MOSFET – Small Signal, N-Channel, Single

60 V, 340 mA, SC−70

2N7002W, 2V7002W

Features

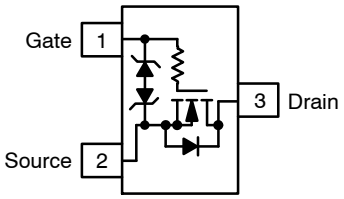
- ESD Protected
- Low $R_{DS(on)}$
- Small Footprint Surface Mount Package
- 2V Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

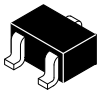
- Low Side Load Switch
- Level Shift Circuits
- DC−DC Converter
- Portable Applications i.e. DSC, PDA, Cell Phone, etc.

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX (Note 1)
60 V	1.6 Ω @ 10 V	340 mA
	2.5 Ω @ 4.5 V	

SIMPLIFIED SCHEMATIC

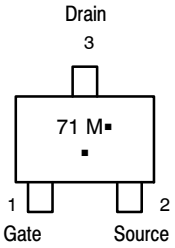


(Top View)



SC−70/SOT−323
CASE 419
STYLE 8

MARKING DIAGRAM & PIN ASSIGNMENT



71 = Device Code
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

Rating		Symbol	Value	Unit
Drain−to−Source Voltage		V_{DSS}	60	V
Gate−to−Source Voltage		V_{GS}	±20	V
Drain Current (Note 1)		I_D		mA
Steady State	T_A = 25°C		310	
	T_A = 85°C		220	
t < 5 s	T_A = 25°C		340	
	T_A = 85°C		240	
Power Dissipation (Note 1)		P_D		mW
Steady State			280	
t < 5 s			330	
Pulsed Drain Current (t_p = 10 μs)		I_{DM}	1.4	A
Operating Junction and Storage Temperature Range		T_J, T_{STG}	−55 to +150	°C
Source Current (Body Diode)		I_S	250	mA
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)		T_L	260	°C
Gate−Source ESD Rating (HBM, Method 3015)		ESD	2000	V

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Junction−to−Ambient − Steady State (Note 1)	$R_{\theta JA}$	450	°C/W
Junction−to−Ambient − t ≤ 5 s (Note 1)	$R_{\theta JA}$	375	

1. Surface−mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces)

ORDERING INFORMATION

Device	Package	Shipping†
2N7002WT1G	SC−70 (Pb−Free)	3000/Tape & Reel
2V7002WT1G	SC−70 (Pb−Free)	3000/Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Typ	Max	Units
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA		60	–	–	V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			–	71	–	mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 60 V	T_J = 25°C	–	–	1.0	μA
			T_J = 150°C	–	–	15	μA
		V_{GS} = 0 V, V_{DS} = 50 V	T_J = 25°C	–	–	100	nA
			T_J = 150°C	–	–	10	μA
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V		–	–	±10	μA
		V_{DS} = 0 V, V_{GS} = ±10 V		–	–	450	nA
		V_{DS} = 0 V, V_{GS} = ±5.0 V		–	–	150	nA
ON CHARACTERISTICS (Note 2)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		1.0	–	2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			–	4.0	–	mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 500 mA		–	1.19	1.6	Ω
		V_{GS} = 4.5 V, I_D = 200 mA		–	1.33	2.5	
Forward Transconductance	g_{FS}	V_{DS} = 5 V, I_D = 200 mA		–	530	–	mS
CHARGES AND CAPACITANCES							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 20 V		–	24.5	–	pF
Output Capacitance	C_{OSS}			–	4.2	–	
Reverse Transfer Capacitance	C_{RSS}			–	2.2	–	
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 10 V; I_D = 200 mA		–	0.7	–	nC
Threshold Gate Charge	$Q_{G(TH)}$			–	0.1	–	
Gate−to−Source Charge	Q_{GS}			–	0.3	–	
Gate−to−Drain Charge	Q_{GD}			–	0.1	–	
SWITCHING CHARACTERISTICS, V_{GS} = V (Note 3)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 10 V, V_{DD} = 25 V, I_D = 500 mA, R_G = 25 Ω		–	12.2	–	ns
Rise Time	t_r			–	9.0	–	
Turn−Off Delay Time	$t_{d(OFF)}$			–	55.8	–	
Fall Time	t_f			–	29	–	
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 200 mA	T_J = 25°C	–	0.8	1.2	V
			T_J = 85°C	–	0.7	–	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

2. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%
3. Switching characteristics are independent of operating junction temperatures

