



## 2N7002

Power MOSFET

### 0.3A, 60V N-CHANNEL POWER MOSFET

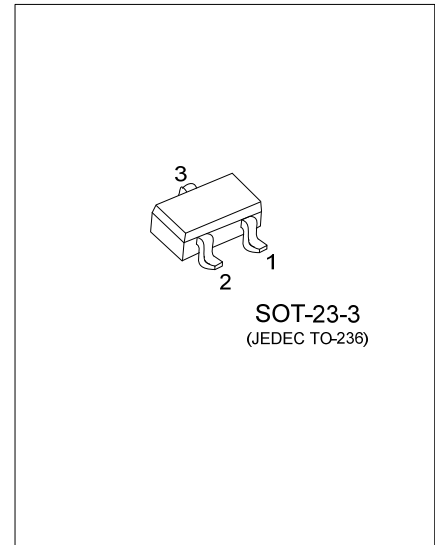
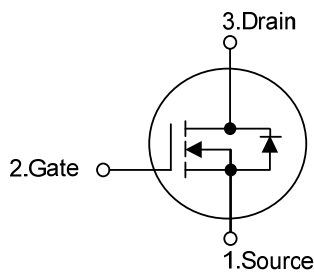
#### DESCRIPTION

The UTC **2N7002** uses advanced technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with low gate voltages. This device is suitable for use as a load switch or in PWM applications.

#### FEATURES

- \* High Density Cell Design for Low  $R_{DS(ON)}$ .
- \* Voltage Controlled Small Signal Switch
- \* Rugged and Reliable
- \* High Saturation Current Capability

#### SYMBOL

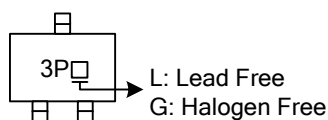


#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
2N7002L-AE2-R	2N7002G-AE2-R	SOT-23-3	S	G	D	Tape Reel

<p>2N7002L-AE2-R</p> <p>(1)Packing Type (2)Package Type (3)Halogen Free</p>	<p>(1) R: Tape Reel (2) AE2: SOT-23-3 (3) L: Lead Free, G: Halogen Free</p>
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#### MARKING



■ ABSOLUTE MAXIMUM RATINGS ( $T_A=25^\circ\text{C}$ , unless otherwise specified.)

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	$V_{DSS}$	60	V
Drain-Gate Voltage ( $R_{GS} \leq 1\text{M}\Omega$ )	$V_{DGR}$	60	V
Gate Source Voltage	$V_{GSS}$	Continuous	$\pm 20$
		Non Repetitive( $t_P < 50\mu\text{s}$ )	$\pm 40$
Drain Current	$I_D$	Continuous	300
		Pulsed	800
Power Dissipation	$P_D$	200	mW
Derated Above $25^\circ\text{C}$		1.6	$\text{mW}/^\circ\text{C}$
Junction Temperature	$T_J$	+ 150	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-55 ~ +150	$^\circ\text{C}$

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	625	$^\circ\text{C}/\text{W}$
Junction to Case	$\theta_{JC}$	215	$^\circ\text{C}/\text{W}$

■ ELECTRICAL CHARACTERISTICS ( $T_A=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0\text{V}, I_D=10\mu\text{A}$	60			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=60\text{V}, V_{GS}=0\text{V}$			1	$\mu\text{A}$
Gate-Source Leakage Current	$I_{GSSF}$	$V_{GS}=20\text{V}, V_{DS}=0\text{V}$			100	nA
		$V_{GS}=-20\text{V}, V_{DS}=0\text{V}$			-100	nA
<b>ON CHARACTERISTICS (Note)</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=250\mu\text{A}$	1	2.1	2.5	V
Drain-Source On-Voltage	$V_{DS(ON)}$	$V_{GS}=10\text{V}, I_D=300\text{mA}$		0.6	3.75	V
		$V_{GS}=5.0\text{V}, I_D=50\text{mA}$			0.375	
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}, I_D=300\text{mA}$			7.5	$\Omega$
		$V_{GS}=5.0\text{V}, I_D=50\text{mA}$			7.5	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25\text{V}, V_{GS}=0\text{V}, f=1.0\text{MHz}$		20	50	pF
Output Capacitance	$C_{OSS}$			11	25	pF
Reverse Transfer Capacitance	$C_{RSS}$			4	5	pF
Turn-On Time	$t_{ON}$	$V_{DD}=30\text{V}, R_L=150\Omega, I_D=200\text{mA}, V_{GS}=10\text{V}, R_{GEN}=25\Omega$			20	nS
Turn-Off Time	$t_{OFF}$	$V_{DD}=30\text{V}, R_L=25\Omega, I_D=200\text{mA}, V_{GS}=10\text{V}, R_{GEN}=25\Omega$			20	nS
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0\text{V}, I_S=300\text{mA}$ (Note)		0.88	1.5	V
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				0.8	A
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				300	mA

