# WPMD2011

**Dual P-Channel -20V, -4.4A, 52mΩ Power MOSFET**

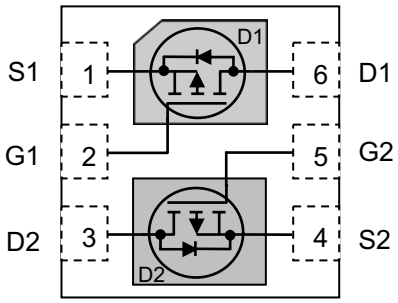
**Http://www.willsemi.com**

| $V_{(BR)DSS}$ | Rds(on) (Ω) |
|---|---|
| -20 | 0.052 @ -4.5V |
| | 0.064 @ -2.5V |
| | 0.080 @ -1.8V |
| | 0.090 @ -1.5V |

**DFN2x2-6L**

## Description

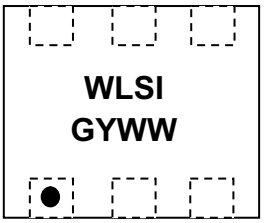
The WPMD2011 is P-Channel enhancement dual MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use in DC-DC conversion and power switch applications. Standard Product WPMD2011 is Pb-free.




**Pin Configuration (Top View)**

## Features

- Trench Technology
- Supper high density cell design
- Excellent ON resistance for highest DC current
- Extremely low threshold voltage
- Bidirectional current flow with common source configuration
- DFN2x2 package provides exposed drain pad for excellent thermal conduction




**WLSI = Company Code**
**G = Device Code**
**Y = Year (last digit)**
**WW = Week**

## Applications

- Driver for Relay, Solenoid, Motor, LED etc.
- DC-DC converter circuit
- Power switch
- High side load switch
- Battery management and charging circuit

## Order Information

| Device | Package | Shipping |
|---|---|---|
| WPMD2011-6/TR | DFN2x2-6L | 3000/Tape&Reel |

## ABSOLUTE MAXIMUM RATINGS (Ta = 25 °C, unless otherwise noted)

| Parameter | | Symbol | 10S | Steady State | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | -20 | | V |
| Gate-Source Voltage | | $V_{GS}$ | ±12 | | |
| Continuous Drain Current ($T_J$ = 150 °C)[a] | $T_A$=25°C | $I_D$ | -4.4 | -3.7 | A |
| | $T_A$=70°C | | -3.5 | -3.0 | |
| Maximum Power Dissipation [a] | $T_A$=25°C | $P_D$ | 2.0 | 1.4 | W |
| | $T_A$=70°C | | 1.3 | 0.9 | |
| Continuous Drain Current ($T_J$ = 150 °C)[b] | $T_A$=25°C | $I_D$ | -3.2 | -2.6 | A |
| | $T_A$=70°C | | -2.5 | -2.1 | |
| Maximum Power Dissipation [b] | $T_A$=25°C | $P_D$ | 1.0 | 0.7 | W |
| | $T_A$=70°C | | 0.6 | 0.4 | |
| Pulsed Drain Current [c] | | $I_{DM}$ | -15 | | A |
| Operating Junction Temperature | | $T_J$ | 150 | | °C |
| Storage Temperature | | $T_{stg}$ | -55 to 150 | | °C |

## THERMAL RESISTANCE RATINGS

**Single Operation**

| Parameter | | Symbol | Typical | Maximum | Unit |
|---|---|---|---|---|---|
| Junction-to-Ambient Thermal Resistance [a] | t ≤ 10 s | $R_{\theta JA}$ | 45 | 60 | °C/W |
| | Steady State | | 62 | 85 | |
| Junction-to-Ambient Thermal Resistance [b] | t ≤ 10 s | $R_{\theta JA}$ | 80 | 115 | |
| | Steady State | | 120 | 170 | |
| Junction-to-Case Thermal Resistance | Steady State | $R_{\theta JC}$ | 32 | 40 | |
| **Dual operation** | | | | | |
| Junction-to-Ambient Thermal Resistance [a] | t ≤ 10 s | $R_{\theta JA}$ | 40 | 55 | °C/W |
| | Steady State | | 58 | 80 | |
| Junction-to-Ambient Thermal Resistance [b] | t ≤ 10 s | $R_{\theta JA}$ | 75 | 110 | |
| | Steady State | | 115 | 160 | |
| Junction-to-Case Thermal Resistance | Steady State | $R_{\theta JC}$ | 30 | 36 | |

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

b. Surface mounted on FR4 board using the minimum recommended pad size, 1oz Cu.

