

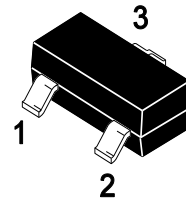


2N7002

Features

- Fast switching
- Low gate charge and $R_{DS(ON)}$
- Low reverse transfer capacitances
- ESD protected(HBM) up to 2KV

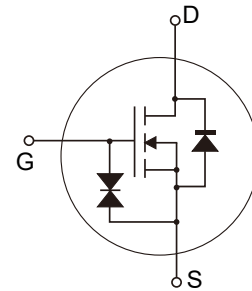
SOT-23



1. Gate 2.Source 3.Drain
Marking: K72

Applications

- PWM applications
- Load switch
- Power management



Absolute Maximum Ratings

($T_C=25^{\circ}\text{C}$, 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	0.3	A
Power Dissipation	P_D	0.35	W
Junction Temperature	T_J	150	$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	-55 to 150	$^{\circ}\text{C}$
Thermal Characteristics			
Parameter	Symbol	Typ.	Units
Maximum Junction-to-Ambient	$R_{\theta JA}$	357	$^{\circ}\text{C/W}$

**Electrical Characteristics** ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
Static Parameters						
V _{DSS}	Drain to Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	60	--	--	V
I _{DSS}	Drain to Source Leakage Current	V _{DS} =60,V _{GS} =0V	--	--	1	μA
I _{GSS}	Gate to Source Forward Leakage	V _{DS} = 0V, V _{GS} = ±20V	--	--	±10	μA
R _{DS(ON)}	Drain-to-Source On-Resistance ^{Note1}	V _{GS} =10V,I _D =0.5A	--	1.9	3	Ω
		V _{GS} =4.5V,I _D =0.3A	--	2.2	4	Ω
V _{GS(TH)}	Gate Threshold Voltage ^{Note1}	V _{DS} =V _{GS} , I _D =250μA	1	1.7	2.5	V
g _{FS}	Forward Transconductance ^{Note1}	V _{DS} =10V, I _D =0.2A	0.1	5	--	S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{GS} =0V,V _{DS} =15V f=1.0MHz	--	20	--	pF
C _{oss}	Output Capacitance		--	12	--	
C _{rss}	Reverse Transfer Capacitance		--	4.4	--	
Switching Characteristics						
t _{d(ON)}	Turn-on Delay Time	I _D =0.2A,V _{DD} = 15V V _{GS} =10V, R _G = 3Ω	--	10	--	ns
t _r	Rise Time		--	45	--	
t _{d(OFF)}	Turn-Off Delay Time		--	15	--	
t _f	Fall Time		--	10	--	
Q _g	Total Gate Charge	I _D =0.3A,V _{DD} =15V, V _{GS} =10V	--	1.7	--	nC
Q _{gs}	Gate to Source Charge		--	0.9	--	
Q _{gd}	Gate to Drain (“ Miller ”)Charge		--	1.3	--	
Source-Drain Diode Characteristics						
I _{SD}	Continuous Source Current (Body Diode)		--	--	0.3	A
I _{SM}	Maximum Pulsed Current (Body Diode)		--	--	0.9	A
V _{SD}	Diode Forward Voltage	I _S =0.3A,V _{GS} =0V	--	--	1.5	V

