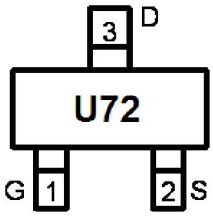
2N7002KU

60V N-Channel MOSFET

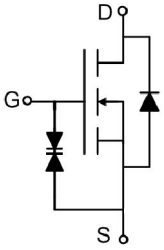
Main Product Characteristics

V_{DSS}	60V
R_{DS}(on)	3Ω(max.)
I_D	0.3A

SOT-23



Marking and Pin Assignment



Schematic Diagram

Features and Benefits

- Advanced MOSFET process technology
- Special designed for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- ESD Rating：2000V HBM
- 150℃ operating temperature
- Lead free product

Description

It utilizes the latest processing techniques to achieve the high cell density and reduces the on-resistance with high repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in power switching application and a wide variety of other applications.

Absolute Max Rating

Symbol	Parameter	Max.	Units
I_D @ TC = 25°C	Continuous Drain Current, V_{GS} @ 10V①	0.3	A
I_{DM}	Pulsed Drain Current②	1.2	
P_D @TC = 25°C	Power Dissipation③	0.63	W
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-to-Source Voltage	± 20	V
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C

Thermal Resistance

Symbol	Characteristics	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-ambient (t ≤ 10s) ④	—	200	℃/W

Electrical Characteristics @T_A=25℃ unless otherwise specified

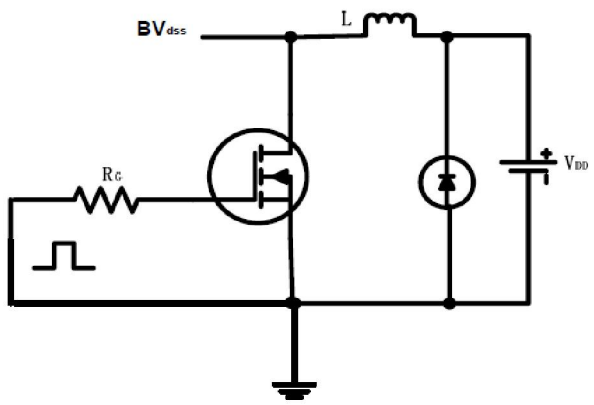
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source breakdown voltage	60	—	—	V	V_{GS} = 0V, ID = 250μA
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	1.6	3	Ω	V_{GS}=10V, I_D=0.5A
		—	—	3.5		V_{GS}=5V, I_D=0.05A
$V_{GS(th)}$	Gate threshold voltage	1	—	2.5	V	V_{DS} = V_{GS}, I_D = 250μA
I_{DSS}	Drain-to-Source leakage current	—	—	1	μA	V_{DS} = 60V,V_{GS} = 0V
I_{GSS}	Gate-to-Source forward leakage	—	—	±100	nA	V_{GS}=±5V,V_{DS}=0V
		—	—	±10	uA	V_{GS}=±20V,V_{DS}=0V
$t_{d(on)}$	Turn-on delay time	—	—	25	ns	V_{GS}=10V, VDS=30V, ID=0.2A,R_{GEN}=10Ω
$t_{d(off)}$	Turn-Off delay time	—	—	45		
C_{iss}	Input capacitance	—	40	—	pF	V_{GS} = 0V V_{DS} = 25V f = 1MHz
C_{oss}	Output capacitance	—	16.6	—		
C_{rss}	Reverse transfer capacitance	—	9.5	—		

Source-Drain Ratings and Characteristics

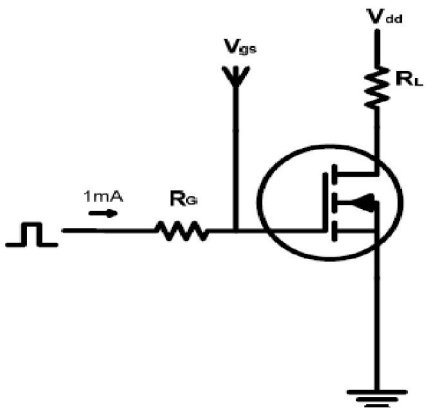
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	0.3	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode)	—	—	1.2	A	
V_{SD}	Diode Forward Voltage	—	—	1.3	V	I_S=0.2A, V_{GS}=0V