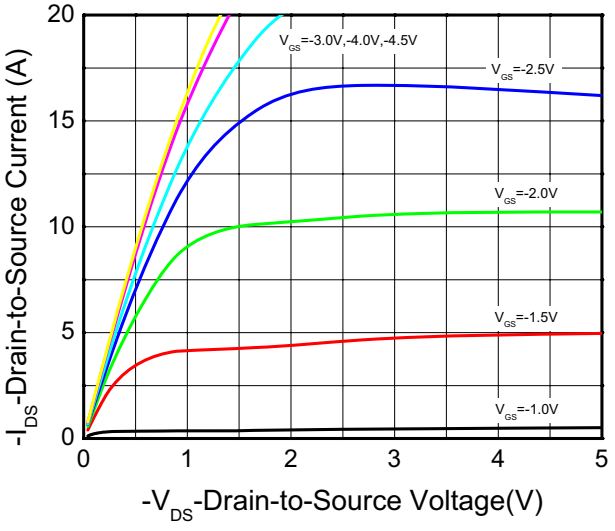
c. Repetitive rating, pulse width limited by junction temperature, tp=10μs, Duty Cycle=1%

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

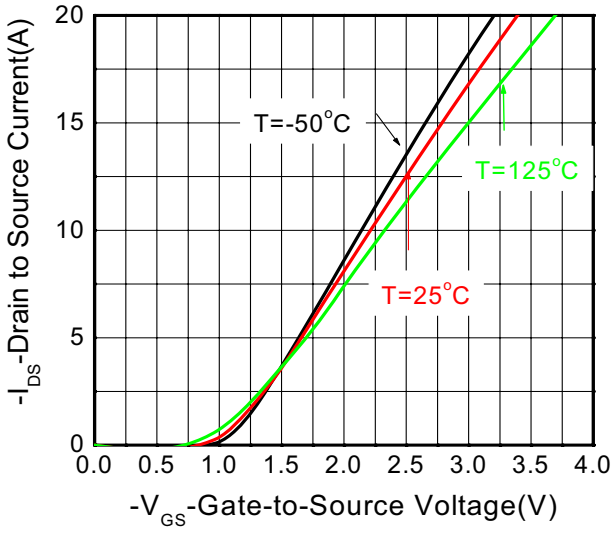
## Electrical Characteristics (Ta= 25°C, unless otherwise noted)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$ = 0 V, $I_D$ = −250 uA | −20 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ =16 V, $V_{GS}$=0V | | | -1 | uA |
| Gate-source Leakage Current | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±12 V | | | ±100 | nA |
| **ON CHARACTERISTICS** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}$ = $V_{DS}$, $I_D$ = −250 uA | -0.35 | -0.6 | -1.0 | V |
| Drain-Source On Resistance | $R_{DS(on)}$ | $V_{GS}$ = −4.5V, $I_D$ = −4.0 A | | 52 | 70 | mΩ |
| | | $V_{GS}$ = −2.5V, $I_D$ = −3.0A | | 64 | 85 | |
| | | $V_{GS}$ = −1.8V, $I_D$ = −2.0A | | 80 | 100 | |
| | | $V_{GS}$ = −1.5V, $I_D$ = −1.0A | | 90 | 150 | |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$ = −5 V, $I_D$ = −3.6A | | 10 | | S |
| **CHARGES, CAPACITANCES AND GATE RESISTANCE** | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{GS}$ = 0 V, f = 1.0 MHz, $V_{DS}$ = −10 V | | 1130 | | pF |
| Output Capacitance | $C_{OSS}$ | | | 120 | | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | 115 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS}$ = −4.5 V, $V_{DS}$ = −10 V, $I_D$ = −2.7 A | | 11 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 0.6 | | |
| Gate-Source Charge | $Q_{GS}$ | | | 1.3 | | |
| Gate-Drain Charge | $Q_{GD}$ | | | 2.7 | | |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| Turn-On Delay Time | $td_{(ON)}$ | $V_{GS}$ = −4.5 V, $V_{DS}$ = −6 V, $R_L$=3 Ω, $R_G$=6 Ω | | 9.5 | | ns |
| Rise Time | tr | | | 5.8 | | |
| Turn-Off Delay Time | $td_{(OFF)}$ | | | 54 | | |
| Fall Time | tf | | | 13 | | |
| **BODY DIODE CHARACTERISTICS** | | | | | | |
| Forward Recovery Voltage | $V_{SD}$ | $V_{GS}$ = 0 V, $I_S$ = −1.0 A | | -0.62 | -1.5 | V |

