

WPM2009D

-20V, -4A, 42mΩ, 2.0W, DFN3x3, P-MOSFET

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

Descriptions

This single P-Channel MOSFET is produced using trench process that provides minimum on resistance performance. WPM2009D is enhancement power MOSFET with 2.0W power dissipation mounting 1 in² pad in a DFN3x3 package. This device is suited for high power charging circuit of mobile phone application. It also can be used in a high power switching application.

Features

- Max Rds(on) 42mΩ @ Vgs=-4.5V
- Max Vds -20V
- Max Current -4.0A
- Typical Vgs(th) -0.65V @ Id=-250uA
- Power Dissipation 2.0W (Note2)
- High performance Trench process
- DFN3x3-8L Package
- Pb-Free

Applications

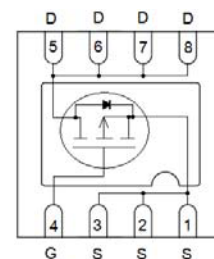
- Battery charging
- Load Switch
- Power Switch
- DC-DC converter

Bottom



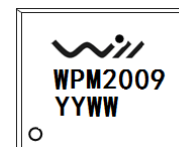
DFN3x3-8L

Bottom



Pin Connection

Top



WPM2009 = Part Number
 YY = Year
 WW = Week

Marking

Order Information

| Device | Package | Shipping |
|---------------|-----------|----------------|
| WPM2009D-8/TR | DFN3x3-8L | 3000/Tape&Reel |

Maximum Ratings

($T_A=25^{\circ}\text{C}$ unless otherwise noted)

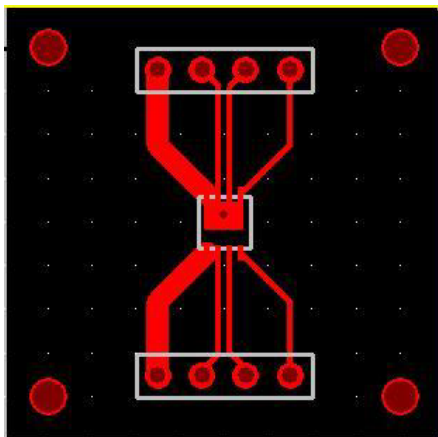
| Symbol | Parameter | Ratings | Unit |
|----------|--|----------|--------------------|
| V_{DS} | Drain-to-Source Voltage | -20 | V |
| V_{GS} | Gate-to-Source Voltage | ± 12 | V |
| I_D | Drain Current – Continue Note1 | -4.0 | A |
| | Drain Current – Continue (t<5s) Note1 | -4.9 | A |
| | Drain Current – Continue Note2 | -6.5 | A |
| | Drain Current – Pulsed (t<300us, Duty<2%) Note2 | -24 | A |
| P_D | Power Dissipation – Note1 | 1.0 | W |
| | Power Dissipation – (t<5s) Note1 | 1.5 | W |
| | Power Dissipation – Note2 | 2.0 | W |
| T_J | Operation junction temperature range | 150 | $^{\circ}\text{C}$ |
| T_{SG} | Storage temperature range | -55~150 | $^{\circ}\text{C}$ |

Thermal Resistance Ratings

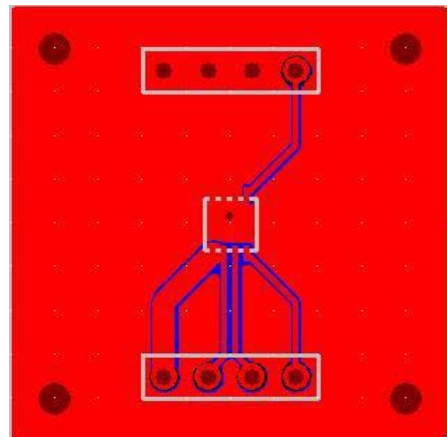
| Symbol | Parameter | Max. | Unit |
|-----------------|--|------|-----------------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient – Note1 | 125 | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient – Note2 | 62 | $^{\circ}\text{C}/\text{W}$ |

Note1: Surface mounted on a 2 oz copper, recommend minimum pad, FR-4 board.

