



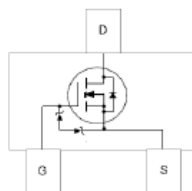
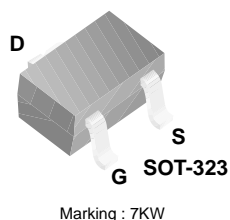
May 2011

## 2N7002KW

### N-Channel Enhancement Mode Field Effect Transistor

#### Features

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Ultra-Small Surface Mount Package
- Pb Free/RoHS Compliant
- ESD HBM=1000V as per JESD22 A114 and ESD CDM=1500V as per JESD22 C101



#### Absolute Maximum Ratings \* $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Value	Units
$V_{DSS}$	Drain-Source Voltage	60	V
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Maximum Drain Current - Continuous	310	mA
	$T_J = 100^\circ\text{C}$	195	mA
	- Pulsed	1.2	A
$T_J$	Operating Junction Temperature Range	-55 to +150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55 to +150	$^\circ\text{C}$

\* These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

#### Thermal Characteristics

Symbol	Parameter	Value	Units
$P_D$	Total Device Dissipation	300	mW
	Derating above $T_A = 25^\circ\text{C}$	2.4	mW/ $^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient *	410	$^\circ\text{C/W}$

\* Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch. Minimum land pad size

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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristics						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> =10μA	60			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C			1.0 0.5	μA mA
I <sub>GSS</sub>	Gate-Body Leakage	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V			±10	μA
On Characteristics (Note1)						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	1.1		2.1	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 500mA V <sub>GS</sub> = 10V, I <sub>D</sub> = 500mA, T <sub>J</sub> = 100°C V <sub>GS</sub> = 5V, I <sub>D</sub> = 50mA V <sub>GS</sub> = 5V, I <sub>D</sub> = 50mA, T <sub>J</sub> = 100°C			1.6 2.4 2 3	Ω Ω Ω Ω
V <sub>DS(ON)</sub>	Drain-Source On-Voltage	V <sub>GS</sub> = 10V, I <sub>D</sub> = 500mA V <sub>GS</sub> = 5V, I <sub>D</sub> = 50mA			3.75 1.5	V V
I <sub>D(ON)</sub>	On-State Drain Current	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 2V	500			mA
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 2V, I <sub>D</sub> = 0.2A	80			mS
Dynamic Characteristics						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz			50	pF
C <sub>oss</sub>	Output Capacitance				25	pF
C <sub>rss</sub>	Reverse Transfer Capacitance				5	pF
Switching Characteristics						
t <sub>D(ON)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 30V, R <sub>L</sub> = 150Ω, V <sub>GS</sub> = 10V, I <sub>D</sub> = 200mA, R <sub>GEN</sub> = 25Ω			20	ns
t <sub>D(OFF)</sub>	Turn-Off Delay Time				60	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current				115	mA
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current				0.8	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0V, I <sub>S</sub> = 115mA			1.1	V

Note1 : 1. Pulse Test: Pulse Width < 300 $\mu s$ , Duty Cycle < 2.0%.

## Typical Performance Characteristics

Figure 1. On-Region Characteristics.

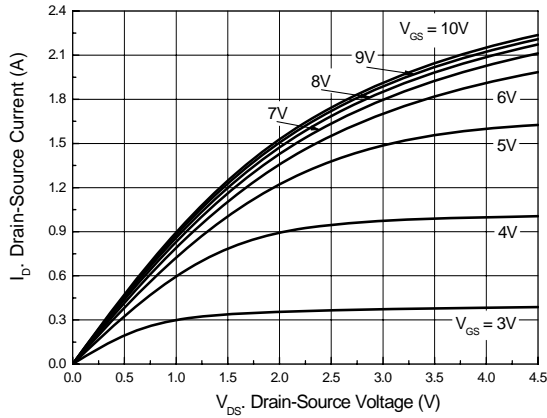


Figure 2. On-Resistance Variation with Temperature.

