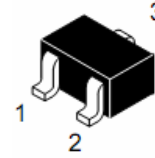
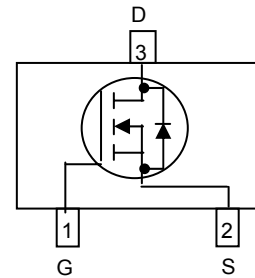
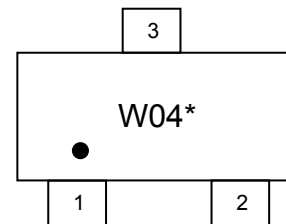


**WNM2023**
**Single N-Channel, 20V, 3.2A, Power MOSFET**
[Http://www.willsemi.com](http://www.willsemi.com)

V <sub>DS</sub> (V)	R <sub>ds(on)</sub> (Ω)	I <sub>D</sub> (A)
20	0.038@ V <sub>GS</sub> =4.5V	3.6
	0.044@ V <sub>GS</sub> =2.5V	3.1
	0.052@ V <sub>GS</sub> =1.8V	1.5


**SOT-23-3L**
**Descriptions**

The WNM2023 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, power switch and charging circuit. Standard Product WNM2023 is Pb-free.


**Pin configuration (Top view)**


W04= Device Code

\* = Month (A~Z)

**Marking**
**Features**

- Trench Technology
- Supper high density cell design
- Excellent ON resistance for higher DC current
- Extremely Low Threshold Voltage
- Small package SOT-23-3L

**Applications**

- Driver for Relay, Solenoid, Motor, LED etc.
- DC-DC converter circuit
- Power Switch
- Load Switch
- Charging

**Order information**

Device	Package	Shipping
WNM2023-3/TR	SOT-23-3L	3000/Reel&Tape

**Absolute Maximum ratings**

Parameter		Symbol	10 S	Steady State	Unit
Drain-Source Voltage		$V_{DS}$	20		V
Gate-Source Voltage		$V_{GS}$	$\pm 8$		
Continuous Drain Current <sup>a</sup>	$T_A=25^\circ\text{C}$	$I_D$	3.2	2.9	A
	$T_A=70^\circ\text{C}$		2.5	2.3	
Maximum Power Dissipation <sup>a</sup>	$T_A=25^\circ\text{C}$	$P_D$	0.8	0.7	W
	$T_A=70^\circ\text{C}$		0.5	0.4	
Continuous Drain Current <sup>b</sup>	$T_A=25^\circ\text{C}$	$I_D$	2.9	2.7	A
	$T_A=70^\circ\text{C}$		2.3	2.1	
Maximum Power Dissipation <sup>b</sup>	$T_A=25^\circ\text{C}$	$P_D$	0.6	0.5	W
	$T_A=70^\circ\text{C}$		0.4	0.3	
Pulsed Drain Current <sup>c</sup>		$I_{DM}$	10		A
Operating Junction Temperature		$T_J$	150		$^\circ\text{C}$
Lead Temperature		$T_L$	260		$^\circ\text{C}$
Storage Temperature Range		$T_{stg}$	-55 to 150		$^\circ\text{C}$

**Thermal resistance ratings**

Parameter		Symbol	Typical	Maximum	Unit
Junction-to-Ambient Thermal Resistance <sup>a</sup>	$t \leq 10 \text{ s}$	$R_{\theta JA}$	125	150	$^\circ\text{C/W}$
	Steady State		140	175	
Junction-to-Ambient Thermal Resistance <sup>b</sup>	$t \leq 10 \text{ s}$	$R_{\theta JA}$	150	180	
	Steady State		165	210	
Junction-to-Case Thermal Resistance		$R_{\theta JC}$	60	75	

