

Description

The 2N7002K 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.

General Features

$V_{DS}=60V$ $I_D=0.5A$

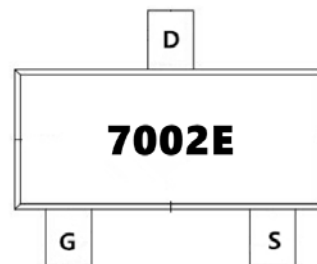
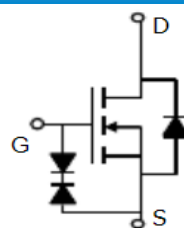
$R_{DS(ON)} < 1600m\Omega$ @ $V_{GS}=10V$ (Type: 1100m Ω)

ESD Rating: HBM \geq 2200V

Application

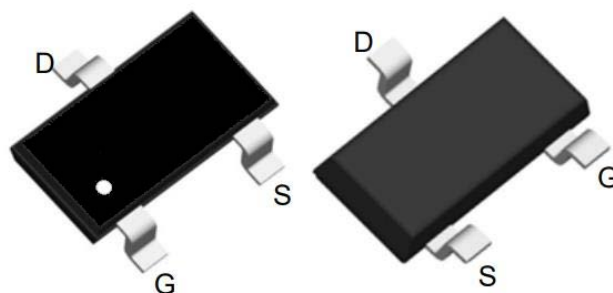
Load switch

Uninterruptible power supply



Top View

Bottom View



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
2N7002K	SOT-23	7002E	3000

Absolute Maximum Ratings ($T_C=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_C=25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V ¹	0.5	A
$I_D@T_C=100^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V ¹	0.13	A
I_{DM}	Pulsed Drain Current ²	1.5	A
EAS	Single Pulse Avalanche Energy ³	1	mJ
$P_D@T_C=25^\circ\text{C}$	Total Power Dissipation ⁴	350	mW
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance Junction-ambient ¹	128	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	15	$^\circ\text{C/W}$

Electrical Characteristics ($T_A=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V(BR)DSS	Drain-Source Breakdown Voltage	VGS= 0V, ID= 250 μ A	60	72	-	V
IGSS	Gate leakage Current	VGS= \pm 20V, VDS= 0V	-	-	\pm 10	μ A
IDSS	Drain Cut-off Current	VDS= 60V, VGS= 0V	-	-	1	μ A
VGS(th)	Gate Threshold Voltage	VDS= VGS, ID= 250 μ A	1.0	1.3	2.0	V
RDS(on)	Drain-Source On-state Resistance ³	VGS= 10V, ID= 0.3A	-	1100	1600	m Ω
		VGS= 4.5V, ID= 0.2A	-	1300	2000	m Ω
Ciss	Input Capacitance	V DS = 30V, V GS = 0V, f = 1MHz		25		pF
Coss	Output Capacitance			5.6		pF
Crss	Reverse Transfer Capacitance			2.2		pF
Qg	Total Gate Charge	VGS = 4.5V, VDS = 30V, ID = 0.3A	-	0.61	-	nC
Qgs	Gate-Source Charge		-	0.27	-	nC
Qgd	Gate-Drain Charge		-	0.23	-	nC
td(on)	Turn-on Delay Time	VGS = 10V, VDD = 30V, ID = 0.3A, RG= 3 Ω	-	4.3	-	ns
tr	Turn-on Rise Time		-	2.4	-	ns
td(off)	Turn-off Delay Time		-	21	-	ns
tf	Turn- off Fall Time		-	14.5	-	ns
VSD	Diode Forward Voltage ³	IS= 0.3A ,VGS=0V,	-	-	1.5	V
IS	Continuous Source Current	-	-	-	0.5	A

Note :

- 1、 The data tested by surface mounted on a 1 inch 2 FR-4 board with 2OZ copper.
- 2、 The data tested by pulsed , pulse width \cong 300us , duty cycle \cong 2%
- 3、 The power dissipation is limited by 150 $^\circ\text{C}$ junction temperature
- 4、 The data is theoretically the same as I D and I DM , in real applications , should be limited by total power dissipation.

