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January 2015

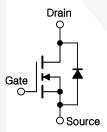


2N7002T N-Channel Enhancement Mode Field Effect Transistor

Features

- · Low On-Resistance
- · Low Gate Threshold Voltage
- · Low Input Capacitance
- · Fast Switching Speed
- · Low Input/Output Leakage
- Ultra-Small Surface Mount Package
- · Lead Free/RoHS Compliant





Ordering Information

Part Number	nber Top Mark Package		Packing Method	
2N7002T	AA	SOT-523F 3L	Tape and Reel	

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at $T_A = 25^{\circ}\text{C}$ unless otherwise noted.

Symbol	Parameter		Value	Unit
V _{DSS}	Drain-Source Voltage		60	V
V_{DGR}	Drain-Gate Voltage ($R_{GS} \le 1.0 \text{ M}\Omega$)		60	V
V _{GSS} Gate-Source Volta	Gate-Source Voltage	Continuous	±20	V
		Pulsed	±40	V
		Continuous	115	mA
I _D	Drain Current	Continuous at 100°C	73	
		Pulsed	800	
TJ	Junction Temperature		150	°C
T _{STG}	Storage Temperature Range		-55 to +150	°C

Thermal Characteristics

Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter	Value	Unit
Total Device Dissipation		200	mW
P _D	Derate Above T _A = 25°C	1.6	mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient ⁽¹⁾	625	°C/W

Note:

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

Electrical Characteristics

Values are at T_A = 25°C unless otherwise noted.