TYPICAL CHARACTERISTICS

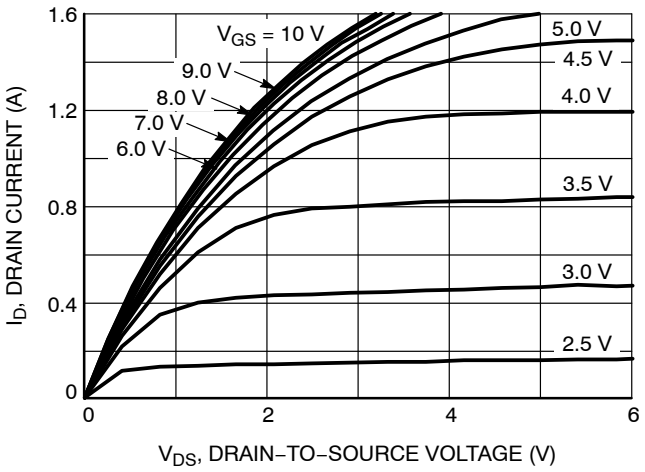


Figure 1. On−Region Characteristics

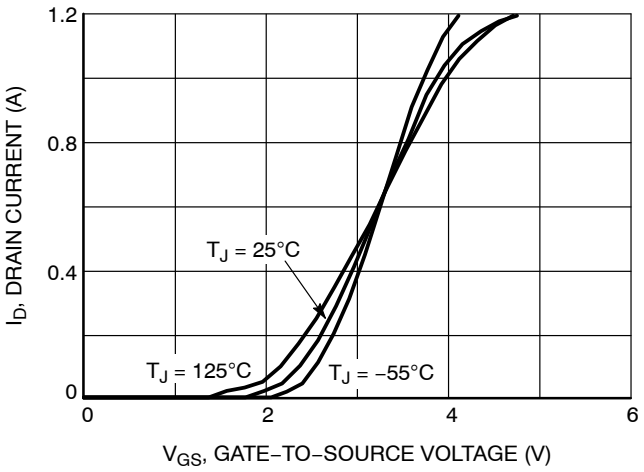


Figure 2. Transfer Characteristics

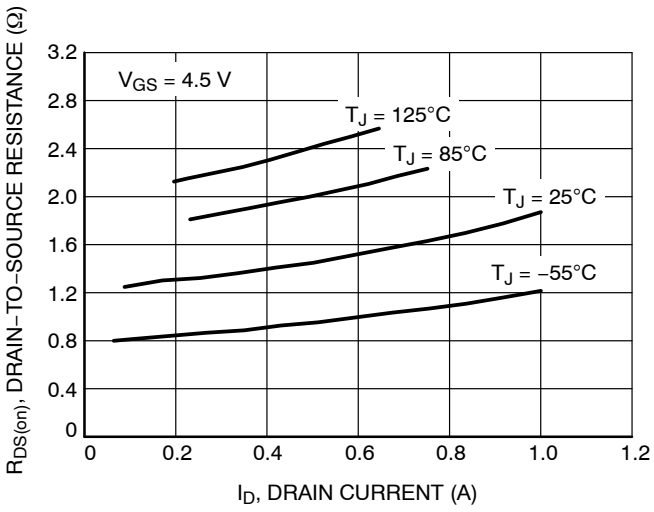


Figure 3. On−Resistance vs. Drain Current and Temperature

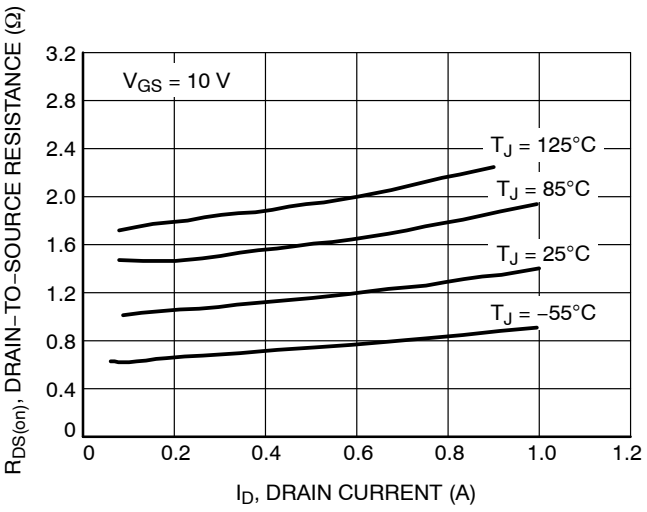


Figure 4. On−Resistance vs. Drain Current and Temperature

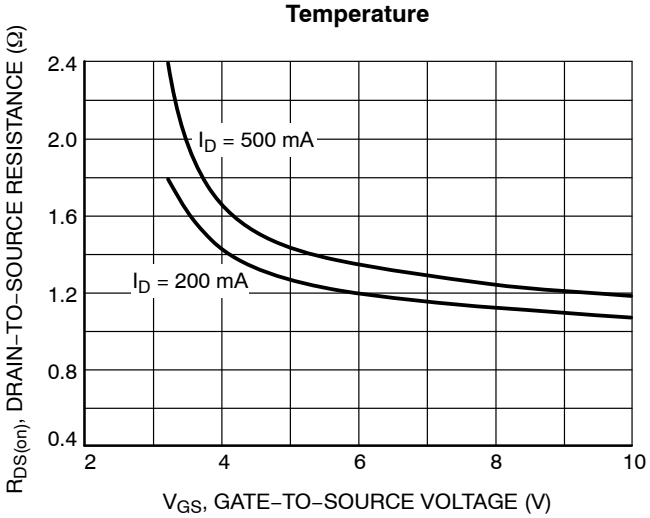


Figure 5. On−Resistance vs. Gate−to−Source Voltage

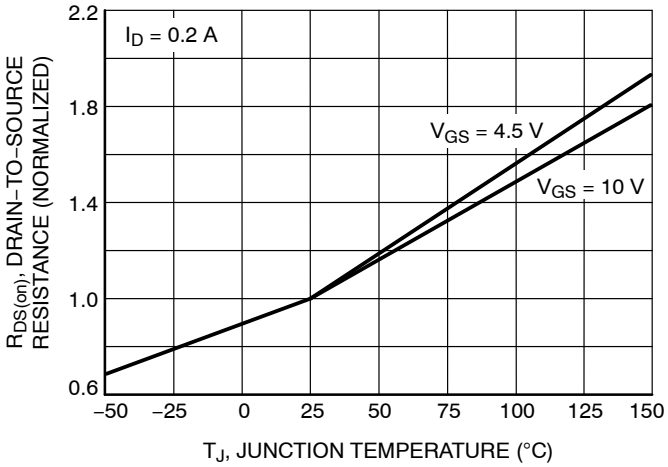


Figure 6. On−Resistance Variation with Temperature

TYPICAL CHARACTERISTICS

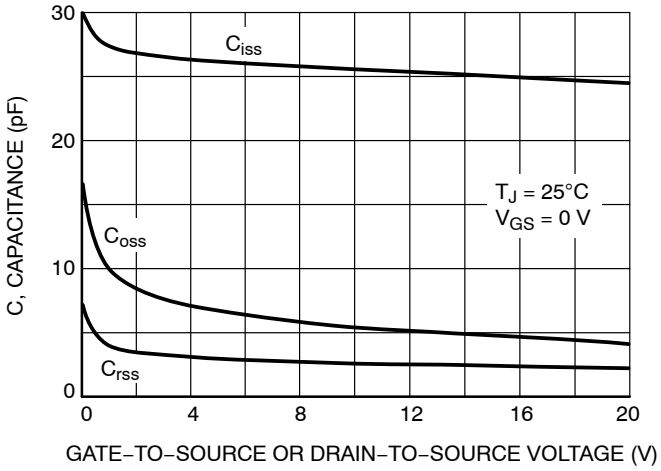


Figure 7. Capacitance Variation

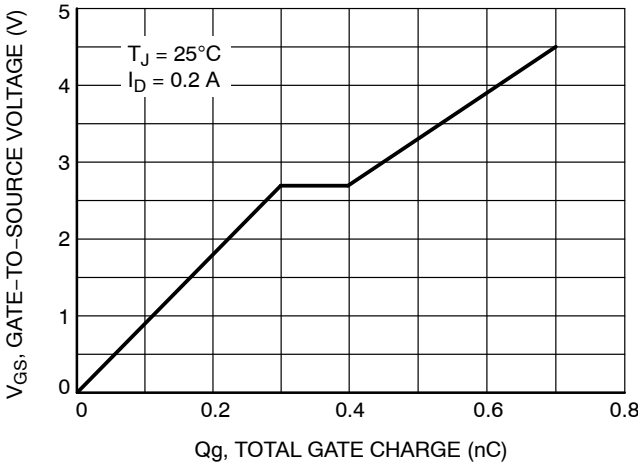


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

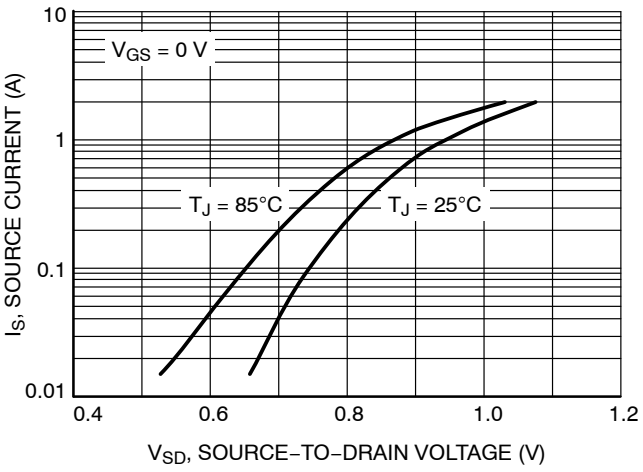


