2N7002

N-CHANNEL ENHANCEMENT MODE FIELD EFFECT TRANSISTOR

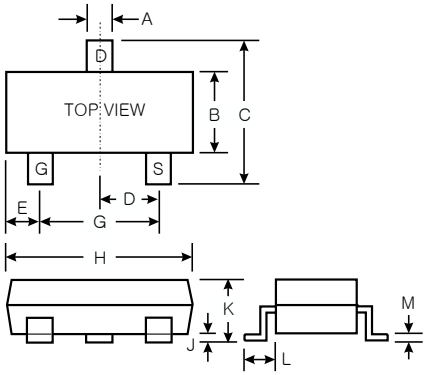
Voltage - 60 Volts Drain Curreent - 115 mAmps

FEATURES

- Low On-Resistance: $R_{DS(ON)}$
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- ESD Protected :1000V

MECHANICAL DATA

- Case: SOT-23, Molded Plastic
- Case Material - UL Flammability Rating Classification 94V-0
- Terminals: Solderable per MIL-STD-202, Method 208
- Marking: Device Code
- Weight: 0.008 grams (approx.)

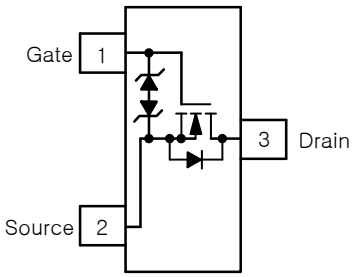


SOT-23		
Dim	Min	Max
A	0.37	0.51
B	1.19	1.40
C	2.10	2.50
D	0.89	1.05
E	0.45	0.61
G	1.78	2.05
H	2.65	3.05
J	0.013	0.15
K	0.89	1.10
L	0.45	0.61
M	0.076	0.178
All Dimensions in mm		

● MAXIMUM RATING (Ta = 25℃)

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	60	Vdc
Drain-Gate Voltage (R_{GS}= 1.0 MΩ)	V_{DGR}	60	Vdc
Drain Current – Continuous T_C = 25°C (Note 1.) T_C = 100°C (Note 1.) – Pulsed (Note 2.)	I_D I_D I_{DM}	± 115 ± 75 ± 800	mAdc
Gate-Source Voltage – Continuous – Non-repetitive (tp ≤ 50 μs)	V_{GS} V_{GSM}	± 20 ± 40	Vdc Vpk

Simplified Schematic



(Top View)

●THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board (Note 3.) T_A = 25℃ Derate above 25℃	P_D	225 1.8	mW mW/℃
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	°C/W
Total Device Dissipation Alumina Substrate,(Note 4.) T_A= 25℃ Derate above 25℃	P_D	300 2.4	mW mW/℃
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	417	°C/W
Junction and Storage Temperature	T_J, T_{stg}	-55 to +150	°C

1. The Power Dissipation of the package may result in a lower continuous drain current.
2. Pulse Test: Pulse Width≤300 μs, Duty Cycle≤2.0%.
3. FR-5 = 1.0 x 0.75 x 0.062 in.
4. Alumina = 0.4 x 0.3 x 0.025 in 99.5% alumina.

