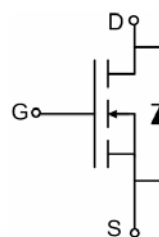
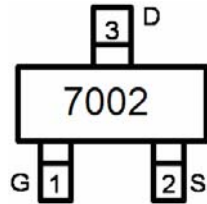



**N-Channel Enhancement Mode Power MOSFET**

<p><b>GENERAL FEATURES</b></p> <ul style="list-style-type: none"> <li>● <math>V_{DS} = 60V, I_D = 0.5A</math></li>   <li><math>R_{DS(ON)} &lt; 3\Omega @ V_{GS}=5V</math></li> <li><math>R_{DS(ON)} &lt; 2\Omega @ V_{GS}=10V</math></li>   <li>● Lead free product is acquired</li> <li>● Surface Mount Package</li> </ul> <p><b>Application</b></p> <ul style="list-style-type: none"> <li>● Direct Logic-Level Interface: TTL/CMOS</li> <li>● Drivers: Relays, Solenoids, Lamps, Hammers, Display, Memories, Transistors, etc.</li> <li>● Battery Operated Systems</li> <li>● Solid-State Relays</li> </ul>	 <p>Schematic diagram</p>  <p>Marking and pin Assignment</p>  <p>SOT-23 top view</p>
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**Package Marking And Ordering Information**

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
7002	HM7002	SOT-23	Ø180mm	8 mm	3000 units

**Absolute Maximum Ratings (TA=25°C unless otherwise noted)**

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	±20	V
Drain Current-Continuous@ Current-Pulsed (Note 1)	$I_D$	0.5	A
	$I_{DM}$	0.8	A
Maximum Power Dissipation	$P_D$	0.2	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	°C

**Thermal Characteristic**

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	625	°C/W
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**Electrical Characteristics (TA=25°C unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	60	68	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$	-	-	1	μA

Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics (Note 3)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1	1.7	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=5V, I_D=0.05A$	-	1.3	3	$\Omega$
		$V_{GS}=10V, I_D=0.5A$	-	1.1	2	$\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=10V, I_D=0.2A$	0.08	-	-	S
<b>Dynamic Characteristics (Note4)</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=30V, V_{GS}=0V,$ $F=1.0MHz$	-	20	50	PF
Output Capacitance	$C_{oss}$		-	10	20	PF
Reverse Transfer Capacitance	$C_{rss}$		-	3.6	5	PF
<b>Switching Characteristics (Note 4)</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=30V, I_D=0.2A$ $V_{GS}=10V, R_{GEN}=10\Omega$	-	10	-	nS
Turn-on Rise Time	$t_r$		-	50	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	17	-	nS
Turn-Off Fall Time	$t_f$		-	10	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=10V, I_D=0.5A,$ $V_{GS}=4.5V$	-	1.7	3	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=0.5A$	-	-	1.2	V
Diode Forward Current (Note 2)	$I_S$		-	-	0.5	A

