

## WNM2021

**N-Channel, 20V, 0.89A, Small Signal MOSFET**

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

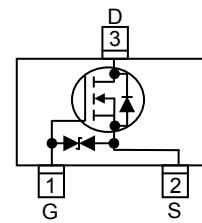
<b>V<sub>DS</sub> (V)</b>	<b>R<sub>ds(on)</sub> (Ω)</b>	<b>I<sub>D</sub> (A)</b>
20	0.220@ V <sub>GS</sub> =4.5V	0.55
	0.260@ V <sub>GS</sub> =2.5V	0.45
	0.320@ V <sub>GS</sub> =1.8V	0.35



**SOT-323**

### Descriptions

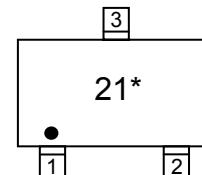
The WNM2021 is N-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent R<sub>DS (ON)</sub> with low gate charge. This device is suitable for use in DC-DC conversion, load switch and level shift. Standard Product WNM2021 is Pb-free.



**Pin configuration (Top view)**

### Features

- Trench Technology
- Supper high density cell design
- Excellent ON resistance
- Extremely Low Threshold Voltage
- Small package SOT-323



21 = Device Code

\* = Month (A~Z)

**Marking**

### Applications

### Order information

<b>Device</b>	<b>Package</b>	<b>Shipping</b>
WNM2021-3/TR	SOT-323	3000/Reel&Tape

- DC-DC converter circuit
- Small Signal Switch
- Load Switch
- Level Shift
-

## Absolute Maximum ratings

Parameter	Symbol	10 S	Steady State	Unit
Drain-Source Voltage	V <sub>DS</sub>	20	±6	V
Gate-Source Voltage	V <sub>GS</sub>	±6		
Continuous Drain Current <sup>a</sup>	T <sub>A</sub> =25°C	I <sub>D</sub>	0.89	0.82
	T <sub>A</sub> =70°C		0.71	0.65
Maximum Power Dissipation <sup>a</sup>	T <sub>A</sub> =25°C	P <sub>D</sub>	0.37	0.31
	T <sub>A</sub> =70°C		0.23	0.20
Continuous Drain Current <sup>b</sup>	T <sub>A</sub> =25°C	I <sub>D</sub>	0.78	0.70
	T <sub>A</sub> =70°C		0.62	0.56
Maximum Power Dissipation <sup>b</sup>	T <sub>A</sub> =25°C	P <sub>D</sub>	0.29	0.23
	T <sub>A</sub> =70°C		0.18	0.14
Pulsed Drain Current <sup>c</sup>	I <sub>DM</sub>		1.4	A
Operating Junction Temperature	T <sub>J</sub>		150	°C
Lead Temperature	T <sub>L</sub>		260	°C
Storage Temperature Range	T <sub>stg</sub>		-55 to 150	°C