Note2: Surface mounted on a 2 oz copper, 1 in² pad with dual side, FR-4 board.



Note1

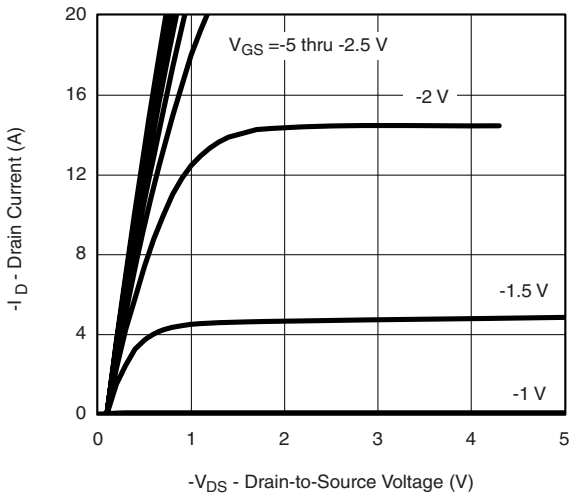
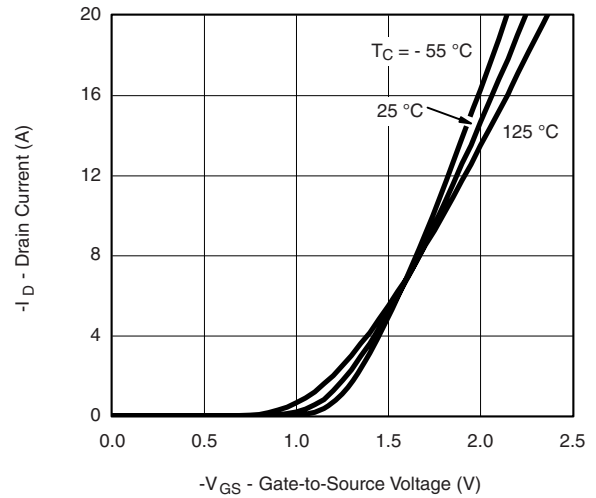
