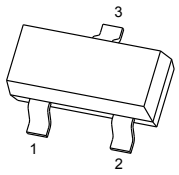
2N7002

SOT-23 Plastic-Encapsulate MOSFETS

60V N-Channel Enhancement Mode MOSFET

$V_{(BR)DSS}$	$R_{DS(on)}$MAX	I_D
60 V	1.1Ω@10V	500mA
	1.3Ω@4.5V	

SOT-23



1. GATE
2. SOURCE
3. DRAIN

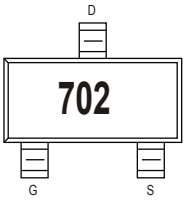
FEATURE

- High density cell design for low $R_{DS(ON)}$
- Voltage controlled small signal switch
- Rugged and reliable
- High saturation current capability

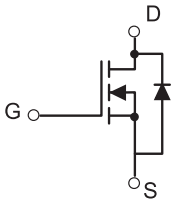
APPLICATION

- Load Switch for Portable Devices
- DC/DC Converter

MARKING



Equivalent circuit



PACKAGE SPECIFICATIONS

Package	Reel Size	Reel DIA. (mm)	Q'TY/Reel (pcs)	Box Size (mm)	QTY/Box (pcs)	Carton Size (mm)	Q'TY/Carton (pcs)
SOT-23	7'	330	3000	203×203×195	45000	438×438×220	180000

MAXIMUM RATINGS (T_a=25℃ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	±20	V
Continuous Drain Current	I_D	0.5	A
Power Dissipation	P_D	0.3	W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	400	℃/W
Junction Temperature	T_J	150	℃
Storage Temperature	T_{stg}	-50 ~+150	

The above data are for reference only.

MOSFET ELECTRICAL CHARACTERISTICS

T_a=25℃ unless otherwise specified

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V I_D=250μA	60	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current(T_A=25℃)	V_{DS}=60V, V_{GS}=0V	--	--	1	μA
	Zero Gate Voltage Drain Current(T_A=125℃)	V_{DS}=50V, V_{GS}=0V	--	--	100	uA
I_{GSS}	Gate-Body Leakage Current	V_{GS}=±20V, V_{DS}=0V	--	--	±100	nA
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250μA	1.0	1.6	2.5	V
$R_{DS(ON)}$	Drain-Source On-State Resistance②	V_{GS}=10V, I_D=0.5A	--	1.1	2.5	Ω
$R_{DS(ON)}$	Drain-Source On-State Resistance②	V_{GS}=4.5V, I_D=0.3A	--	1.3	3	Ω

Dynamic Electrical Characteristics

C_{iss}	Input Capacitance	V_{DS}=30V, V_{GS}=0V, f=1MHz	--	23.6	--	pF
C_{oss}	Output Capacitance		--	3.9	--	pF
C_{rss}	Reverse Transfer Capacitance		--	1.5	--	pF
Q_g	Total Gate Charge	V_{DS}=30V I_D=0.5A, V_{GS}=10V	--	0.91	--	nC
Q_{gs}	Gate Source Charge		--	0.18	--	nC
Q_{gd}	Gate Drain Charge		--	0.31	--	nC

Switching Characteristics

$t_{d(on)}$	Turn on Delay Time	V_{DD}=30V, I_D=0.3A, R_G=3.3Ω, V_{GS}=10V	--	6	--	ns
t_r	Turn on Rise Time		--	3.5	--	ns
$t_{d(off)}$	Turn Off Delay Time		-	20	--	ns
t_f	Turn Off Fall Time		--	5.9	--	ns

Source Drain Diode Characteristics

I_{SD}	Source drain current(Body Diode)	T_A=25℃	--	--	0.2	A
V_{SD}	Forward on voltage②	T_j=25℃, I_{SD}=0.5A, V_{GS}=0V	--	0.78	1.2	V

Notes:

① Pulse width limited by maximum allowable junction temperature

②Pulse test ; Pulse width≤300μs, duty cycle≤2%.

These parameters have no way to verify.