Figure 9. Diode Forward Voltage vs. Current

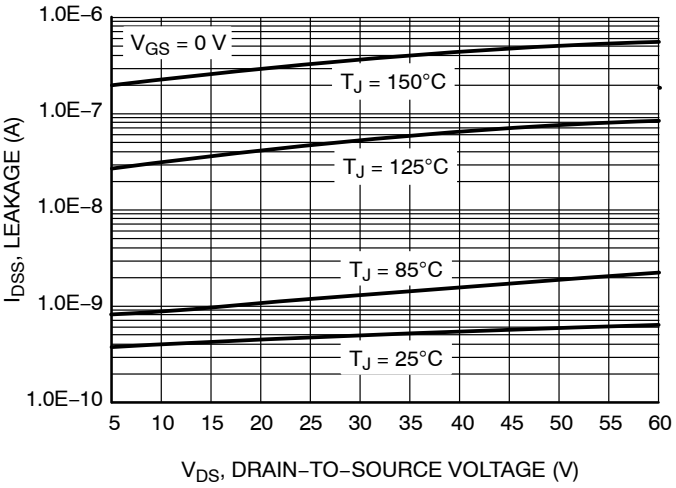
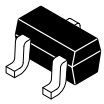


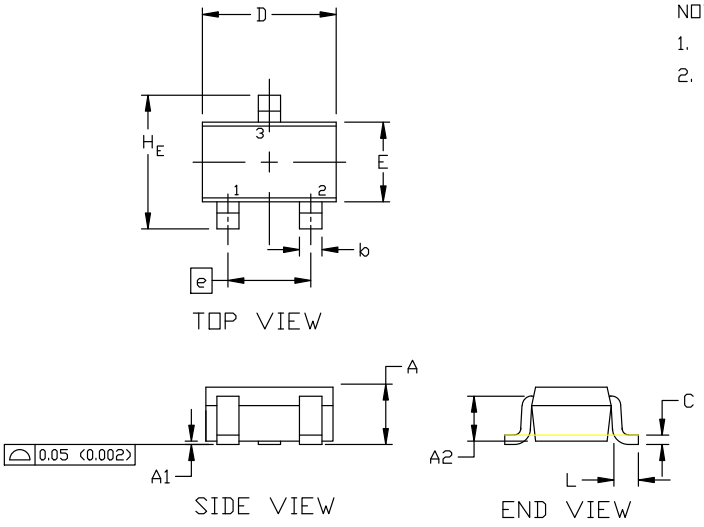
Figure 10. Drain−to−Source Leakage Current vs. Voltage



SCALE 4:1

SC−70 (SOT−323)
CASE 419
ISSUE R

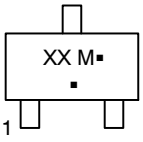
DATE 11 OCT 2022



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH

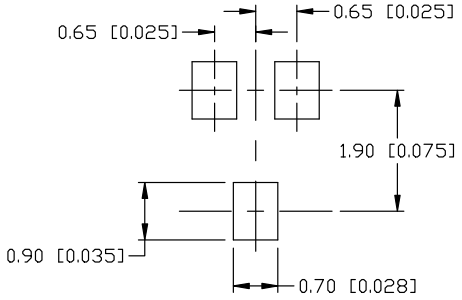
	MILLIMETERS			INCHES		
DIM	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.80	0.90	1.00	0.032	0.035	0.040
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	0.70 REF			0.028 BSC		
b	0.30	0.35	0.40	0.012	0.014	0.016
c	0.10	0.18	0.25	0.004	0.007	0.010
D	1.80	2.00	2.20	0.071	0.080	0.087
E	1.15	1.24	1.35	0.045	0.049	0.053
e	1.20	1.30	1.40	0.047	0.051	0.055
e1	0.65 BSC			0.026 BSC		
L	0.20	0.38	0.56	0.008	0.015	0.022
H_E	2.00	2.10	2.40	0.079	0.083	0.095

GENERIC MARKING DIAGRAM



XX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.



* For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

SOLDERING FOOTPRINT

STYLE 1:
CANCELLED

STYLE 2:
PIN 1. ANODE
2. N.C.
3. CATHODE

STYLE 3:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 4:
PIN 1. CATHODE
2. CATHODE
3. ANODE

STYLE 5:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 6:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

STYLE 7:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 8:
PIN 1. GATE
2. SOURCE
3. DRAIN

STYLE 9:
PIN 1. ANODE
2. CATHODE
3. CATHODE−ANODE

STYLE 10:
PIN 1. CATHODE
2. ANODE
3. ANODE−CATHODE

STYLE 11:
PIN 1. CATHODE
2. CATHODE
3. CATHODE

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