General Description

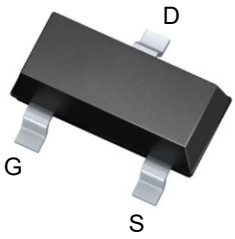
The 2N7002 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

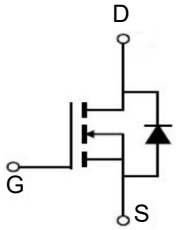
Features

V_{DSS}	60	V
I_D	0.3	A
$R_{DS(ON)}$(atV_{GS}=10V)	< 2	Ω
$R_{DS(ON)}$(atV_{GS}=5V)	< 3	Ω

Application

- Battery protection
- Load switch
- Uninterruptible power supply





Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
2N7002	SOT-23	72K/7002	3000

Absolute Maximum Ratings (T_A=25℃unless otherwise noted)

Symbol	Parameter		Limit	Unit
V_{DS}	Drain-Source Voltage		60	V
V_{GS}	Gate-Source Voltage		±20	V
I_D	Continuous Drain Current (T_J=150℃)	T_A=25℃	0.3	A
		T_A=100℃	0.19	
I_{DM}	Drain Current-Pulsed (Note 1)		0.8	A
P_D	Maximum Power Dissipation		0.35	W
T_J,T_{STG}	Operating Junction and Storage Temperature Range		-55 To 150	℃
$R_{\theta JA}$	Thermal Resistance,Junction-to-Ambient (Note 2)		350	℃/W

Electrical Characteristics (T_J=25 ℃, unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA	60	68	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=60V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±10V,V_{DS}=0V	-	±100	±500	nA
		V_{GS}=±20V,V_{DS}=0V	-	±4	±10	uA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	0.7	1.2	1.9	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=5V, I_D=0.1A	-	1.3	3	Ω
		V_{GS}=10V, I_D=0.1A	-	1	2	Ω
Forward Transconductance	g_{FS}	V_{DS}=10V,I_D=0.2A	0.1	-	-	S
Input Capacitance	C_{lss}	V_{DS}=25V,V_{GS}=0V, F=1.0MHz	-	21	50	PF
Output Capacitance	C_{oss}		-	11	25	PF
Reverse Transfer Capacitance	C_{rss}		-	4.2	5	PF
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=30V,I_D=0.2A V_{GS}=10V,R_{GEN}=10Ω	-	10	-	nS
Turn-on Rise Time	t_r		-	50	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	17	-	nS
Turn-Off Fall Time	t_f		-	10	-	nS
Total Gate Charge	Q_g	V_{DS}=10V,I_D=0.3A, V_{GS}=4.5V	-	1.7	3	nC
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=0.2A	-	-	1.2	V
Diode Forward Current (Note 2)	I_S		-	-	0.3	A

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.

2. Surface Mounted on FR4 Board, t ≤ 10 sec.

3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.

