

# WPM3407

## Single P-Channel, -30 V, -4.4A, Power MOSFET

### Description

The WPM3407 uses advanced trench technology to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use in DC-DC conversion applications. Standard Product WPM3407 is Pb-free.

### Features

$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	$I_D$ Max
-30 V	36 m $\Omega$ @ -10 V	-4.4A
	53 m $\Omega$ @ -4.5 V	

### Application

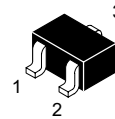
- Power Management in Note book
- Portable Equipment
- Battery Powered System
- DC/DC Converter
- Load Switch

ABSOLUTE MAXIMUM RATINGS $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted					
Parameter	Symbol	10 S	Steady State	Unit	
Drain-Source Voltage	$V_{DS}$		-30	V	
Gate-Source Voltage	$V_{GS}$		$\pm 20$		
Continuous Drain Current ( $T_J = 150\text{ }^\circ\text{C}$ ) <sup>a</sup>	$T_A = 25\text{ }^\circ\text{C}$	$I_D$	-4.4	-3.7	A
	$T_A = 70\text{ }^\circ\text{C}$		-3.5	-2.9	
Pulsed Drain Current	$I_{DM}$		-20		
Maximum Power Dissipation <sup>a</sup>	$T_A = 25\text{ }^\circ\text{C}$	$P_D$	1.4	1.0	W
	$T_A = 70\text{ }^\circ\text{C}$		0.9	0.6	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$		-55 to 150	$^\circ\text{C}$	

### Order information

Part Number	Package	Shipping
WPM3407-3/TR	SOT23-3	3000Tape&Reel

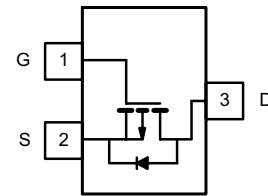
<http://www.willsemi.com>



SOT 23-3

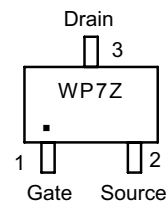
pin connections :

P-Channel



Top View

Marking:



W P7= Specific Device Code  
Z = Date Code

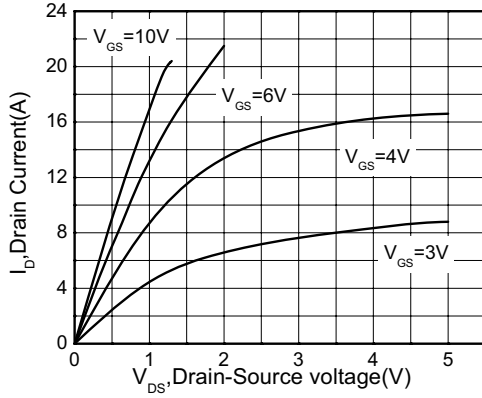
THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Junction-to-Ambient Thermal Resistance <sup>a</sup>	t ≤ 10 s	R <sub>θJA</sub>	70	90	°C/W
	Steady State		90	125	
Junction-to-Case Thermal Resistance	Steady State	R <sub>θJC</sub>	50	80	

a. Surface Mounted on FR4 Board using 1 in sq pad size, 1oz Cu.

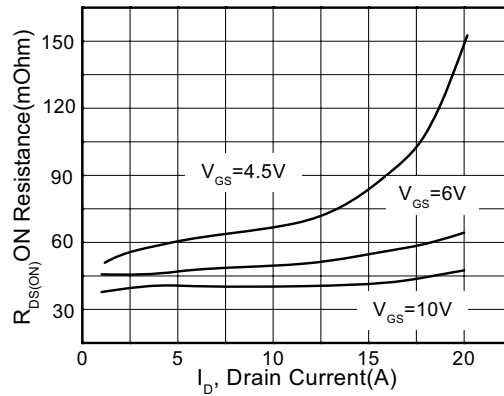
## Electrical Characteristics (T<sub>J</sub> = 25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static Parameters</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA	-30			V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -30 V, V <sub>GS</sub> = 0 V	T <sub>J</sub> = 25°C		-1	μA
			T <sub>J</sub> = 85°C		-10	
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V			±100	nA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = -250 μA	-1.0	-2.0	-3.0	V
Drain-source On-Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = -10V, I <sub>D</sub> = -4.4A	29	36	43	mΩ
		V <sub>GS</sub> = -4.5, I <sub>D</sub> = -3A	42	53	63	
Forward Recovery Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = -1.0 A	-0.5	-0.79	-1	V
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = -5.0 V, I <sub>D</sub> = -5 A	5	8		S
<b>Dynamic</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = -15 V	700	950	1200	pF
Output Capacitance	C <sub>oss</sub>		90	120	150	
Reverse Transfer Capacitance	C <sub>rss</sub>		75	100	125	
Total Gate Charge	Q <sub>g(tot)</sub>	V <sub>GS</sub> = -10 V, V <sub>DS</sub> = -15 V, I <sub>D</sub> = -5 A	13	18	23	nC
Threshold Gate Charge	Q <sub>g(th)</sub>		1.5	2	2.5	
Gate- Source Charge	Q <sub>gs</sub>		2	2.5	3	
Gate- Drain Charge	Q <sub>gd</sub>		3	3.8	4.5	
Gate Resistance	R <sub>g</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 0 V, f = 1.0 MHz		5	8	Ω
<b>Switching Parameters</b>						
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = -10 V, V <sub>DS</sub> = -15 V, I <sub>D</sub> = -4.3A, R <sub>G</sub> = 6 Ω	8	11	15	ns
Rise Time	t <sub>r</sub>		4	6	9	
Turn-Off Delay Time	t <sub>d(off)</sub>		30	40	50	
Fall Time	t <sub>f</sub>		5	7.5	10	
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = -5A, dI/dt = 100A/μs		25		ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	I <sub>F</sub> = -5A, dI/dt = 100A/μs		14		nC

