 (Type DN)



SOT223 (Type DN)			
Dim	Min	Max	Typ
A	--	1.70	--
A1	0.01	0.15	--
A2	1.50	1.68	1.60
b	0.60	0.80	0.70
b2	2.90	3.10	--
c	0.20	0.32	--
D	6.30	6.70	--
E	6.70	7.30	--
E1	3.30	3.70	--
e	--	--	2.30
e1	--	--	4.60
L	0.85	--	--
All Dimensions in mm			

### Suggested Pad Layout

SOT223 (Type DN)



Dimensions	Value (in mm)
C	2.30
C1	6.40
X	1.20
X1	3.30
Y	1.60
Y1	1.60
Y2	8.00