Parameter	Conditions	Min.	Тур.	Max.	Unit
eristics ⁽²⁾					
Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 10 \mu\text{A}$	60	78		V
	V _{DS} = 60 V, V _{GS} = 0 V		0.001	1.0	μΑ
Zero Gate Voltage Drain Current	V _{DS} = 60 V, V _{GS} = 0 V, T _J = 125°C		7	500	
Gate-Body Leakage	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$		0.2	±10	nA
eristics ⁽²⁾		•			
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu\text{A}$	1.00	1.76	2.00	V
	$V_{GS} = 5 \text{ V}, I_D = 0.05 \text{ A}$		1.6	7.5	Ω
Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 0.5 A			2.0	
otatio Brain Godree On Resistance	V _{GS} = 10 V, I _D = 0.5 A, T _J = 125°C		2.53	13.5	
On-State Drain Current	V _{GS} = 10 V, V _{DS} = 7.5 V	0.50	1.43		Α
Forward Transconductance	V _{DS} = 10 V, I _D = 0.2 A	80.0	356.5		mS
naracteristics		•			
Input Capacitance	.,		37.8	50	pF
Output Capacitance			12.4	25	pF
Reverse Transfer Capacitance	1.0 Will 12		6.5	7	pF
Characteristics					
Turn-On Delay Time V _{DD} = 30 V, I _D = 0.2 A, 5.85		20	ns		
Turn-Off Delay Time	V_{GEN} = 10 V, R _L = 150 Ω , R _{GEN} = 25 Ω		12.5	20	ns
	Prain-Source Breakdown Voltage Zero Gate Voltage Drain Current Gate-Body Leakage Pristics ⁽²⁾ Gate Threshold Voltage Static Drain-Source On-Resistance On-State Drain Current Forward Transconductance Practeristics Input Capacitance Output Capacitance Reverse Transfer Capacitance Characteristics Turn-On Delay Time	eristics(2)Drain-Source Breakdown Voltage $V_{GS} = 0 \text{ V}, I_D = 10 \text{ μA}$ Zero Gate Voltage Drain Current $V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$ $V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$ $V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$ $V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$ $V_{DS} = 60 \text{ V}, V_{DS} = 0 \text{ V}$ Gate-Body Leakage $V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$ eristics(2) $V_{DS} = V_{GS}, I_D = 250 \text{ μA}$ Gate Threshold Voltage $V_{DS} = V_{GS}, I_D = 250 \text{ μA}$ $V_{GS} = 10 \text{ V}, I_D = 0.05 \text{ A}$ $V_{GS} = 10 \text{ V}, I_D = 0.5 \text{ A}$ $V_{GS} = 10 \text{ V}, I_D = 0.5 \text{ A}$ $V_{DS} = 10 \text{ V}, I_D = 0.5 \text{ A}$ Forward Transconductance $V_{DS} = 10 \text{ V}, I_D = 0.2 \text{ A}$ ParacteristicsInput Capacitance $V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ Ontput Capacitance $V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ Paracteristics $V_{DS} = 30 \text{ V}, I_D = 0.2 \text{ A},$ Turn-On Delay Time $V_{DD} = 30 \text{ V}, I_D = 0.2 \text{ A},$ $V_{GEN} = 10 \text{ V}, R_L = 150 \Omega,$	eristics ⁽²⁾ Drain-Source Breakdown Voltage $V_{GS} = 0 \text{ V}$, $I_D = 10 \text{ μA}$ 60 VDS = 60 V, VGS = 0 V $V_{DS} = 60 \text{ V}$, $V_{GS} = 0 \text{ V}$ VDS = 60 V, $V_{GS} = 0 \text{ V}$ $V_{DS} = 60 \text{ V}$, $V_{DS} = 0 \text{ V}$ Gate-Body Leakage $V_{GS} = \pm 20 \text{ V}$, $V_{DS} = 0 \text{ V}$ Peristics ⁽²⁾ $V_{DS} = V_{GS}$, $I_D = 250 \text{ μA}$ 1.00 Static Drain-Source On-Resistance $V_{DS} = V_{GS}$, $I_D = 0.05 \text{ A}$ $V_{GS} = 10 \text{ V}$, $I_D = 0.5 \text{ A}$ VGS = 10 V, $I_D = 0.5 \text{ A}$ $V_{GS} = 10 \text{ V}$, $V_{DS} = 7.5 \text{ V}$ 0.50 Forward Transconductance $V_{DS} = 10 \text{ V}$, $V_{DS} = 0.2 \text{ A}$ 80.0 Paracteristics $V_{DS} = 25 \text{ V}$, $V_{GS} = 0 $	Pristics (2) Drain-Source Breakdown Voltage $V_{GS} = 0 \text{ V}, I_D = 10 \text{ μA}$ 60 78 Zero Gate Voltage Drain Current $V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$ 0.001 Zero Gate Voltage Drain Current $V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$ 7 Gate-Body Leakage $V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$ 0.2 Pristics (2) Gate Threshold Voltage $V_{DS} = V_{GS}, I_D = 250 \text{ μA}$ 1.00 1.76 Static Drain-Source On-Resistance $V_{GS} = 10 \text{ V}, I_D = 0.05 \text{ A}$ 1.6 1.6 V _{GS} = 10 V, I _D = 0.5 A, T _J = 125°C 2.53 2.53 On-State Drain Current $V_{GS} = 10 \text{ V}, V_{DS} = 7.5 \text{ V}$ 0.50 1.43 Forward Transconductance $V_{DS} = 10 \text{ V}, I_D = 0.2 \text{ A}$ 80.0 356.5 Paracteristics Input Capacitance 37.8 12.4 Output Capacitance $V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, I_D = 0.2 \text{ A}, I_D =$	Peristics (2) Drain-Source Breakdown Voltage $V_{GS} = 0 \text{ V}, I_D = 10 \text{ μA}$ 60 78 Zero Gate Voltage Drain Current $V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$ 0.001 1.0 V _{DS} = 60 V, V _{GS} = 0 V, V _{DS} = 0 V 7 500 Gate-Body Leakage $V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$ 7 500 eristics(2) V _{DS} = V _{GS} , I _D = 250 μA 1.00 1.76 2.00 Static Drain-Source On-Resistance $V_{GS} = 5 \text{ V}, I_D = 0.05 \text{ A}$ 1.6 7.5 V _{GS} = 10 V, I _D = 0.5 A, T _J = 125°C 2.53 13.5 On-State Drain Current $V_{GS} = 10 \text{ V}, I_D = 0.5 \text{ A}$, T _J = 125°C 2.53 13.5 On-State Drain Current $V_{GS} = 10 \text{ V}, I_D = 0.2 \text{ A}$ 80.0 356.5 Paracteristics Input Capacitance $V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1.0 MHz 37.8 50 Output Capacitance $V_{DS} = 30 \text{ V}, I_D = 0.2 \text{ A},$ VGEN = 10 V, R _L = 150 Ω, 5.85 20 Turn-On Delay Time $V_{DD} = 30 \text{ V}, I_D = 0.2 \text{ A},$ VGEN = 10 V, R _L = 150 Ω, 12.4 5.85 20

