

## WNM4002

Small Signal N-Channel, 20V, 0.3A, MOSFET

[Http://www.willsemi.com](http://www.willsemi.com)

$V_{(BR)DSS}$	$R_{DS(on)}$ Typ.
20 V	1.4Ω @ 4.5V
	2.2Ω @ 2.5V
	3.8Ω @ 1.8V

### Descriptions

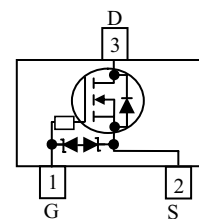
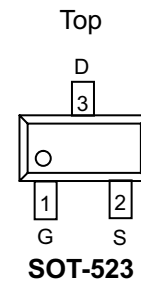
The WNM4002 is the N-Channel enhancement MOS Field Effect Transistor, uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use in small signal switch. Standard product WNM4002 is Pb-free.

### Features

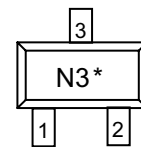
- Trench N-Channel
- Supper high density cell design for extremely low  $R_{ds(on)}$
- Exceptional ON resistance and maximum DC current capability
- Small package design with SOT-523

### Applications

- Driver: Relays, Solenoids, Lamps, Hammers
- Power supply converters circuit
- Load/Power Switching for potable device



**Pin Configuration**



N3 = Device Code

\* = Month

### Marking

### Order Information

Device	Package	Shipping
WNM4002-3/TR	SOT-523	3000/Tape&Reel

**Absolute Maximum Ratings**

 (T<sub>A</sub>=25°C unless otherwise noted)

Symbol	Parameter	Ratings	Unit
V <sub>DSS</sub>	Drain-to-Source Voltage	20	V
V <sub>GSS</sub>	Gate-to-Source Voltage	±6.0	V
I <sub>D</sub>	Drain Current – Continue <b>Note1</b>	0.3	A
	Drain Current – Pulsed (t<300us, Duty<2%) <b>Note1</b>	0.6	A
P <sub>D</sub>	Power Dissipation – <b>Note1</b>	0.25	W
T <sub>J</sub>	Operation junction temperature range	150	°C
T <sub>SG</sub>	Storage temperature range	-55~150	°C

**Thermal Resistance Ratings**

 (T<sub>A</sub>=25°C unless otherwise noted)