Note: Pulse Test: Pulse Width $\leq 300\mu\text{s}$ , Duty Cycle $\leq 2.0\%$

■ TEST CIRCUIT AND WAVEFORM

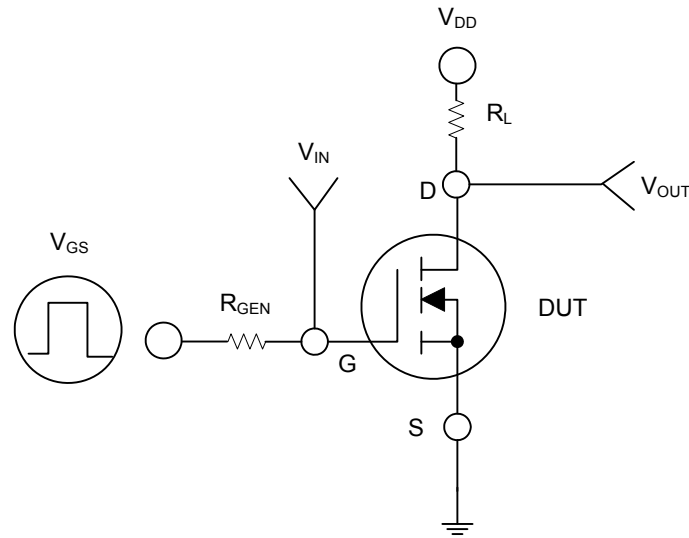


Fig. 1

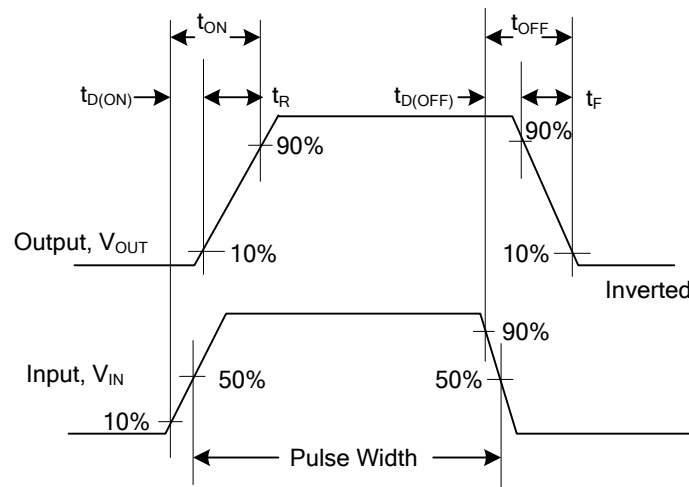
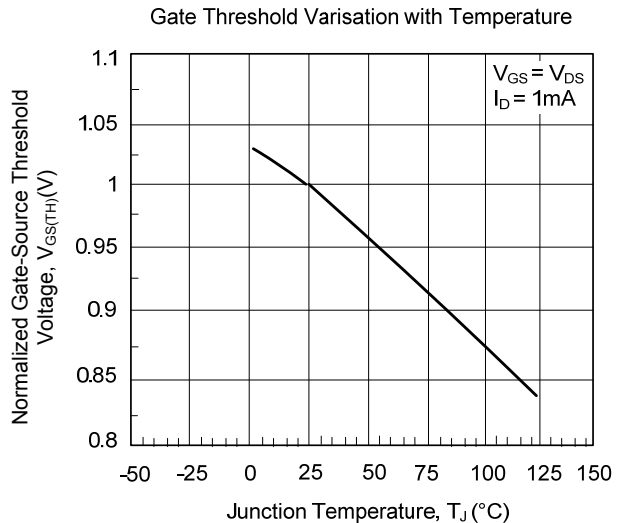
