WILLAS

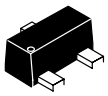
RoHS COMPLIANT

30 V, 154 mA, Single, N−Channel, Gate ESD Protection, SC−89

2N7002NT1

Features

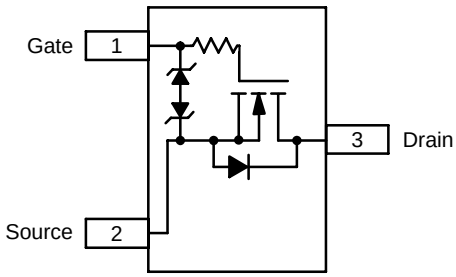
- Low Gate Charge for Fast Switching
- Small 1.6 X 1.6 mm Footprint
- ESD Protected Gate
- **Pb-Free package is available**
  RoHS product for packing code suffix ”G”
  Halogen free product for packing code suffix “H”



SC-89

Applications

- Power Management Load Switch
- Level Shift
- Portable Applications such as Cell Phones, Media Players, Digital Cameras, PDA’s, Video Games, Hand Held Computers, etc.



(Top View)

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

Parameter		Symbol	Value	Unit
Drain−to−Source Voltage		V_{DSS}	30	V
Gate−to−Source Voltage		V_{GS}	±10	V
Continuous Drain Current (Note 1)	Steady State = 25°C	I_D	154	mA
Power Dissipation (Note 1)	Steady State = 25°C	P_D	300	mW
Pulsed Drain Current	$t_P \leq 10\ \mu s$	I_{DM}	618	mA
Operating Junction and Storage Temperature		T_J, T_{STG}	−55 to 150	°C
Continuous Source Current (Body Diode)		I_{SD}	154	mA
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)		T_L	260	°C

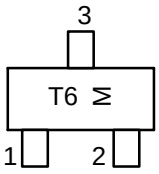
THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction−to−Ambient – Steady State (Note 1)	$R_{\theta JA}$	416	°C/W

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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

MARKING DIAGRAM



TF = Specific Device Code
M = Month Code

ORDERING INFORMATION

Device	Marking	Shipping
2N7002NT1	T6	3000/Tape&Reel

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2N7002NT1

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 100 μA	30			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 30 V			1.0	μA
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 20 V, T = 85 °C			1.0	μA
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±10 V			±25	μA
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±5 V			±1.0	μA
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±5 V T = 85 °C			±1.0	μA
ON CHARACTERISTICS (Note 2)						
Gate Threshold Voltage	$V_{GS(TH)}$	V_{DS} = V_{GS}, I_D = 100 μA	0.5	1.0	1.5	V
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 4.5 V, I_D = 154 mA		1.4	7.0	Ω
		V_{GS} = 2.5 V, I_D = 154 mA		2.3	7.5	
Forward Transconductance	g_{FS}	V_{DS} = 3 V, I_D = 154 mA		80		mS
CAPACITANCES						
Input Capacitance	C_{ISS}	V_{DS} = 5.0 V, f = 1 MHz, V_{GS} = 0 V		11.5		pF
Output Capacitance	C_{OSS}			10		
Reverse Transfer Capacitance	C_{RSS}			3.5		
SWITCHING CHARACTERISTICS (Note 3)						
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 4.5 V, V_{DS} = 5.0 V, I_D = 75 mA, R_G = 10 Ω		13		ns
Rise Time	t_r			15		ns
Turn−Off Delay Time	$t_{d(OFF)}$			98		
Fall Time	t_f			60		
Drain−Source Diode Characteristics						
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 0.154 mA		0.77	0.9	V