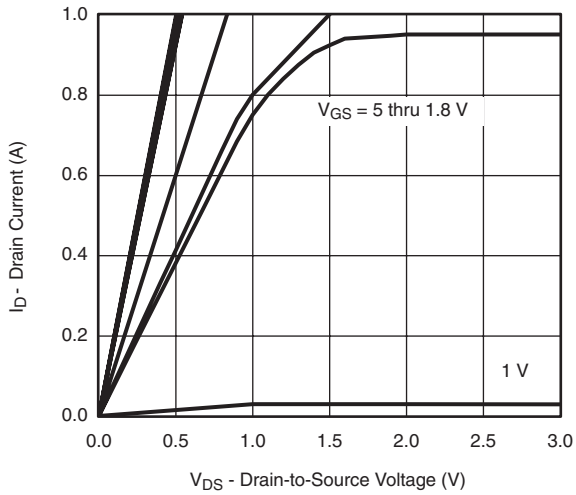
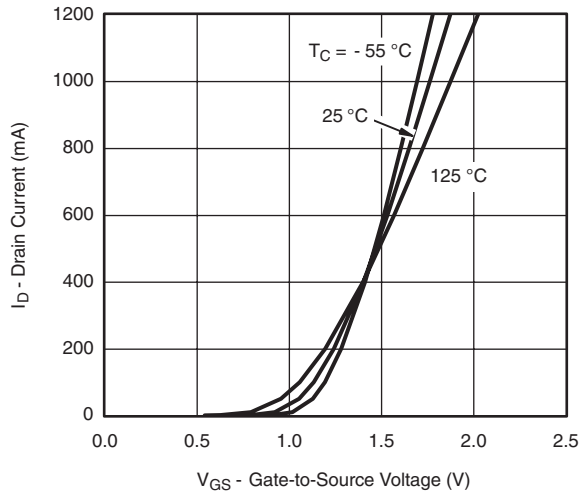
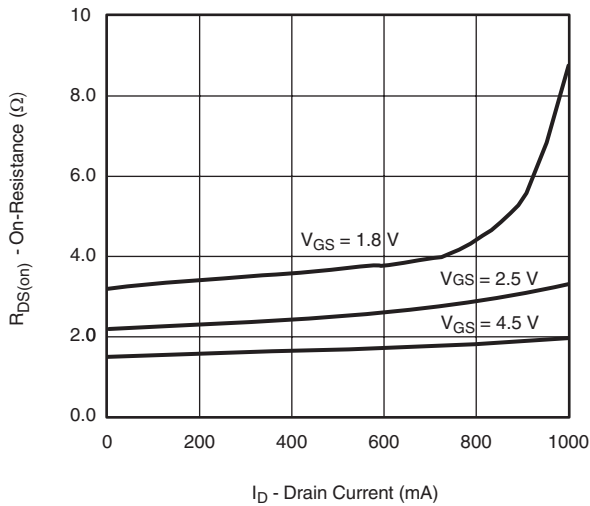
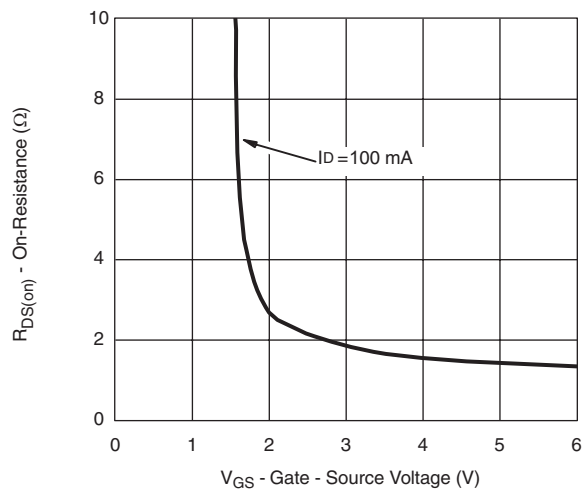
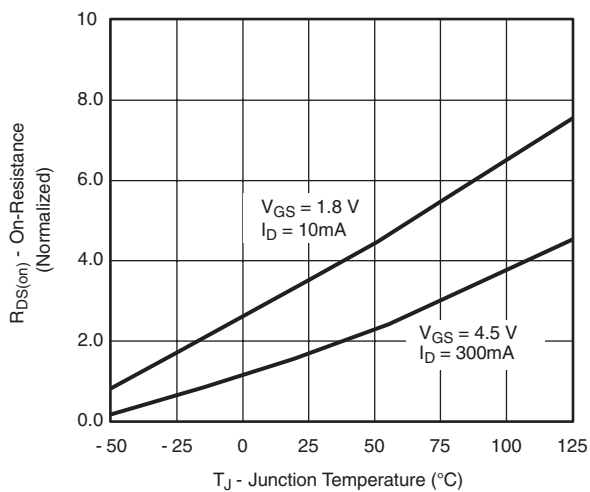
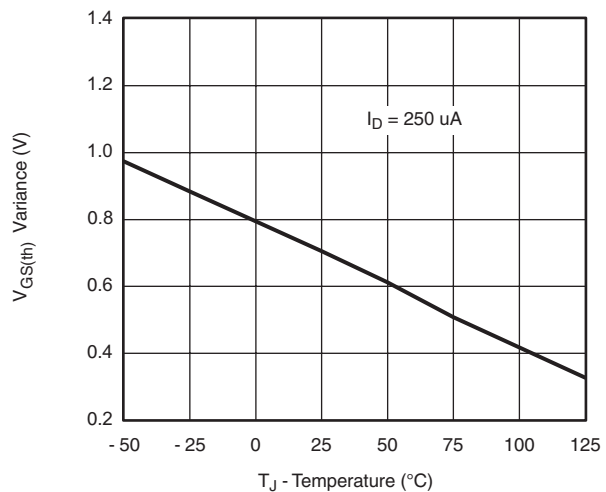
Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient – <b>Note1</b>	500	620	°C/W