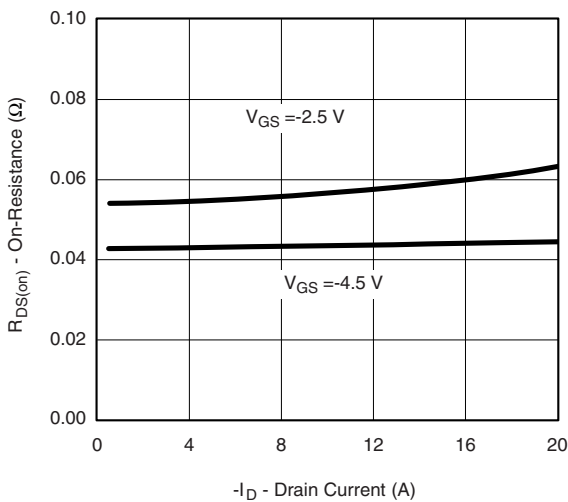
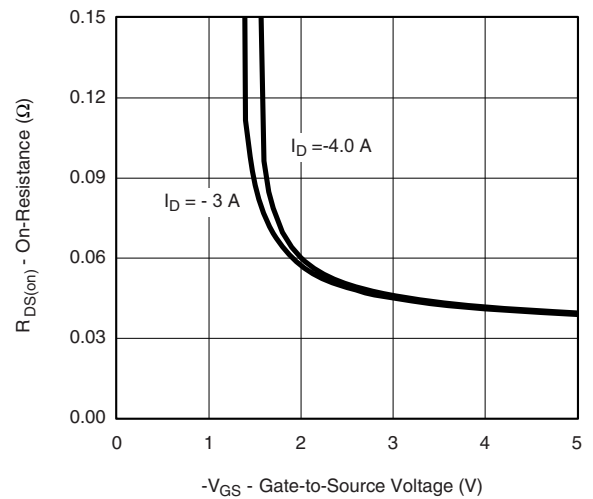
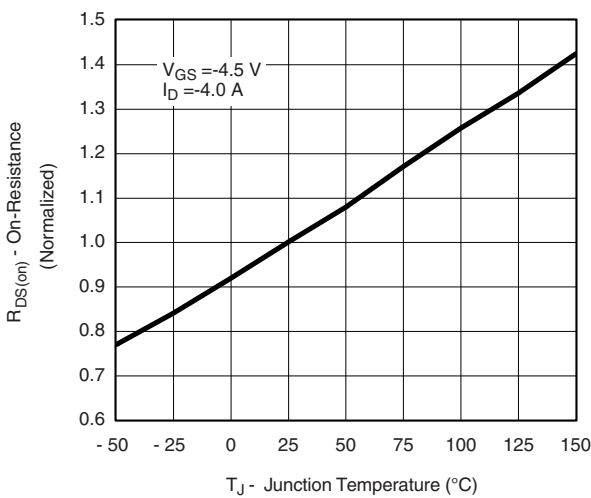
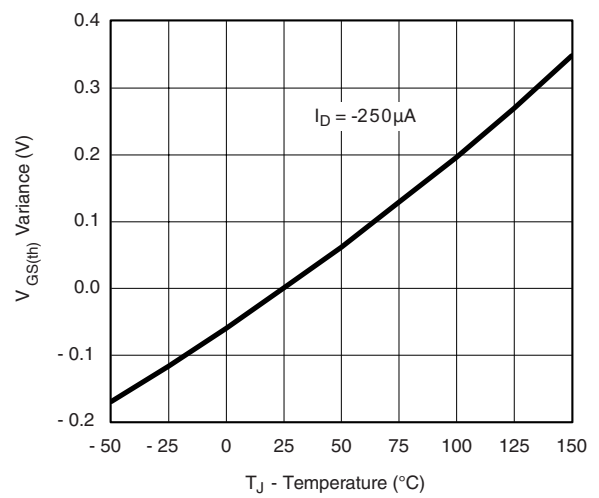