Note: 1. Pulse Test: Pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

Typical Characteristic Curves

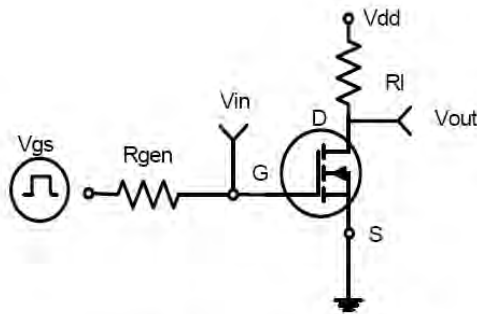


Figure 1: Switching Test Circuit

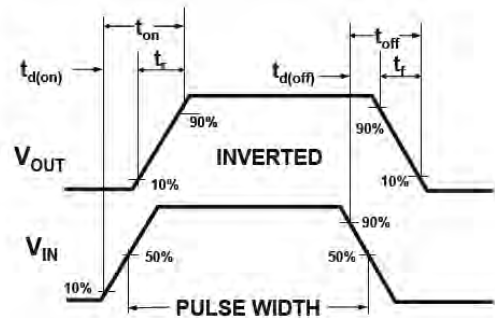


Figure 2: Switching Waveforms

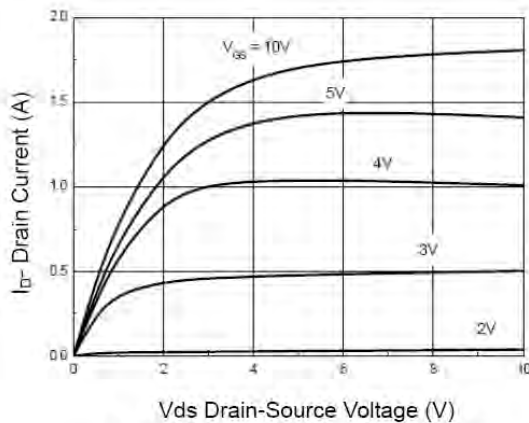


Figure 3 Output Characteristics

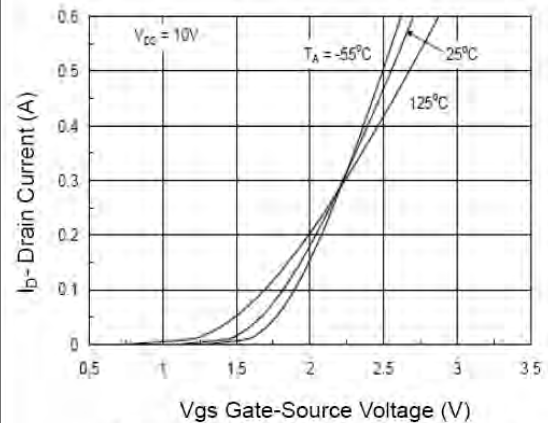