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● **ELECTRICAL CHARACTERISTICS** (T_A = 25℃ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
● OFF CHARACTERISTICS					
Drain–Source Breakdown Voltage (V_{GS} = 0, I_D = 10μAdc)	$V_{(BR)DSS}$	60	–	–	Vdc
Zero Gate Voltage Drain Current (V_{GS} = 0, V_{DS} = 60 Vdc) T_J = 25℃	I_{DSS}	–	–	1.0	μAdc
T_J = 125℃		–	–	500	
Gate–Body Leakage Current, Forward (V_{GS} = 20 Vdc)	I_{GSSF}	–	–	1	μAdc
Gate–Body Leakage Current, Reverse (V_{GS} = – 20 Vdc)	I_{GSSR}	–	–	–1	μAdc
● ON CHARACTERISTICS (Note 2.)					
Gate ThresholdVoltage (V_{DS} = V_{GS}, I_D = 250μAdc)	$V_{GS(th)}$	1.0	1.6	2	Vdc
On–State Drain Current (V_{DS} ≥ 2.0 $V_{DS(on)}$, V_{GS} = 10 Vdc)	$I_{D(on)}$	500	–	–	mA
Static Drain–Source On–State Voltage	$V_{DS(on)}$				Vdc
(V_{GS} = 10 Vdc, I_D = 500 mAdc)		–	–	3.75	
(V_{GS} = 5.0 Vdc, I_D = 50 mAdc)		–	–	0.375	
Static Drain–Source On–State Resistance	$r_{DS(on)}$				Ohms
(V_{GS} = 10 V, I_D = 500 mAdc) T_C = 25℃		–	1.4	7.5	
T_C = 125℃		–	–	13.5	
(V_{GS} = 5.0 Vdc, I_D = 50 mAdc) T_C = 25°C		–	1.8	7.5	
T_C = 125℃		–	–	13.5	
Forward Transconductance (V_{DS} ≥ 2.0 $V_{DS(on)}$, I_D = 200 mAdc)	g_{FS}	80	–	–	mmhos
● DYNAMIC CHARACTERISTICS					
Input Capacitance (V_{DS} = 25 Vdc, V_{GS} = 0, f = 1.0 MHz)	C_{iss}	–	17	50	pF
Output Capacitance (V_{DS} = 25 Vdc, V_{GS} = 0, f = 1.0 MHz)	C_{oss}	–	10	25	pF
Reverse Transfer Capacitance (V_{DS} = 25 Vdc, V_{GS} = 0, f = 1.0 MHz)	C_{rss}	–	2.5	5.0	pF
● SWITCHING CHARACTERISTICS (Note 2.)					
Turn–On Delay Time (V_{DD} = 25 Vdc , I_D ≅ 500 mAdc, R_G = 25Ω, R_L = 50Ω, V_{gen} = 10 V)	$t_{d(on)}$	–	7	20	ns
Turn–Off Delay Time	$t_{d(off)}$	–	11	40	ns
● BODY–DRAIN DIODE RATINGS					
Diode Forward On–Voltage (I_S = 115 mAdc, V_{GS} = 0 V)	V_{SD}	–	–	–1.5	Vdc
Source Current Continuous (Body Diode)	I_S	–	–	–115	mAdc
Source Current Pulsed	I_{SM}	–	–	–800	mAdc

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

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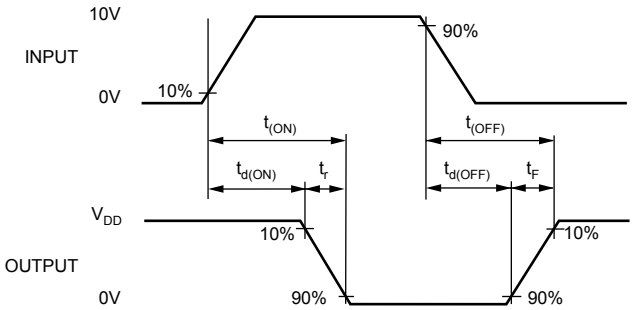
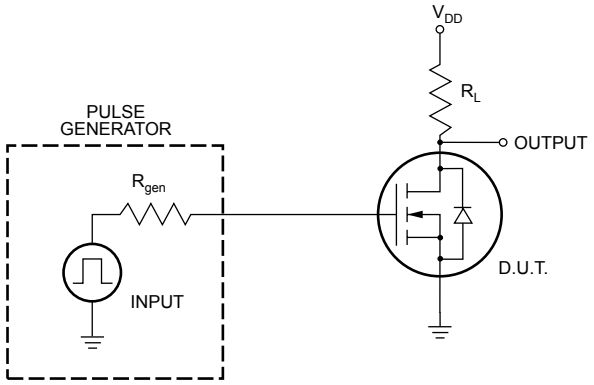
RATINGS AND CHARACTERISTIC CURVES

