



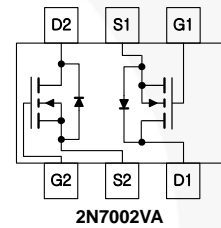
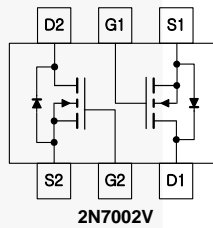
January 2015

# 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



### Ordering Information

Part Number	Top Mark	Package	Packing Method
2N7002V	AB	SOT-563F 6L	Tape and Reel
2N7002VA	AC	SOT-563F 6L	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 ( $R_{GS} \leq 1.0 \text{ M}\Omega$ )	60	V
$V_{GSS}$	Gate-Source Voltage	Continuous	$\pm 20$
		Pulsed	$\pm 40$
$I_D$	Drain Current	Continuous	280
		Pulsed	1.5
$T_J, T_{STG}$	Junction and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

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

## Thermal Characteristics

Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Value	Unit
$P_D$	Total Device Dissipation	250	mW
	Derate Above $T_A = 25^\circ\text{C}$	2.0	mW/ $^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient <sup>(1)</sup>	500	$^\circ\text{C}/\text{W}$

### Note:

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

## Electrical Characteristics

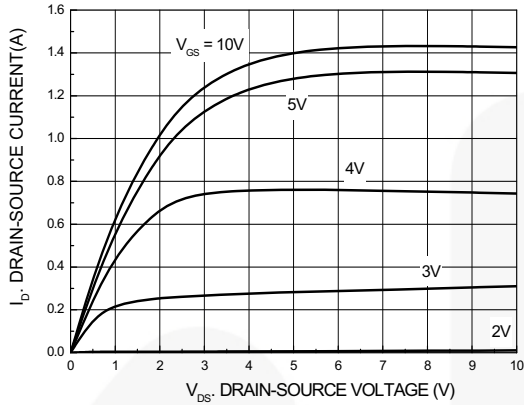
Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics<sup>(2)</sup></b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 10\ \mu\text{A}$	60	78		V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$		0.001	1.0	$\mu\text{A}$
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 125^\circ\text{C}$		7	500	
$I_{GSS}$	Gate-Body Leakage	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$		0.2	$\pm 100$	nA
<b>On Characteristics<sup>(2)</sup></b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1.00	1.76	2.50	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 5\text{ V}, I_D = 0.05\text{ A}$		1.6	7.5	$\Omega$
		$V_{GS} = 10\text{ V}, I_D = 0.5\text{ A}$			2.0	
		$V_{GS} = 10\text{ V}, I_D = 0.5\text{ A}, T_J = 125^\circ\text{C}$		2.53	13.5	
$I_{D(ON)}$	On-State Drain Current	$V_{GS} = 10\text{ V}, V_{DS} = 7.5\text{ V}$	1.50	1.43		A
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{ V}, I_D = 0.2\text{ A}$	80	356.5		mS
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$		37.8	50	pF
$C_{oss}$	Output Capacitance			12.4	25	pF
$C_{rss}$	Reverse Transfer Capacitance			6.5	7	pF
<b>Switching Characteristics</b>						
$t_{D(ON)}$	Turn-On Delay Time	$V_{DD} = 30\text{ V}, I_D = 0.2\text{ A}, V_{GEN} = 10\text{ V}, R_L = 150\ \Omega, R_{GEN} = 25\ \Omega$		5.85	20	ns
$t_{D(OFF)}$	Turn-Off Delay Time			12.5	20	ns

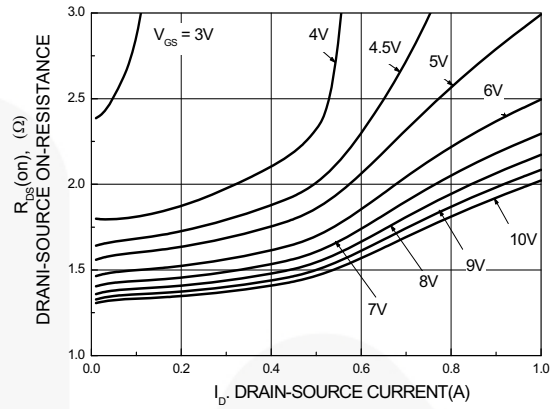
### Note:

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

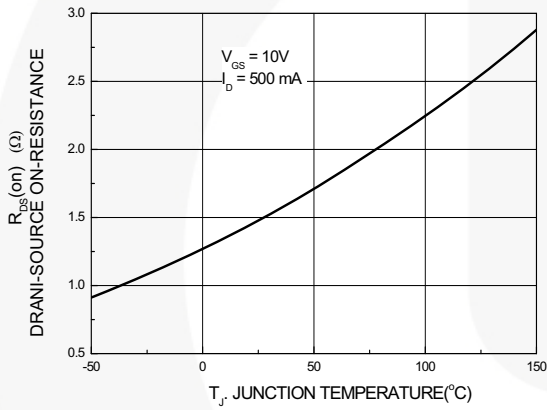
## Typical Performance Characteristics



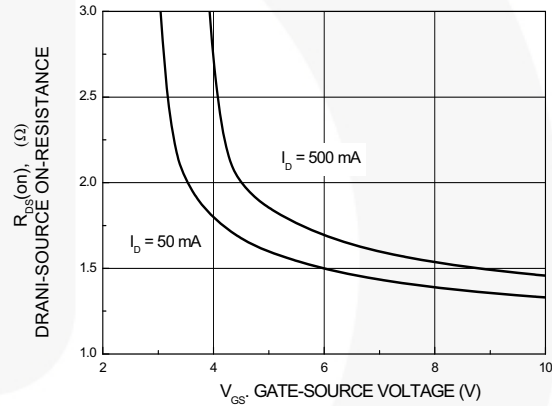
**Figure 1. On-Region Characteristics**



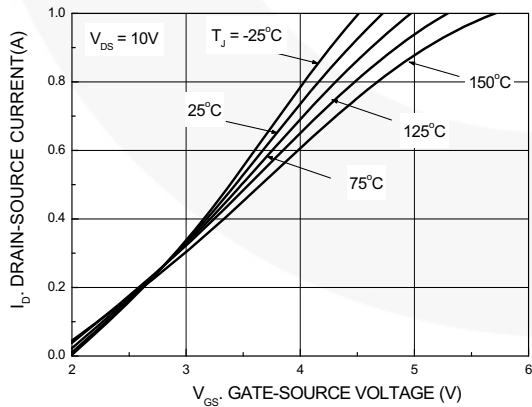
**Figure 2. On-Resistance Variation with Gate Voltage and Drain Current**



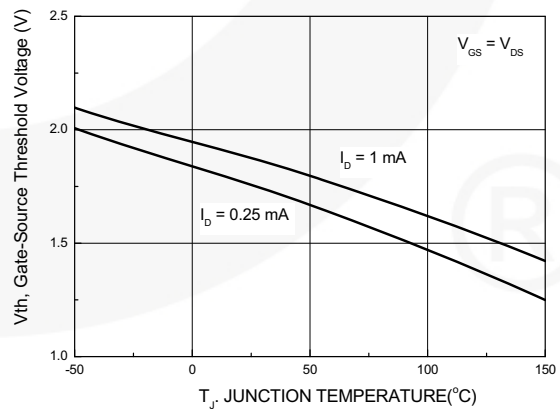
**Figure 3. On-Resistance Variation with Temperature**



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



**Figure 5. Transfer Characteristics**



**Figure 6. Gate Threshold Variation with Temperature**

Typical Performance Characteristics (Continued)

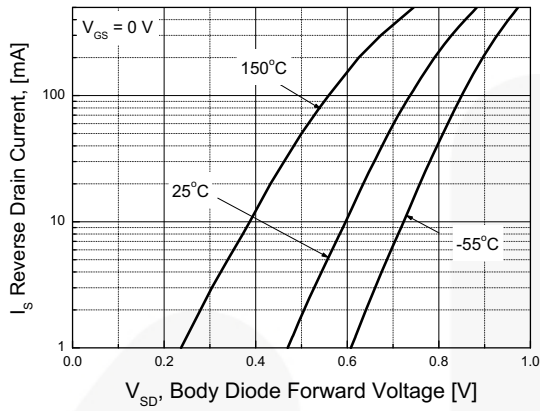


Figure 7. Reverse Drain Current Variation with Diode Forward Voltage and Temperature