4. Guaranteed by design, not subject to production

Typical Electrical and Thermal Characteristics

Typical Electrical And Thermal Characteristics

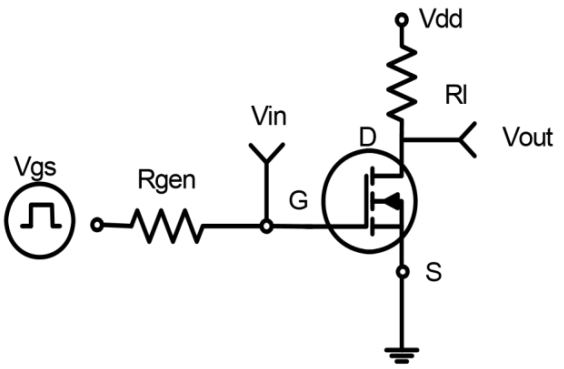


Figure 1:Switching Test Circuit

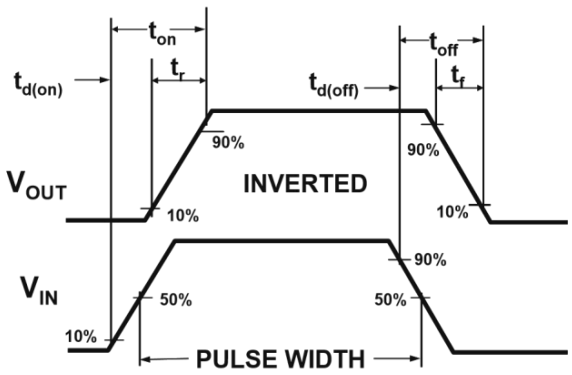


Figure 2:Switching Waveforms

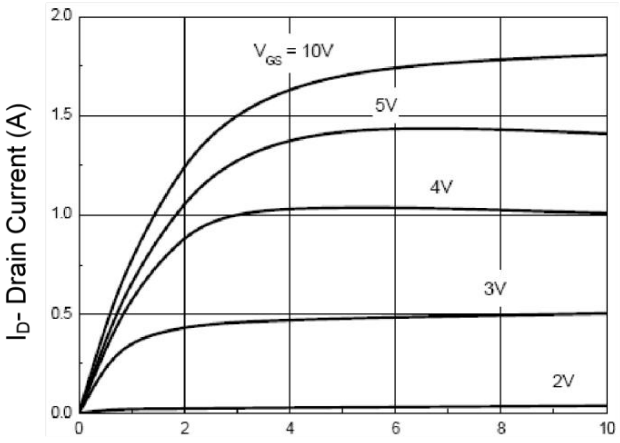


Figure 3 Output Characteristics

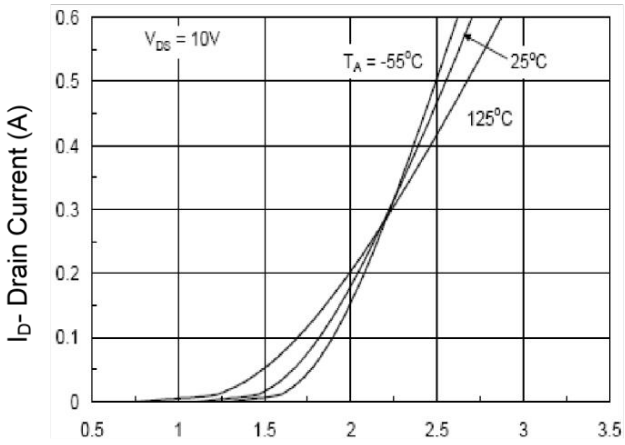