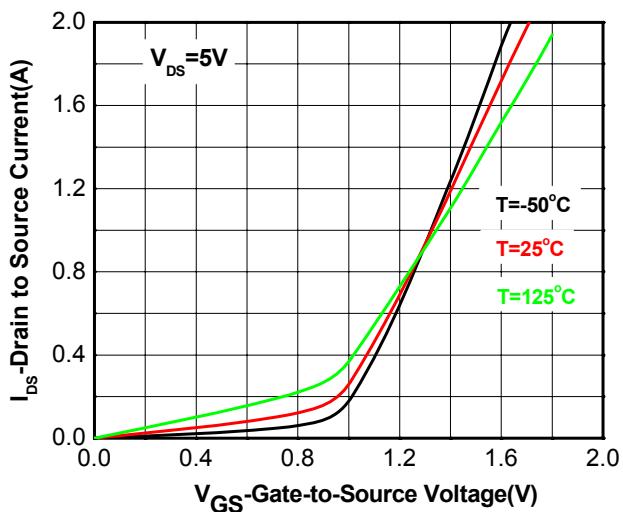
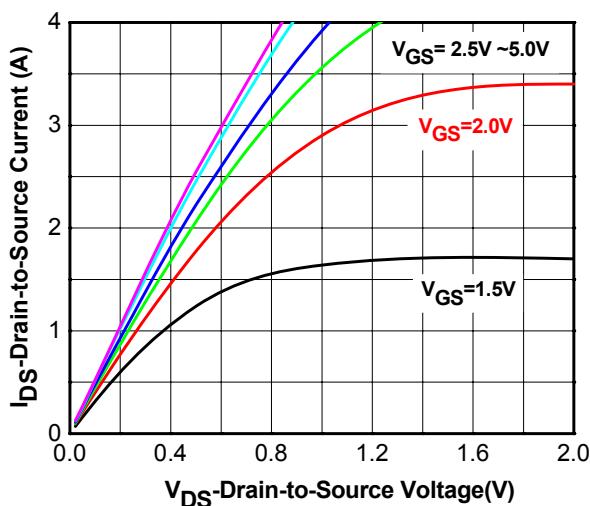
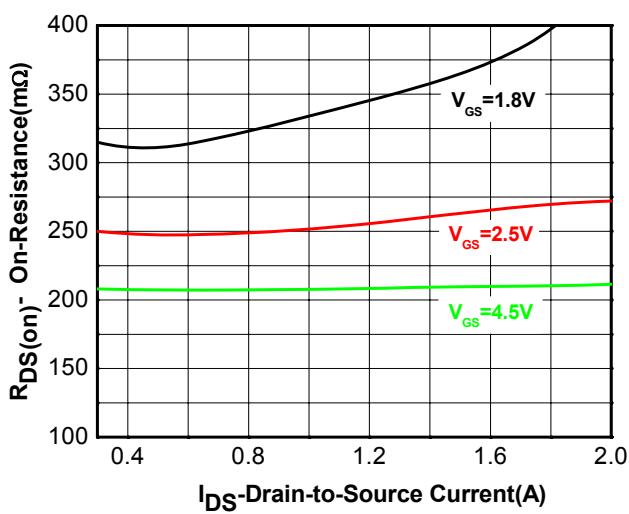
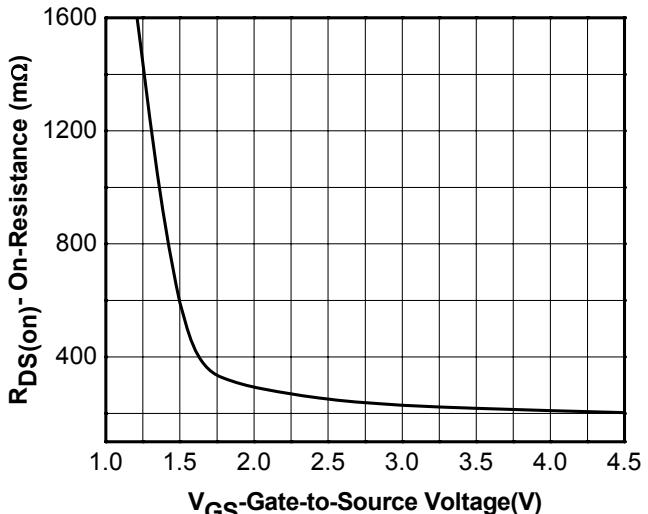
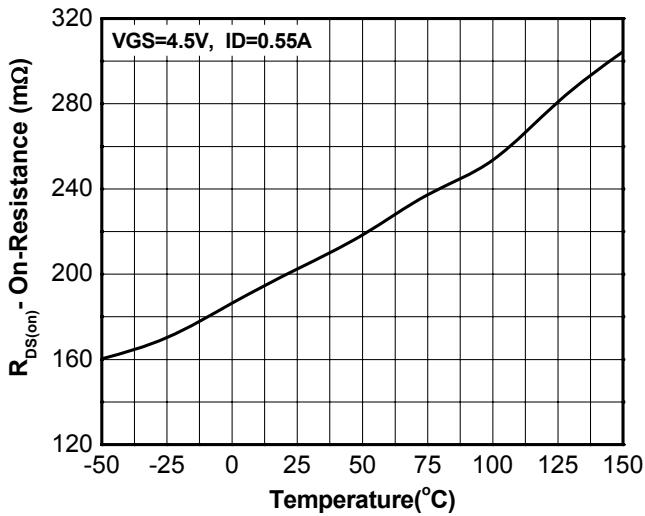
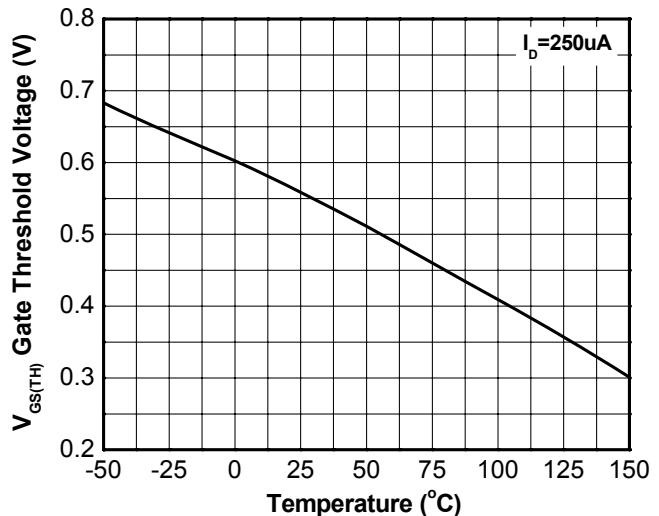
## Thermal resistance ratings