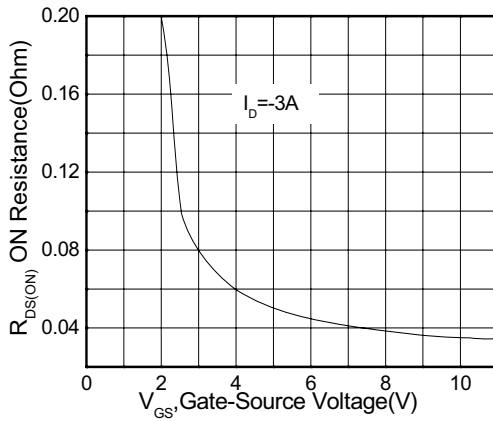
## Typical Performance Characteristics



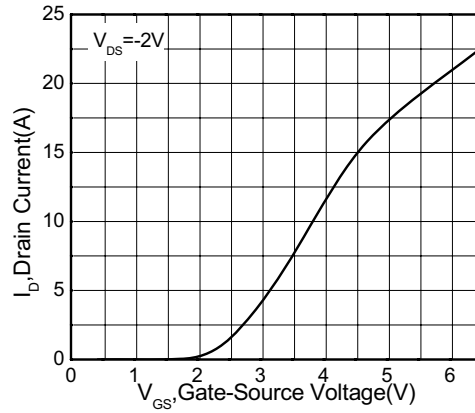
Drain Current VS Drain-Source voltage



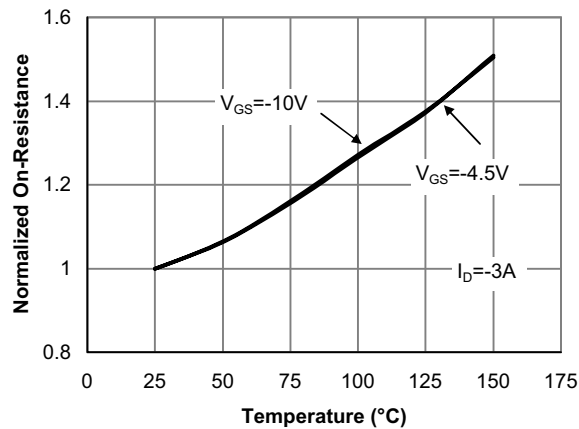
Drain Current vs ON Resistance



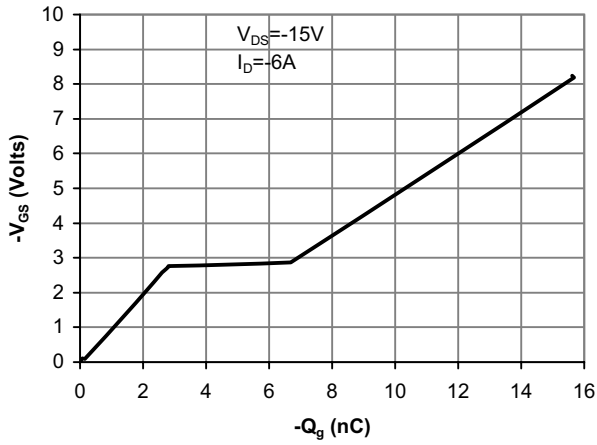
Gate-Source Voltage vs ON Resistance



