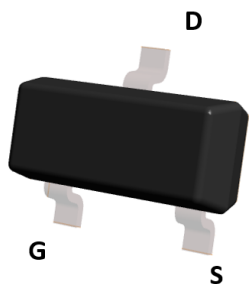


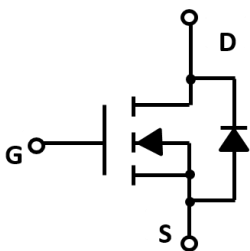
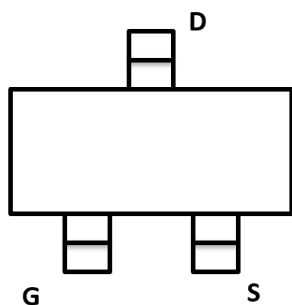
# 2N7002A

## N-Channel Enhancement Mode Field Effect Transistor



Top View

**SOT-23**



### Product Summary

- $V_{DS}$  60V
- $I_D$  340mA
- $R_{DS(ON)}$  (at  $V_{GS}=10V$ ) <2.5ohm
- $R_{DS(ON)}$  (at  $V_{GS}=4.5V$ ) <3.0ohm

### General Description

- Trench Power MV MOSFET technology
- Voltage controlled small signal switch
- Low input Capacitance
- Fast Switching Speed
- Low Input / Output Leakage

### Applications

- Battery operated systems
- Solid-state relays
- Direct logic-level interface: TTL/CMOS

### ■ Absolute Maximum Ratings ( $T_A=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-source Voltage	$V_{DS}$	60	V
Gate-source Voltage	$V_{GS}$	$\pm 30$	V
Peak Gate-source Voltage $T_p < 50\mu s$ , duty cycle=0.25	$V_{GSm}$	$\pm 40$	V
Drain Current	$I_D$	$T_A=25^\circ C$ @ Steady State	340
		$T_A=70^\circ C$ @ Steady State	272
Pulsed Drain Current <sup>A</sup>	$I_{DM}$	1.5	A
Total Power Dissipation @ $T_A=25^\circ C$	$P_D$	350	mW
Thermal Resistance Junction-to-Ambient @ Steady State <sup>B</sup>	$R_{\theta JA}$	357	$^\circ C/W$
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55~+150	$^\circ C$

### ■ Ordering Information (Example)

PREFERRED P/N	PACKING CODE	Marking	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
2N7002A	F2	7002A.	3000	30000	120000	7" reel

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

Parameter	Symbol	Conditions	Min	Typ	Max	Units
<b>Static Parameter</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	60			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$			1	$\mu A$
Gate-Body Leakage Current	$I_{GSS1}$	$V_{GS}=\pm 30V, V_{DS}=0V$			$\pm 100$	nA
	$I_{GSS2}$	$V_{GS}=\pm 20V, V_{DS}=0V$			$\pm 50$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1	1.6	2.5	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=300mA$		1.2	2.5	$\Omega$
		$V_{GS}=4.5V, I_D=200mA$		1.3	3.0	
Diode Forward Voltage	$V_{SD}$	$I_S=300mA, V_{GS}=0V$			1.2	V
Maximum Body-Diode Continuous Current	$I_S$				340	mA
<b>Dynamic Parameters</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=30V, V_{GS}=0V, f=1MHz$		17		pF
Output Capacitance	$C_{oss}$			11		
Reverse Transfer Capacitance	$C_{rss}$			6		
<b>Switching Parameters</b>						
Total Gate Charge	$Q_g$	$V_{GS}=15V, V_{DS}=30V, I_D=0.3A$		1.7	2.4	nC
Turn-on Delay Time	$t_{D(on)}$	$V_{GS}=10V, V_{DD}=30V, I_D=300mA, R_{GEN}=6\Omega$		5		ns
Turn-off Delay Time	$t_{D(off)}$			17		
Reverse recovery Time	$t_{rr}$	$V_{GS}=0V, I_S=300mA, V_R=25V, di_S/dt=-100A/\mu s$		30		ns

A. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .

B. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch.

