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January 2015

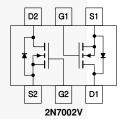
2N7002V / 2N7002VA N-Channel Enhancement Mode Field Effect Transistor

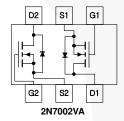
Features

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



SOT- 563F
* Pin1 and Pin4 are exchangeable.





Ordering Information

Part Number	mber Top Mark Package		Packing Method	
2N7002V	AB	SOT-563F 6L Tape and Reel		
2N7002VA	002VA AC SOT-		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 $T_A = 25^{\circ}C$ unless otherwise noted.

Symbol	Parameter		Value	Unit
V _{DSS}	Drain-Source Voltage		60	V
V _{DGR}	Drain-Gate Voltage (R _{GS} ≤ 1.0 MΩ)		60	V
V _{GSS} Gate-Source Voltage	Cata Course Voltage	Continuous	±20	V
	Gale-Source voltage	Pulsed	±40	
I _D Drain Current	Drain Current	Continuous	280	mA
	Drain Current	Pulsed	1.5	Α
T _J , T _{STG}	Junction and Storage Temperature Range	•	-55 to +150	°C

Thermal Characteristics

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

Symbol	Parameter	Value	Unit
В	Total Device Dissipation	250	mW
P _D	Derate Above T _A = 25°C	2.0	mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient ⁽¹⁾	500	°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
teristics ⁽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	μА
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	±100	nA
eristics ⁽²⁾		•			
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu\text{A}$	1.00	1.76	2.50	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	
State Brain Source on Residance	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	1.50	1.43		Α
Forward Transconductance	V _{DS} = 10 V, I _D = 0.2 A	80	356.5		mS
haracteristics		•			
Input Capacitance			37.8	50	pF
Output Capacitance	1 V _{DS} = 25 V, V _{GS} = 0 V, f = 1.0 MHz		12.4	25	pF
Reverse Transfer Capacitance			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			12.5	20	ns
	Prain-Source Breakdown Voltage Zero Gate Voltage Drain Current Gate-Body Leakage eristics ⁽²⁾ Gate Threshold Voltage Static Drain-Source On-Resistance On-State Drain Current Forward Transconductance naracteristics 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 $V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$ $V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$ $V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$ $V_{DS} = B_0 \text{ V}, V_{DS} = 0 \text{ V}$ $V_{CS} = 120 \text{ V}, V_{DS} = 0 \text{ V}$ eristics(2) $V_{DS} = V_{GS}, I_D = 250 \text{ μA}$ Gate Threshold Voltage $V_{DS} = V_{CS}, I_D = 250 \text{ μA}$ $V_{CS} = 10 \text{ V}, I_D = 0.05 \text{ A}$ $V_{CS} = 10 \text{ V}, I_D = 0.5 \text{ A}$ $V_{CS} = 10 \text{ V}, I_D = 0.5 \text{ A}$ $V_{CS} = 10 \text{ V}, I_D = 0.5 \text{ A}$ $V_{CS} = 10 \text{ V}, I_D = 0.2 \text{ A}$ Provard Transconductance $V_{DS} = 10 \text{ V}, I_D = 0.2 \text{ A}$ $V_{CS} = 10 \text{ V}, I_D = 0.2 \text{ A}$ $V_{CS} = 10 \text{ V}, I_D = 0.2 \text{ A}$ $V_{CS} = 10 \text{ V}, I_D = 0.2 \text{ A}$ $V_{CS} = 10 \text{ V}, I_D = 0.2 \text{ A}$ $V_{CS} = 10 \text{ V}, I_D = 0.2 \text{ A}$ $V_{CS} = 10 \text{ V}, I_D = 0.2 \text{ A}$ $V_{CS} = 10 \text{ V}, I_D = 0.2 \text{ A}$ $V_{CS} = 10 \text{ V}, I_D = 0.2 \text{ A}$ $V_{CS} = 10 \text{ V}, I_D = 0.2 \text{ A}$ $V_{CS} = 10 \text{ V}, I_D = 0.2 \text{ A}$ $V_{CS} = 10 \text{ V}, I_D = 0.2 \text{ A}$	eristics ⁽²⁾ Drain-Source Breakdown Voltage $V_{GS} = 0 \text{ V}$, $I_D = 10 \text{ μA}$ 60 Zero Gate Voltage Drain Current $V_{DS} = 60 \text{ V}$, $V_{GS} = 0 \text{ V}$, $V_{DS} = 60 \text{ V}$, V_{DS}	eristics ⁽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 eristics ⁽²⁾ Gate Threshold Voltage $V_{DS} = V_{GS}, I_D = 250 \text{ μA}$ 1.00 1.76 Static Drain-Source On-Resistance $V_{GS} = 5 \text{ V}, I_D = 0.05 \text{ A}$ 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 $V_{GS} = 10 \text{ V}, V_{DS} = 7.5 \text{ V}$ 1.50 1.43 Forward Transconductance $V_{DS} = 10 \text{ V}, I_D = 0.2 \text{ A}$ 80 356.5 naracteristics Input Capacitance $V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, f = 1.0 \text{ MHz}$ 12.4 Reverse Transfer Capacitance $V_{DD} = 30 \text{ V}, I_D = 0.2 \text{ A}, V_{GEN} = 10 \text{ V}, R_L = 150 \Omega, V_{DS} = 10 \text{ V}$ 5.85 Turn-On Delay Time $V_{DS} = 10 \text{ V}, R_L = 150 \Omega, V_{DS} = 10 \text{ V}$ 10.2 Mag Section Incomplete Incomplete Incomplete Incomplete Incomplete Incomplete Incomplete Incomplete Incomplete Incom	eristics(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 VDS = 60 V, VGS = 0 V, VDS = 0 V 7 500 Gate-Body Leakage $V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$ 0.2 ±100 eristics(2) VDS = VGS, ID = 250 μA 1.00 1.76 2.50 Static Drain-Source On-Resistance $V_{GS} = 5 \text{ V}, I_{D} = 0.05 \text{ A}$ 1.6 7.5 VGS = 10 V, ID = 0.5 A, TJ = 125°C 2.53 13.5 On-State Drain Current $V_{GS} = 10 \text{ V}, V_{DS} = 7.5 \text{ V}$ 1.50 1.43 Forward Transconductance $V_{DS} = 10 \text{ V}, I_{D} = 0.2 \text{ A}$ 80 356.5 naracteristics Input Capacitance $V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, ID = 0.2 \text{ A}$ 12.4 25 Reverse Transfer Capacitance $V_{DD} = 30 \text{ V}, I_{D} = 0.2 \text{ A}, V_{GEN} = 10 \text{ V}, R_L = 150 \Omega, V_{DS} = 10 \text{ V}, R_L = 150 \Omega, V_{DS} = 10 \text{ V}, R_L = 150 \Omega, V_{DS} = 10 \text{ V}, R_L = 150 \Omega, V_{DS} = 10 \text{ V}, R_L = 150 \Omega, V_{DS} = 10 \text{ V}, R_L = 150 \Omega, V_{DS} = 10 \text{ V}, R_L = 150 \Omega, V_{DS} = 10 \text{ V}, R_L = 150 \Omega, V_{DS} = 10 \text{ V}, R_L = 150 \Omega, V_{DS} = 10 \text{ V}, R_L = 150 \Omega, V_{DS} $