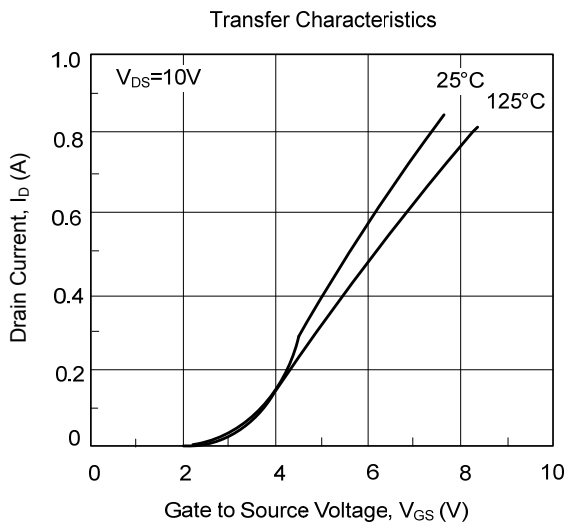
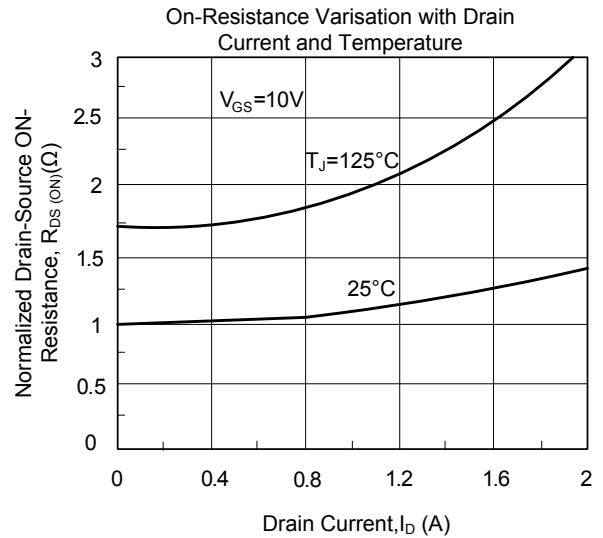
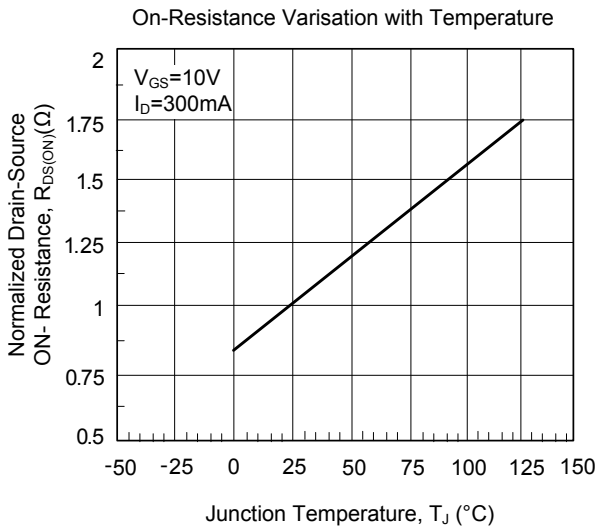
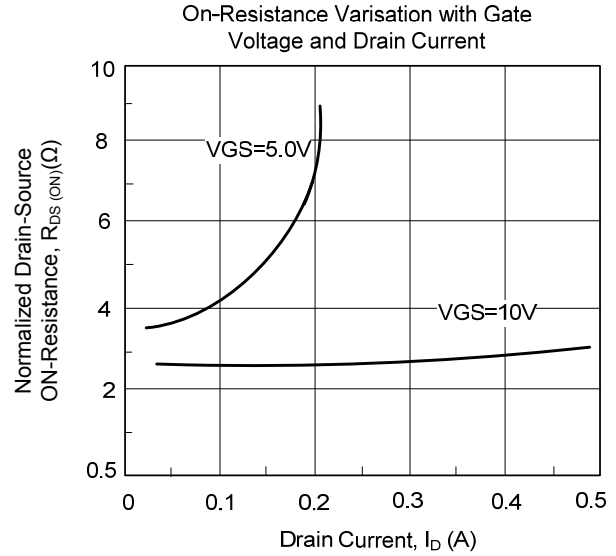
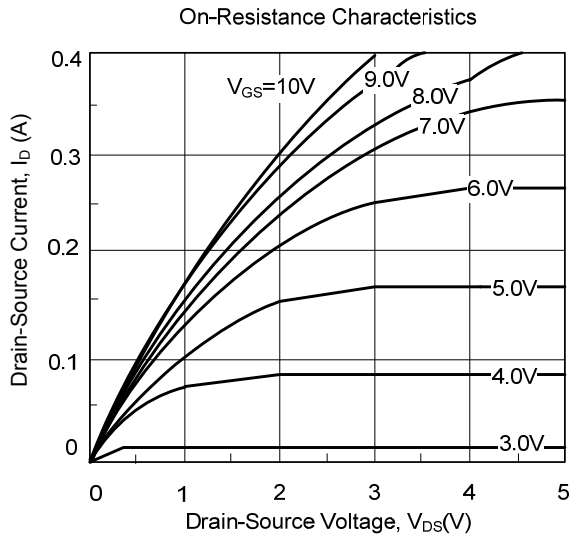