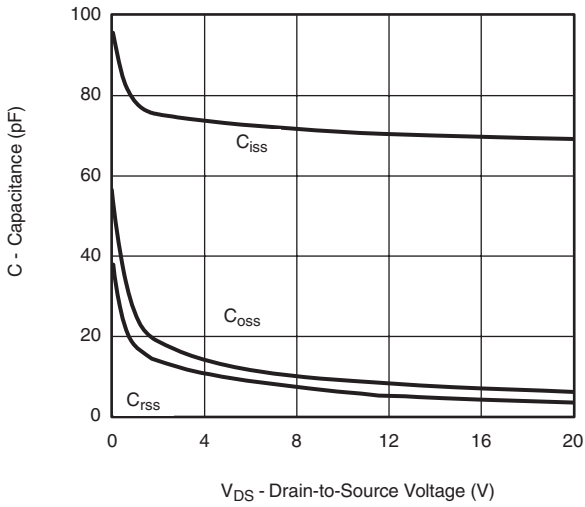
**Note1:** Surface mounted on a 2 oz copper, 1 in<sup>2</sup> pad, FR-4 board.

**Electronics Characteristics**

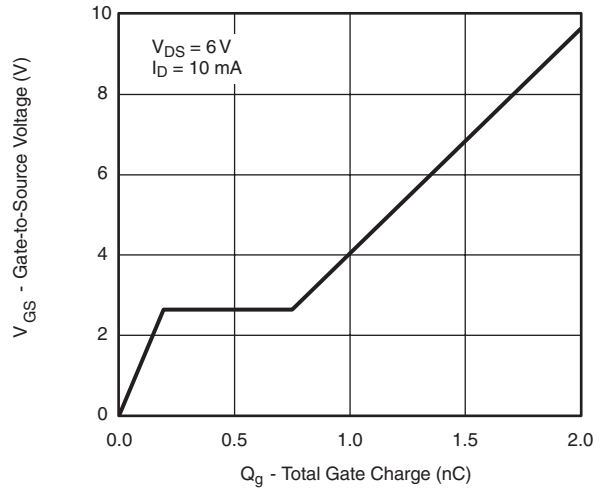
 (T<sub>A</sub>=25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ.	Max	Unit
<b>Off Characteristics</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	20			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V			1	uA
I <sub>GSS</sub>	Gate –Source leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±5V			5	uA
<b>ON Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250uA	0.35		1.0	V
R <sub>DS(on)</sub>	Drain-Source On-Resistance	V <sub>GS</sub> =4.5V, I <sub>D</sub> =0.3A			2.0	Ω
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =0.1A			3.5	Ω
		V <sub>GS</sub> =1.8V, I <sub>D</sub> =0.01A			5.0	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =6V, I <sub>D</sub> =0.1A		1.0		S
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =6V, V <sub>GS</sub> =0V, F=100kHz		72		pF
C <sub>oss</sub>	Output Capacitance			12		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			10		pF
Q <sub>G(TOT)</sub>	Total Gate Charge	V <sub>DS</sub> =6V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =0.01A		1.1		nC
Q <sub>GS</sub>	Gate-Source Charge			0.11		nC
Q <sub>GD</sub>	Gate-Drain Charge			0.45		nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DS</sub> =10V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =0.1A, R <sub>G</sub> =6Ω		22		ns
t <sub>r</sub>	Turn-On Rise Time			80		ns
t <sub>d(off)</sub>	Turn-Off Delay Time			700		ns
t <sub>f</sub>	Turn-Off Fall Time			380		ns
<b>Drain-to-Source Diode Characteristics</b>						
V <sub>SD</sub>	Forward Diode Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =0.15A		-0.7		V