Figure 4 Transfer Characteristics

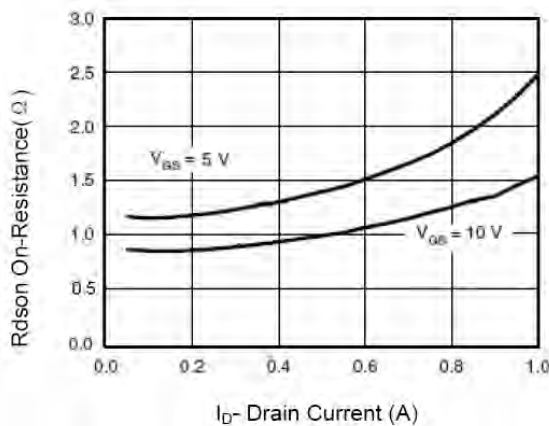


Figure 5 Drain-Source On-Resistance

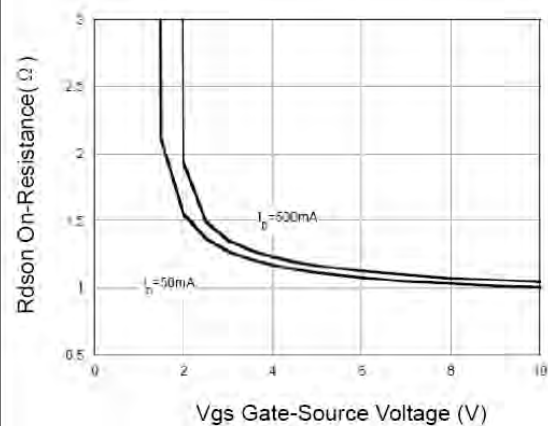
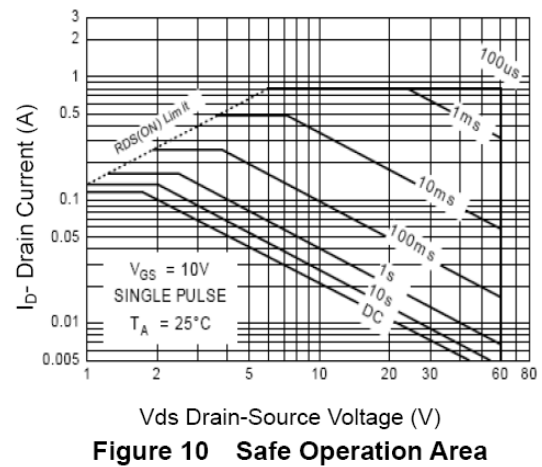
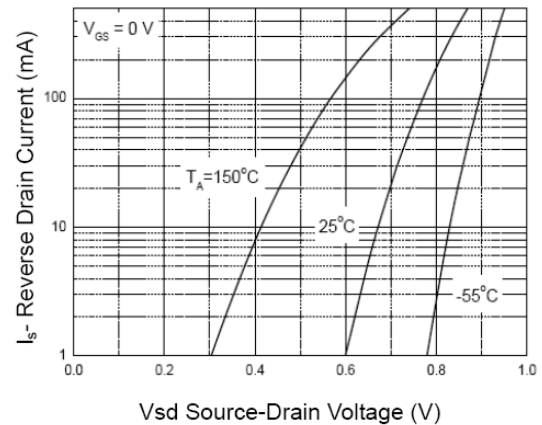
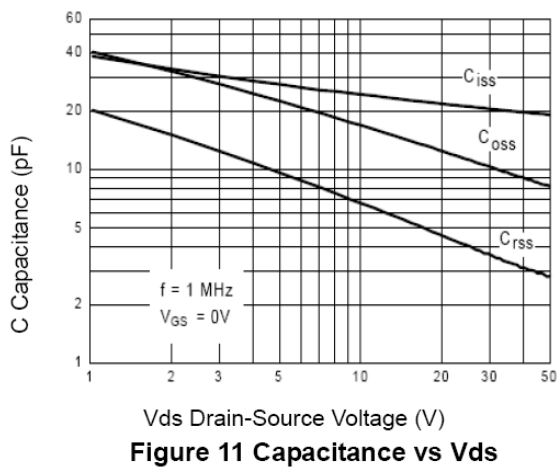
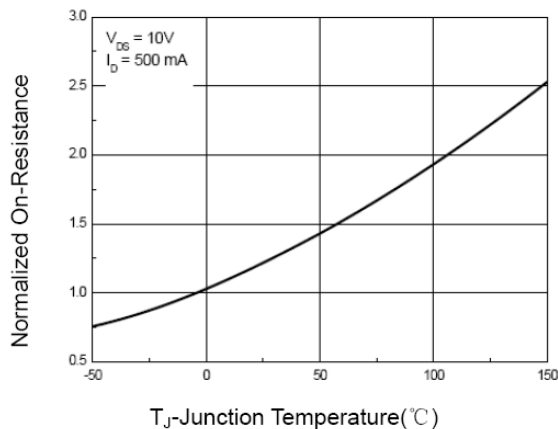
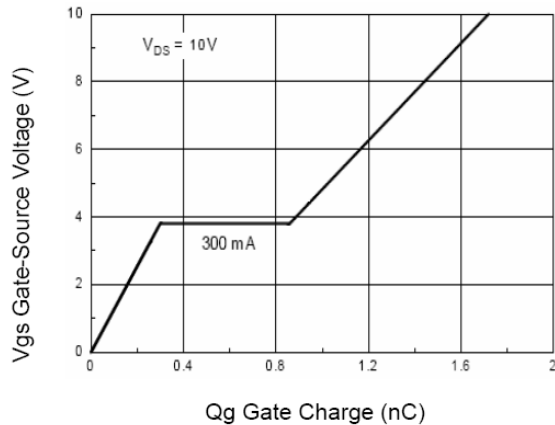


