

WPM2301

Single P-Channel, -20V, -2.7A, Power Mosfet

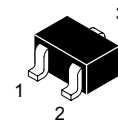
<http://www.willsemi.com>

Description

The WPM2301 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use in DC-DC conversion applications. Standard Product WPM2301 is Pb-free.

Features

$V_{(BR)DSS}$	$R_{DS(on)}$ Typ
-20 V	90 m Ω @ -4.5 V
	120 m Ω @ -2.5 V

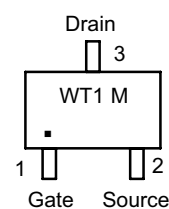
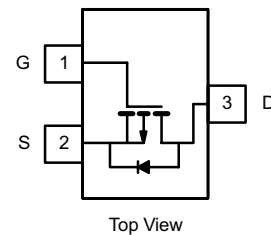


SOT 23

Application

- Li-Ion Battery Charging
- High Side DC-DC Conversion Circuits
- High Side Drive for Small Brushless DC Motors
- Power Management in Portable, Battery Powered Products

P-Channel MOSFET



WT1 = Specific Device Code
M = Date Code

Absolute Maximum Ratings (TA=25°C unless otherwise specified)

Parameter	Symbol	10 S	Steady State	Unit	
Drain-Source Voltage	V_{DS}	-20		V	
Gate-Source Voltage	V_{GS}	± 8			
Continuous Drain Current ^a	I_D	$T_A=25^\circ\text{C}$	-2.7	-2.5	A
		$T_A=70^\circ\text{C}$	-2.2	-1.9	
Maximum Power Dissipation ^a	P_D	$T_A=25^\circ\text{C}$	1.4	1.25	W
		$T_A=70^\circ\text{C}$	1.0	0.8	
Continuous Drain Current ^b	I_D	$T_A=25^\circ\text{C}$	-2.4	-2.2	A
		$T_A=70^\circ\text{C}$	-1.9	-1.7	
Maximum Power Dissipation ^b	P_D	$T_A=25^\circ\text{C}$	1.2	1.0	W
		$T_A=70^\circ\text{C}$	0.8	0.6	
Pulsed Drain Current ^c	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		$^\circ\text{C}$	

Order information

Part Number	Package	Shipping
WPM2301-3/TR	SOT23	3000Tape&Reel

Thermal resistance ratings

Single Operation					
Parameter		Symbol	Typical	Maximum	Unit
Junction-to-Ambient Thermal Resistance ^a	t ≤ 10 s	R _{θJA}	80	100	°C/W
	Steady State		105	125	
Junction-to-Ambient Thermal Resistance ^b	t ≤ 10 s	R _{θJA}	110	130	
	Steady State		120	155	
Junction-to-Case Thermal Resistance	Steady State	R _{θJC}	36	56	
Dual Operation					
Junction-to-Ambient Thermal Resistance ^a	t ≤ 10 s	R _{θJA}	85	105	°C/W
	Steady State		110	130	
Junction-to-Ambient Thermal Resistance ^b	t ≤ 10 s	R _{θJA}	115	135	
	Steady State		125	160	
Junction-to-Case Thermal Resistance	Steady State	R _{θJC}	38	59	

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=10μs, Duty Cycle=1%

d Repetitive rating, pulse width limited by junction temperature T_J=150°C.

Electrical Characteristics

OFF

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Units
BV _{DSS}	Drain-Source Voltage	I _D =-250μA, V _{GS} =0V	-20			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = -16V, V _{GS} =0V	T _C =25°C		-1	μA
			T _C =55°C		-5	μA
I _{GSS}	Gate-body Leakage Current	V _{DS} =0V, V _{GS} =±8V			±100	nA

ON

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Units
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =-250 μ A	-0.4	-0.6	-0.8	V
R _{DS(ON)}	Static Drain-Source On resistance	V _{GS} = -4.5V, I _D = -2.2A		90	110	mΩ
		V _{GS} = -2.5V, I _D = -1.7A		120	150	mΩ

Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Units
g_{FS}	Transconductance	$V_{DS} = -10V, I_D = -1.7A$	4	6		S
C_{iss}	Input Capacitance	$V_{DS} = -10V, V_{GS} = 0V, f = 1MHz$		200	300	pF
C_{oss}	Output Capacitance			90	140	pF
C_{rss}	Reverse Transfer Capacitance			40	60	pF
R_g	Gate Resistance	$V_{DS} = 0V, V_{GS} = 0V, f = 1MHz$		12		Ω