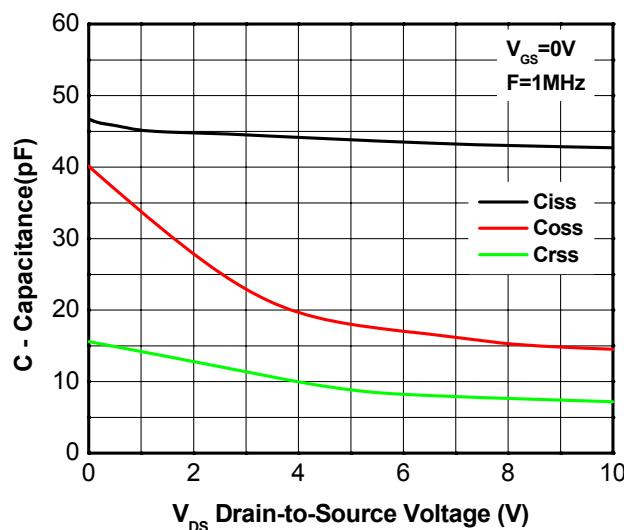
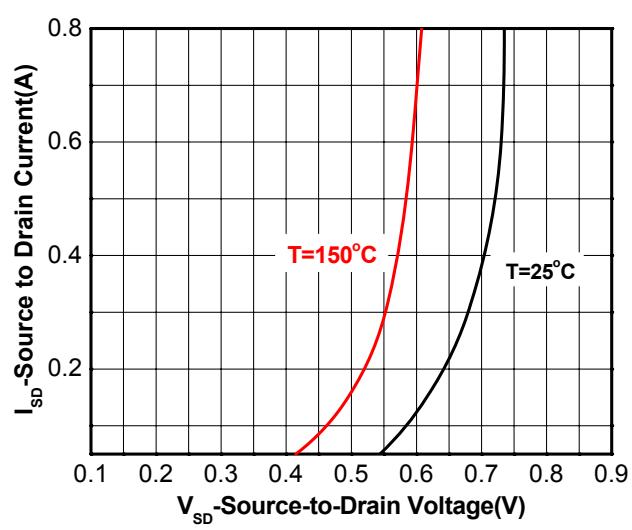
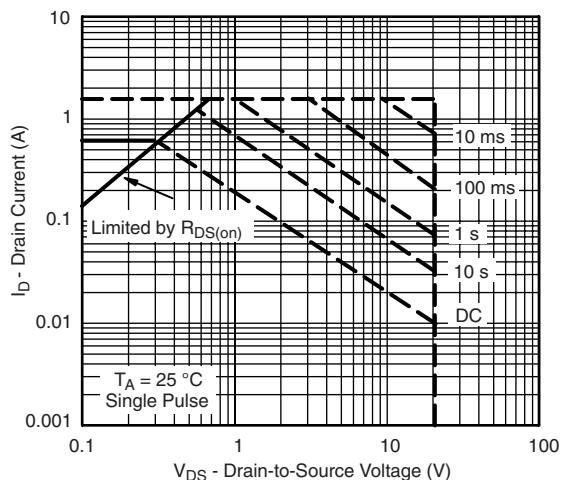
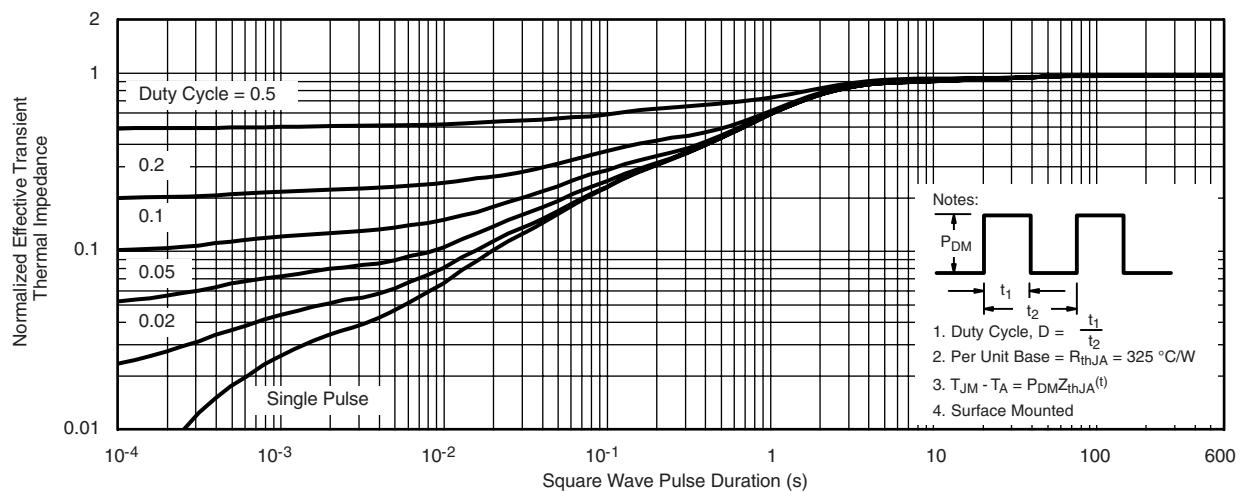
Parameter	Symbol	Typical	Maximum	Unit
Junction-to-Ambient Thermal Resistance <sup>a</sup>	t ≤ 10 s	R <sub>θJA</sub>	275	335
	Steady State		325	395
Junction-to-Ambient Thermal Resistance <sup>b</sup>	t ≤ 10 s	R <sub>θJA</sub>	375	430
	Steady State		445	535
Junction-to-Case Thermal Resistance	R <sub>θJC</sub>	260	300	°C/W