Typical Characteristics

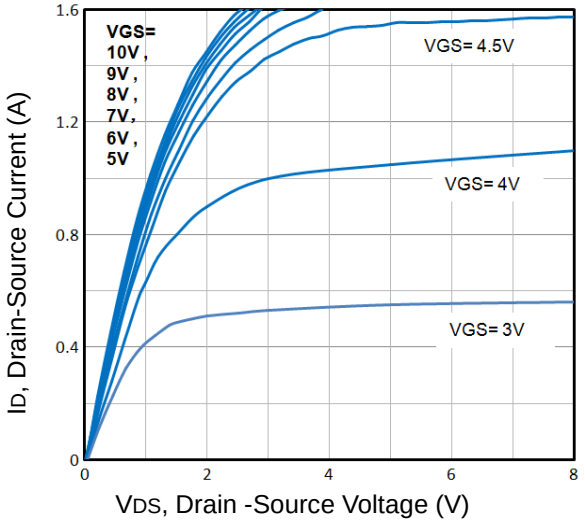


Fig1. Typical Output Characteristics

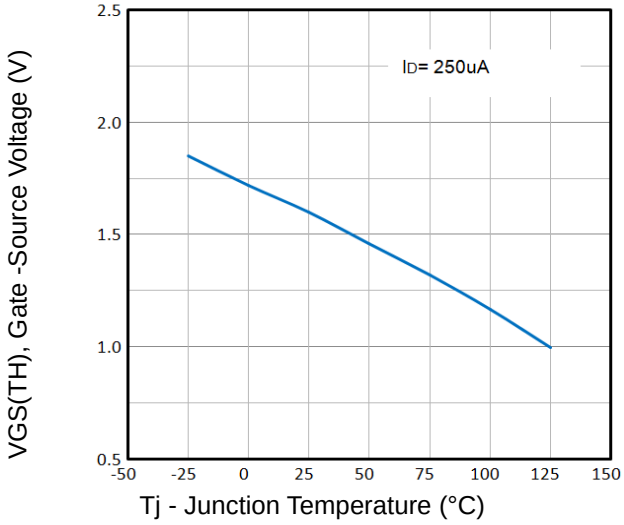


Fig2. Normalized Threshold Voltage Vs. Temperature

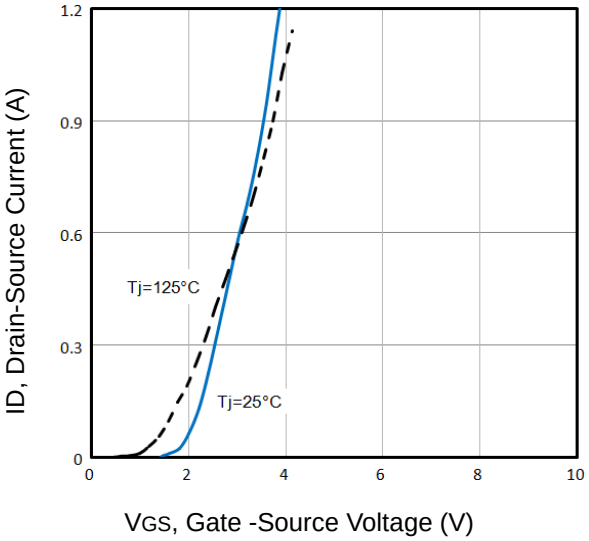


Fig3. Typical Transfer Characteristics

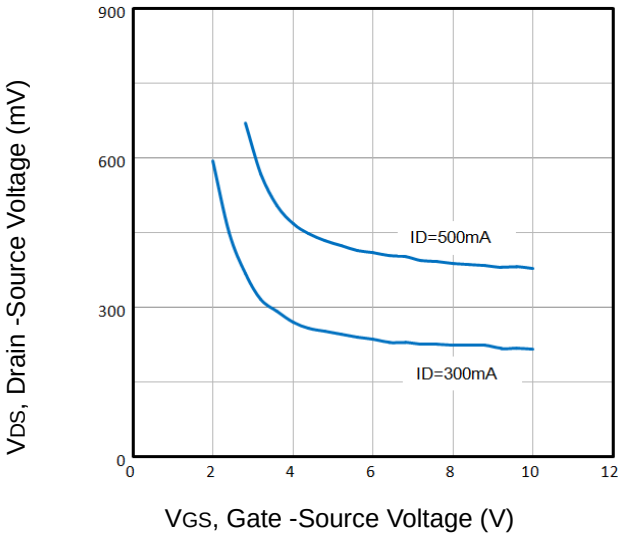


Fig4. Drain -Source Voltage vs Gate -Source Voltage

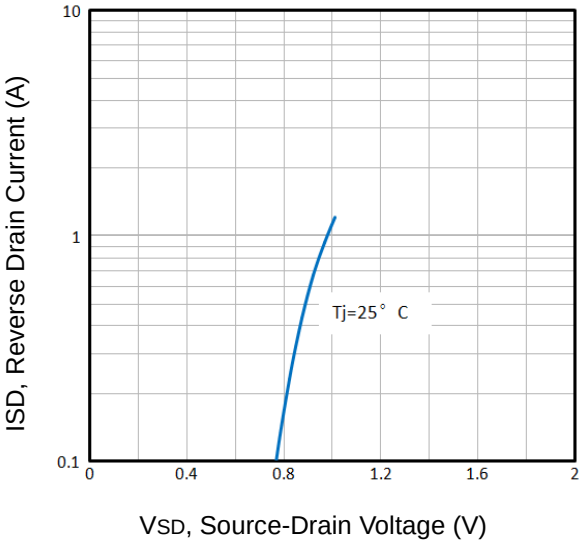


Fig5. Typical Source-Drain Diode Forward Voltage

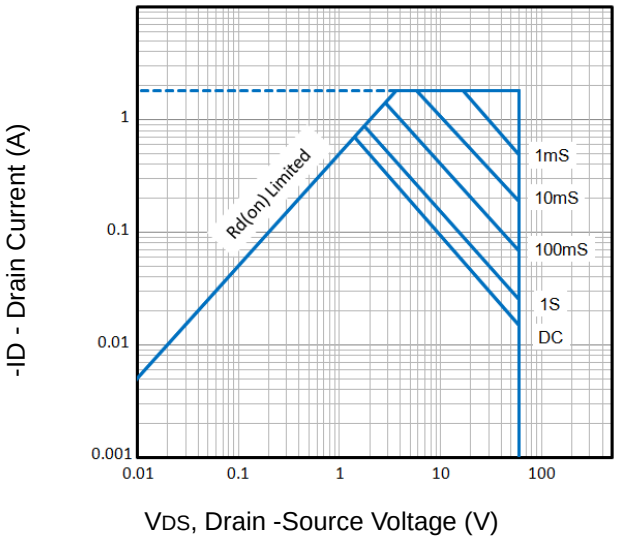