Switching

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Units
Q_g	Total Gate Charge	$V_{GS} = -4.5V, I_D = -2.2A, V_{DS} = -10V$		4		nC
Q_{gs}	Gate Source Charge			0.5		nC
Q_{gd}	Gate Drain Charge			1		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS} = -4.5V, V_{DD} = -16V, I_D = -2.2A, R_{GEN} = 2.5\Omega$		8		ns
t_r	Turn-On Rise Time			15		ns
$t_{D(off)}$	Turn-Off Delay Time			35		ns
t_f	Turn-Off Fall Time			25		ns

Source Drain Diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Units
V_{SD}	Diode Forward Voltage	$I_S = -1A, V_{GS} = 0V$		-0.79	-1.5	V
I_S	Maximum Body-diode Continuous Current				-2	A
t_{rr}	Body-diode Reverse Recovery Time	$I_S = -2.1A, di/dt = 100A/\mu s$		30		ns
Q_{rr}	Body-diode Reverse Recovery Charge			12		nC

Typical Performance Characteristics

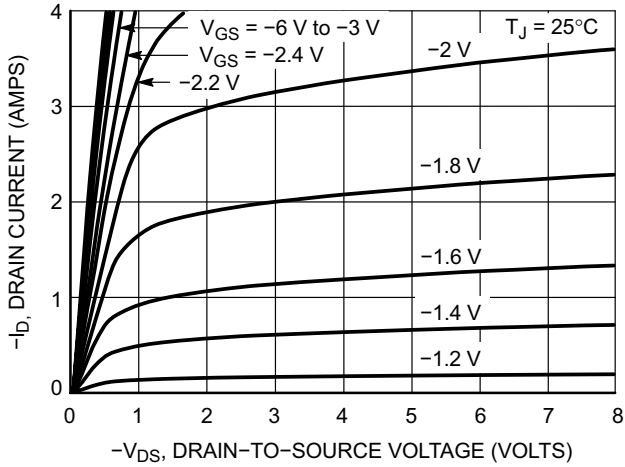


Figure 1. On-Region Characteristics

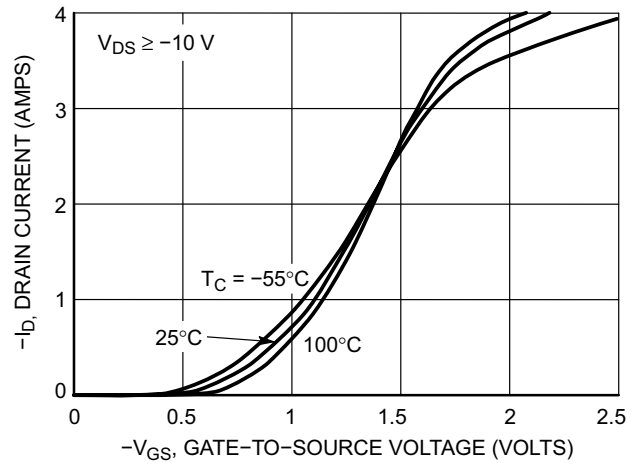


Figure 2. Transfer Characteristics

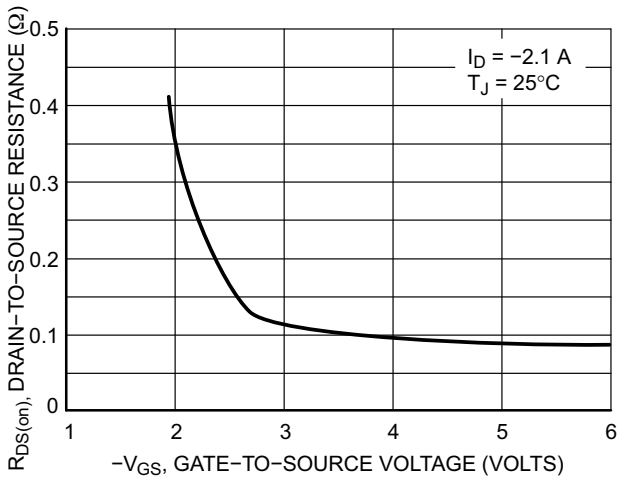


Figure 3. On-Resistance vs. Gate-to-Source Voltage