**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

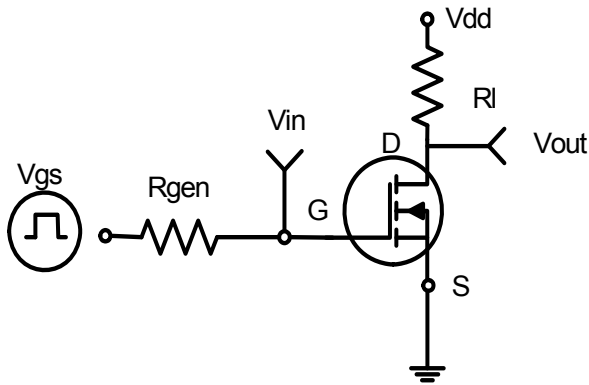


Figure 1: Switching Test Circuit

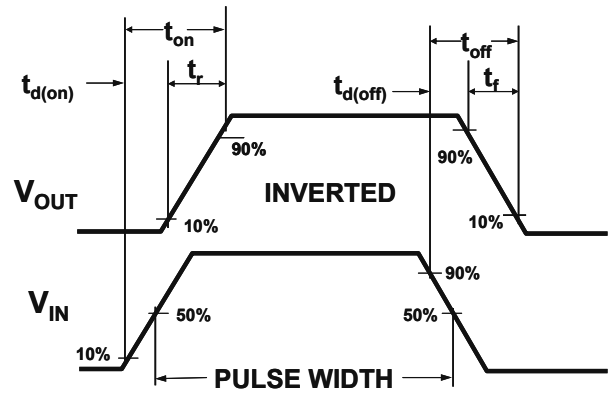


Figure 2: Switching Waveforms

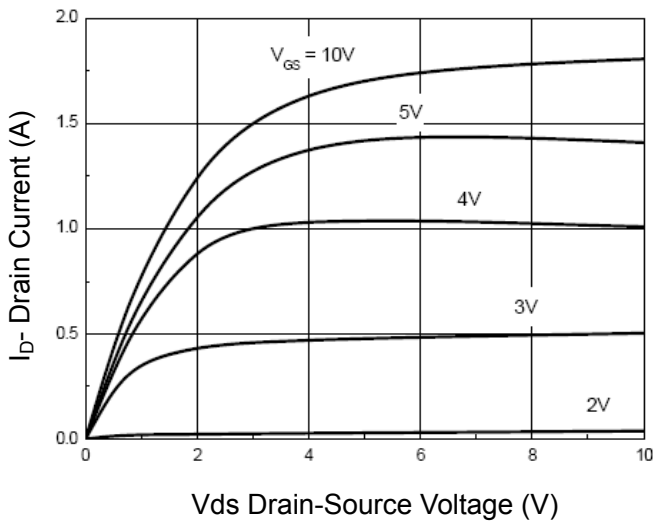


Figure 3 Output CHARACTERISTICS

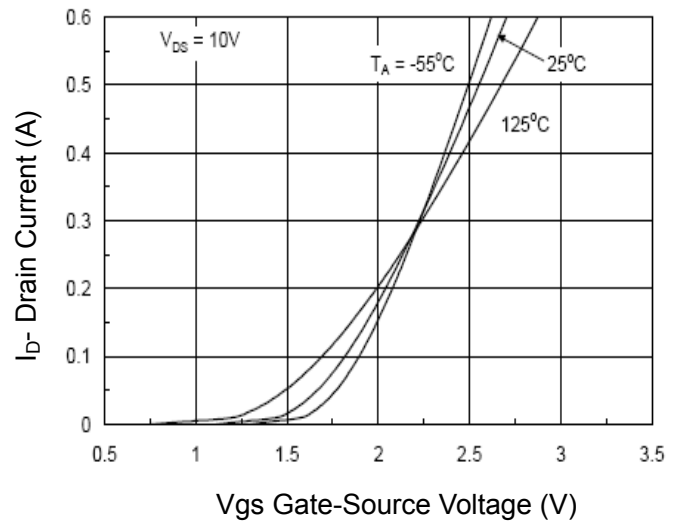


Figure 4 Transfer Characteristics

