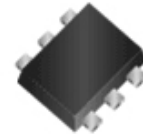


**WPMD2013**

**Dual P-Channel, -20V, -0.64A, Small Signal MOSFET**

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

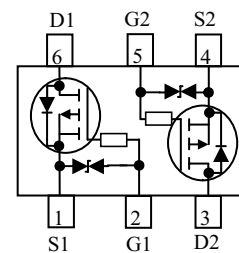
$V_{DS}$ (V)	$R_{ds(on)}$ ( $\Omega$ )
-20	0.550@ $V_{GS}=-4.5V$
	0.740@ $V_{GS}=-2.5V$
	0.860@ $V_{GS}=-1.8V$



**SOT-563**

### Descriptions

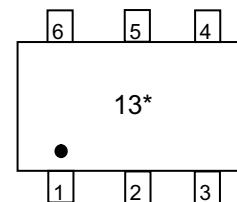
The WPMD2013 is P-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use in DC-DC conversion, load switch and level shift. Standard Product WPMD2013 is Pb-free.



**Pin configuration (Top view)**

### Features

- Trench Technology
- Supper high density cell design
- Excellent ON resistance
- Extremely Low Threshold Voltage
- Small package SOT-563



13 = Device Code  
\* = Month (A~Z)

**Marking**

### Applications

- DC-DC converter circuit
- Small Signal Switch
- Load Switch
- Level Shift

### Order information

Device	Package	Shipping
WPMD2013-6/TR	SOT-563	3000/Reel&Tape

**Absolute Maximum ratings**

Parameter		Symbol	10 S	Steady State	Unit
Drain-Source Voltage		$V_{DS}$	-20		V
Gate-Source Voltage		$V_{GS}$	$\pm 6$		
Continuous Drain Current <sup>a</sup>	$T_A=25^\circ\text{C}$	$I_D$	-0.64	-0.56	A
	$T_A=70^\circ\text{C}$		-0.51	-0.45	
Maximum Power Dissipation <sup>a</sup>	$T_A=25^\circ\text{C}$	$P_D$	0.37	0.29	W
	$T_A=70^\circ\text{C}$		0.23	0.18	
Continuous Drain Current <sup>b</sup>	$T_A=25^\circ\text{C}$	$I_D$	-0.54	-0.50	A
	$T_A=70^\circ\text{C}$		-0.43	-0.40	
Maximum Power Dissipation <sup>b</sup>	$T_A=25^\circ\text{C}$	$P_D$	0.27	0.22	W
	$T_A=70^\circ\text{C}$		0.17	0.14	
Pulsed Drain Current <sup>c</sup>		$I_{DM}$	-1.0		A
Operating Junction Temperature		$T_J$	150		$^\circ\text{C}$
Storage Temperature Range		$T_{stg}$	-55 to 150		$^\circ\text{C}$

