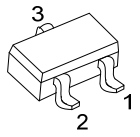
2N7002

Power MOSFET

0.3A, 60V N-CHANNEL POWER MOSFET



SOT-23-3
(JEDEC TO-236)

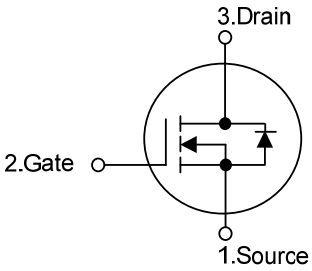
■ DESCRIPTION

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



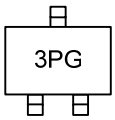
■ ORDERING INFORMATION

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

Note: Pin Assignment: G: Gate D: Drain S: Source

2N7002G-AE2-R (1)Packing Type	(1) R: Tape Reel
(2)Package Type	(2) AE2: SOT-23-3
(3)Green Package	(3) G: Halogen Free and Lead Free

■ MARKING



■ ABSOLUTE MAXIMUM RATINGS (T_A=25°C, unless otherwise specified.)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	60	V
Drain-Gate Voltage (R_{GS} ≤1MΩ)		V_{DGR}	60	V
Gate Source Voltage	Continuous	V_{GSS}	±20	V
	Non Repetitive(t_P<50μs)		±40	
Drain Current	Continuous	I_D	300	mA
	Pulsed		800	
Power Dissipation		P_D	200	mW
Derated Above 25°C			1.6	mW/°C
Junction Temperature		T_J	+ 150	°C
Storage Temperature		T_{STG}	-55 ~ +150	°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	$θ_{JA}$	625	°C/W
Junction to Case	$θ_{JC}$	215	°C/W

■ ELECTRICAL CHARACTERISTICS (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=10μA	60			V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=60V, V_{GS} =0V			1	μA
Gate-Source Leakage Current	I_{GSSF}	V_{GS} =20V, V_{DS}=0V			100	nA
	I_{GSSR}	V_{GS} =-20V, V_{DS}=0V			-100	nA
ON CHARACTERISTICS (Note)						
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D=250μA	1	2.1	2.5	V
Drain-Source On-Voltage	$V_{DS\ (ON)}$	V_{GS} = 10V, I_D=300mA		0.6	3.75	V
		V_{GS} = 5.0V, I_D=50mA			0.375	
Static Drain-Source On-Resistance	$R_{DS\ (ON)}$	V_{GS} =10V, I_D=300mA			7.5	Ω
		V_{GS} =5.0V, I_D=50mA			7.5	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	V_{DS}=25V,V_{GS}=0V,f=1.0MHz		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}=30V, R_L=150Ω, I_D=200mA, V_{GS} =10V, R_{GEN} =25Ω			20	nS
Turn-Off Time	t_{OFF}	V_{DD}=30V, R_L=25Ω, I_D=200mA, V_{GS}=10V, R_{GEN} =25Ω			20	nS
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS}=0V, Is=300mA (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≤300μs, Duty Cycle≤2.0%