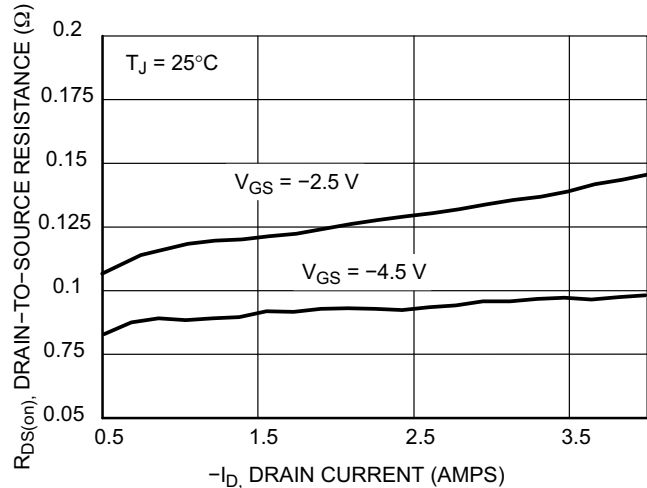


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

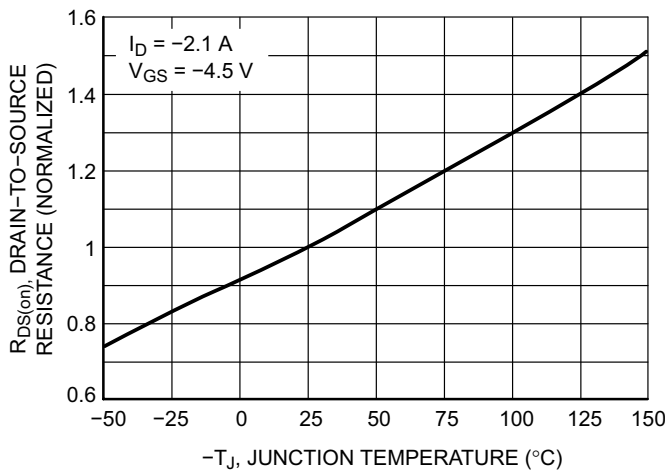


Figure 5. On-Resistance Variation with Temperature

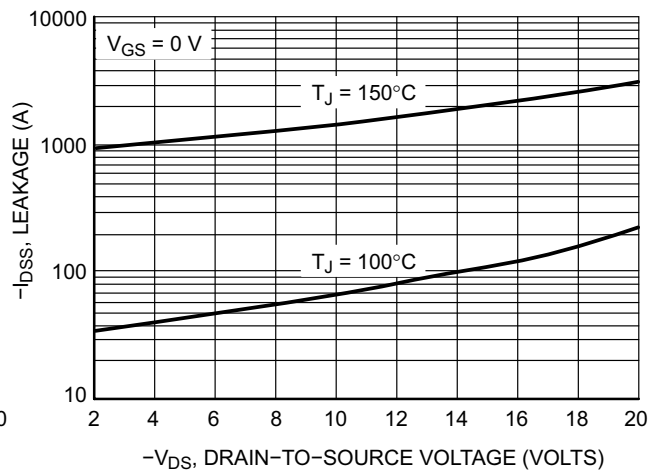


Figure 6. Drain-to-Source Leakage Current vs. Voltage

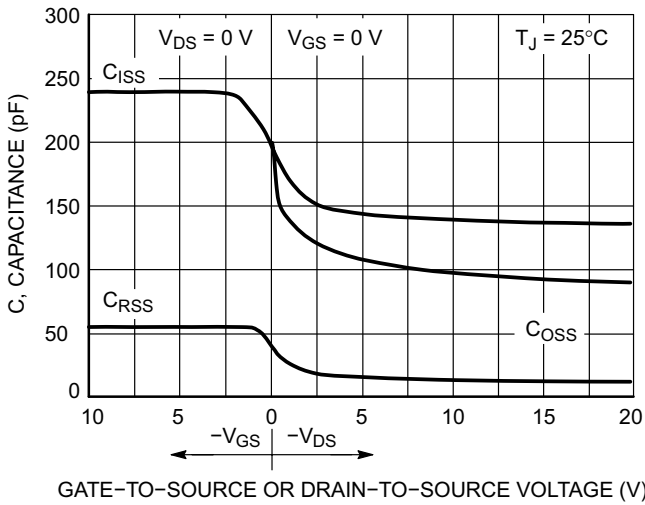


Figure 7. Capacitance Variation

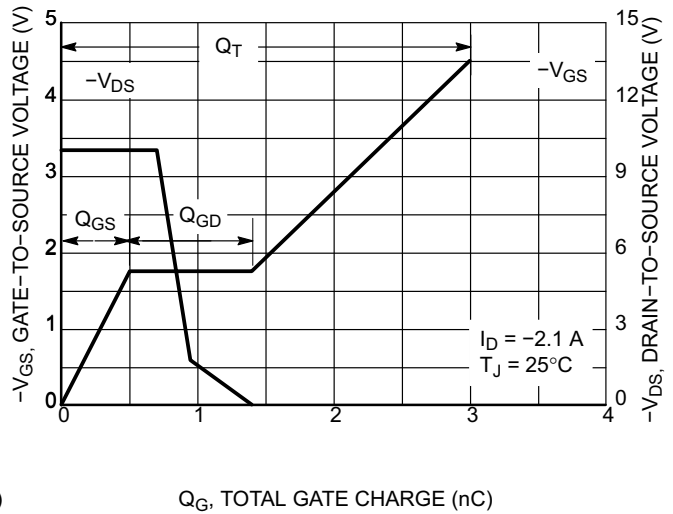


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

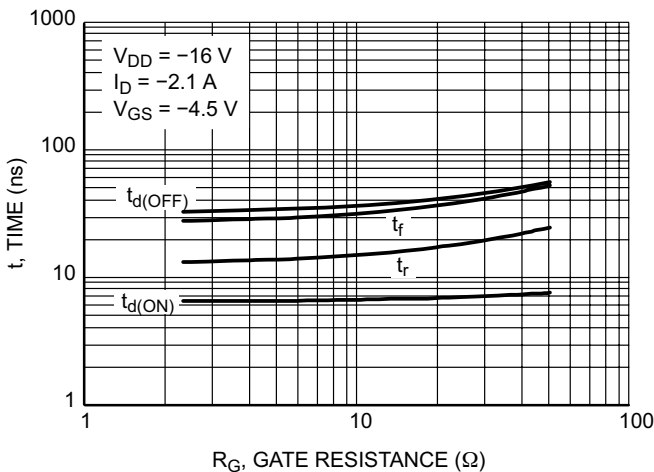