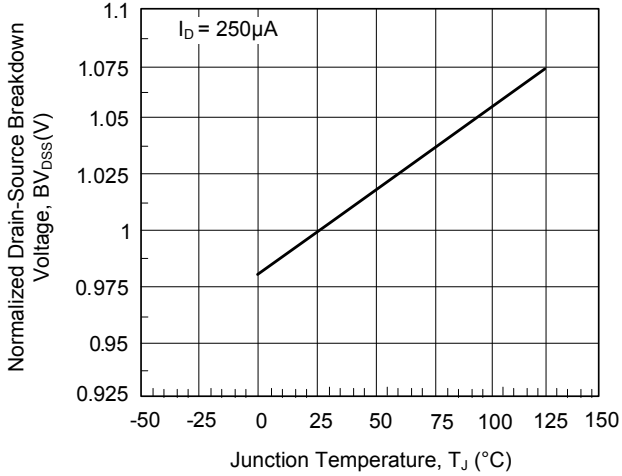
Fig. 2 Switching Waveforms

■ TYPICAL CHARACTERISTICS

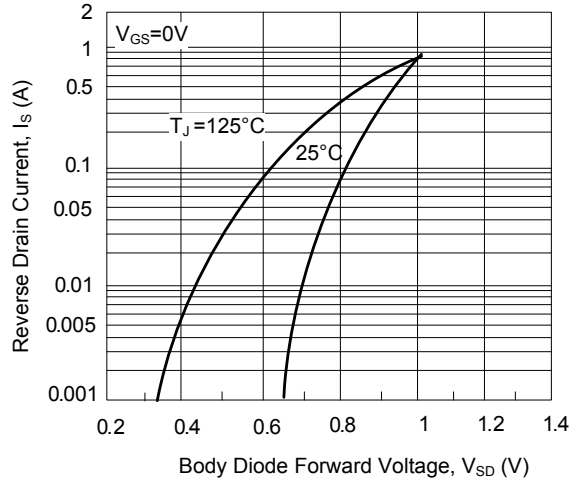


■ TYPICAL CHARACTERISTICS (Cont.)