Test Circuits and Waveforms

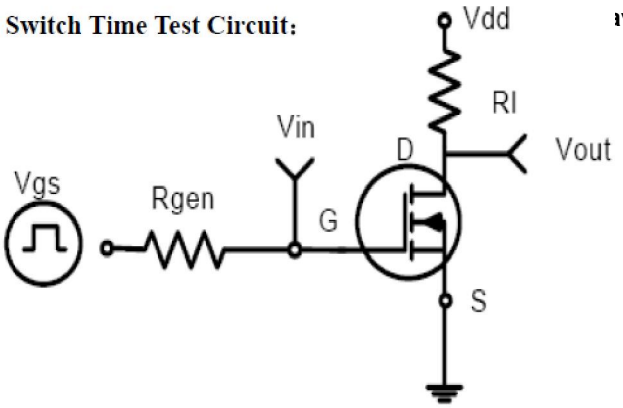
EAS test circuits:



Gate charge test circuit:



Switch Time Test Circuit:



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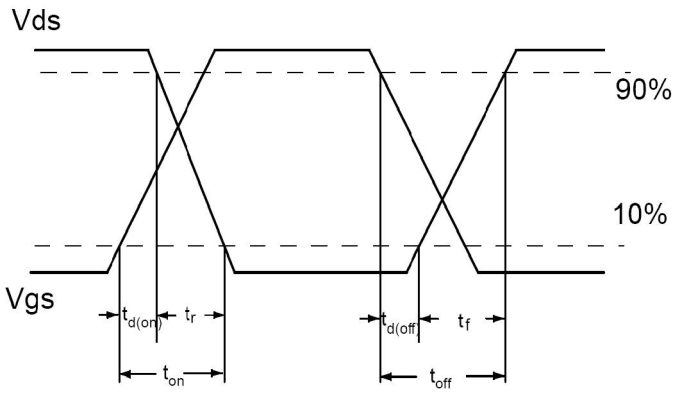


Notes:

①The maximum current rating is limited by bond-wires.
②Repetitive rating; pulse width limited by max. junction temperature.
③The power dissipation PD is based on max. junction temperature, using junction-to-case thermal resistance.
④The value of $R_{\theta JA}$ is measured with the device mounted on 1in 2 FR-4 board with 2oz. Copper, in a still air environment with TA =25°C
⑤These curves are based on the junction-to-case thermal impedence which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=150°C.