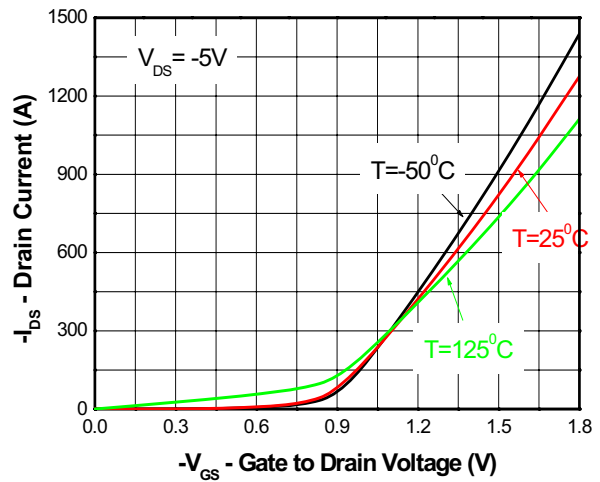
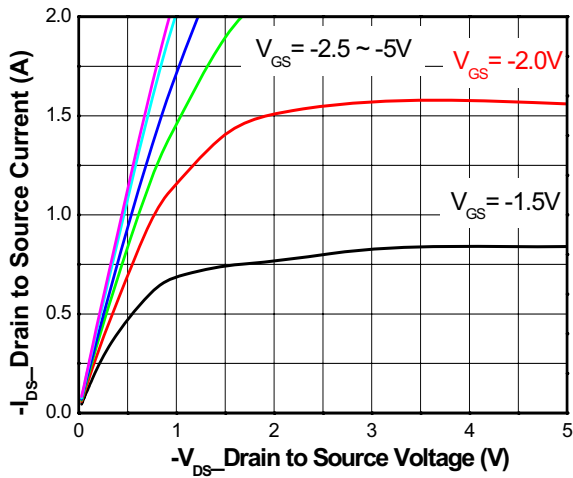
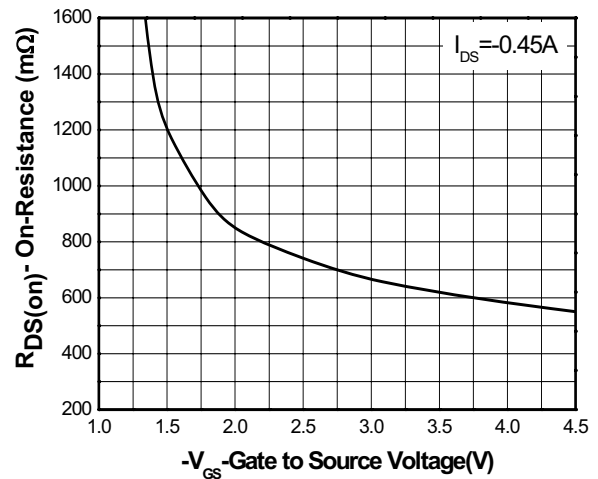
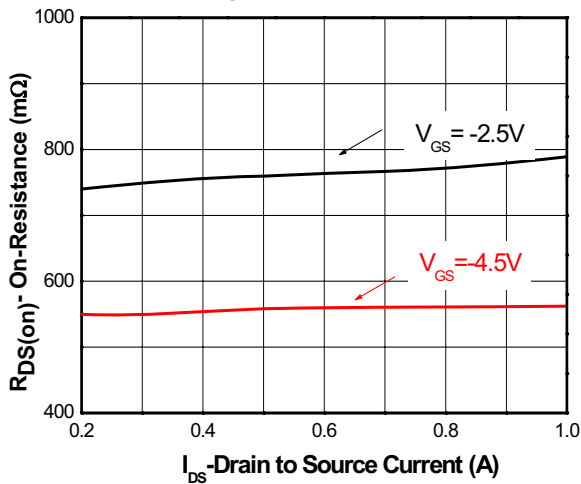
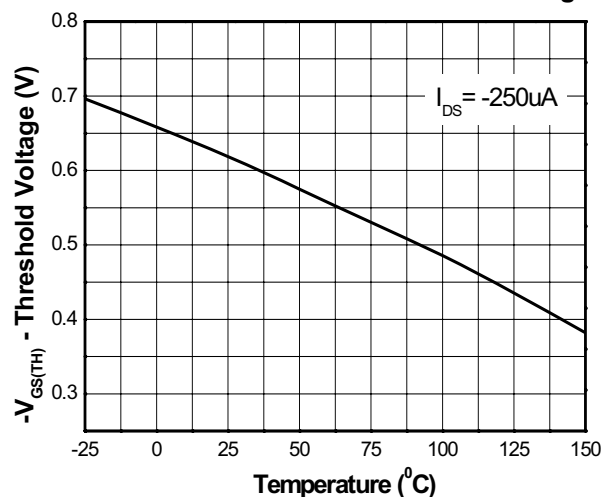
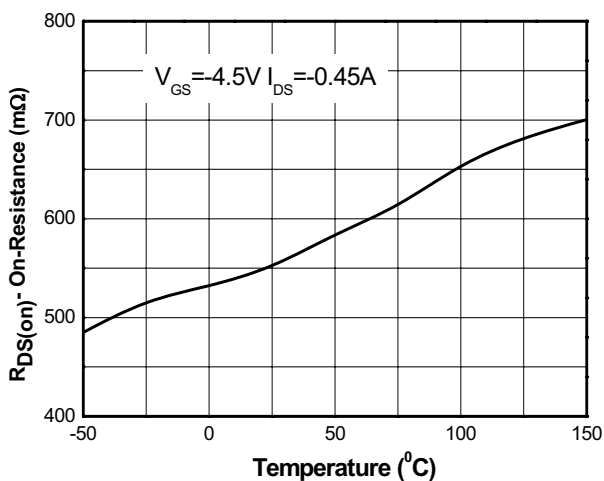
**Thermal resistance ratings**