Typical Characteristics

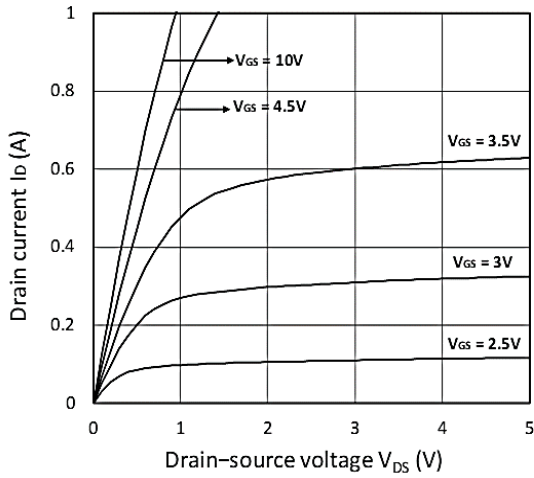


Figure 1. Output Characteristics

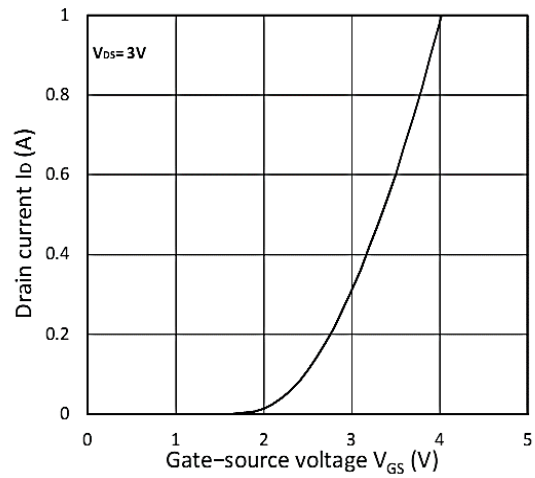


Figure 2. Transfer Characteristics

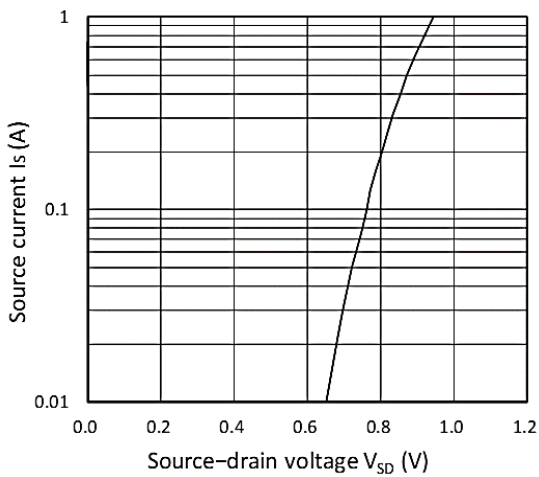


Figure 3. Forward Characteristics of Reverse

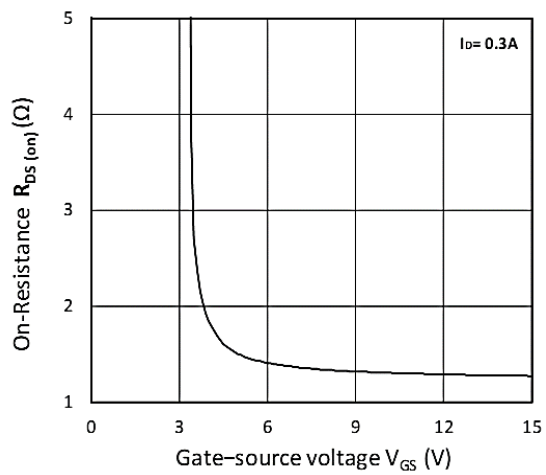


Figure 4. $R_{DS(ON)}$ vs. V_{GS}