a Surface mounted on FR4 Board using 1 square inch pad size, 1oz copper

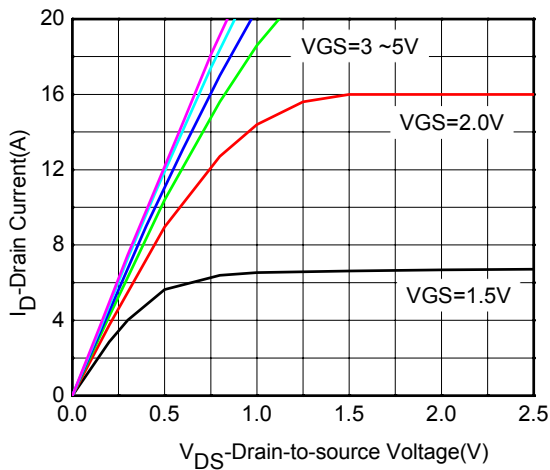
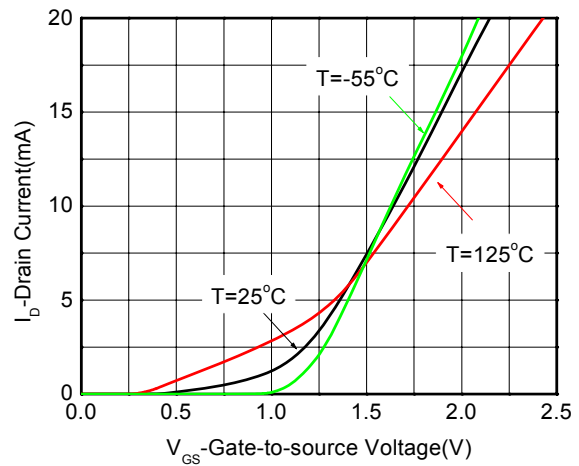
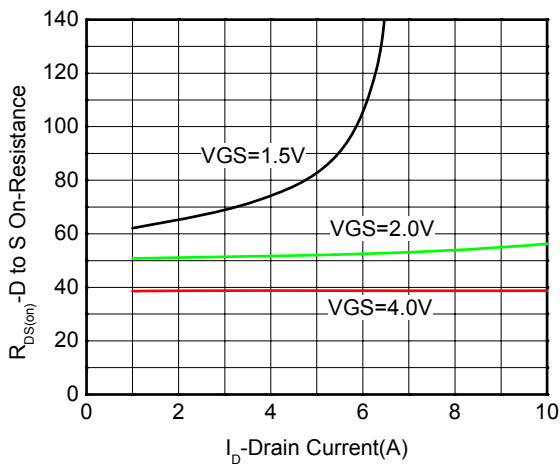
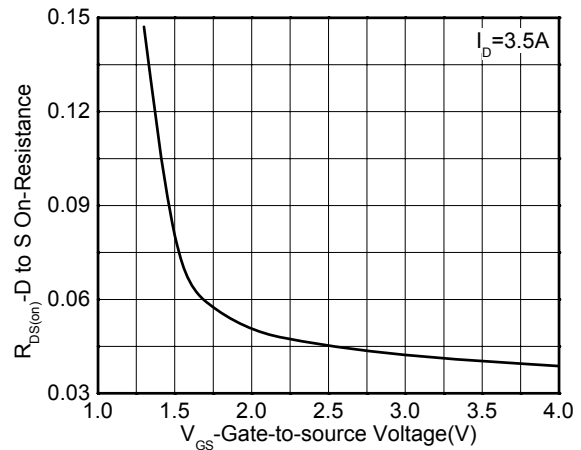
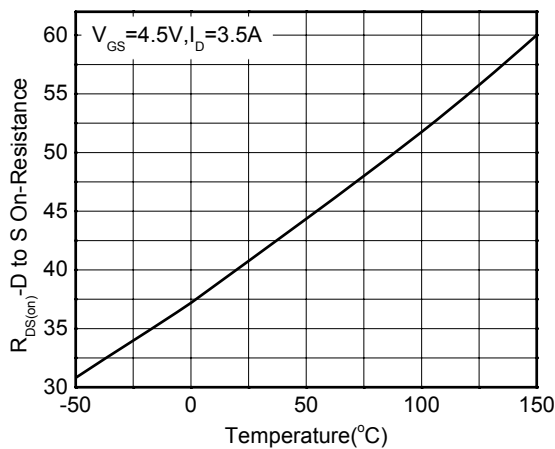
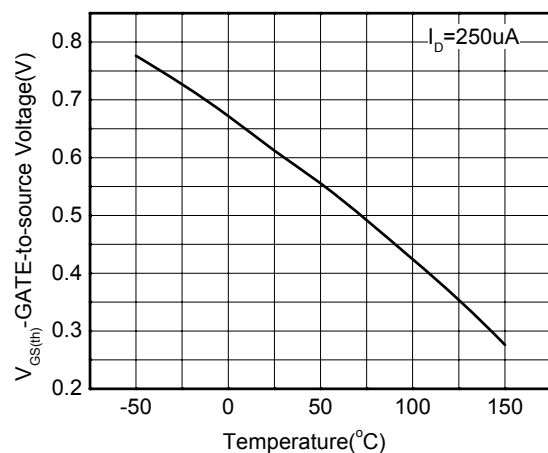
b Surface mounted on FR4 board using minimum pad size, 1oz copper