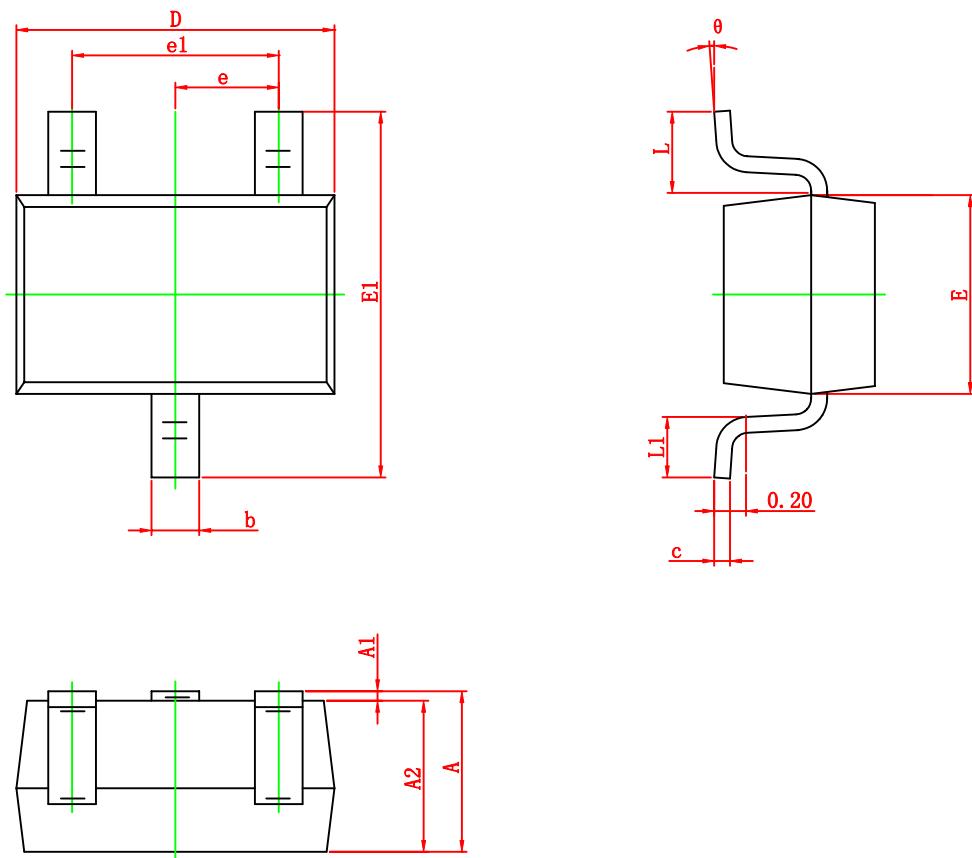
- a Surface mounted on FR4 Board using 1 square inch pad size, 1oz copper
- b Surface mounted on FR4 board using minimum pad size, 1oz copper
- c Repetitive rating, pulse width limited by junction temperature, t<sub>p</sub>=10μs, Duty Cycle=1%
- d Repetitive rating, pulse width limited by junction temperature T<sub>J</sub>=150°C.