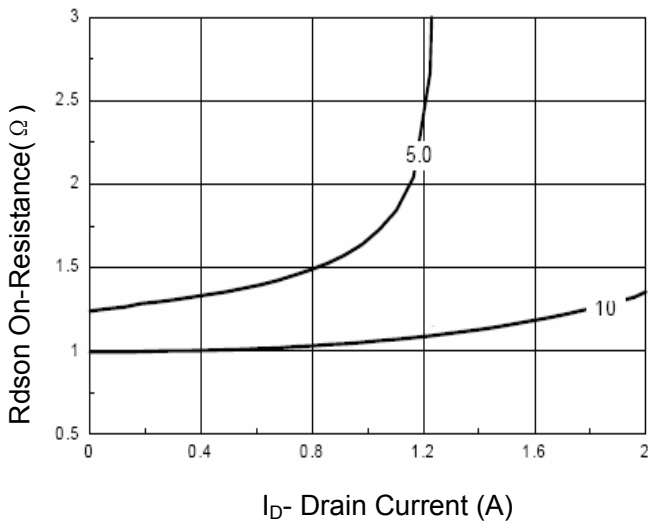


Figure 5 Drain-Source On-Resistance

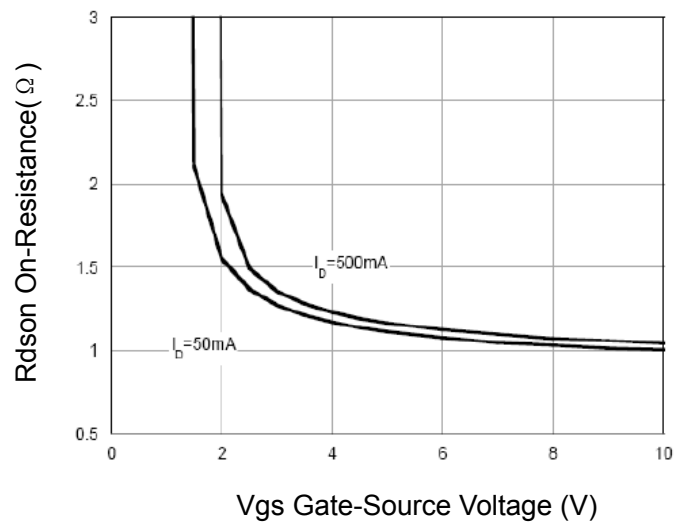


Figure 6 Rdson vs Vgs

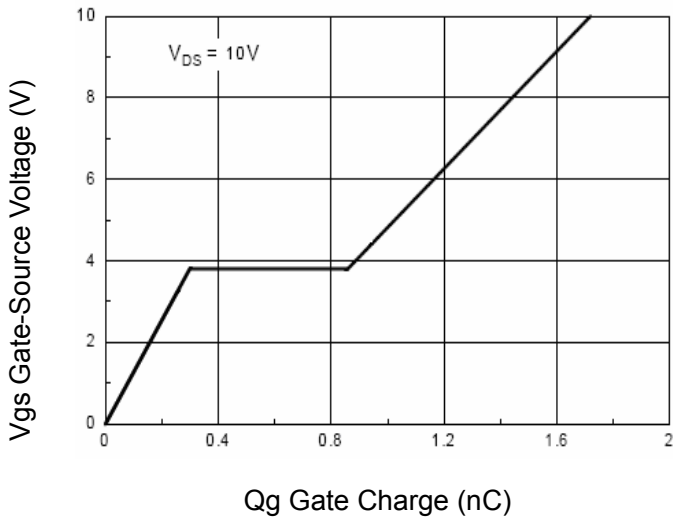


Figure 7 Gate Charge

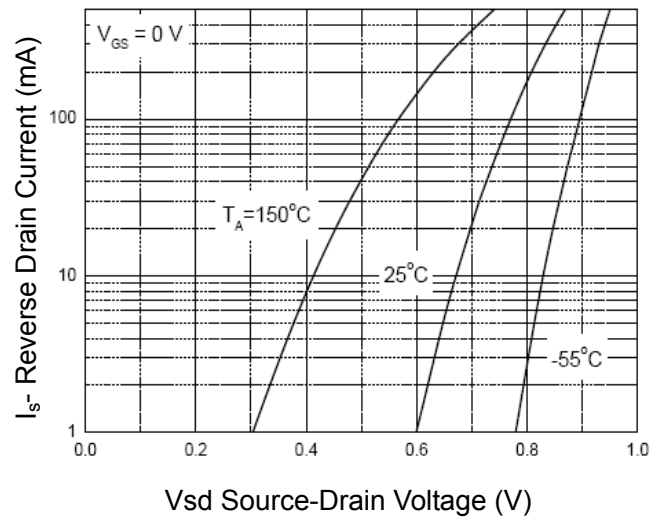


Figure 8 Source-Drain Diode Forward

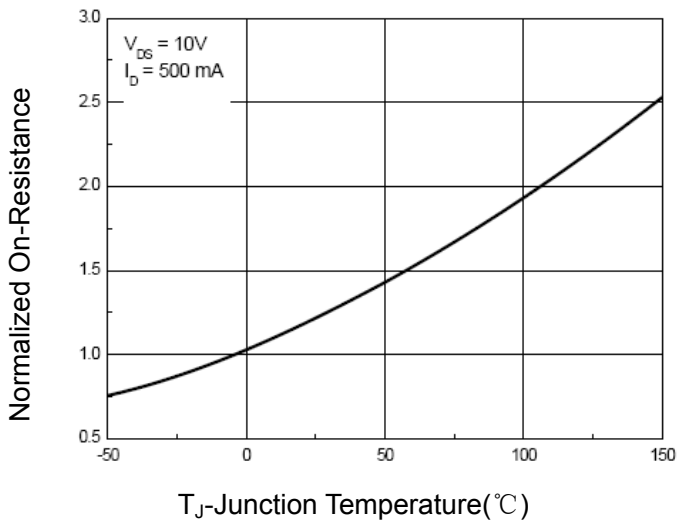