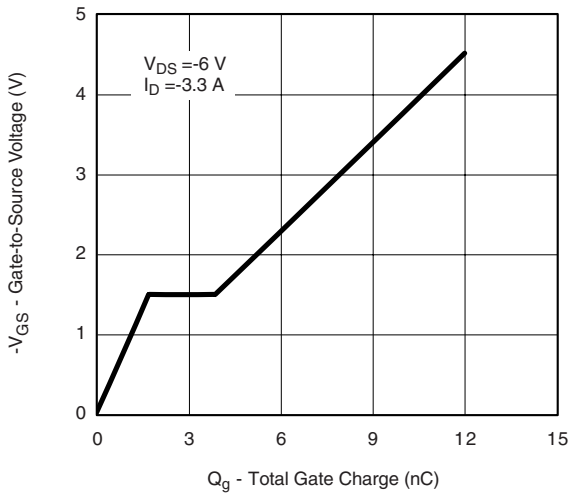
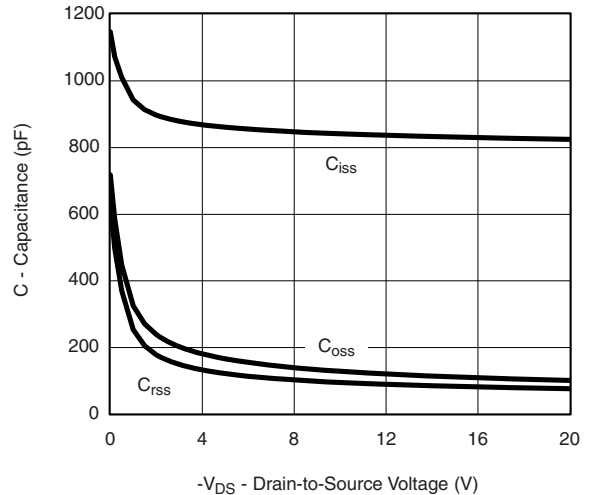
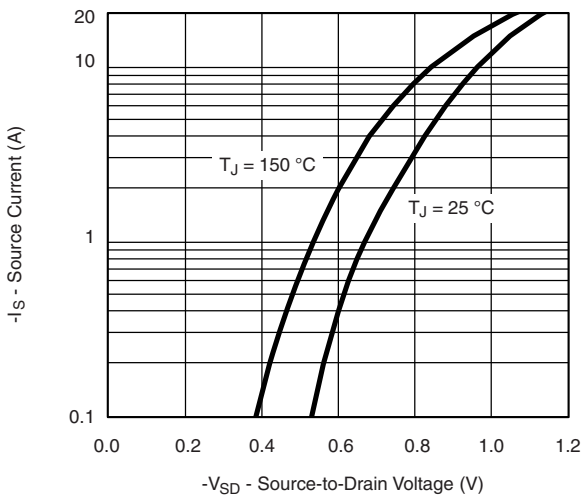
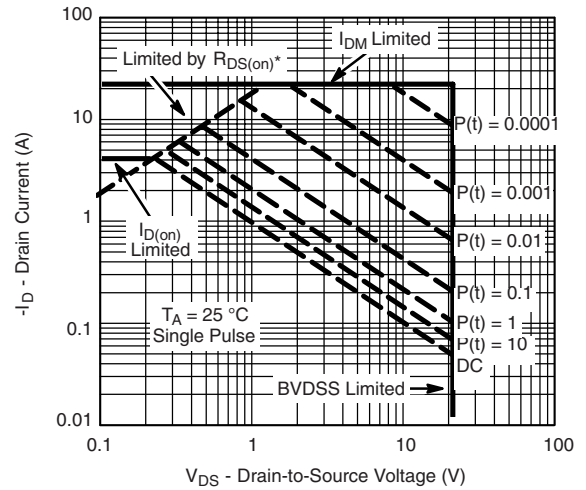
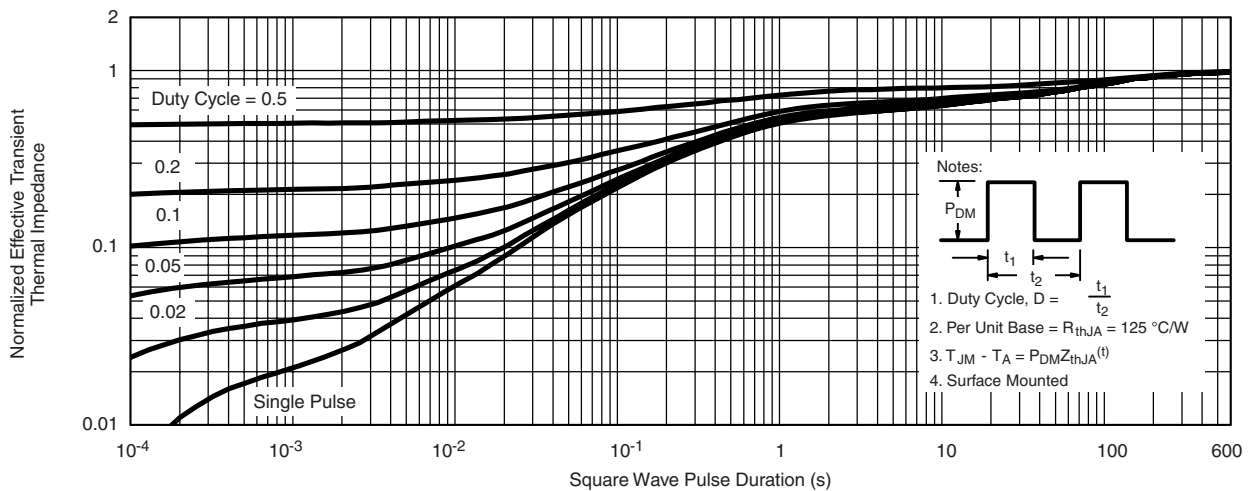
Note2