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## ■ Typical Performance Characteristics

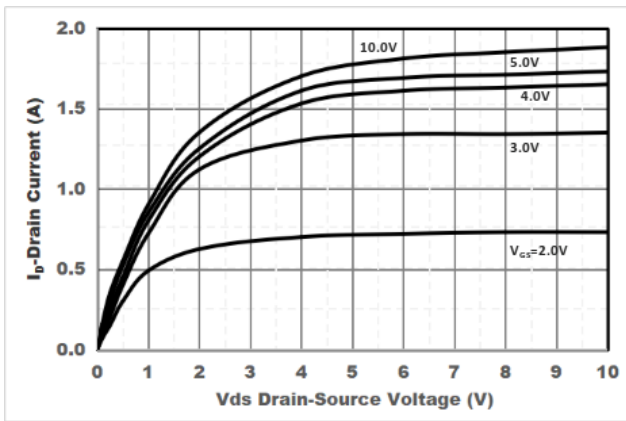


Figure1. Output Characteristics

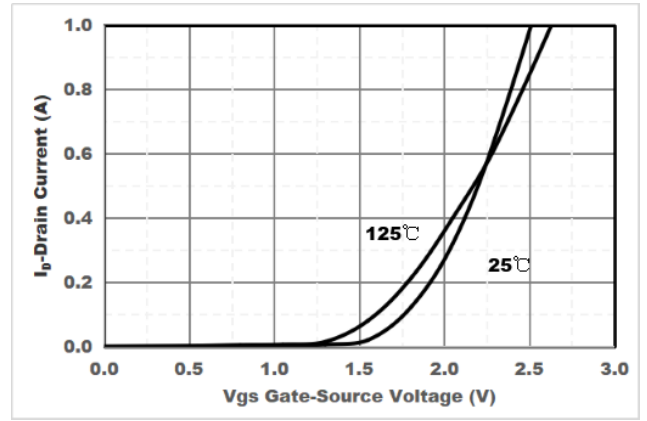


Figure2. Transfer Characteristics

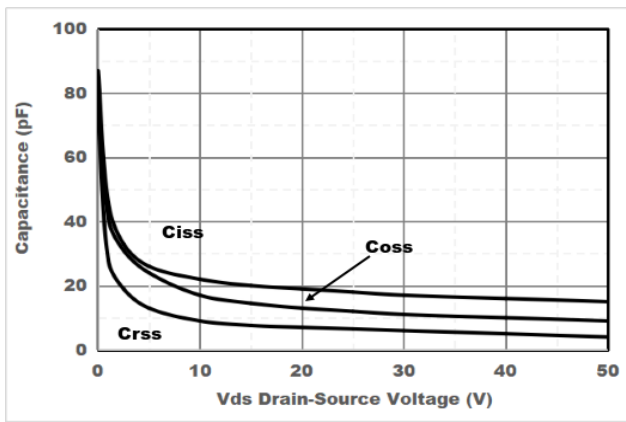


Figure3. Capacitance Characteristics

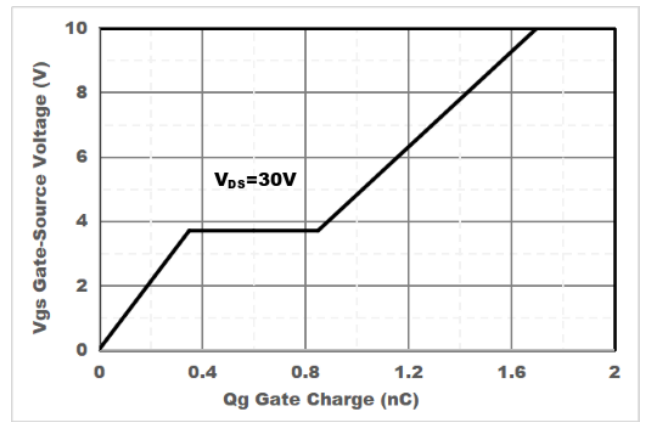


Figure4. Gate Charge

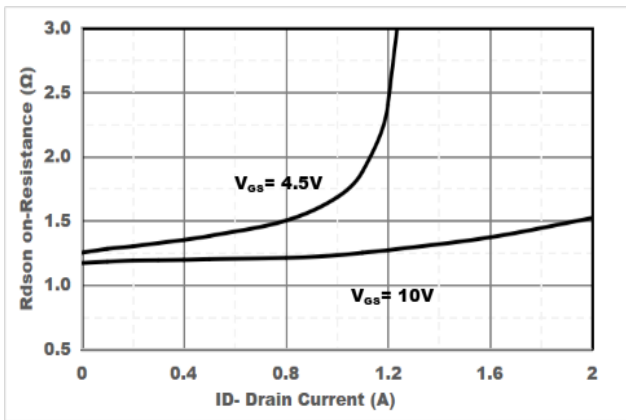


Figure5. Drain-Source on Resistance

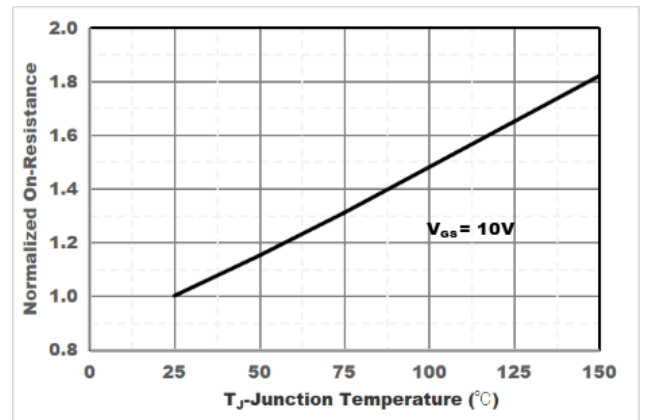


Figure6. Drain-Source on Resistance

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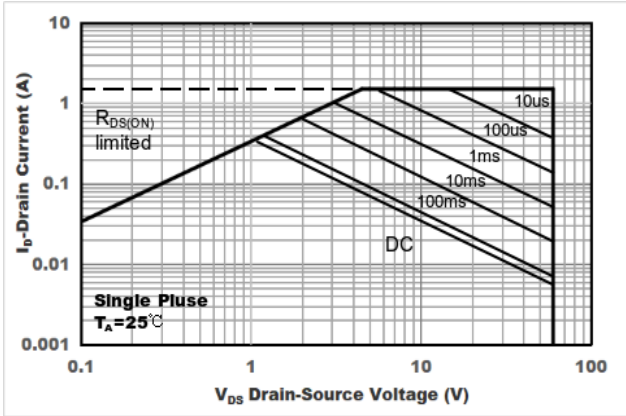