Typical Electrical and Thermal Characteristics

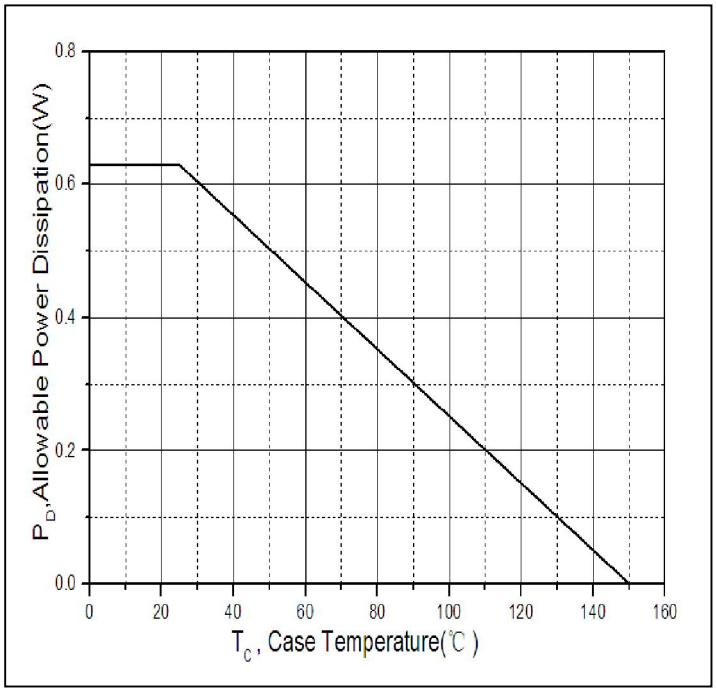


Figure 1. Power Dissipation Vs. Case Temperature

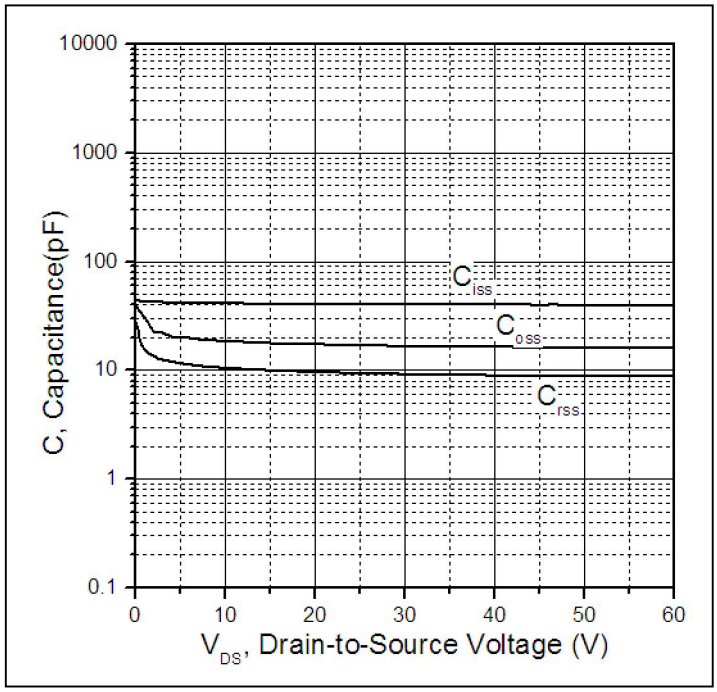


Figure 2.Typical Capacitance Vs. Drain-to-Source Voltage

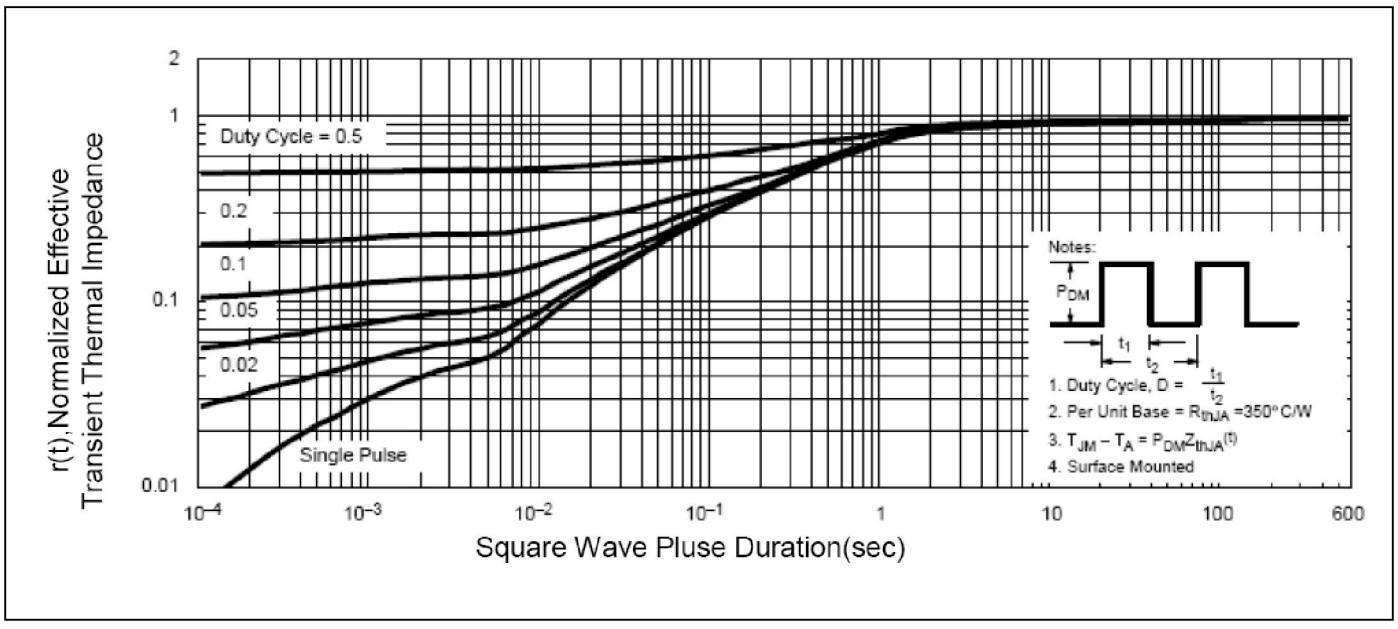
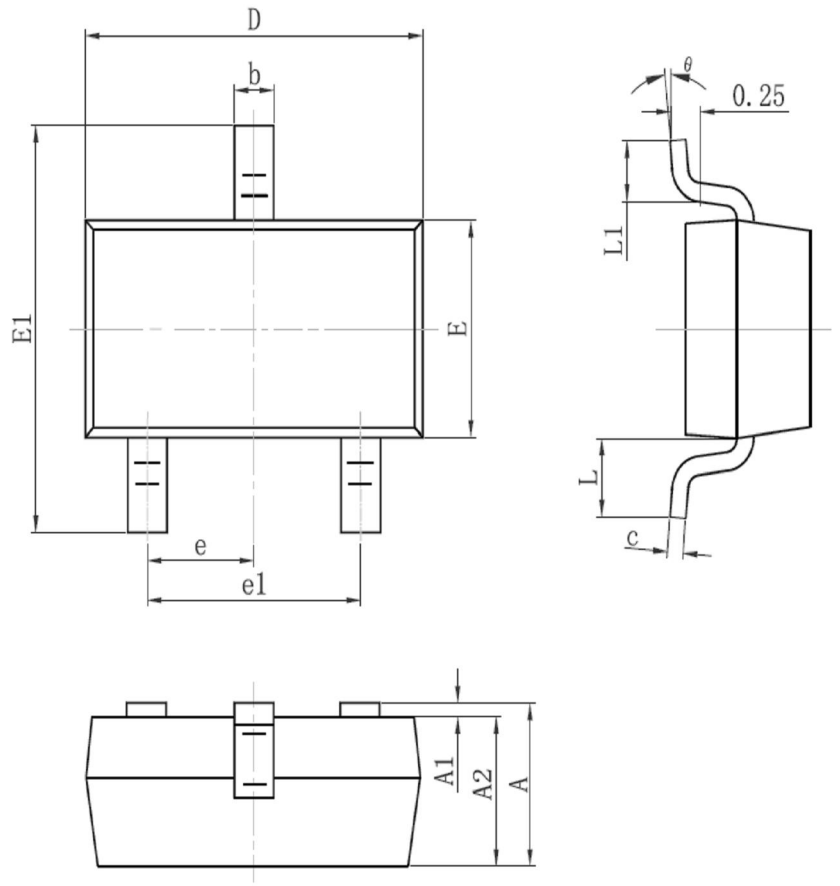


Figure3. Maximum Effective Transient Thermal Impedance, Junction-to-Case

Mechanical Data



Ordering and Marking Information

Device Marking: U72

Package (Available)
SOT-23
Operating Temperature Range
C : -55 to 150 ºC

Devices per Unit

Package Type	Units/ Tape	Tapes/Inner Box	Units/Inner Box	Inner Boxes/Carton Box	Units/ Carton Box
SOT-23	3000	10	30000	4	120000

Reliability Test Program

Test Item	Conditions	Duration	Sample Size
High Temperature Reverse Bias(HTRB)	T_j=125℃ to 150℃ @ 80% of Max V_{DSS}/V_{CES}/VR	168 hours 500 hours 1000 hours	3 lots x 77 devices
High Temperature Gate Bias(HTGB)	T_j=150℃ @ 100% of Max V_{GSS}	168 hours 500 hours 1000 hours	3 lots x 77 devices