Figure 4 Transfer Characteristics

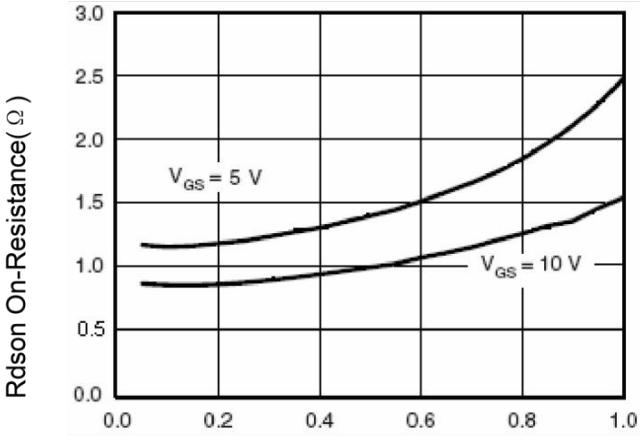


Figure 5 Drain-Source On-Resistance

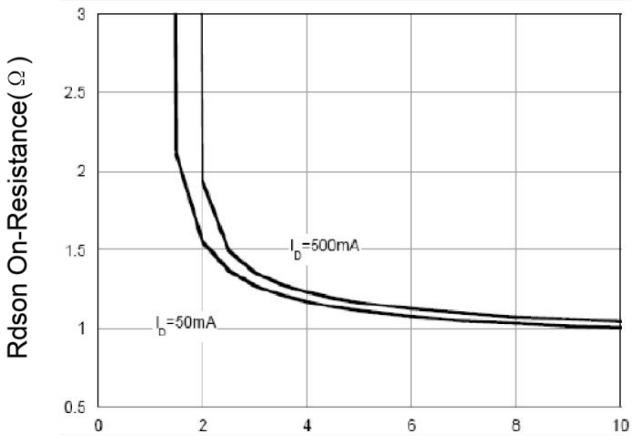


Figure 6 Rdson vs Vgs

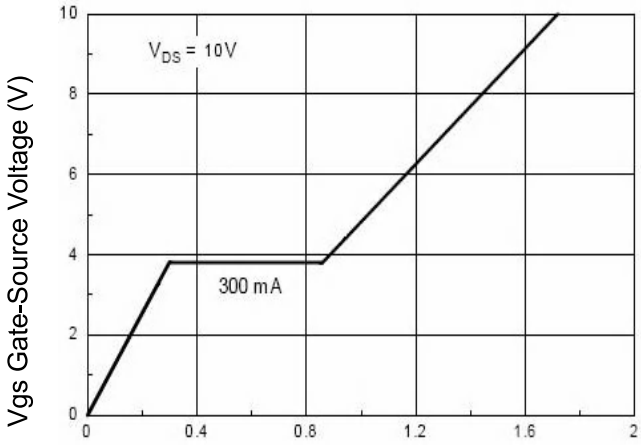


Figure 7 Gate Charge

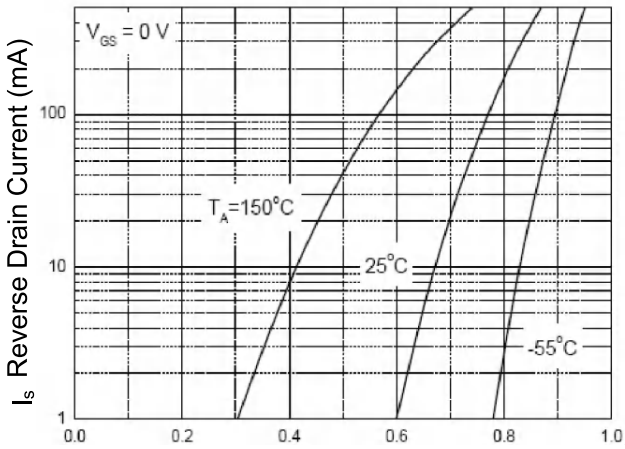


Figure 8 Source-DrainDiode Forward

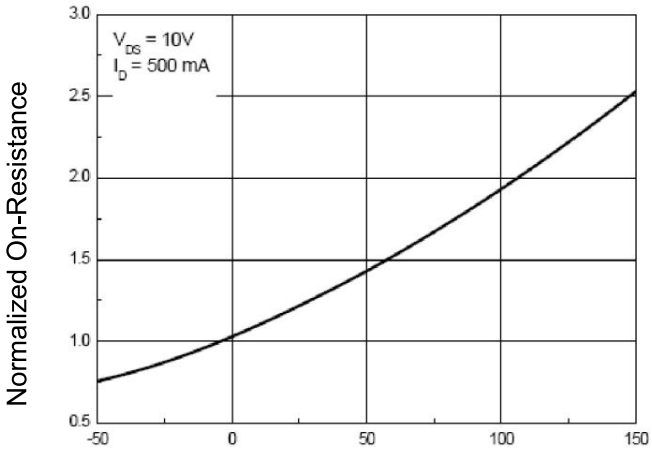