Switching Waveforms and Test Circuit





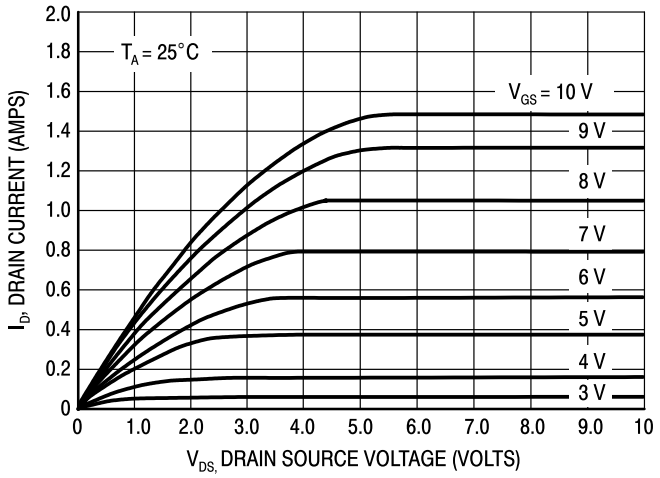


Figure 1. Ohmic Region

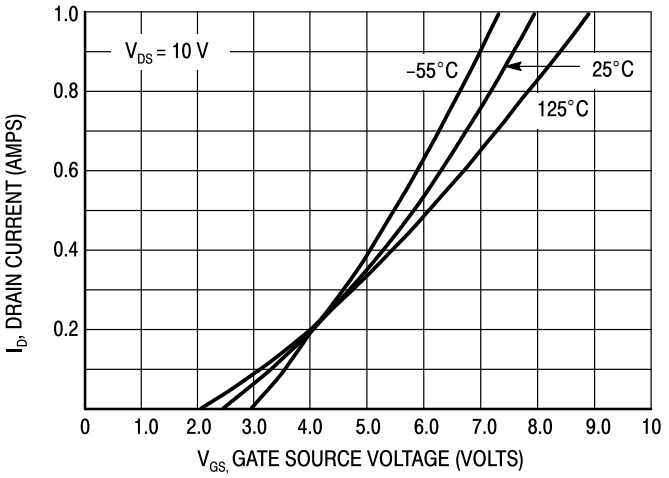


Figure 2. Transfer Characteristics

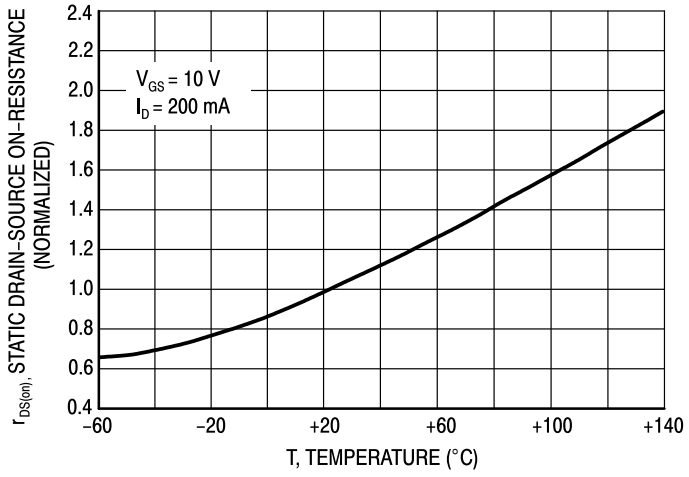


Figure 3. Temperature versus Static Drain–Source On–Resistance

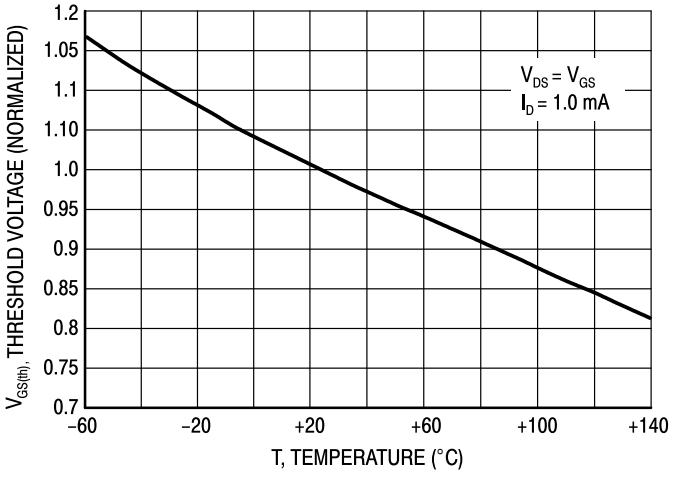


Figure 4. Temperature versus Gate Threshold Voltage