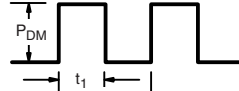
Electronics Characteristics

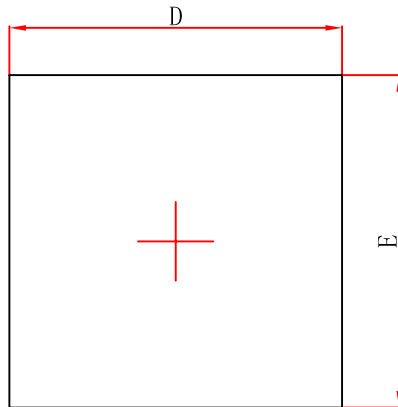
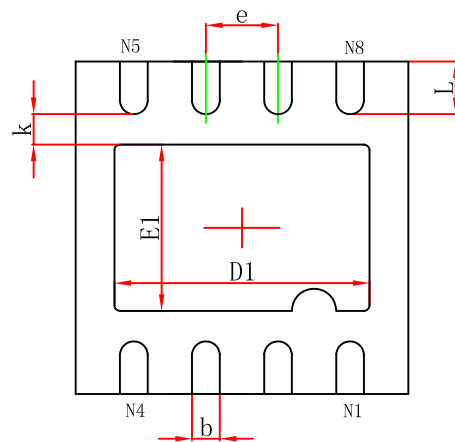
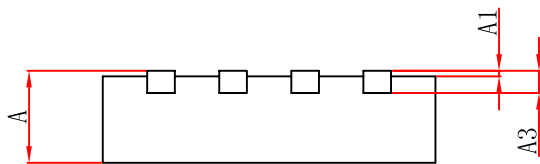
 (T_A = 25 °C, unless otherwise noted)

| Symbol | Parameter | Test Condition | Min | Typ. | Max | Unit |
|--|---------------------------------|---|-------|-------|-------|------|
| Off Characteristics | | | | | | |
| V _{(BR)DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =-250A | -20 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =-16V, V _{GS} =0V | | | -1.0 | uA |
| I _{GSS} | Gate –Source leakage current | V _{GS} =±12V, V _{DS} =0V | | | ±100 | nA |
| ON Characteristics | | | | | | |
| V _{GS(th)} | Gate Threshold Voltage | V _{GS} =V _{DS} , I _D =-250A | -0.35 | -0.65 | -1.00 | V |
| R _{DS(on)} | Drain-Source On-Resistance | V _{GS} =-4.5V, I _D =-4.0A | | 42 | 59 | mΩ |
| | | V _{GS} =-2.5V, I _D =-3.5A | | 54 | 74 | mΩ |
| | | V _{GS} =-1.8V, I _D =-3.0A | | 77 | 93 | mΩ |
| g _{FS} | Forward Transconductance | V _{DS} =-5V, I _D =-3.3A | | 3.0 | | S |
| Dynamic Characteristics | | | | | | |
| C _{iss} | Input Capacitance | V _{DS} =-6V, V _{GS} =0V, F=1.0 MHz | 700 | 850 | 1000 | pF |
| C _{oss} | Output Capacitance | | 100 | 150 | 200 | pF |
| C _{rss} | Reverse Transfer Capacitance | | 80 | 120 | 150 | pF |
| Q _{G(TOT)} | Total Gate Charge | V _{DS} =-6V, I _D =-3.3A, V _{GS} =-4.5V | 8 | 12 | 15 | nC |
| Q _{G(TH)} | Threshold gate charge | | 0.4 | 0.6 | 0.8 | nC |
| Q _{GS} | Gate-Source Charge | | 1.2 | 1.6 | 2.0 | nC |
| Q _{GD} | Gate-Drain Charge | | 1.8 | 2.2 | 2.6 | nC |
| Switching Characteristics | | | | | | |
| t _{d(on)} | Turn-On Delay Time | V _{GS} =-4.5V, V _{DS} =-6V, I _D = -1.0A, R _G =6.0Ω | 15 | 19 | 25 | ns |
| t _r | Turn-On Rise Time | | 5 | 8 | 15 | ns |
| t _{d(off)} | Turn-Off Delay Time | | 80 | 100 | 120 | ns |
| t _f | Turn-Off Fall Time | | 15 | 25 | 35 | ns |
| Drain-to-Source Diode Characteristics | | | | | | |
| V _{SD} | Forward Diode Voltage | V _{GS} =0V, I _S =-1.6A | | -0.7 | | V |