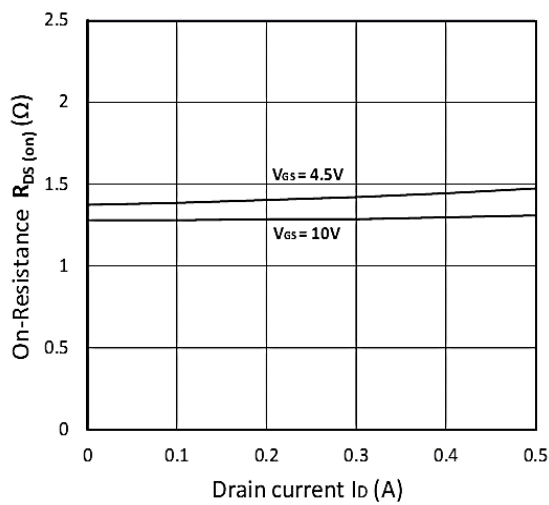


Figure 5. $R_{DS(ON)}$ vs. I_D

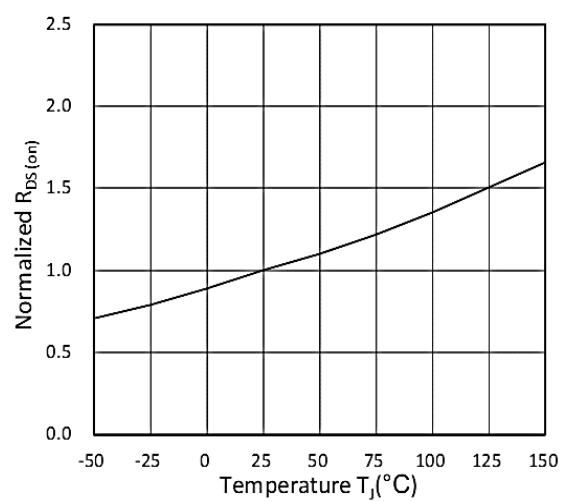


Figure 6. Normalized $R_{DS(on)}$ vs. Temperature

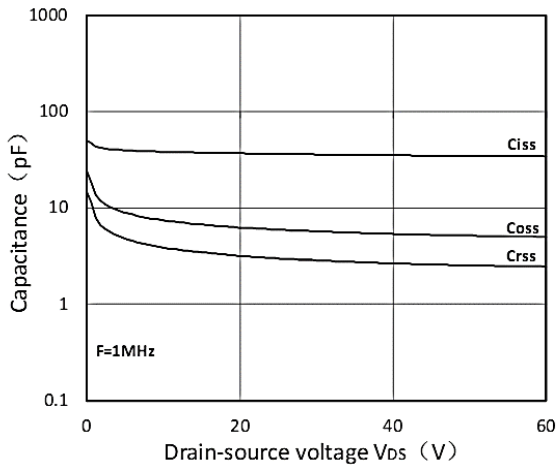


Figure 7. Capacitance Characteristics

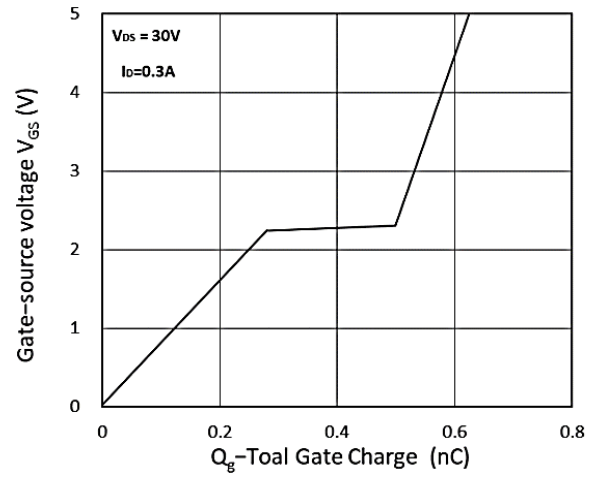


Figure 8. Gate Charge Characteristics