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

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TYPICAL PERFORMANCE CURVES

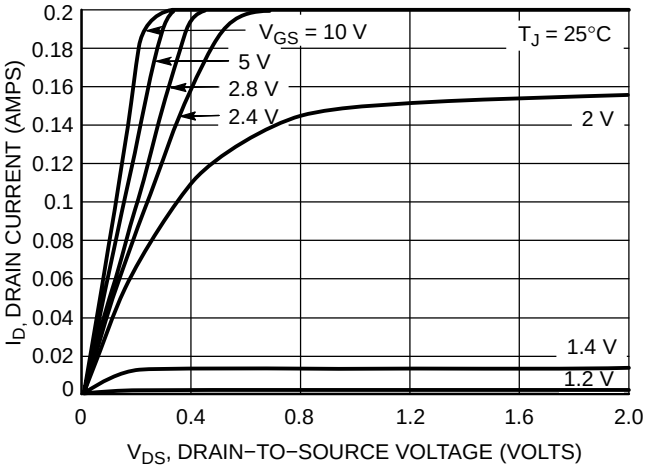

Figure 1. On−Region Characteristics

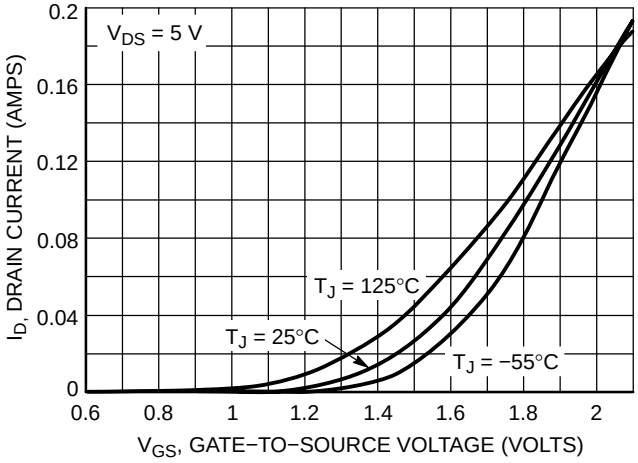

Figure 2. Transfer Characteristics

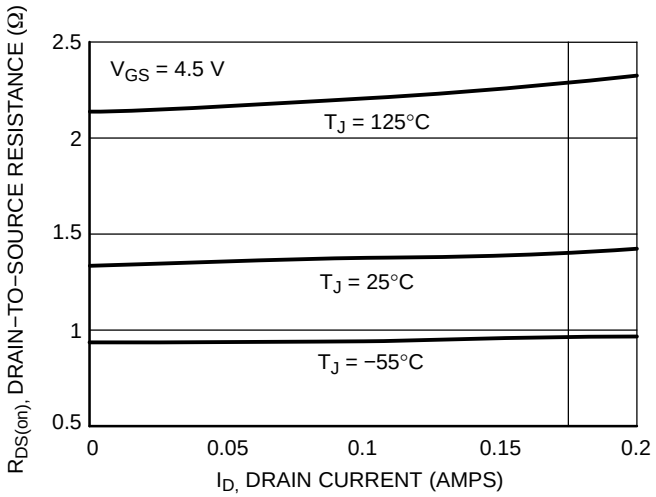

Figure 3. On−Resistance vs. Drain Current and Temperature