■ TEST CIRCUIT AND WAVEFORM

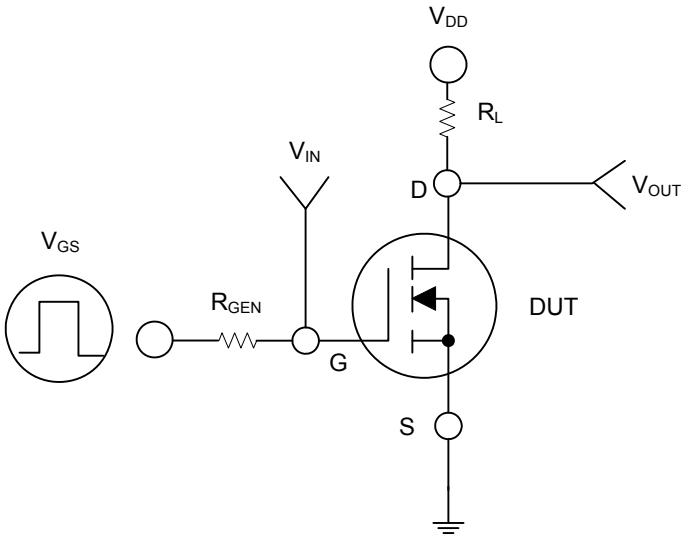


Fig. 1

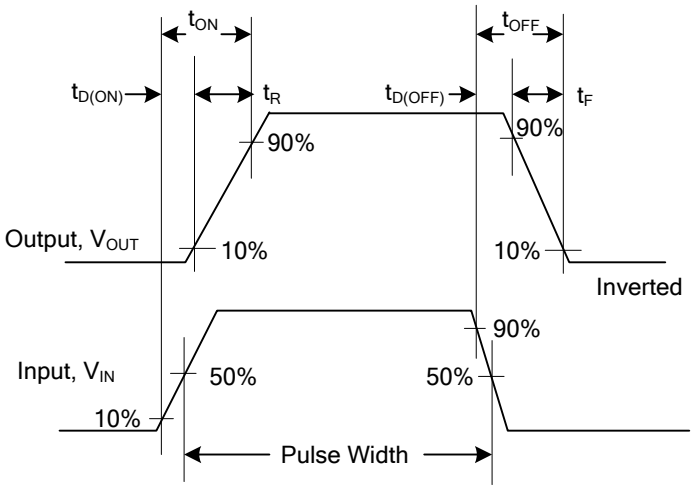
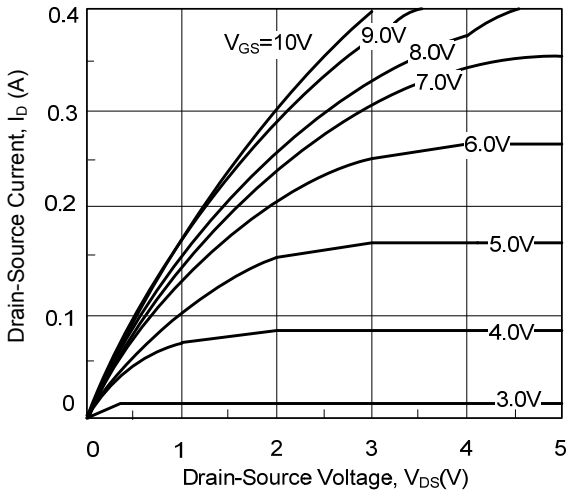