Note:

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

Typical Performance Characteristics

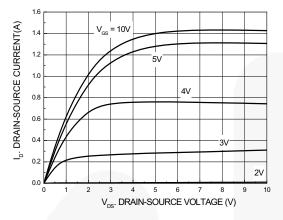


Figure 1. On-Region Characteristics

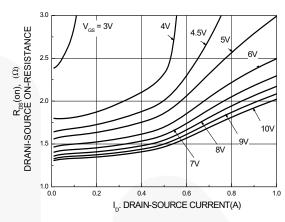


Figure 2. On-Resistance Variation with Gate Voltage and Drain Current

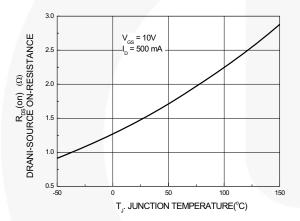


Figure 3. On-Resistance Variation with Temperature

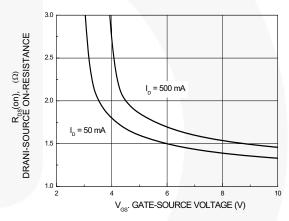


Figure 4. On-Resistance Variation with Gate-Source Voltage

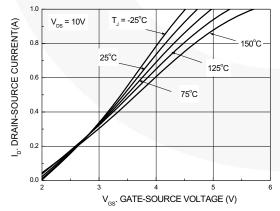


Figure 5. Transfer Characteristics

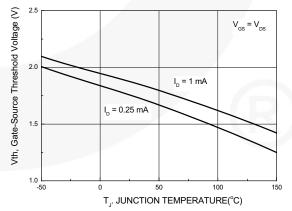


Figure 6. Gate Threshold Variation with Temperature

Typical Performance Characteristics (Continued)

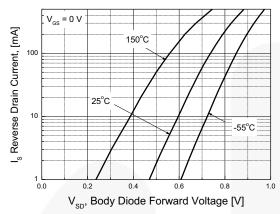


Figure 7. Reverse Drain Current Variation with Diode Forward Voltage and Temperature

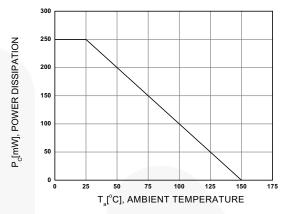


Figure 8. Power Derating

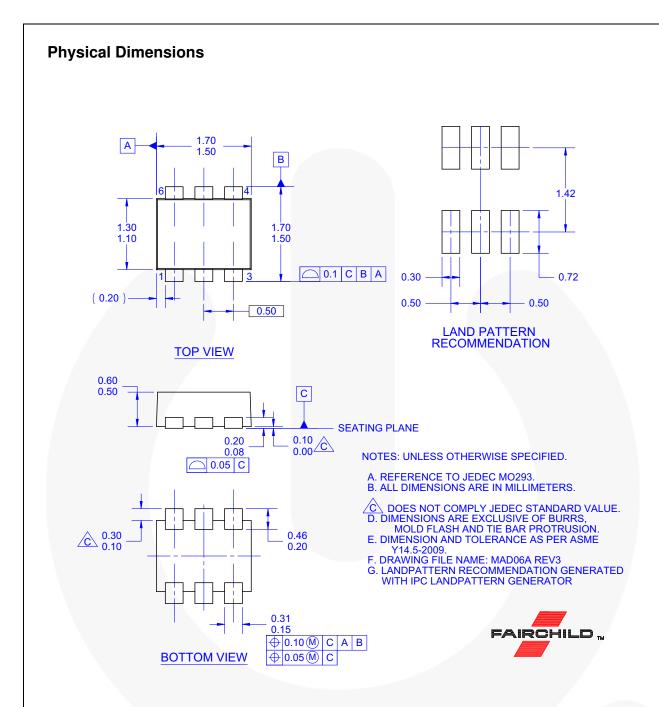


Figure 9. 6-LEAD, MO293, 1.2MM WIDE, SOT563F



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