Figure 9 Drain-Source On-Resistance

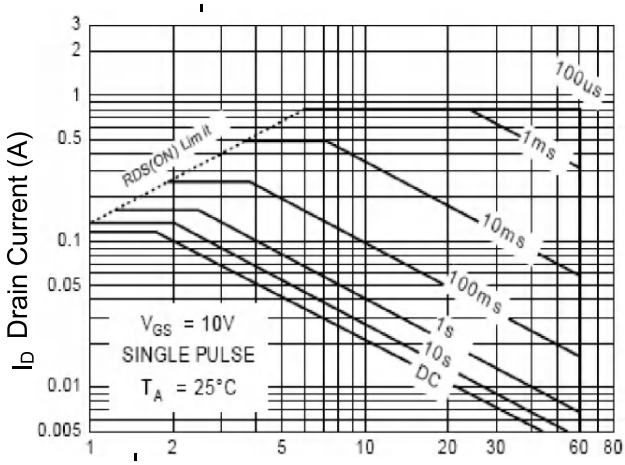


Figure 10 Safe Operation Area

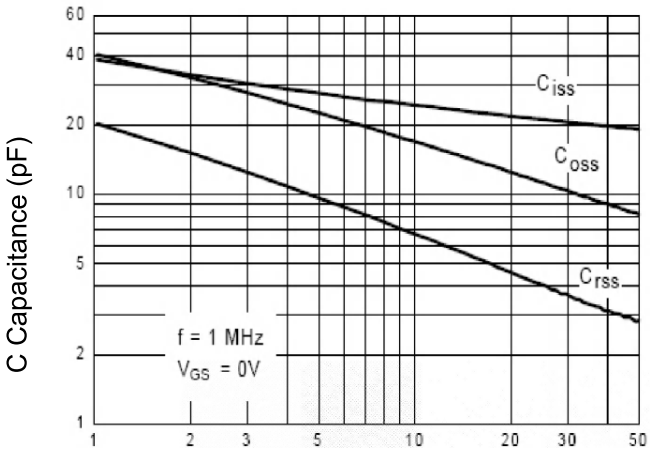


Figure 11 Capacitance vs Vds

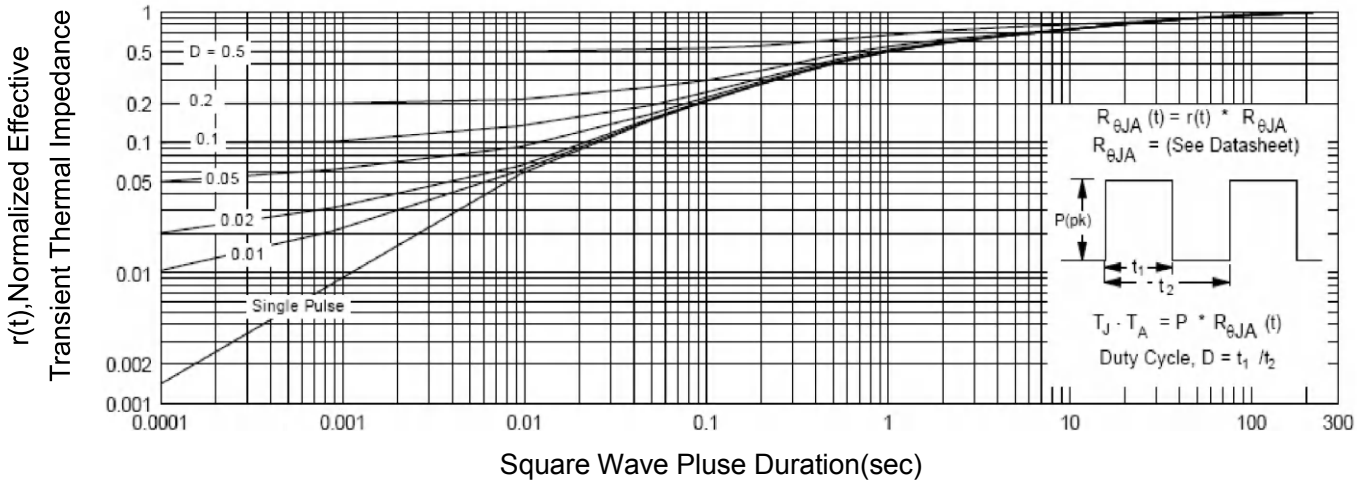
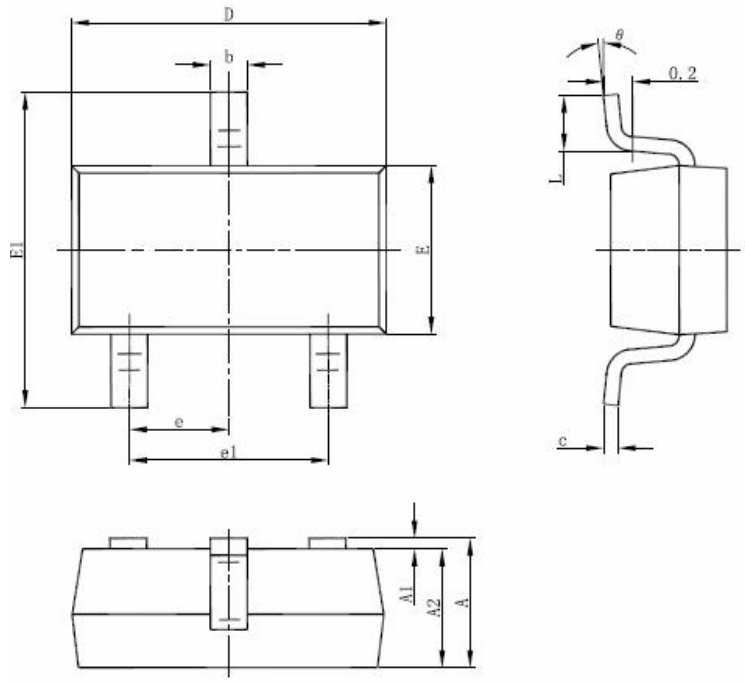


Figure 12 Normalized Maximum Transient Thermal Impedance

Package Mechanical Data-SOT-23



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°