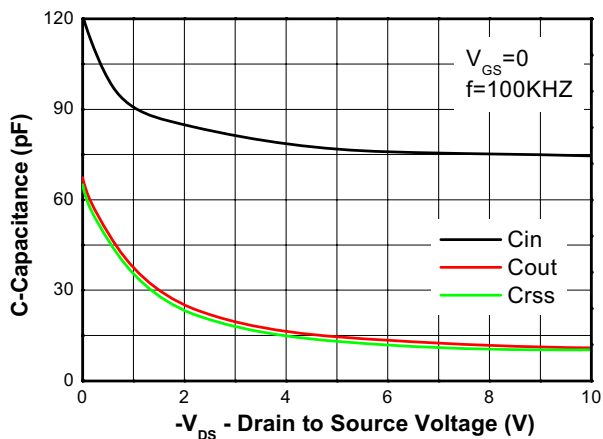
Single Operation					
Parameter		Symbol	Typical	Maximum	Unit
Junction-to-Ambient Thermal Resistance <sup>a</sup>	$t \leq 10 \text{ s}$	$R_{\theta JA}$	285	335	$^\circ\text{C}/\text{W}$
	Steady State		350	430	
Junction-to-Ambient Thermal Resistance <sup>b</sup>	$t \leq 10 \text{ s}$	$R_{\theta JA}$	380	460	
	Steady State		465	555	
Junction-to-Case Thermal Resistance		$R_{\theta JC}$	280	320	
Dual Operation					
Junction-to-Ambient Thermal Resistance <sup>a</sup>	$t \leq 10 \text{ s}$	$R_{\theta JA}$	317	370	
	Steady State		375	445	
Junction-to-Ambient Thermal Resistance <sup>b</sup>	$t \leq 10 \text{ s}$	$R_{\theta JA}$	425	492	
	Steady State		505	590	
Junction-to-Case Thermal Resistance		$R_{\theta JC}$	285	325	

- Surface mounted on FR4 Board using 1 in sq pad size, 1oz Cu.
- Surface mounted on FR4 board using the minimum recommended pad size, 1oz Cu.
- Repetitive rating, pulse width limited by junction temperature,  $t_p=10\mu\text{s}$ , Duty Cycle=1%
- Repetitive rating, pulse width limited by junction temperature  $T_J(\text{MAX})=150^\circ\text{C}$

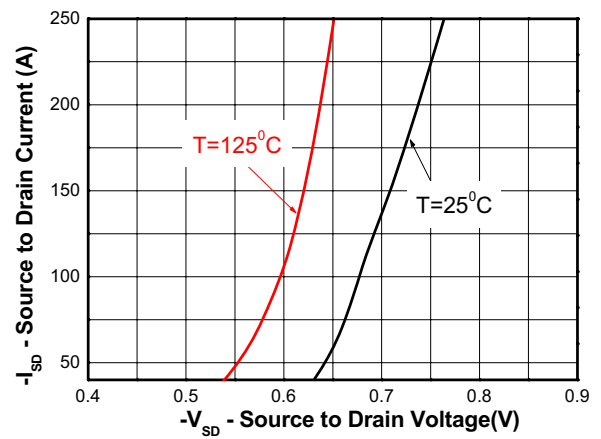
**Electronics Characteristics (Ta=25°C, unless otherwise noted)**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250uA	-20			V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0V			-1	uA
Gate-to-source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±5V			-5	uA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = -250uA	-0.40	-0.65	-0.90	V
Drain-to-source On-resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -0.45A		550	810	mΩ
		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -0.35A		740	1050	
		V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -0.25A		860	1300	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = -5 V, I <sub>D</sub> = -0.45A		1.25		S
<b>CHARGES, CAPACITANCES AND GATE RESISTANCE</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> = 0 V, f = 100KHz, V <sub>DS</sub> = -10 V		74.5		pF
Output Capacitance	C <sub>OSS</sub>			10.8		
Reverse Transfer Capacitance	C <sub>RSS</sub>			10.2		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -10 V, I <sub>D</sub> = -0.45A		1.8		nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			0.12		
Gate-to-Source Charge	Q <sub>GS</sub>			0.18		
Gate-to-Drain Charge	Q <sub>GD</sub>			0.74		
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	td(ON)	V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -10 V, I <sub>D</sub> = -0.45A, R <sub>G</sub> = 6 Ω		45		ns
Rise Time	tr			140		
Turn-Off Delay Time	td(OFF)			1500		
Fall Time	tf			2100		
<b>BODY DIODE CHARACTERISTICS</b>						
Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = -0.15A	-0.50	-0.65	-1.50	V