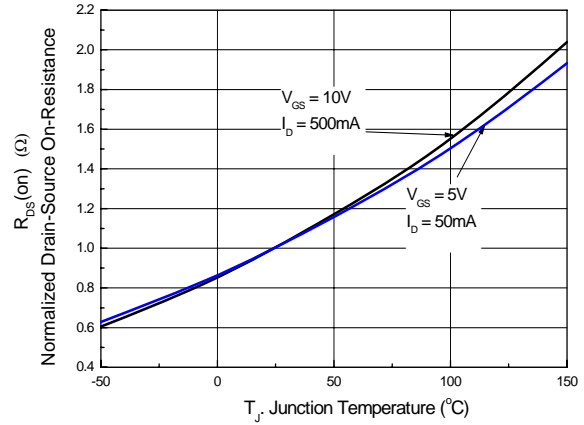


Figure 3. On-Resistance Variation with Gate Voltage and Drain Current.

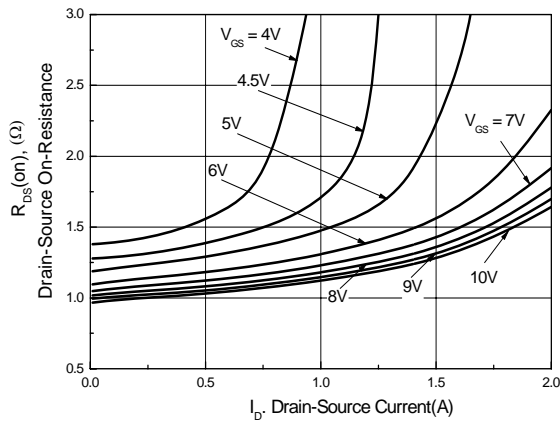


Figure 4. On-Resistance Variation with Drain Current and Temperature.

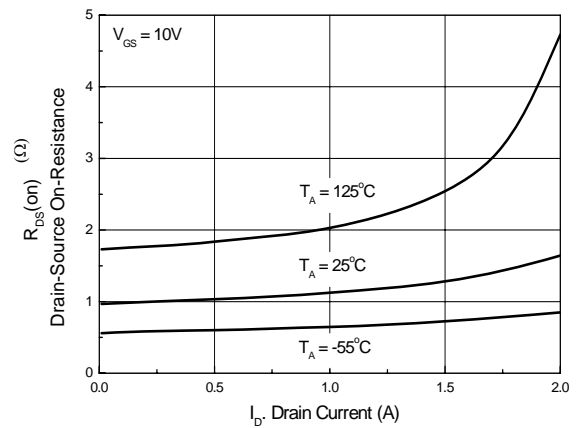


Figure 5. Transfer Characteristics

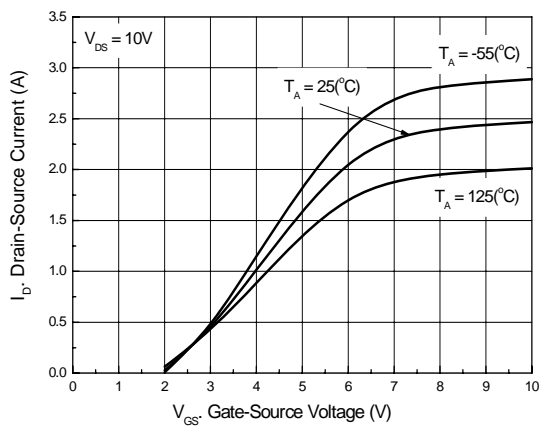
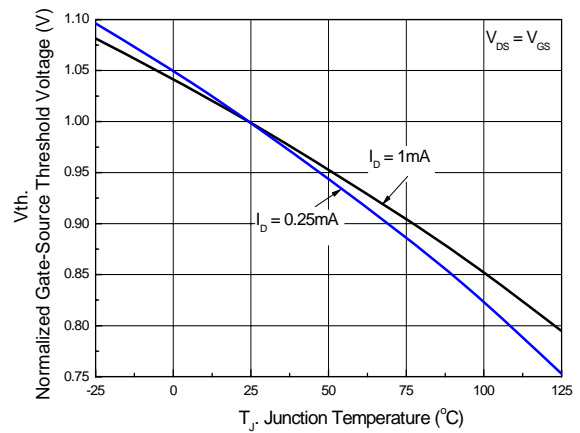
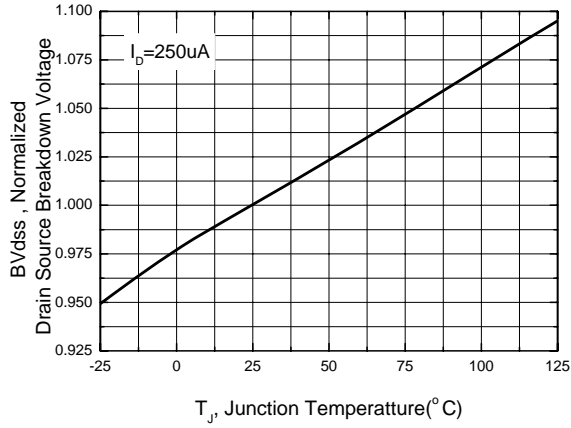