Fig6. Maximum Safe Operating Area

Typical Characteristics

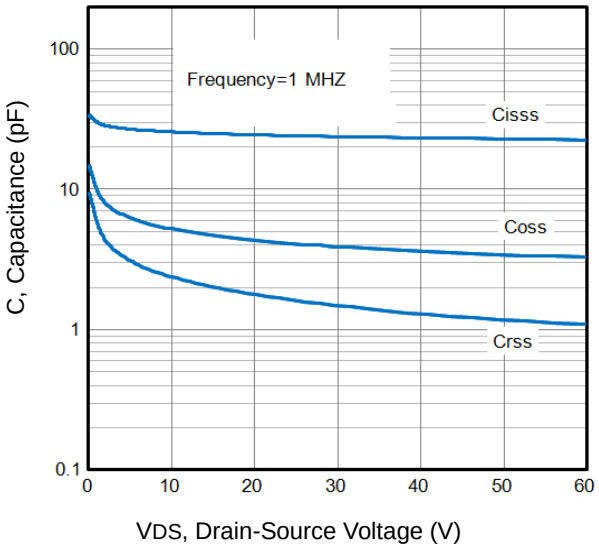


Fig7. Typical Capacitance Vs. Drain-Source Voltage

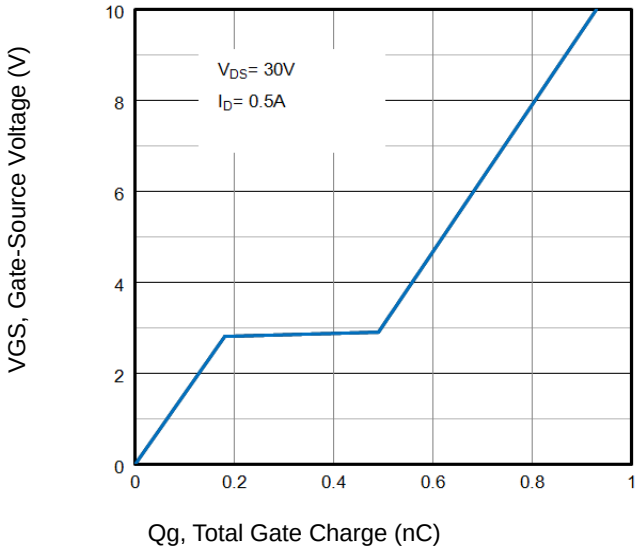


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

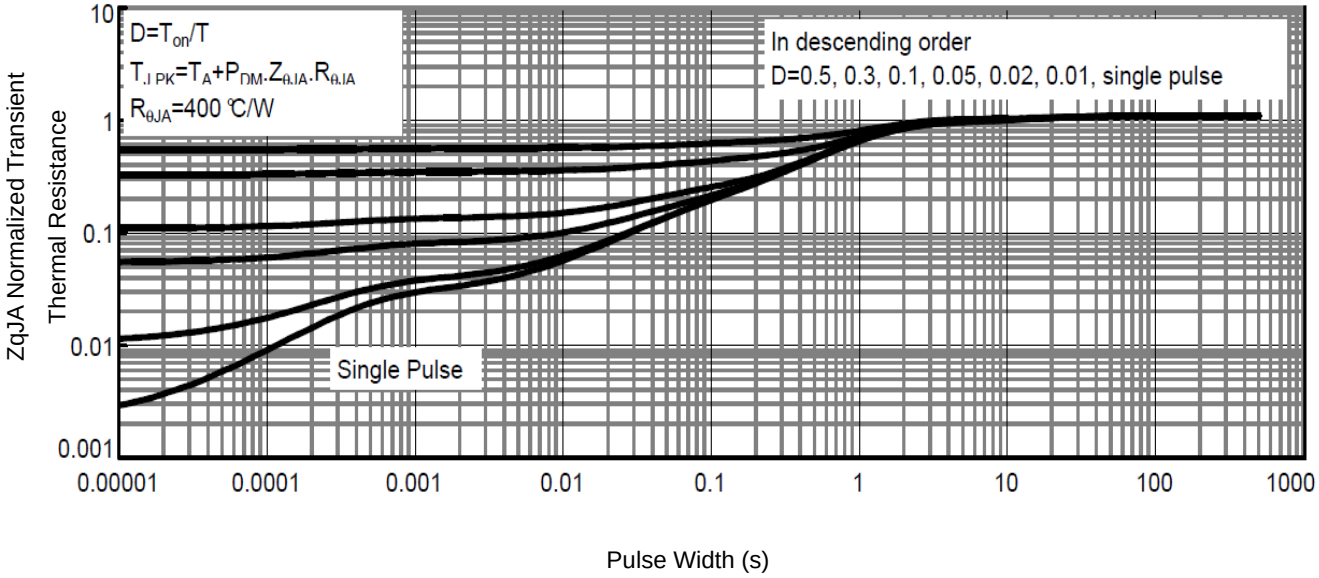


Fig9. Normalized Maximum Transient Thermal Impedance

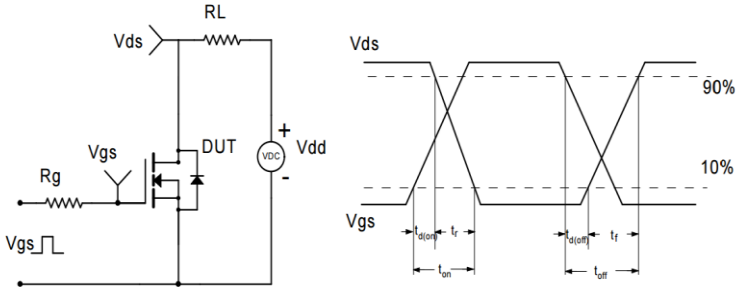
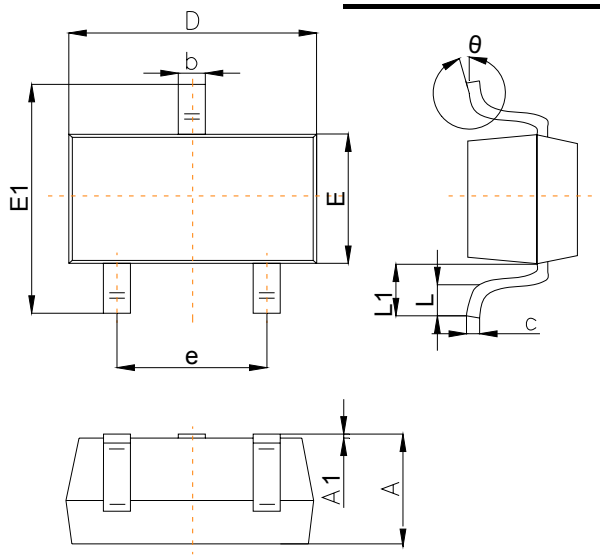


Fig10. Switching Time Test Circuit and waveforms

The curve above is for reference only.

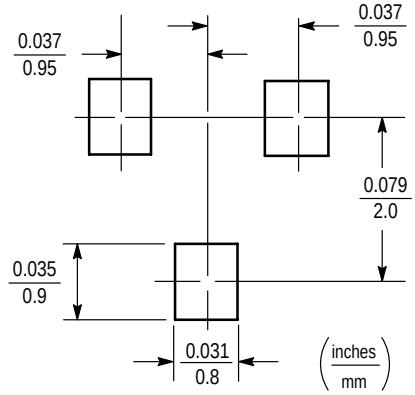
Outlitne Drawing

SOT-23 Package Outline Dimensions



Symbol	Dimensions In Millimeters		
	Min	Typ	Max
A	1.00		1.40
A1			0.10
b	0.35		0.50
c	0.10		0.20
D	2.70	2.90	3.10
E	1.40		1.60
E1	2.4		2.80
e		1.90	
L	0.10		0.30
L1	0.4		
θ	0°		10°

Suggested Pad Layout



Note:
1.Controlling dimension:in/millimeters.
2.General tolerance: ±0.05mm.
3.The pad layout is for reference purposes only.

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