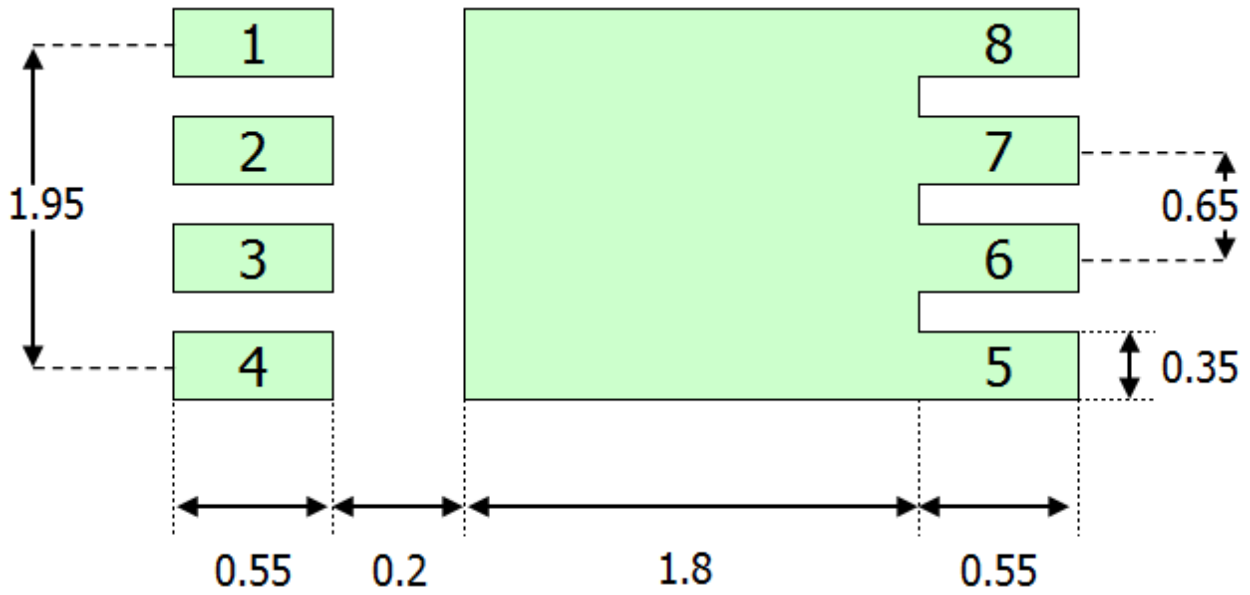
Typical Performance Graph
 ($T_A = 25^\circ\text{C}$, unless otherwise noted)

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current

On-Resistance vs. Gate-to-Source Voltage

On-Resistance vs. Junction Temperature

Threshold Voltage


Gate Charge

Capacitance

Source-Drain Diode Forward Voltage

Safe Operating Area

Normalized Thermal Transient Impedance, Junction-to-Ambient

- Notes:
- 
1. Duty Cycle, $D = \frac{t_1}{t_2}$
 2. Per Unit Base = $R_{thJA} = 125 \text{ }^\circ\text{C/W}$
 3. $T_{JM} - T_A = P_{DM} Z_{thJA}(t)$
 4. Surface Mounted

Package Outline Dimension
DFN3x3-8L

Top View

Bottom View

Side View

| Symbol | Dimensions in millimeters | |
|--------|---------------------------|-------|
| | Min. | Max. |
| A | 0.7 | 0.8 |
| A1 | 0.00 | 0.05 |
| A3 | 0.203 Ref. | |
| D | 2.9 | 3.1 |
| E | 2.9 | 3.1 |
| D1 | 2.2 | 2.4 |
| E1 | 1.4 | 1.6 |
| k | 0.200 Min. | |
| b | 0.18 | 0.3 |
| e | 0.650 Typ. | |
| L | 0.375 | 0.575 |

PCB Layout Guide


Recommend Minimum Pad Guide
Unit: mm