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

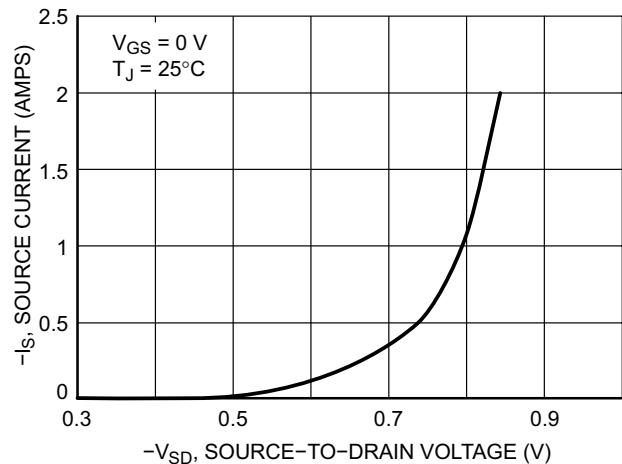


Figure 10. Diode Forward Voltage vs. Current

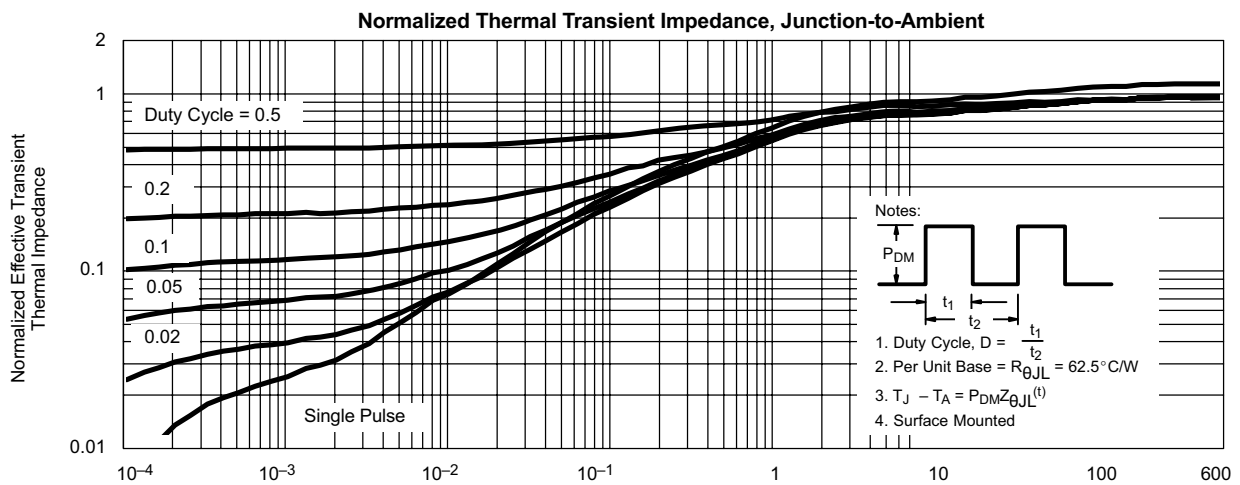
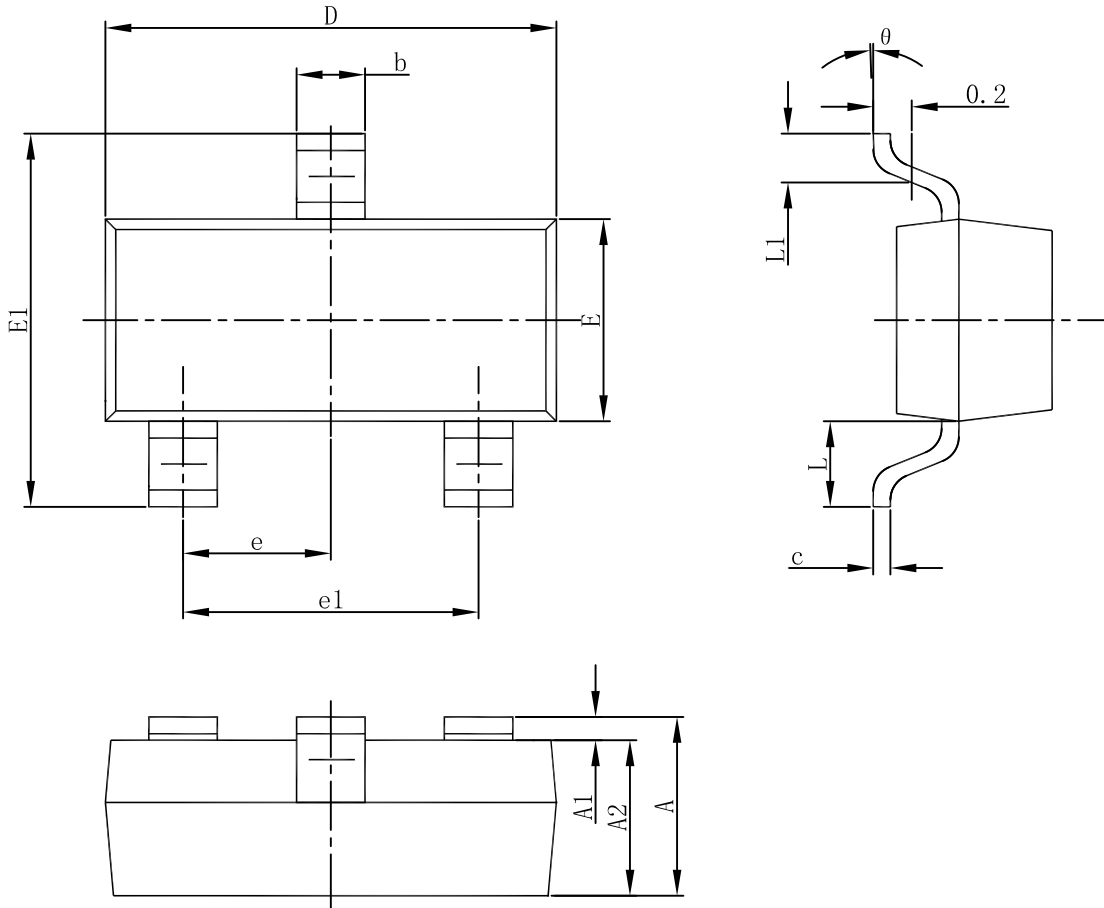


Figure 11. Thermal Response

Packaging Information

SOT23 Package Outline Dimension



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.200	0.035	0.047
A1	0.000	0.100	0.000	0.004
A2	0.900	1.100	0.035	0.043
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

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