Figure 6. Gate Threshold Variation with Temperature.

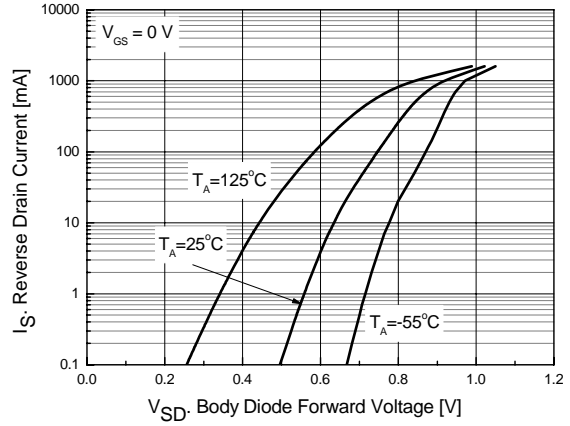


## Typical Performance Characteristics (Continued)

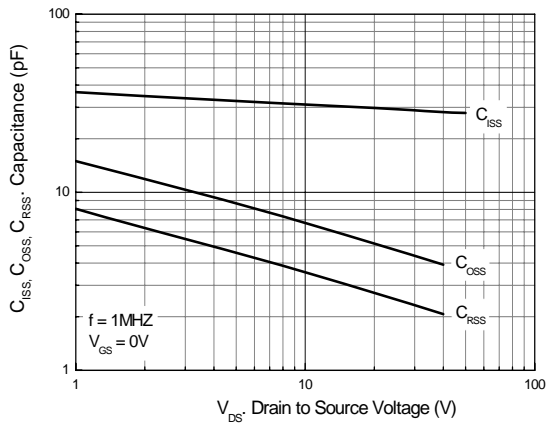
**Figure 7. Breakdown Voltage Variation with Temperature**



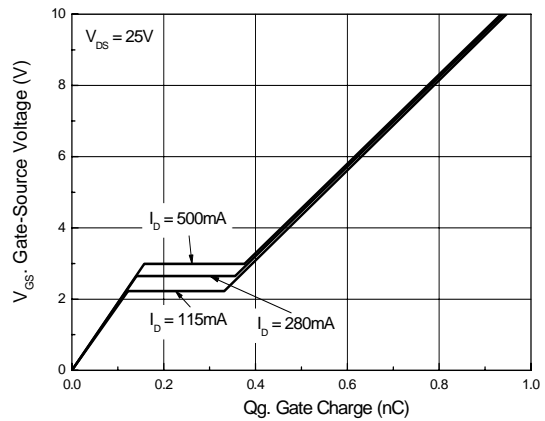
**Figure 8. Body Diode Forward Voltage Variation with Source Current and Temperature.**