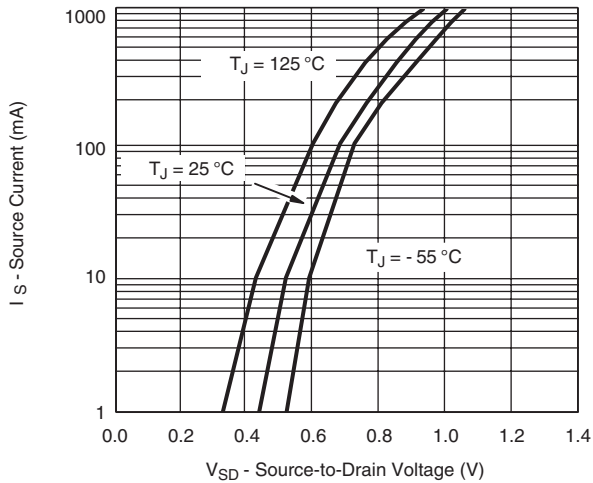
**Typical Performance Graph**

**Output Characteristics**

**Transfer Characteristics**

**On Resistance vs. Drain Current**

**On Resistance vs. Gate - Source Voltage**

**On Resistance vs. Junction Temperature**

**Threshold Voltage**



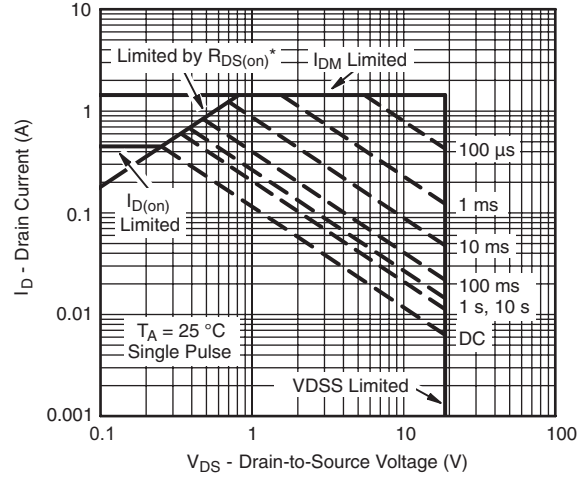
Capacitance



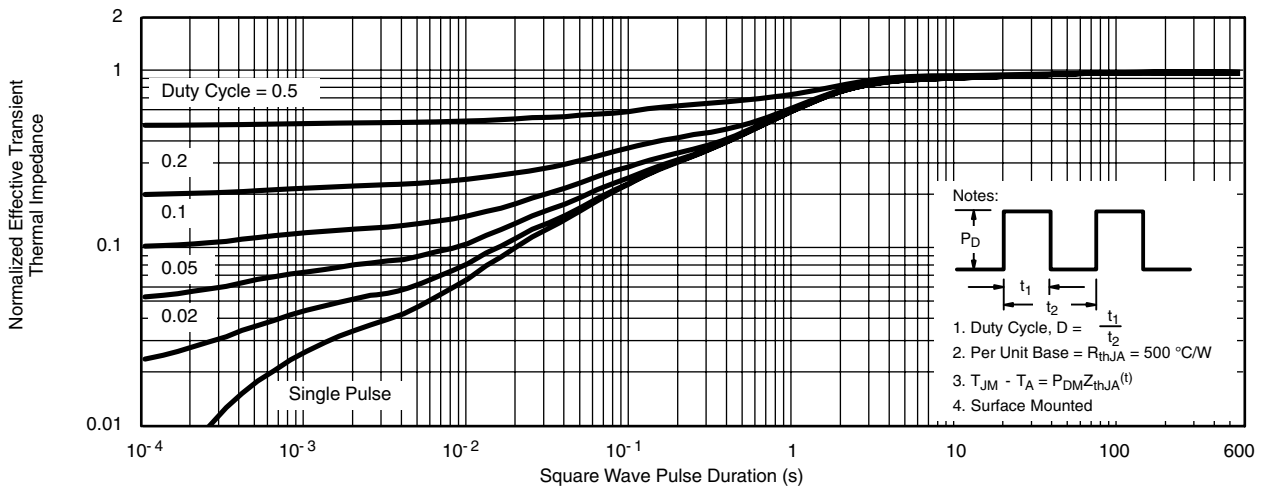
Gate Charge



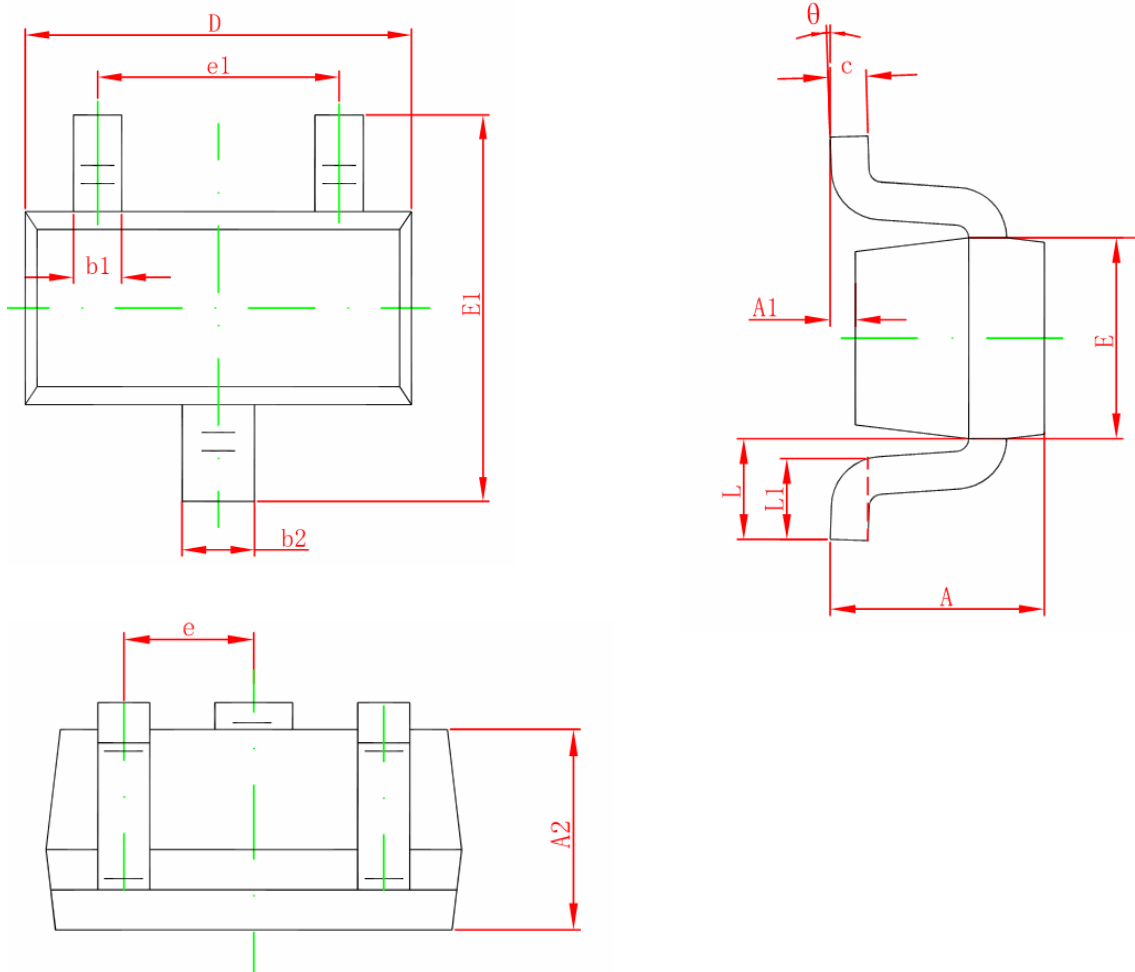
Source-Drain Diode Forward Voltage



Safe Operation Area, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Ambient

**Package Outline Dimension**
**SOT-523**


Symbol	Dimension in Millimeters	
	Min.	Max.
A	0.700	0.900
A1	0.000	0.100
A2	0.700	0.800
b1	0.150	0.250
b2	0.250	0.350
c	0.100	0.200
D	1.500	1.700
E	0.700	0.900
E1	1.450	1.750
e	0.500 Typ.	
e1	0.900	1.100
L	0.400 Ref.	
L1	0.260	0.460
theta	0°	8