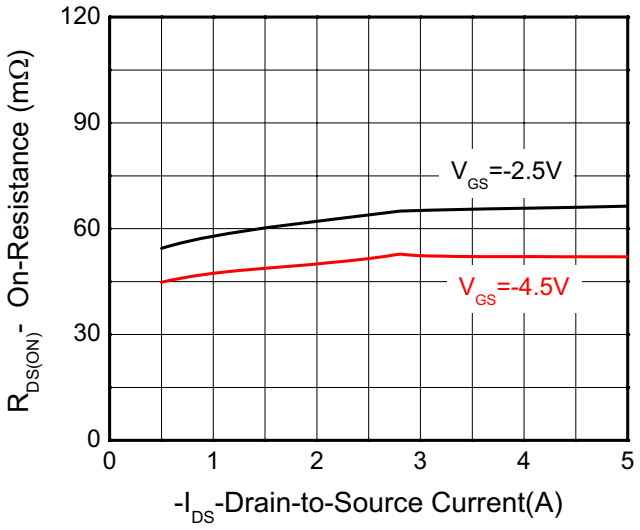
## Typical Performance Characteristics



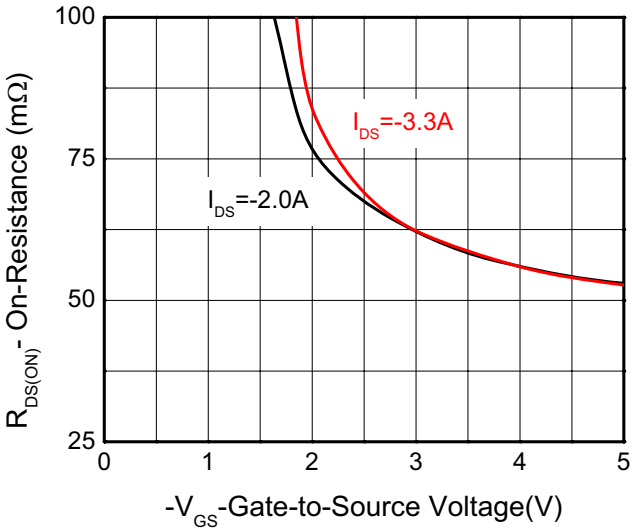

**Output Characteristics**



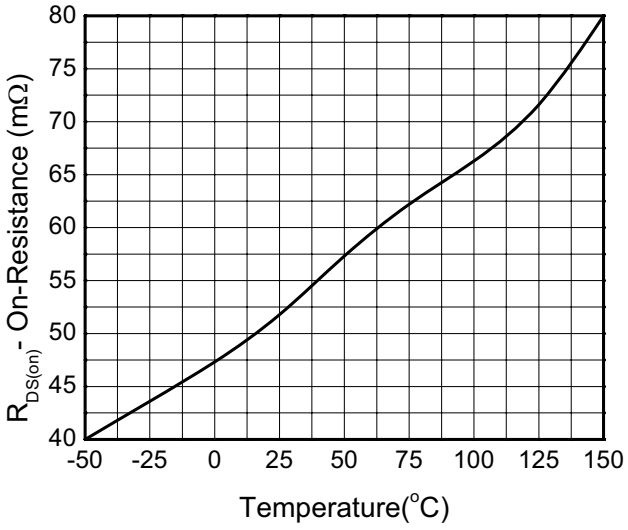

**Transfer Characteristics**



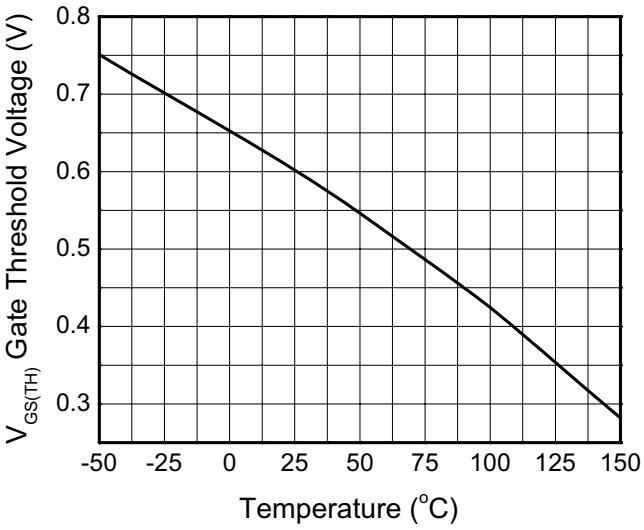

**ON Resistance vs. Drain Current**



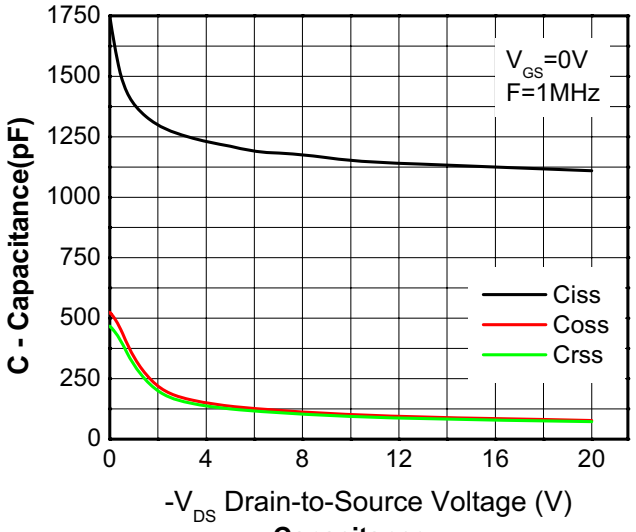

**ON Resistance vs. Gate to Source Voltage**



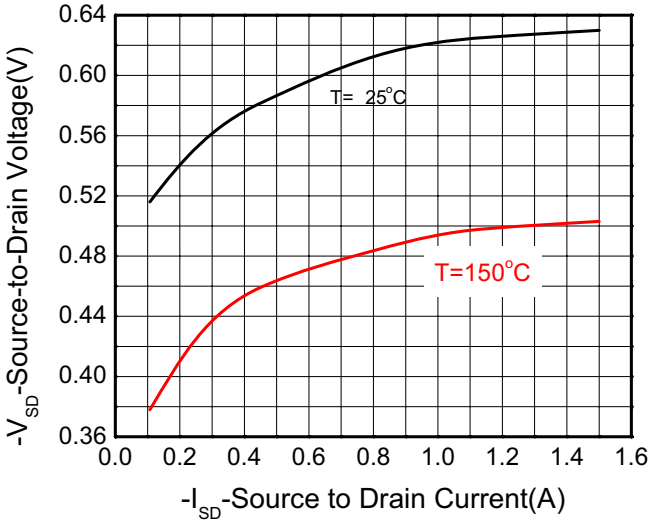