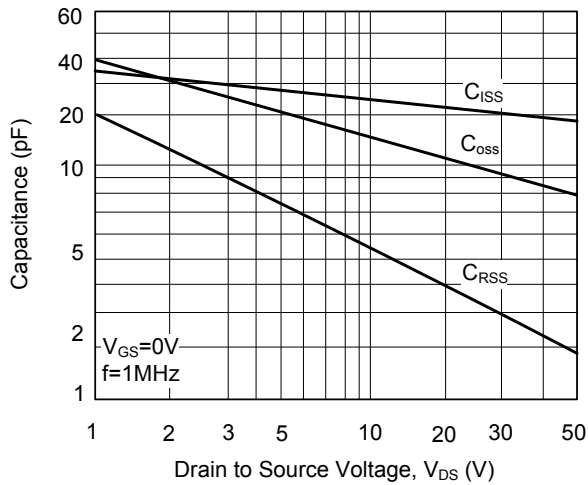
Breakdown Voltage Variation with Temperature



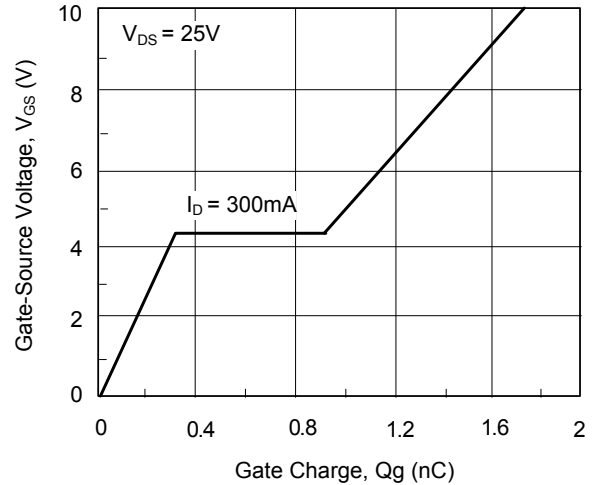
Body Diode Forward Voltage Variation with Temperature



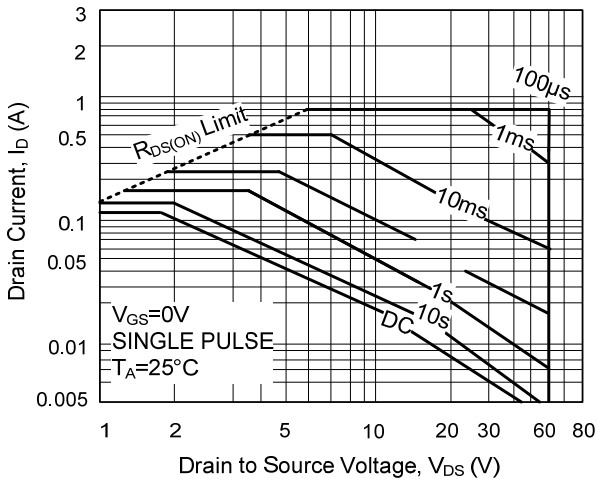
Capacitance Characteristics



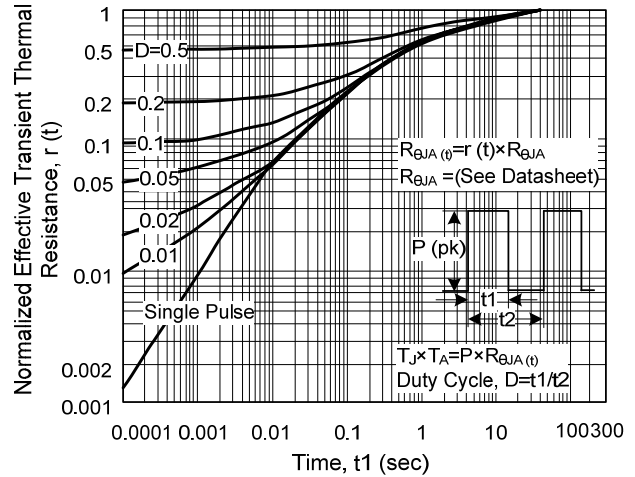
Gate Charge Characteristics



Maximum Safe Operating Area



Transient Thermal Response Curve



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