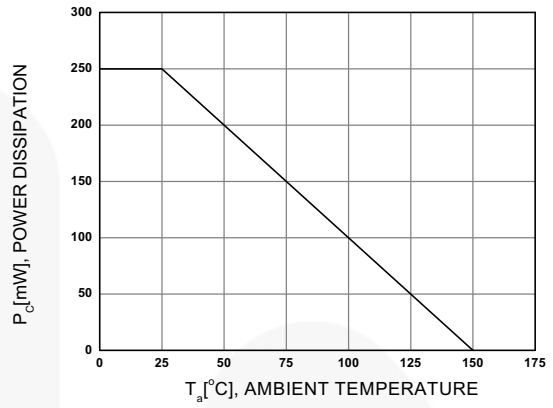


Figure 8. Power Derating



## Physical Dimensions

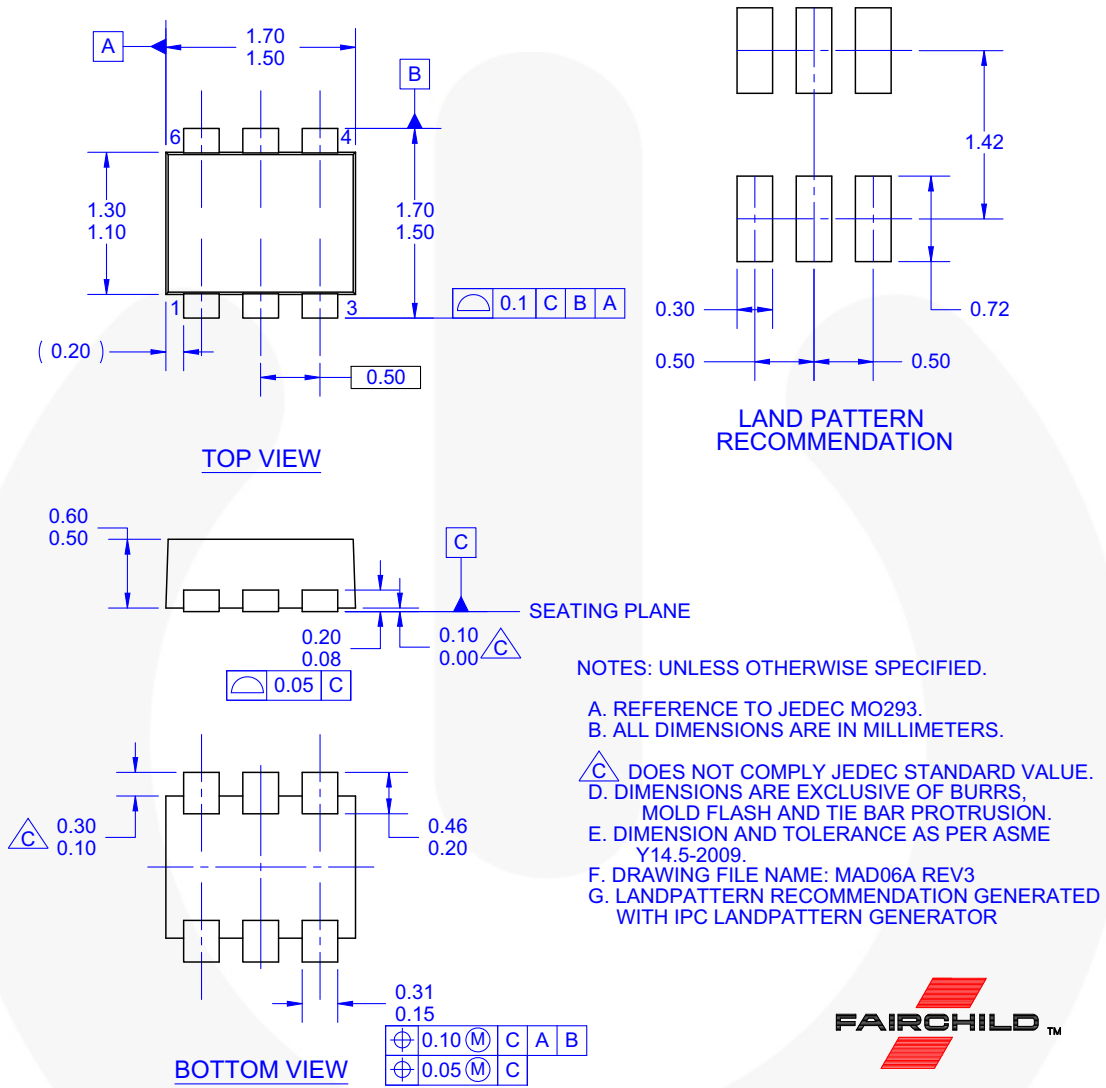


Figure 9. 6-LEAD, MO293, 1.2MM WIDE, SOT563F





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