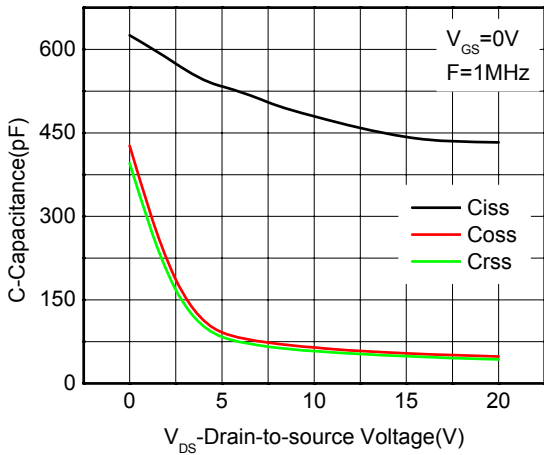
c Repetitive rating, pulse width limited by junction temperature,  $t_p=10\mu\text{s}$ , Duty Cycle=1%

d Repetitive rating, pulse width limited by junction temperature  $T_J=150^\circ\text{C}$ .

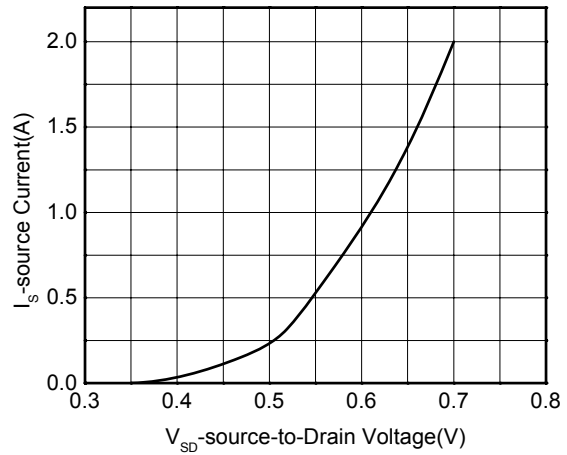
**Electronics Characteristics (Ta=25°C, unless otherwise noted)**

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	$I_{DSS}$	$V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}$			0.5	$\mu\text{A}$
Gate-to-source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$			$\pm 100$	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	0.45	0.6	1	V
Drain-to-source On-resistance	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 3.6\text{ A}$		38	45	m $\Omega$
		$V_{GS} = -2.5\text{ V}, I_D = 3.1\text{ A}$		44	55	
		$V_{GS} = 1.8\text{ V}, I_D = 1.5\text{ A}$		52	66	
Forward Transconductance	$g_{FS}$	$V_{DS} = 5\text{ V}, I_D = 3.1\text{ A}$		11		S
<b>CHARGES, CAPACITANCES AND GATE RESISTANCE</b>						
Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 10\text{ V}$		500	700	pF
Output Capacitance	$C_{OSS}$			68	150	
Reverse Transfer Capacitance	$C_{RSS}$			60	90	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -10\text{ V}, I_D = 2.7\text{ A}$		6.5		nC
Threshold Gate Charge	$Q_{G(TH)}$			0.5		
Gate-to-Source Charge	$Q_{GS}$			0.8		
Gate-to-Drain Charge	$Q_{GD}$			1.5		
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	$t_d(ON)$	$V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}, R_L = 3\ \Omega, R_G = 6\ \Omega$		5	8	ns
Rise Time	$t_r$			6	9	
Turn-Off Delay Time	$t_d(OFF)$			30	45	
Fall Time	$t_f$			8	12	
<b>BODY DIODE CHARACTERISTICS</b>						
Forward Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 1.0\text{ A}$	0.5	0.62	0.9	V

