2N7002E

N-Channel SMD MOSFET ESD Protection

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)MAX}$	I_D
60V	5.0Ω@10V	0.34A
	5.3Ω@4.5V	

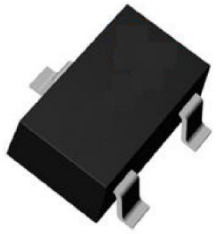
Feature

- ESD protection
- Advanced trench process technology
- High density cell design for ultra low on-resistance
- Very low leakage current in off condition
- In compliance with EU RoHS 2002/95/EC directives.

Application

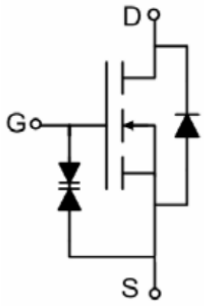
- Specially designed for battery operated system, solid-state relays drivers,relays,displays,lamps, solenoids,memories,etc.

Package

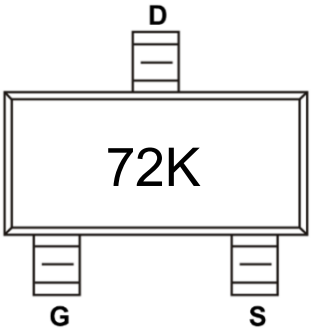


SOT-23

Circuit diagram



Marking



Absolute maximum ratings (Ta=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	0.34	A
Pulsed Drain Current	I_{DM}	1.5	A
Power Dissipation	P_D	0.35	W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	357	℃/W
Junction Temperature	T_J	150	℃
Storage Temperature	T_{STG}	-55 ~ +150	℃

Electrical characteristics (T_A=25 °C, unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D =10μA	60			V
Zero gate voltage drain current	I_{DSS}	V_{DS} =48V,V_{GS} = 0V			1	μA
Gate-body leakage current	I_{GSS}	V_{GS} =±20V, V_{DS} = 0V			±10	μA
Gate threshold voltage	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =250μA	1.0		2.5	V
Drain-source on-resistance[1]	$R_{DS(on)}$	V_{GS} =10V, I_D =0.3A			5.0	Ω
		V_{GS} =4.5V, I_D =0.2A			5.3	
Dynamic characteristics[2]						
Input Capacitance	C_{iss}	V_{DS} =30V,V_{GS} =0V,f =1MHz		18		pF
Output Capacitance	C_{oss}			12		
Reverse Transfer Capacitance	C_{rss}			7		
Total Gate Charge	Q_g	V_{DS} =30V,V_{GS} =10V,ID =0.3A		1.7	2.4	nC
Turn-on delay time	$t_{d(on)}$	V_{DD}=30V,V_{GS}=10V, I_D=0.3A R_{GEN}=6Ω		5		nS
Turn-off delay time	$t_{d(off)}$			17		
Source-Drain Diode characteristics						
Diode Forward Current[1]	I_S				0.34	A
Diode Forward voltage	V_{DS}	V_{GS} =0V, I_S=0.3A			1.2	V

Notes:

1) Pulse Test: Pulse Width < 300μs, Duty Cycle ≤2%.

2) Guaranteed by design, not subject to production testing.