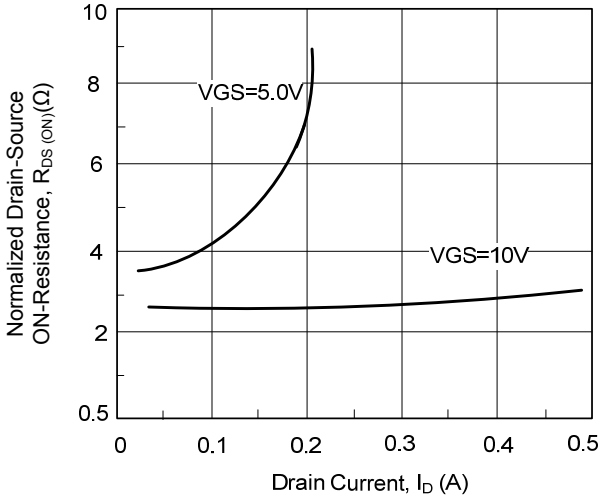
Fig. 2 Switching Waveforms

■ TYPICAL CHARACTERISTICS

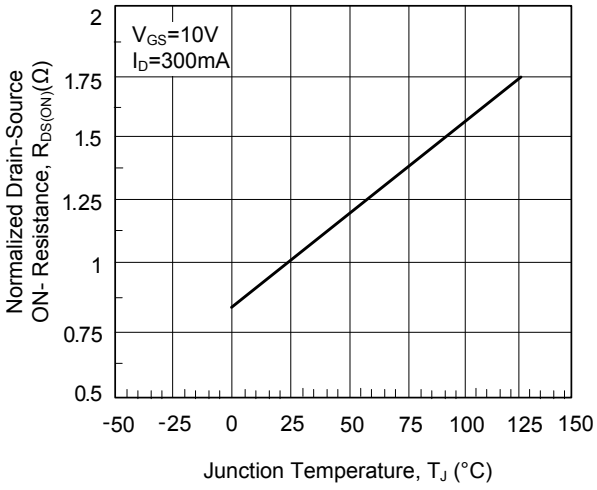
On-Resistance Characteristics



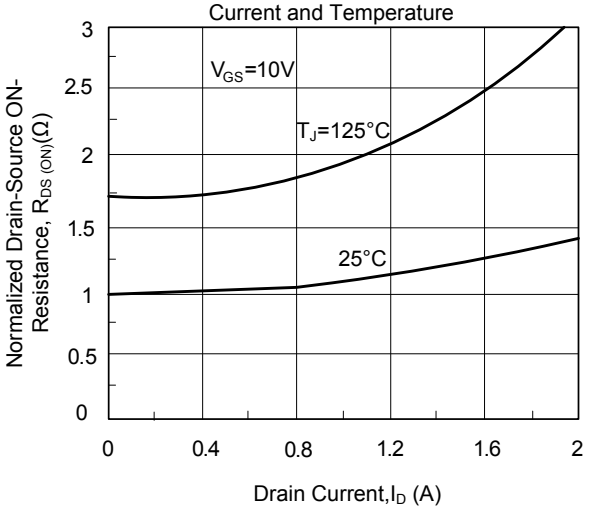
On-Resistance Varisation with Gate Voltage and Drain Current



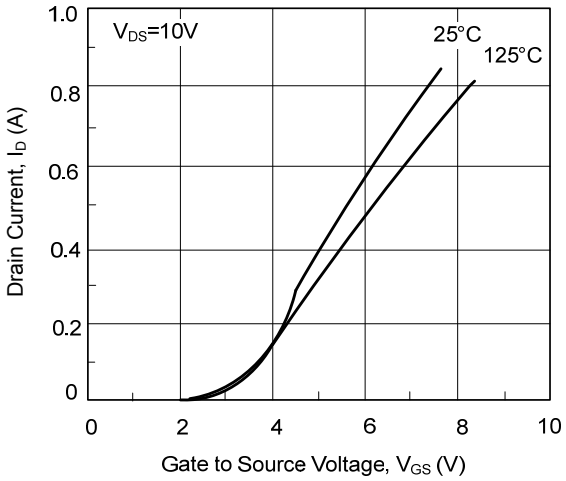
On-Resistance Varisation with Temperature



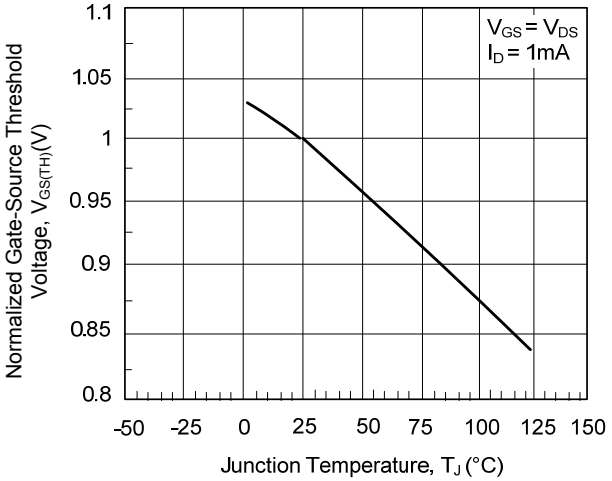
On-Resistance Varisation with Drain Current and Temperature