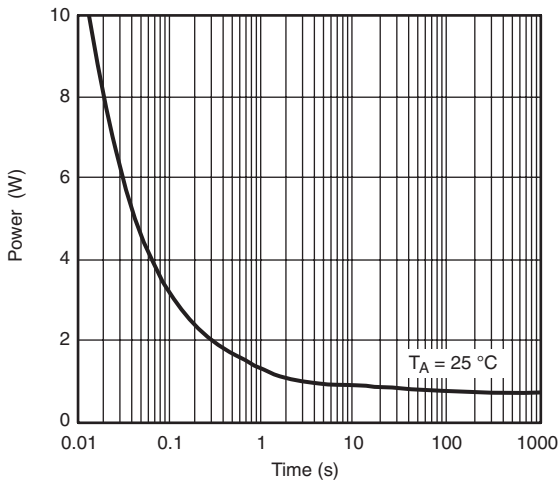
**Typical Characteristics (Ta=25°C, unless otherwise noted)**

**Output characteristics**

**Transfer characteristics**

**On-Resistance vs. Drain current**

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

**On-Resistance vs. Junction temperature**

**Threshold voltage vs. Temperature**



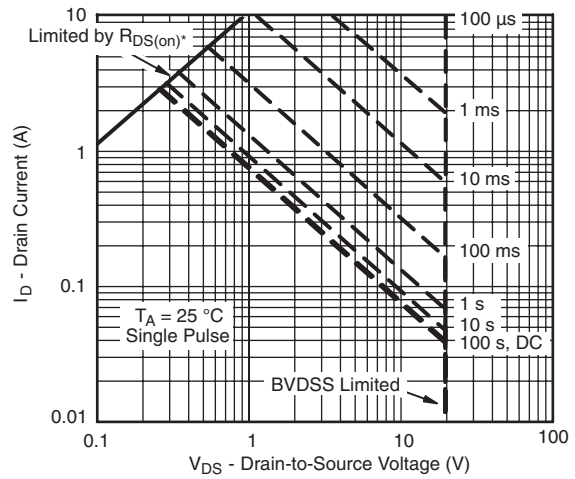
Capacitance



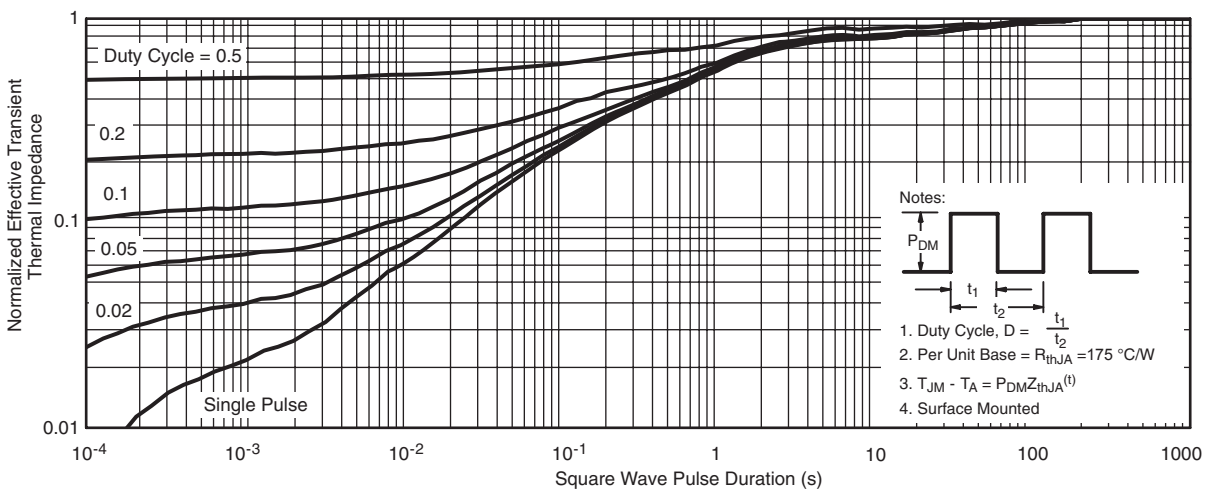
Body diode forward voltage