Typical Characteristics

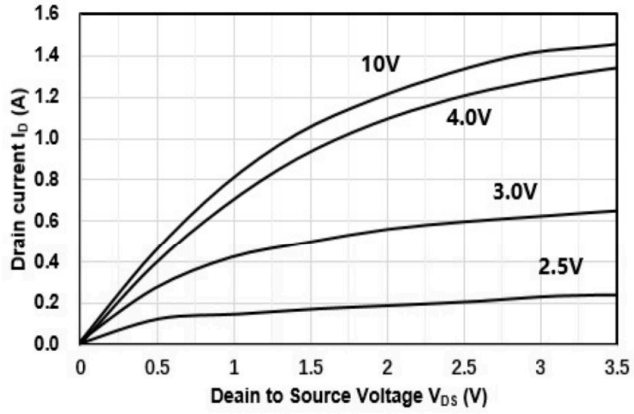


Figure1. Output Characteristics

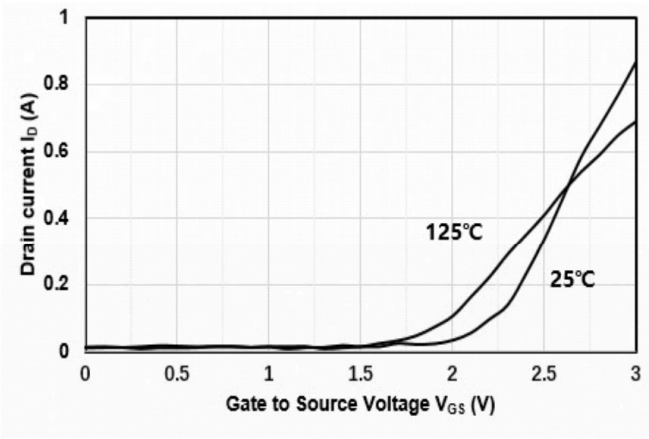


Figure2. Transfer Characteristics

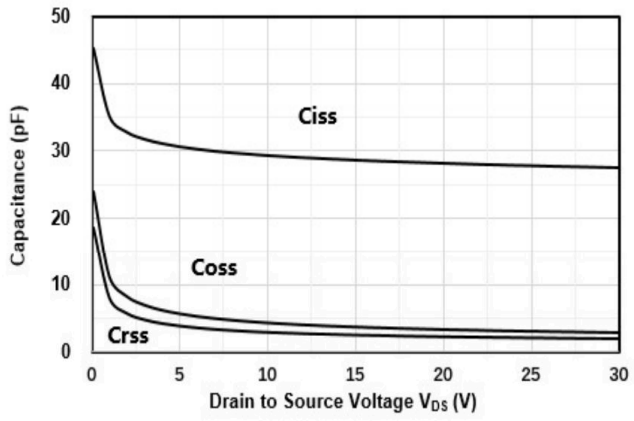


Figure3. Capacitance Characteristics

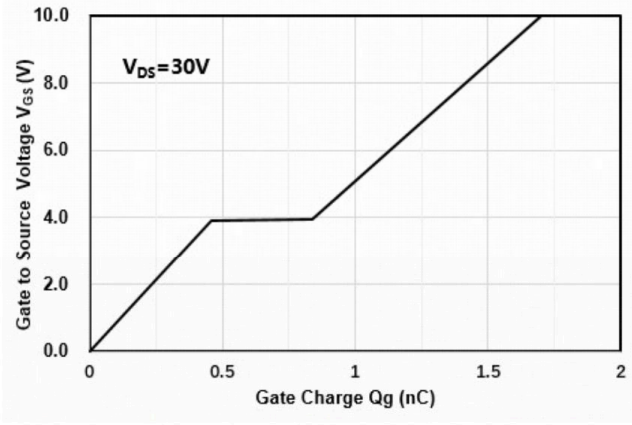


Figure4. Gate Charge

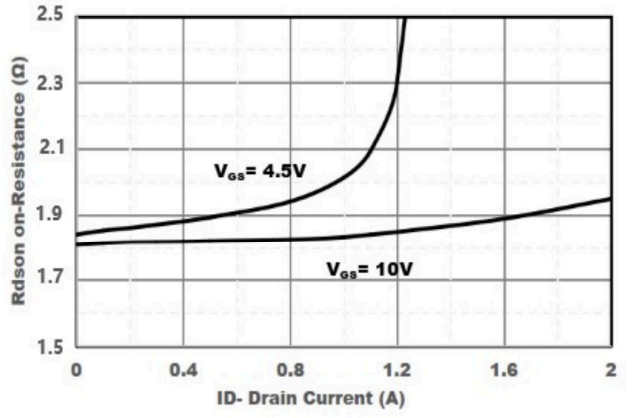


Figure5. Drain-Source on Resistance

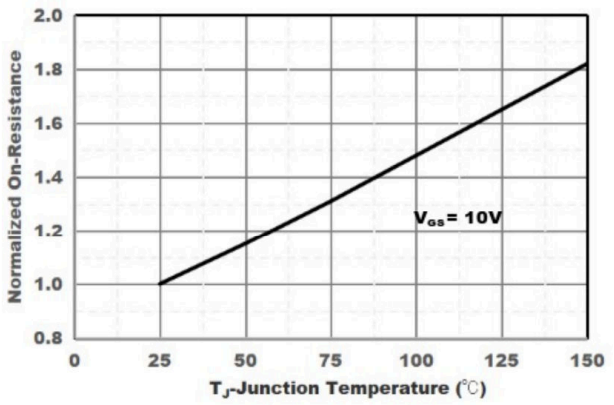


Figure6. Drain-Source on Resistance

Typical Characteristics