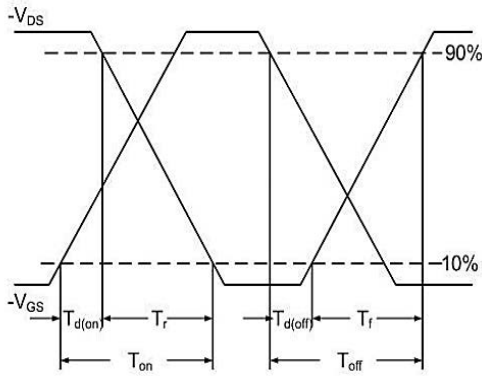


Figure.9 Switching Time Waveform

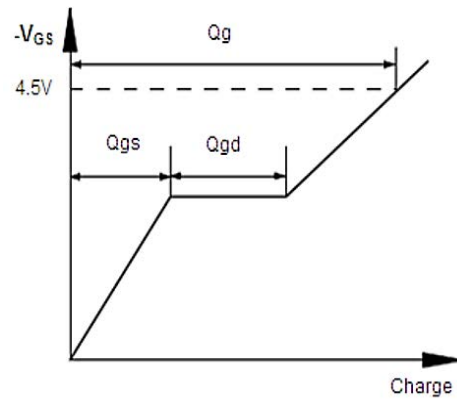
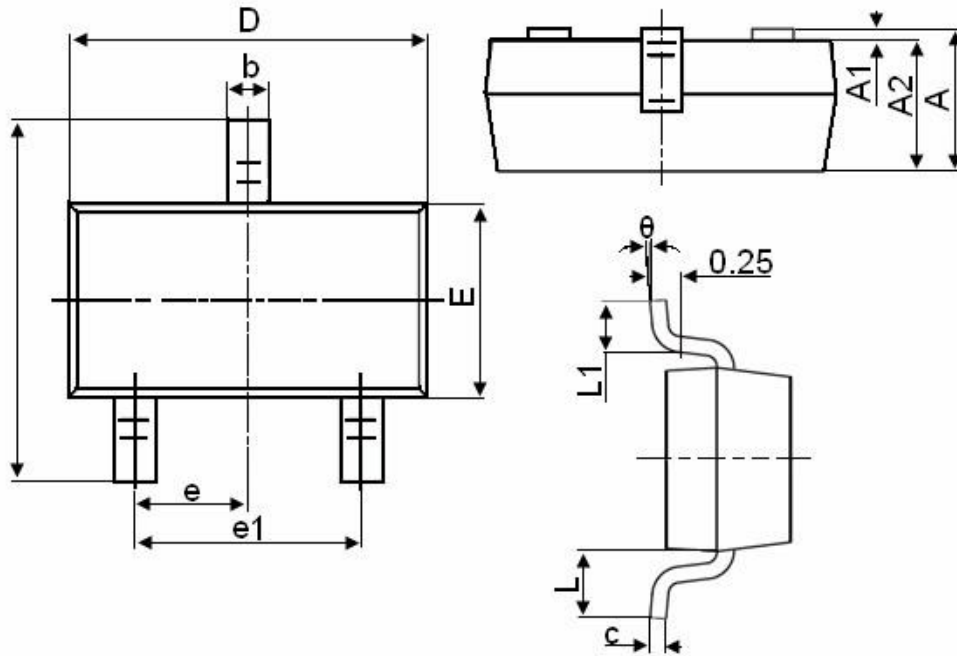


Figure.10 Gate Charge Waveform

Package Mechanical Data-SOT-23 Single



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°

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