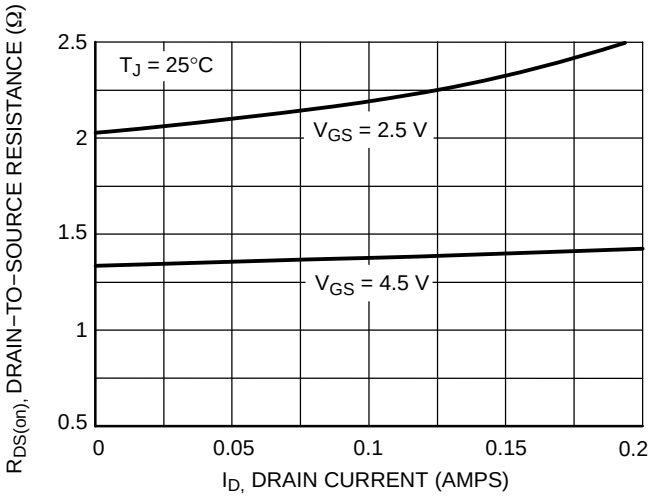

Figure 4. On−Resistance vs. Drain Current and Gate Voltage

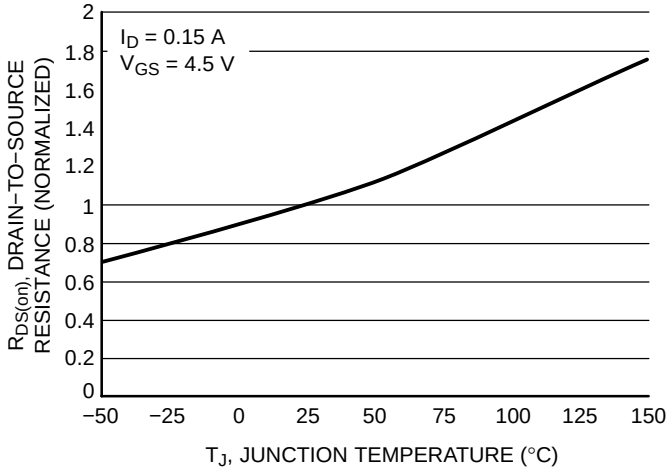

Figure 5. On−Resistance Variation with Temperature

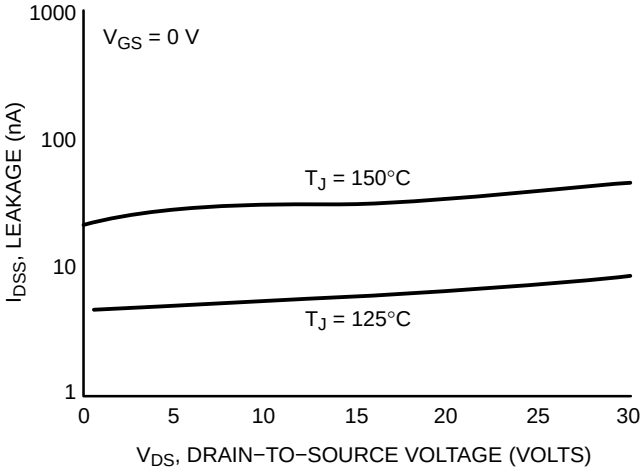

Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES

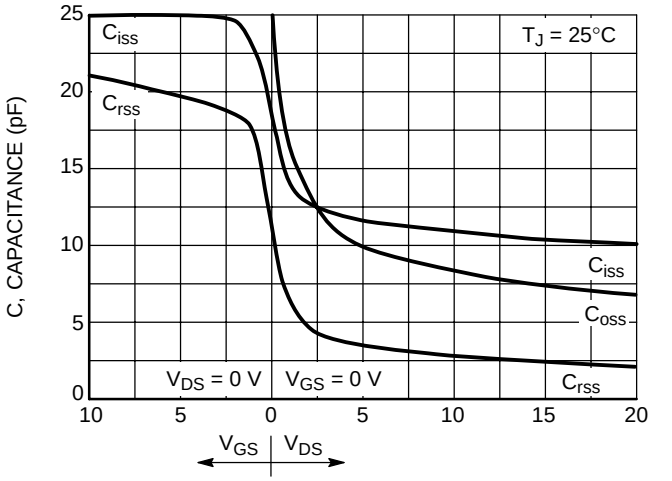