Figure7. Safe Operation Area

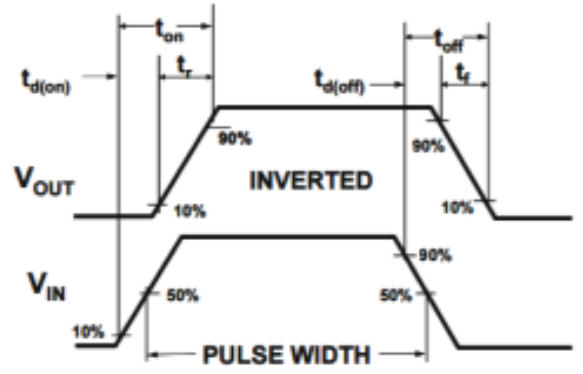
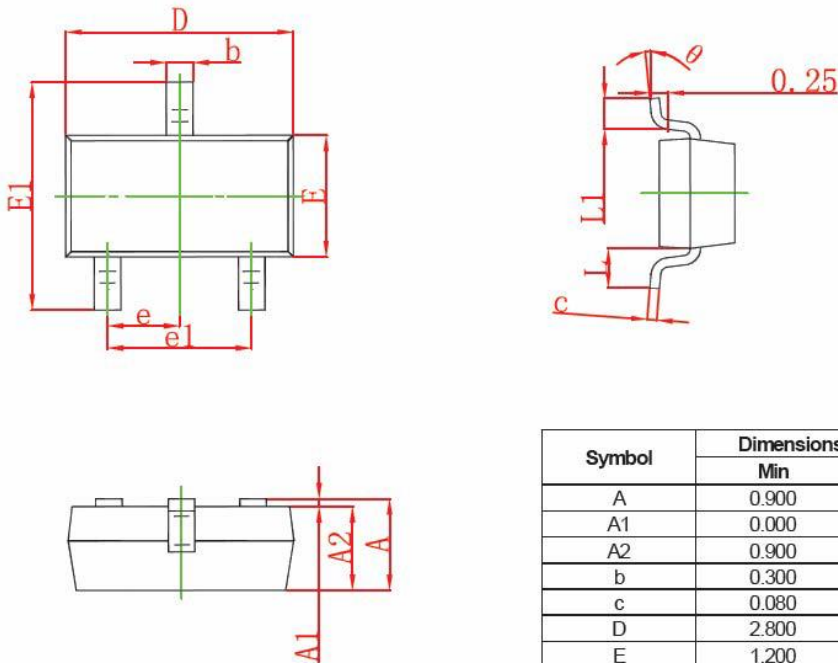


Figure8. Switching wave

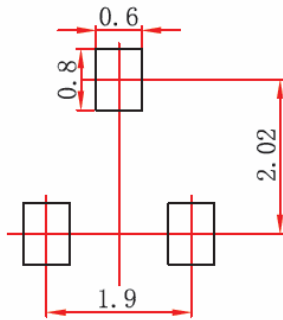
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## ■ SOT-23 Package information



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	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
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
θ	0°	8°	0°	8°

## ■ SOT-23 Suggested Pad Layout



### Note:

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.

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