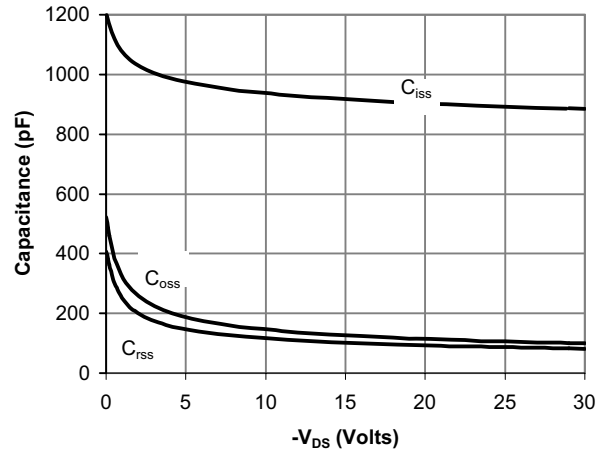
Drain Current VS Gate-Source Voltage



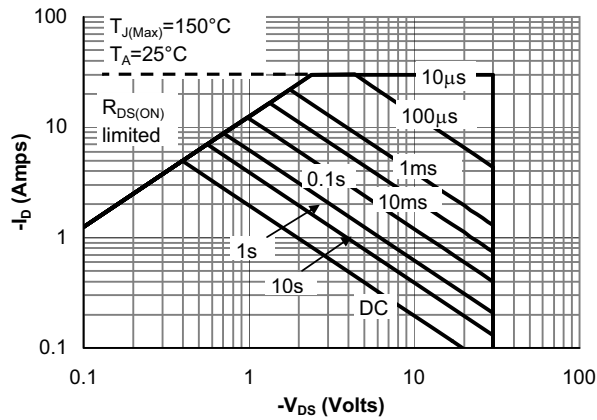
On-Resistance vs. Junction



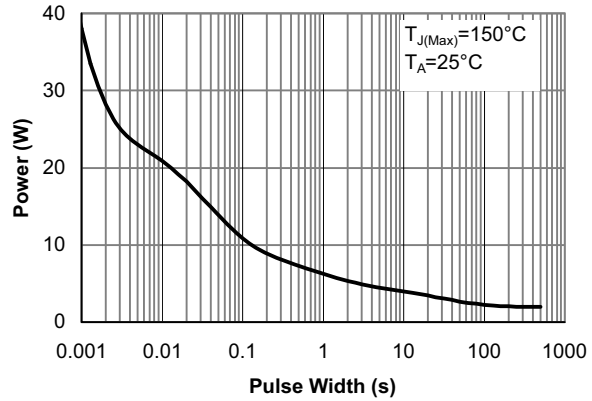
Gate-Charge Characteristics



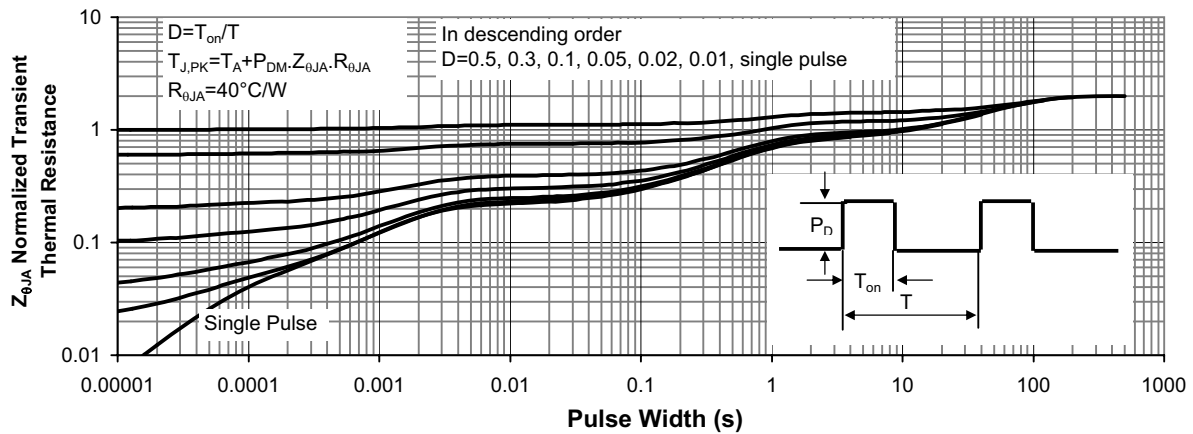
Capacitance Characteristics



Maximum Forward Biased Safe Operating Area (Note E)