**Electronics Characteristics (Ta=25°C, unless otherwise noted)**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0 \text{ V}, I_D = 250\mu\text{A}$	20			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 16 \text{ V}, V_{GS} = 0\text{V}$			100	nA
Gate-to-source Leakage Current	$I_{GSS}$	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 5\text{V}$			5	$\mu\text{A}$
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	0.45	0.58	0.85	V
Drain-to-source On-resistance	$R_{DS(on)}$	$V_{GS} = 4.5\text{V}, I_D = 0.55\text{A}$		220	260	$\text{m}\Omega$
		$V_{GS} = 2.5\text{V}, I_D = 0.45\text{A}$		260	310	
		$V_{GS} = 1.8\text{V}, I_D = 0.35\text{A}$		320	380	
Forward Transconductance	$g_{FS}$	$V_{DS} = 5 \text{ V}, I_D = 0.55\text{A}$		2.0		S
<b>CHARGES, CAPACITANCES AND GATE RESISTANCE</b>						
Input Capacitance	$C_{ISS}$	$V_{GS} = 0 \text{ V}, f = 1.0 \text{ MHz}, V_{DS} = 10 \text{ V}$		50		$\text{pF}$
Output Capacitance	$C_{OSS}$			13		
Reverse Transfer Capacitance	$C_{RSS}$			8		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5 \text{ V}, V_{DS} = 10 \text{ V}, I_D = 0.55\text{A}$		1.15		$\text{nC}$
Threshold Gate Charge	$Q_{G(TH)}$			0.06		
Gate-to-Source Charge	$Q_{GS}$			0.15		
Gate-to-Drain Charge	$Q_{GD}$			0.23		
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	$td(\text{ON})$	$V_{GS} = 4.5 \text{ V}, V_{DS} = 10\text{V}, R_L=3 \Omega, R_G=6 \Omega$		22		$\text{ns}$
Rise Time	$tr$			80		
Turn-Off Delay Time	$td(\text{OFF})$			700		
Fall Time	$tf$			380		
<b>BODY DIODE CHARACTERISTICS</b>						
Forward Voltage	$V_{SD}$	$V_{GS} = 0 \text{ V}, I_S = 0.35\text{A}$	0.5	0.7	1.1	V

**Typical Characteristics (Ta=25°C, unless otherwise noted)**

**Output characteristics**

**Transfer characteristics**

**On-Resistance vs. Drain current**

**On-Resistance vs. Junction temperature**
**On-Resistance vs. Gate-to-Source voltage**

**Threshold voltage vs. Temperature**


**Capacitance**

**Body diode forward voltage**

**Safe operating power**

**Transient thermal response (Junction-to-Ambient)**

**Package outline dimensions**
**SOT-323**


Symbol	Dimensions in millimeter		
	Min.	Typ.	Max.
A	0.900	1.000	1.100
A1	0.000	0.050	0.100
A2	0.900	0.950	1.000
b	0.200	0.300	0.400
c	0.080	0.115	0.150
D	2.000	2.100	2.200
E	1.150	1.250	1.350
E1	2.150	2.300	2.450
e	0.650TYP		
e1	1.200	1.300	1.400
L	0.525REF		
L1	0.260		0.460
θ	0°		8°