Transfer Characteristics

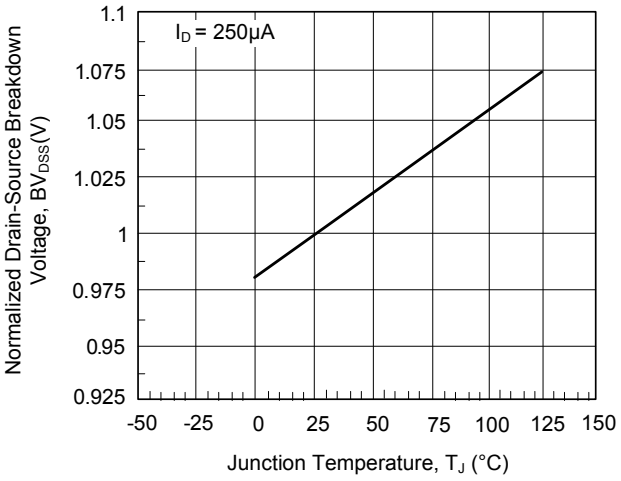


Gate Threshold Varisation with Temperature

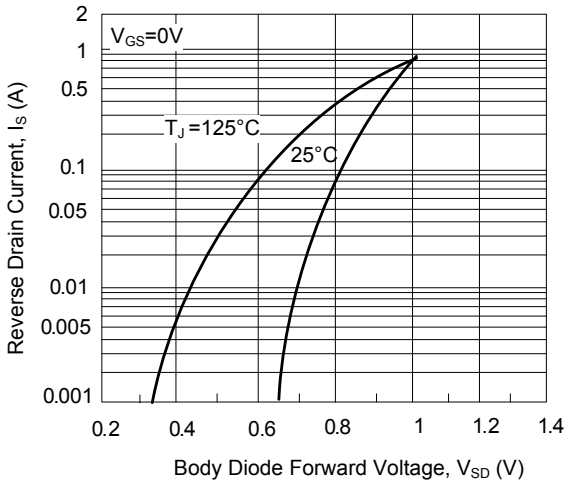


■ TYPICAL CHARACTERICS (Cont.)

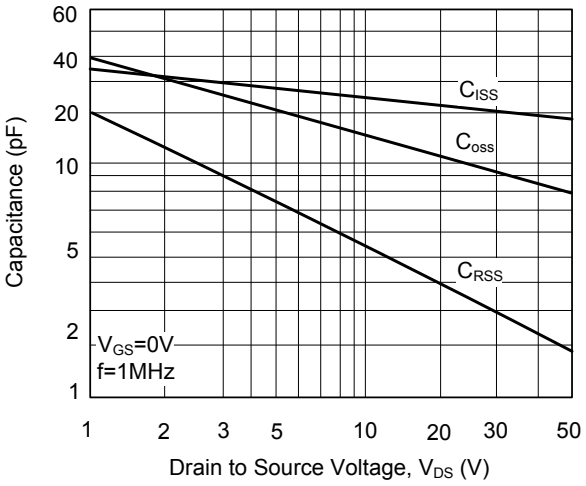
Breakdown Voltage Varisation with Temperature



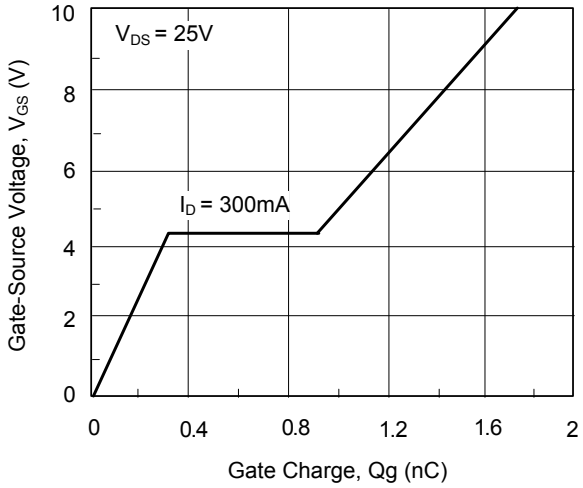
Body Diode Forward Voltage Varisation with Temperature



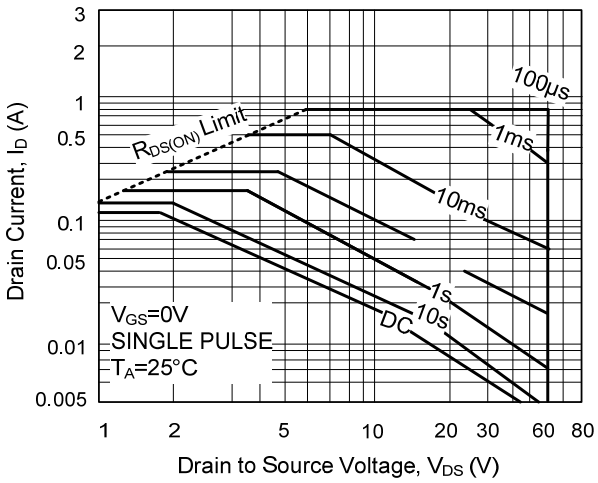
Capacitance Characteristics



Gate Charge Characteristics



Maximum Safe Operating Area



Transient Thermal Response Curve