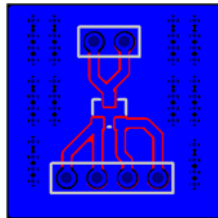
Single Pulse Power Rating Junction-to-Ambient (Note E)



Normalized Maximum Transient Thermal Impedance

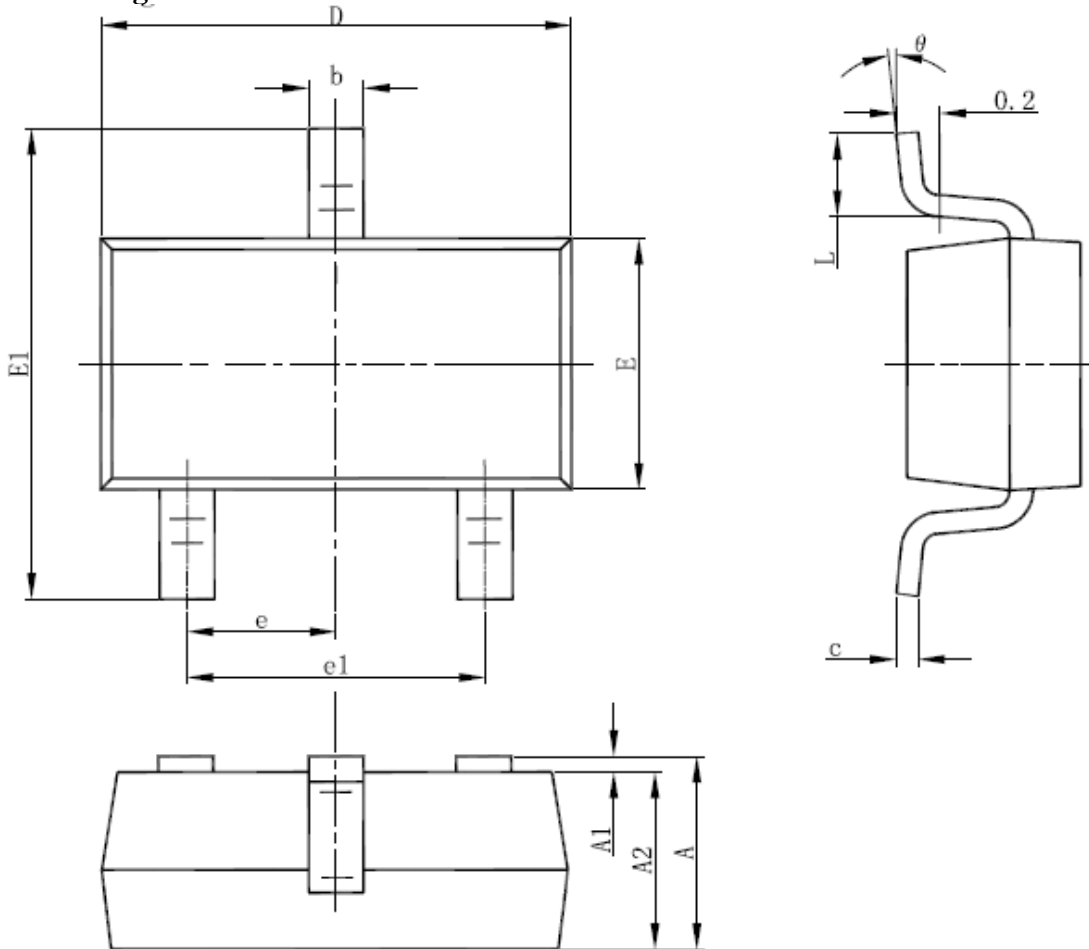
## Power Dissipation Characteristics

1. The package of WPM3407 is SOT23-3, surface mounted on FR4 Board using 1 in sq pad size, 1 oz Cu,  $R_{\theta JA}$  is 125 °C/W.
2. The power dissipation  $P_D$  is based on  $T_{J(MAX)}=150^{\circ}C$ , and the relation between  $T_J$  and  $P_D$  is  $T_J = T_a + R_{\theta JA} * P_D$ , the maximum power dissipation is determined by  $R_{\theta JA}$ .
3. The  $R_{\theta JA}$  is the thermal impedance from junction to ambient, using larger PCB pad size can get smaller  $R_{\theta JA}$  and result in larger maximum power dissipation.



125 °C/W when mounted on  
a 1 in<sup>2</sup> pad of 1 oz copper.

**Packaging Information**  
**SOT-23-3 Package Outline Dimension**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°