Figure 6 Rds(on) vs Vgs



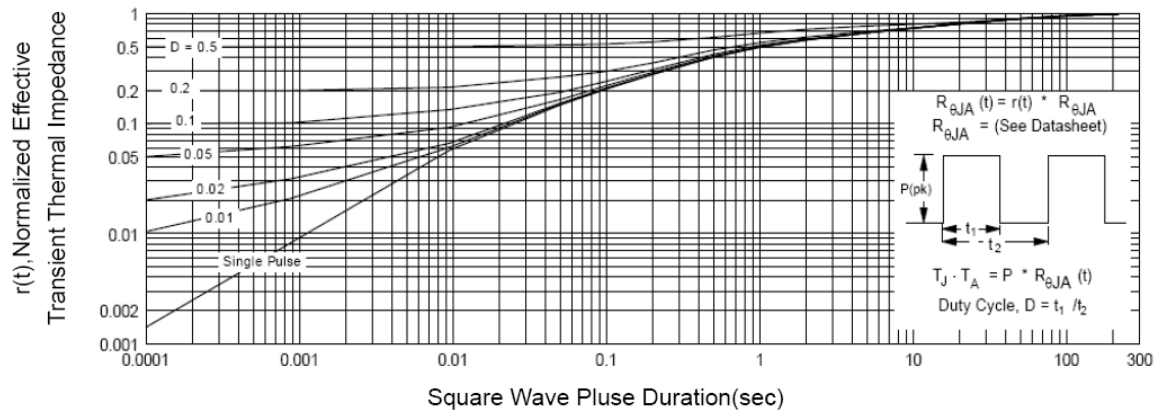
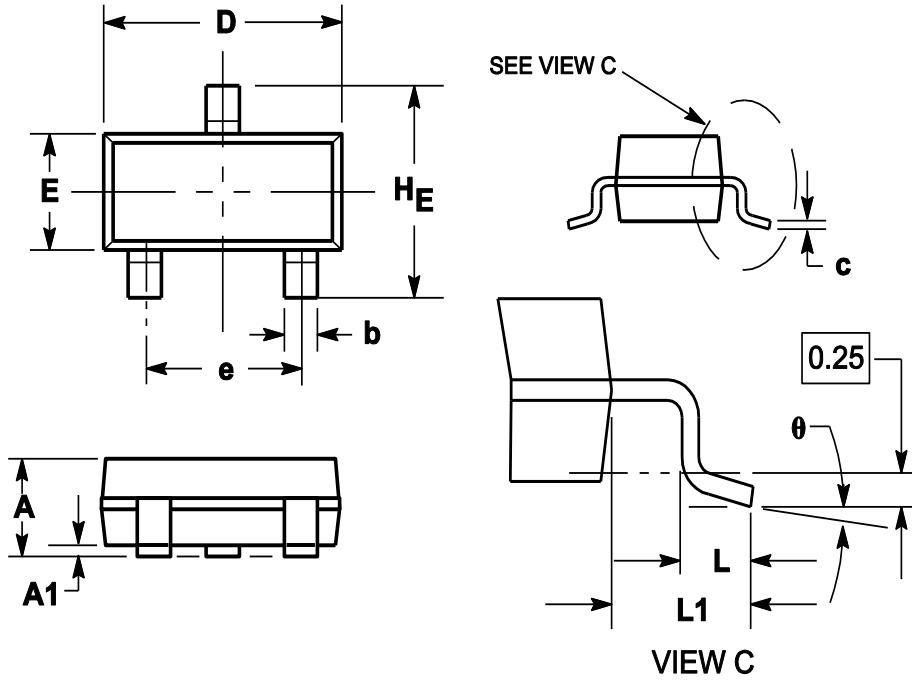