Note:

2. Short duration test pulse used to minimize self-heating effect.

Typical Performance Characteristics

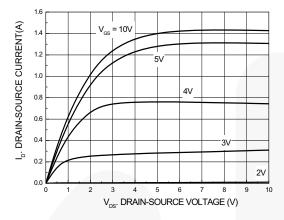


Figure 1. On-Region Characteristics

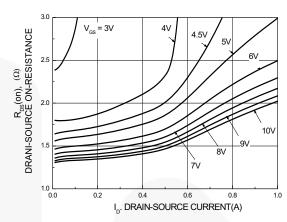


Figure 2. On-Resistance Variation with Gate Voltage and Drain Current

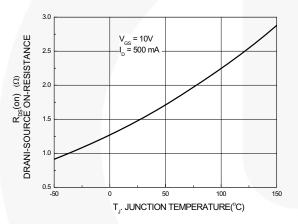


Figure 3. On-Resistance Variation with Temperature

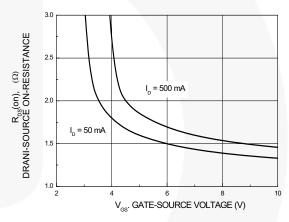


Figure 4. On-Resistance Variation with Gate-Source Voltage

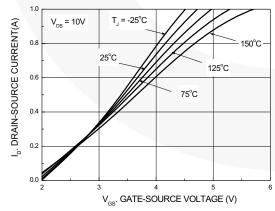


Figure 5. Transfer Characteristics

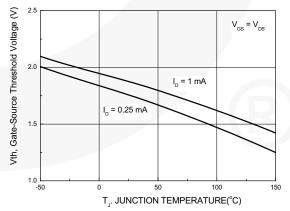


Figure 6. Gate Threshold Variation with Temperature

Typical Performance Characteristics (Continued)

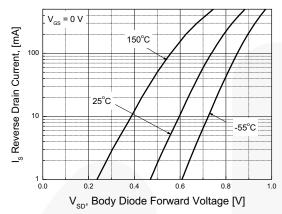


Figure 7. Reverse Drain Current Variation with Diode Forward Voltage and Temperature

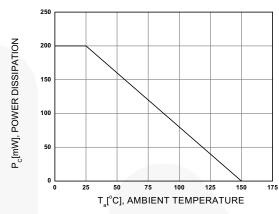
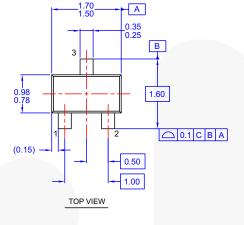
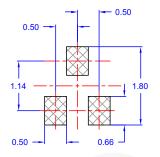


Figure 8. Power Derating

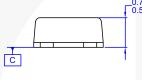
Physical Dimensions

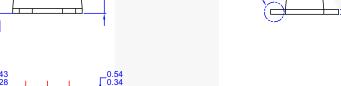




LAND PATTERN RECOMMENDATION

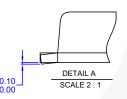
_0.20 _0.04





SEE DETAIL A

BOTTOM VIEW



- NOTES: A) THIS PACKAGE CONFORMS TO EIAJ SC89 PACKAGING STANDARD.
- B) ALL DIMENSIONS ARE IN MILLIMETERS. C) DRAWING CONFORMS TO ASME Y14.5M-1994
- D) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

MAD03ArevA

Figure 9. 3-LEAD, SC89, EIAJ-SC89, 0.88MM WIDE, SOT523F





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		Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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