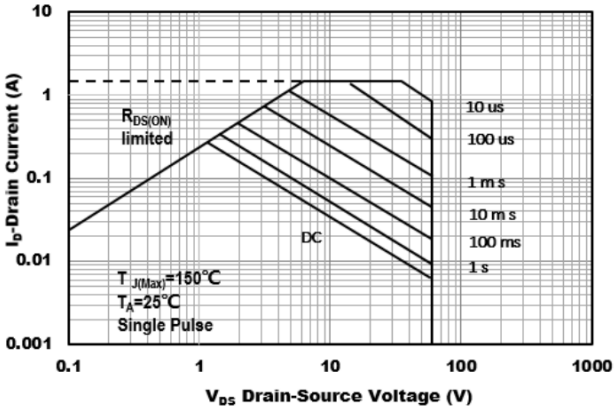


Figure7. Safe Operation Area

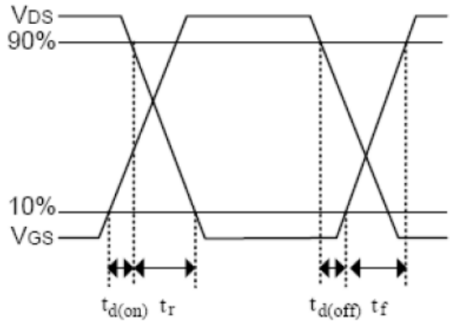
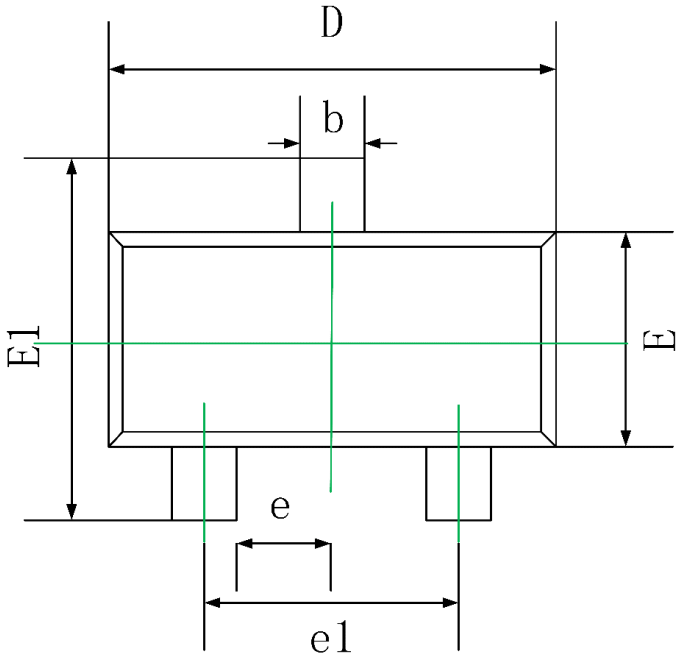
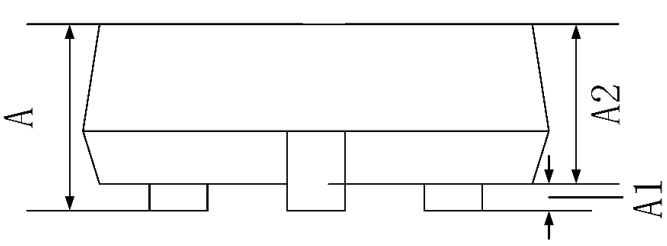
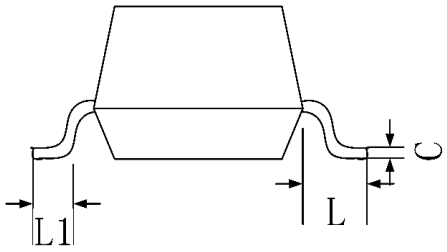


Figure8. Switching wave

SOT-23 Package Information







Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.200	0.003	0.008
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.100	2.640	0.082	0.105
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.550 REF.		0.022 REF.	
L1	0.300	0.500	0.012	0.020