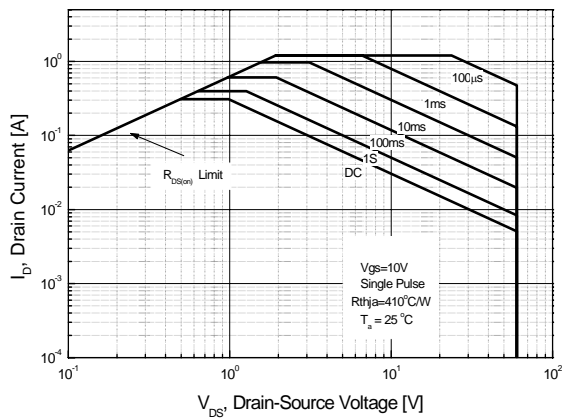
**Figure 9. Capacitance Characteristics.**



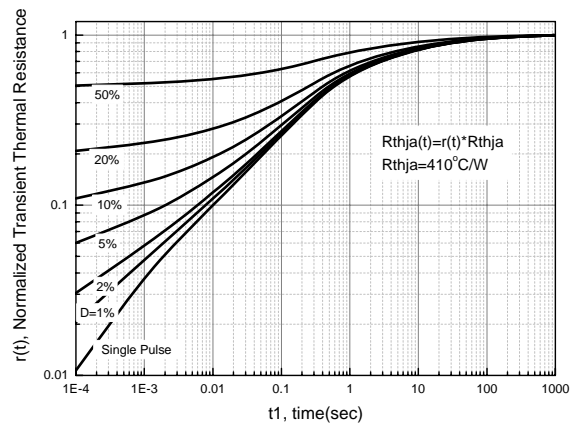
**Figure 10. Gate Charge Characteristics.**



**Figure 11. Maximum Safe Operating Area.**

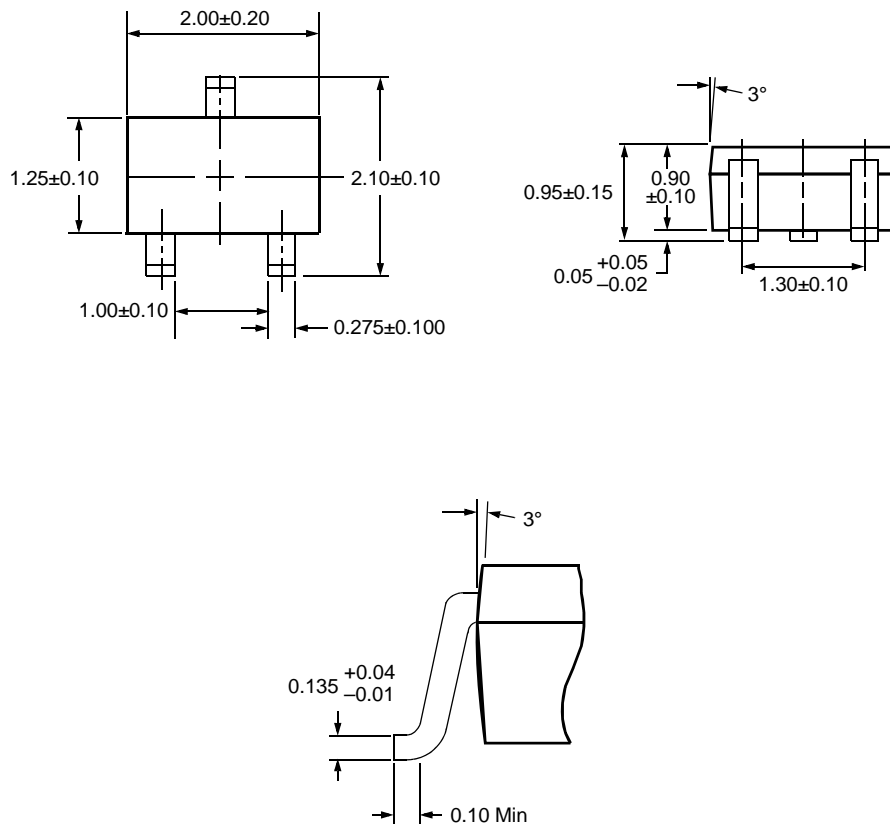


**Figure 12. Transient Thermal Response Curve.**



# Physical Dimensions

## SOT-323








Dimensions in Millimeters



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