Figure 9 Drain-Source On-Resistance

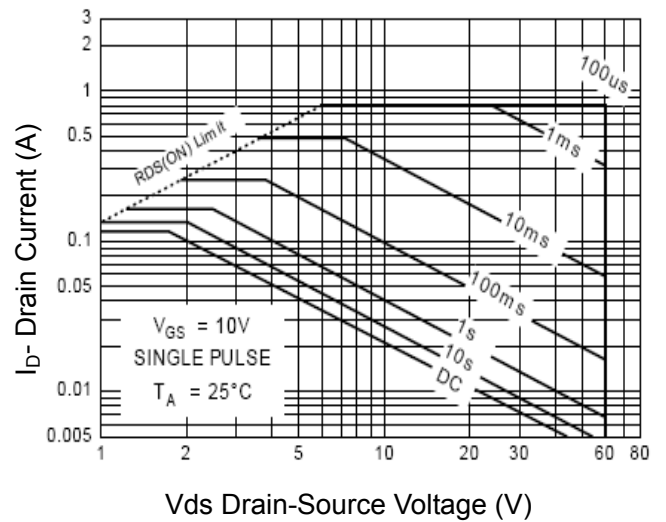


Figure 10 Safe Operation Area

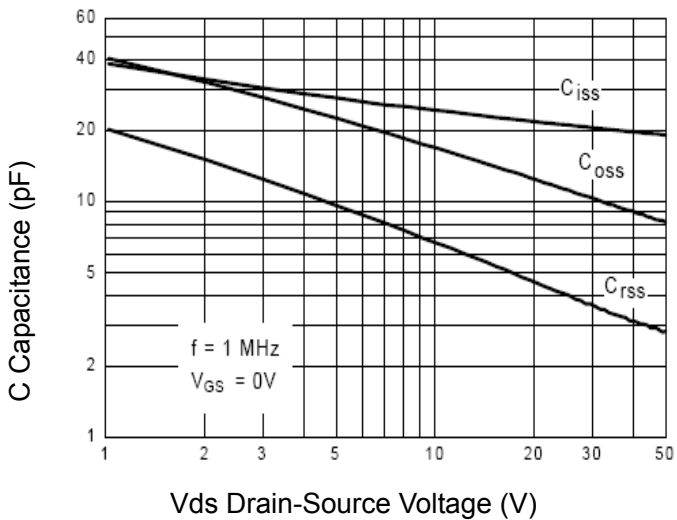


Figure 11 Capacitance vs Vds

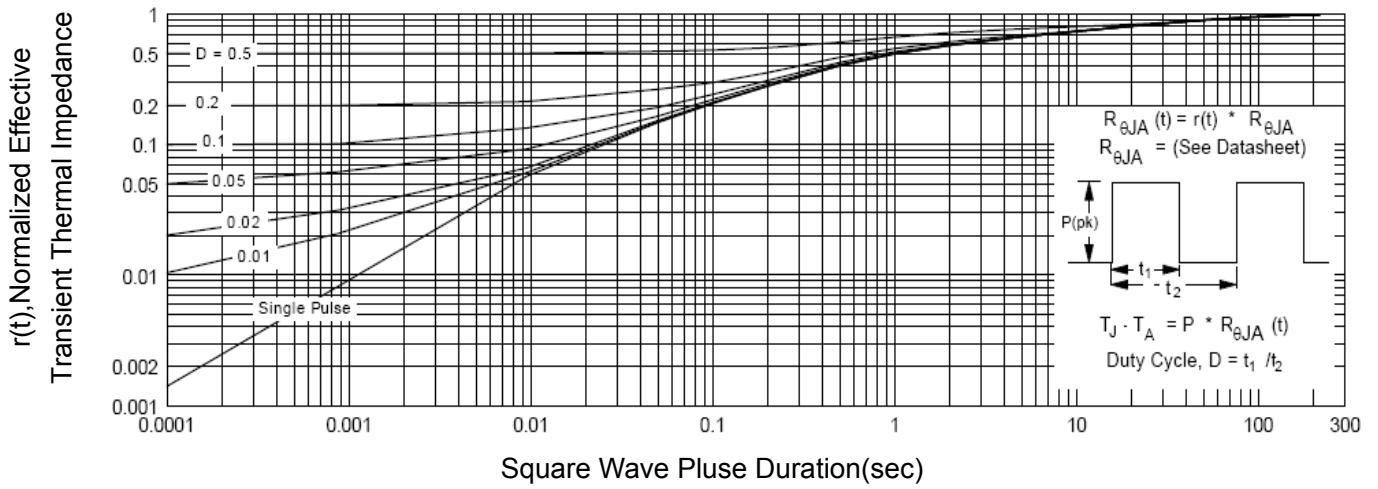
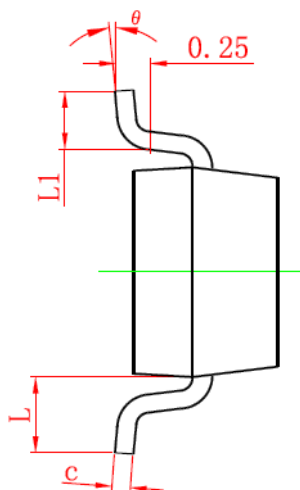
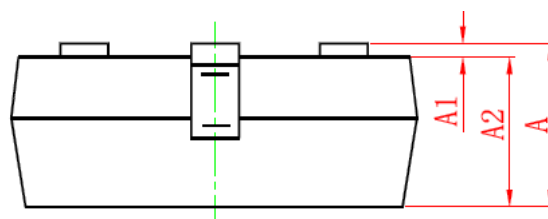
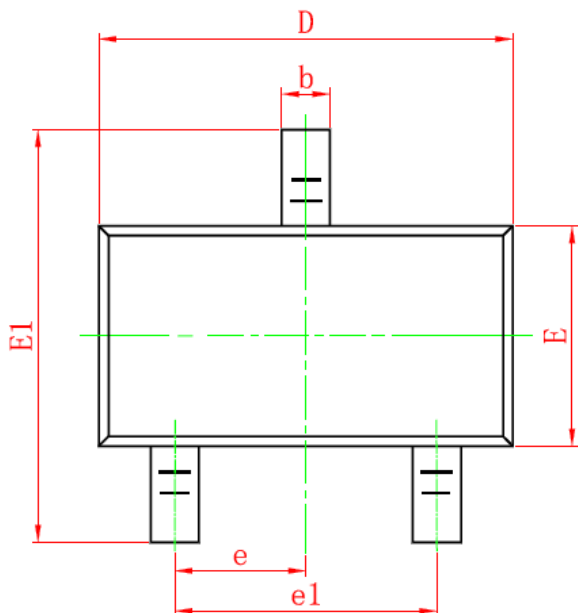


Figure 12 Normalized Maximum Transient Thermal Impedance

## SOT-23 PACKAGE INFORMATION

Dimensions in Millimeters (UNIT:mm)



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°

### NOTES

1. All dimensions are in millimeters.
2. Tolerance  $\pm 0.10\text{mm}$  (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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