Figure 12 Normalized Maximum Transient Thermal Impedance

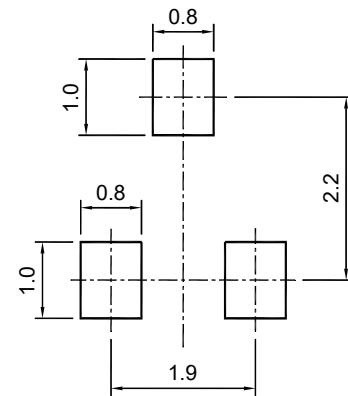


2N7002

SOT-23



Symbol	Dimensions in millimeter		
	Min.	Typ.	Max.
A	0.900	1.025	1.150
A1	0.000	0.050	0.100
b	0.300	0.400	0.500
c	0.080	0.115	0.150
D	2.800	2.900	3.000
E	1.200	1.300	1.400
HE	2.250	2.400	2.550
e	1.800	1.900	2.000
L1	0.550REF		
L	0.300		0.500
θ	0°		8°



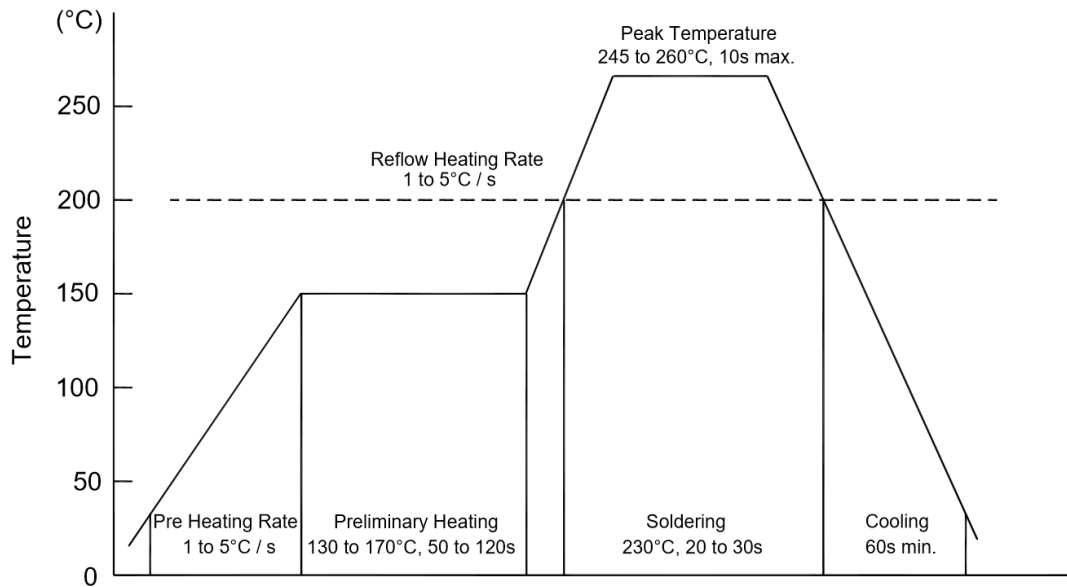
SOT-23

Recommended soldering pad



Conditions of Soldering and Storage

◆ Recommended condition of reflow soldering



Recommended peak temperature is over 245 °C. If peak temperature is below 245 °C, you may adjust the following parameters:

- Time length of peak temperature (longer)
- Time length of soldering (longer)
- Thickness of solder paste (thicker)

◆ Conditions of hand soldering

- Temperature: 370 °C
- Time: 3s max.
- Times: one time

◆ Storage conditions

- **Temperature**
5 to 40 °C
- **Humidity**
30 to 80% RH
- **Recommended period**
One year after manufacturing