**ON Resistance vs. Junction Temperature**



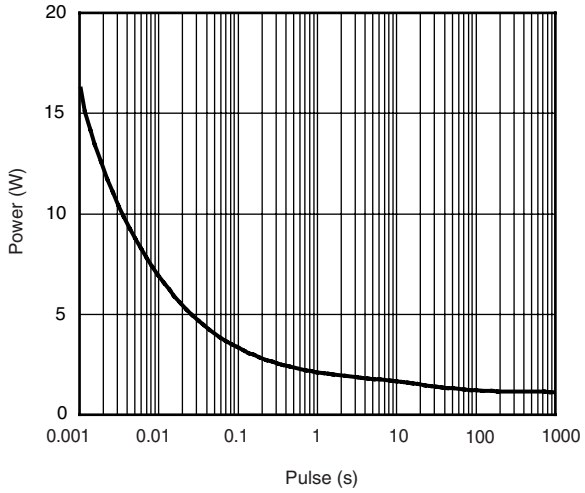

**Threshold Voltage vs. Temperature**



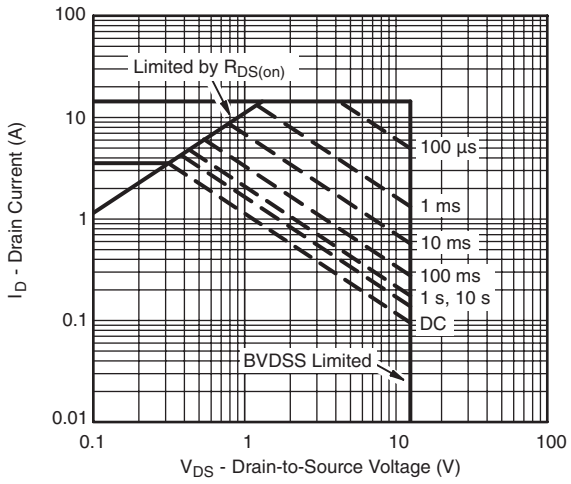

**Capacitance**



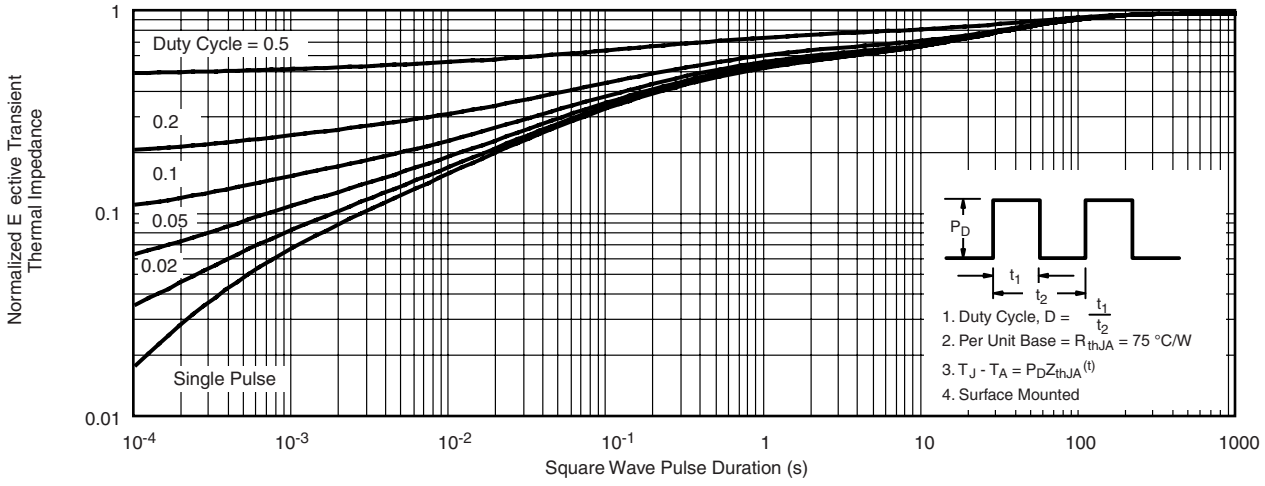

**Drain to Source Diode Forward Voltage**




**Single Pulse Power**



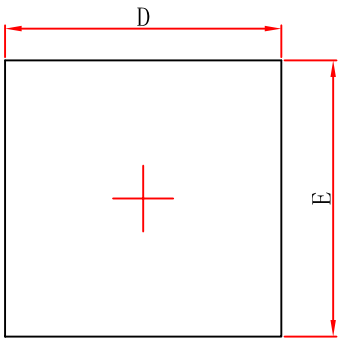

**Safety Operation Area**



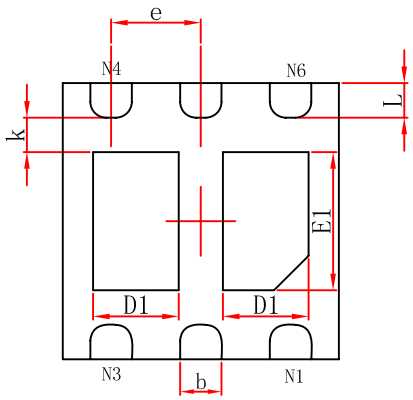

**Transient thermal response (Junction-to-Ambient)**

## Packaging Information

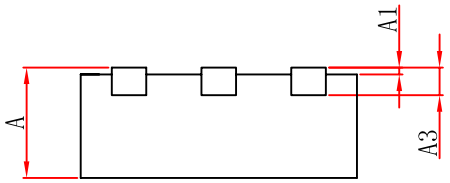
**DFN2x2-6L**




**Top View**




**Bottom View**




**Side View**

| Symbol | Dimension in Millimeters | |
|---|---|---|
| | Min. | Max. |
| A | 0.700 | 0.800 |
| A1 | 0.000 | 0.050 |
| A3 | 0.203REF | |
| D | 1.900 | 2.100 |
| E | 1.900 | 2.100 |
| E1 | 0.750 | 0.850 |
| D1 | 0.600 | 0.700 |
| k | 0.200MIN | |
| b | 0.250 | 0.350 |
| e | 0.650TYP | |
| L | 0.250 | 0.350 |