Figure 7. Capacitance Variation

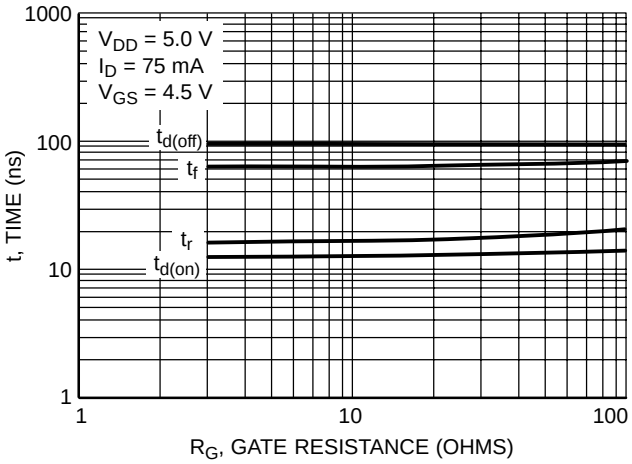

Figure 8. Resistive Switching Time Variation vs. Gate Resistance

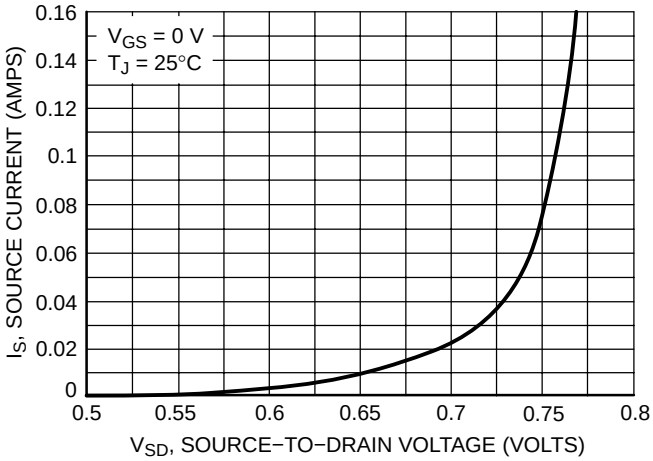

Figure 9. Diode Forward Voltage vs. Current

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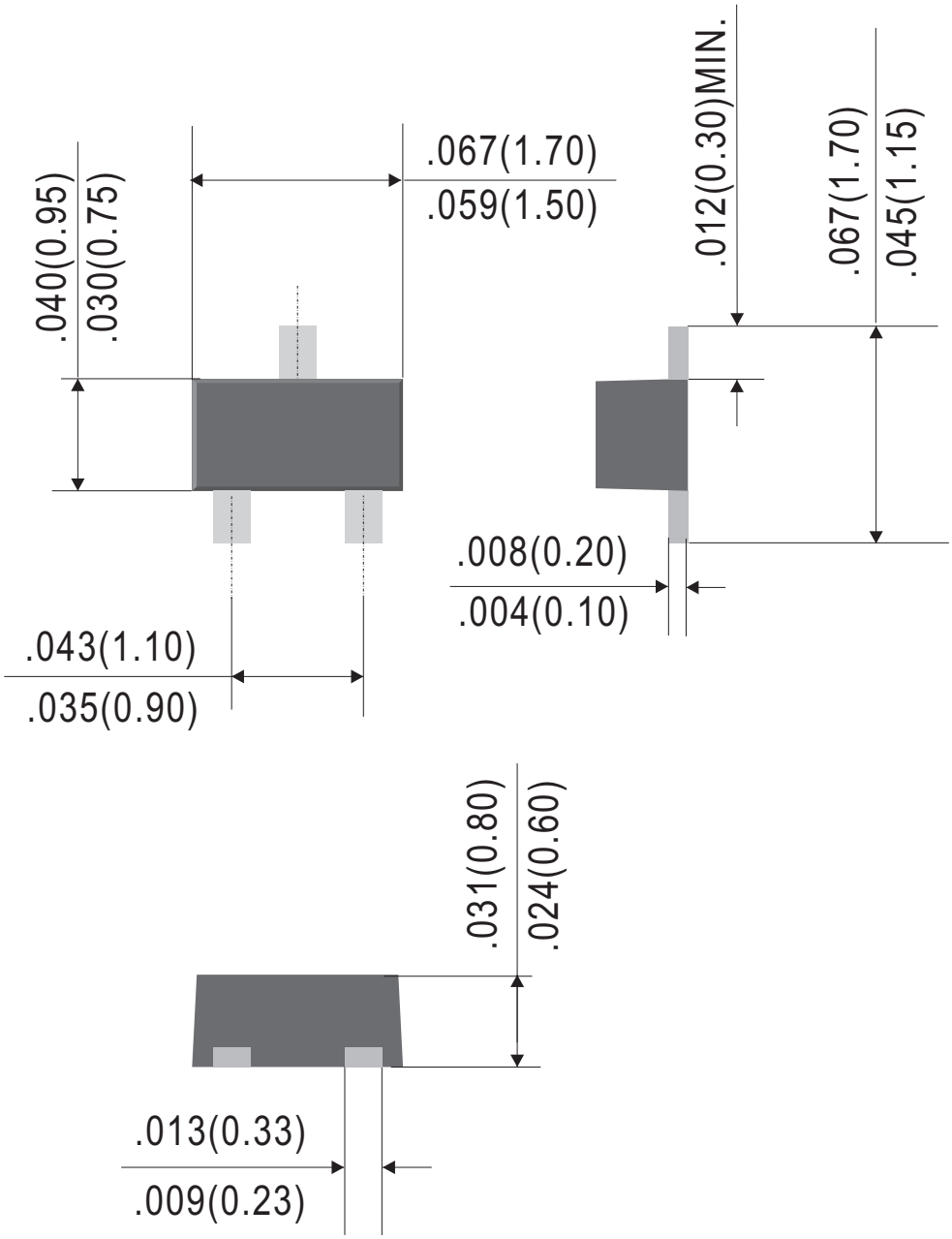
SC-89



Dimensions in inches and (millimeters)