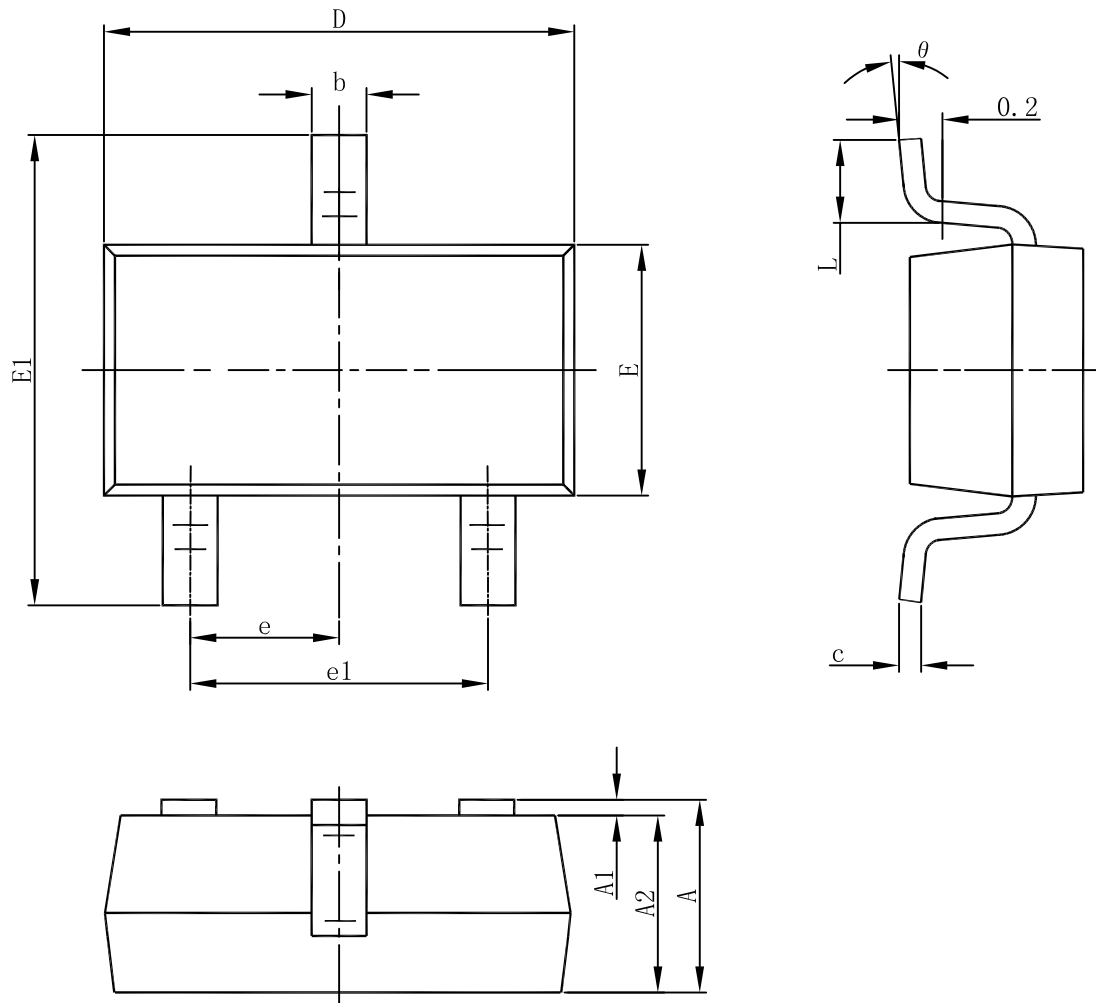
Single pulse power



Safe operating area



Transient thermal response (Junction-to-Ambient)

**Package outline dimensions**
**SOT-23-3L**


Symbol	Dimensions in millimeter		
	Min.	Typ.	Max.
A	1.050	1.150	1.250
A1	0.000	0.050	0.100
A2	1.050	1.100	1.150
b	0.300	0.400	0.500
c	0.100	0.150	0.200
D	2.820	2.920	3.020
E	1.500	1.600	1.700
E1	2.650	2.800	2.950
e	0.950(BSC)		
e1	1.800	1.900	2.000
L	0.300		0.600
$\theta$	0°		8°