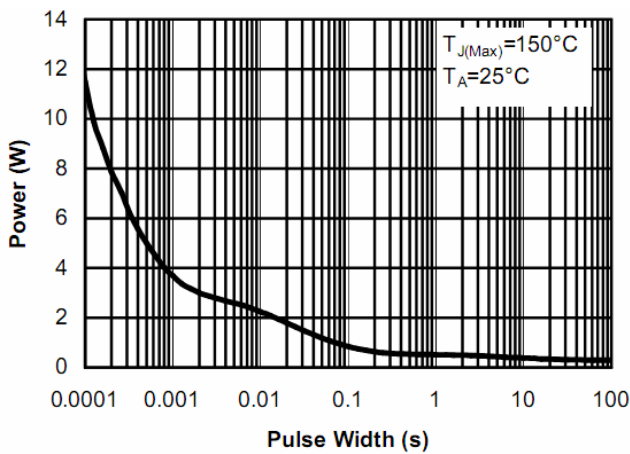
**Typical Characteristics (Ta=25°C, unless otherwise noted)**

**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**



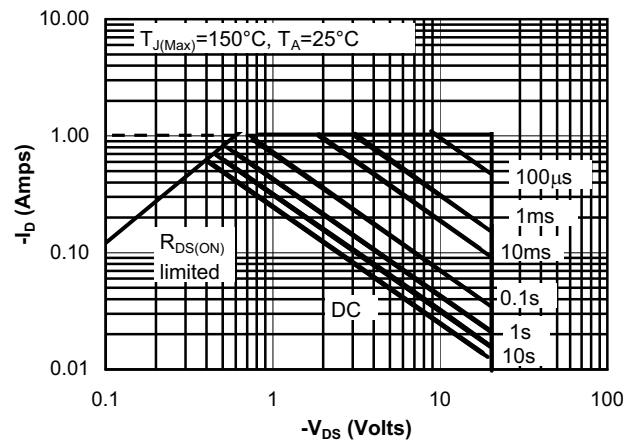
Capacitance



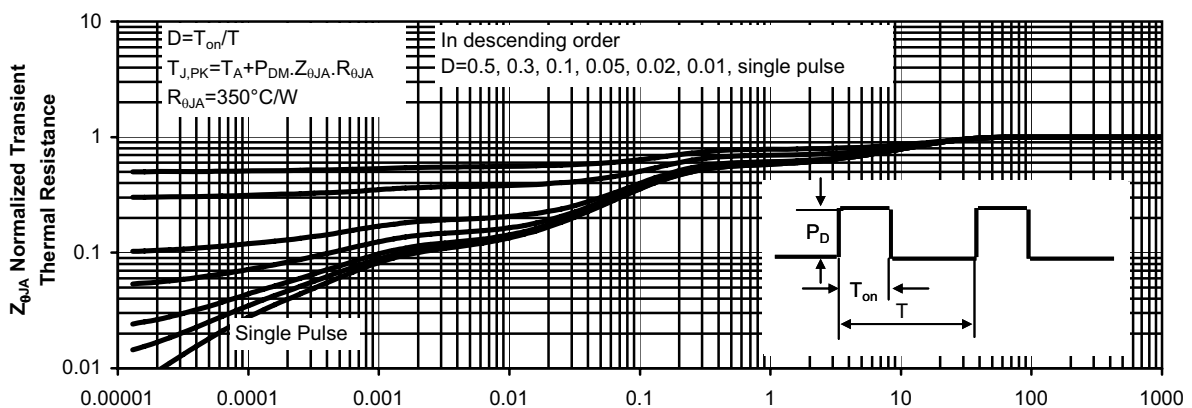
Body diode forward voltage



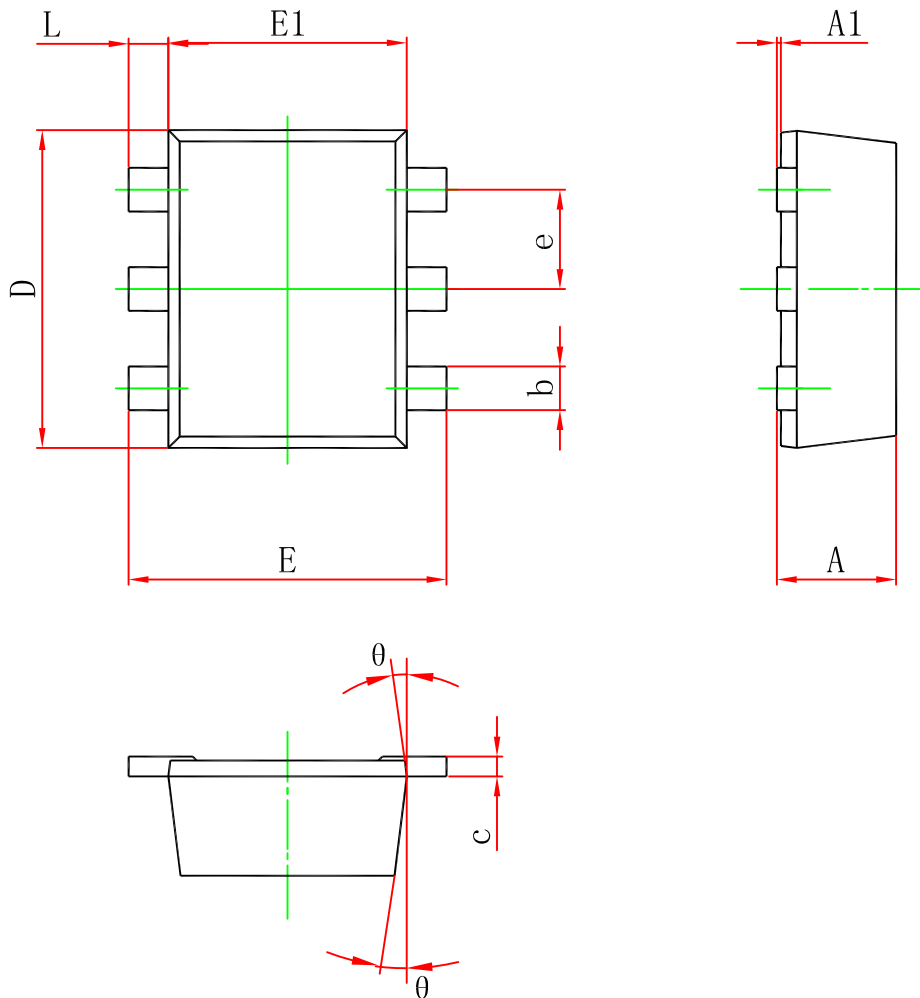
Single pulse power



Safe operating power



Transient thermal response (Junction-to-Ambient)

**Package Outline Dimension**
**SOT-563**


Symbol	Dimensions in millimeter		
	Min.	Typ.	Max.
A	0.525	0.563	0.600
A1	0.000	0.025	0.050
e	0.450	0.500	0.550
c	0.090	0.125	0.160
D	1.500	1.600	1.700
b	0.170	0.22	0.270
E1	1.100	1.200	1.300
E	1.500	1.600	1.700
L	0.100	0.200	0.300
$\theta$	7° REF		