

# MT58P02N3

## P-Channel Enhancement Mode Field Effect Transistor

### Product Summary

- $V_{DS} = -20V$
- $I_D = -55A$
- $R_{DS(ON)} 8.3m\Omega$  @  $V_{GS} = -4.5V$
- $R_{DS(ON)} 10.5 m\Omega$  @  $V_{GS} = -2.5V$

### Features

- Advanced Trench Process Technology.
- High Density Cell Design for Ultra Low
- On-Resistance.
- Lead free product is acquired.
- RoHS Compliant.

### Applications

- Notebook Computer
- Portable Battery Pack

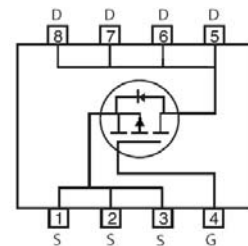
PDFN3.3X3.3-8L



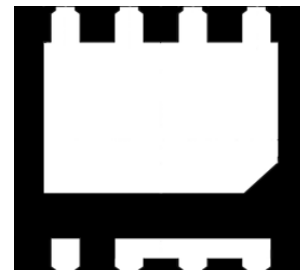
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### Simplified Schematic



### MARKING DIAGRAM & PIN ASSIGNMENT



PIN1

### Absolute Maximum Ratings ( $T_A = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Drain Current-Continuous	$I_D$	-55	A
Drain Current-Pulsed <small>(Note 1)</small>	$I_{DM}$	-220	A
Maximum Power Dissipation	$P_D$	66	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ C$

### Thermal Characteristic

Thermal Resistance, Junction-to-Ambient <small>(Note 2)</small>	$R_{\theta JA}$	48	$^\circ C/W$
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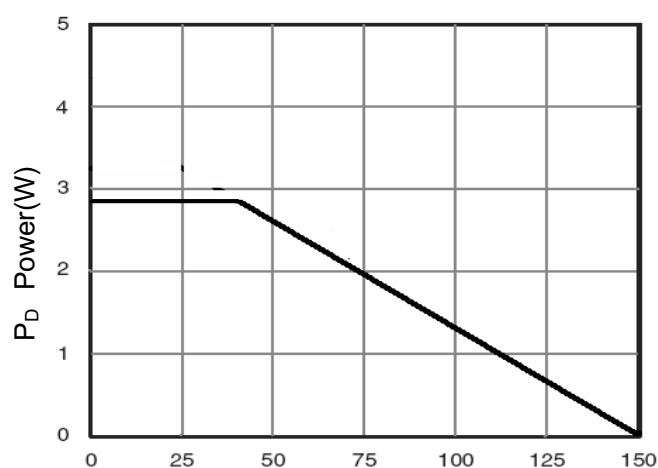
**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =-250μA	-20	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-	-0.8	-1.2	V
Drain-Source On-State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-10A	-	6.5	8.3	mΩ
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> = -5A	-	8.0	10.5	mΩ
Dynamic Characteristics (Note4)						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V, F=1.0MHz	-	4470	-	PF
Output Capacitance	C <sub>oss</sub>		-	570	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	502	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =-10V, ,R <sub>L</sub> =2Ω V <sub>GS</sub> =-10V, R <sub>GEN</sub> =3Ω	-	11	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	110	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	157	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	160	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =-10V, I <sub>D</sub> =-15A, V <sub>GS</sub> =-4.5V	-	56	-	nS
Gate-Source Charge	Q <sub>gs</sub>		-	8	-	nS
Gate-Drain Charge	Q <sub>gd</sub>		-	16	-	nS
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =-30A	-	-0.7	-1.3	V
Diode Forward Current (Note 2)	I <sub>S</sub>		-	-	-55	A

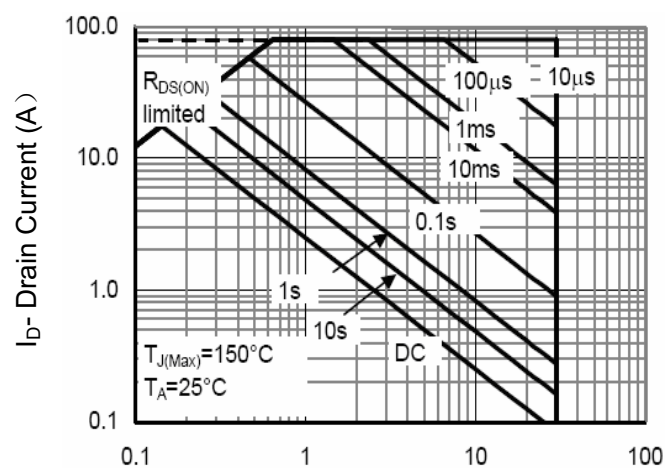
**Notes**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

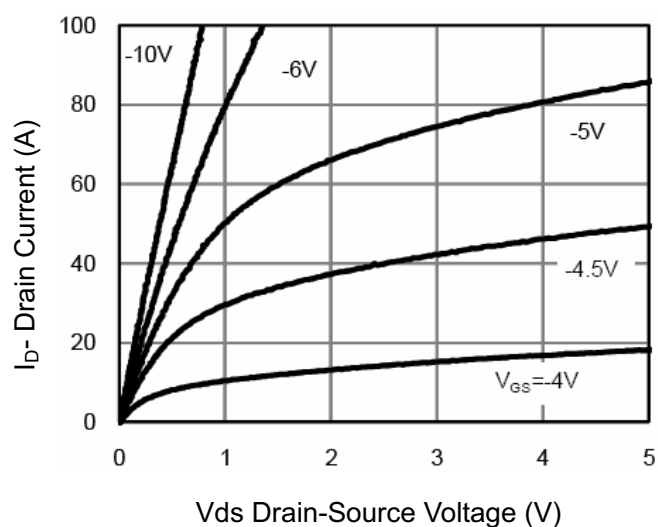
## Characteristics Curve ( $T_A=25^\circ\text{C}$ , unless otherwise noted)



$T_J$ -Junction Temperature ( $^\circ\text{C}$ )  
Figure 1 Power Dissipation



$V_{DS}$  Drain-Source Voltage (V)  
Figure 2 Safe Operation Area



$V_{DS}$  Drain-Source Voltage (V)  
Figure 3 Output Characteristics

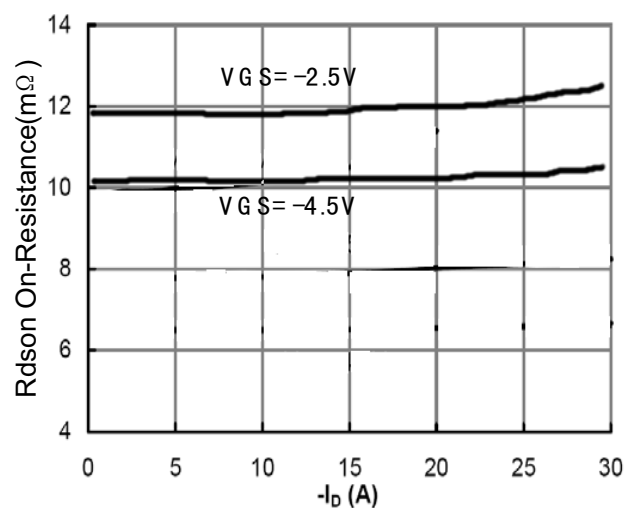
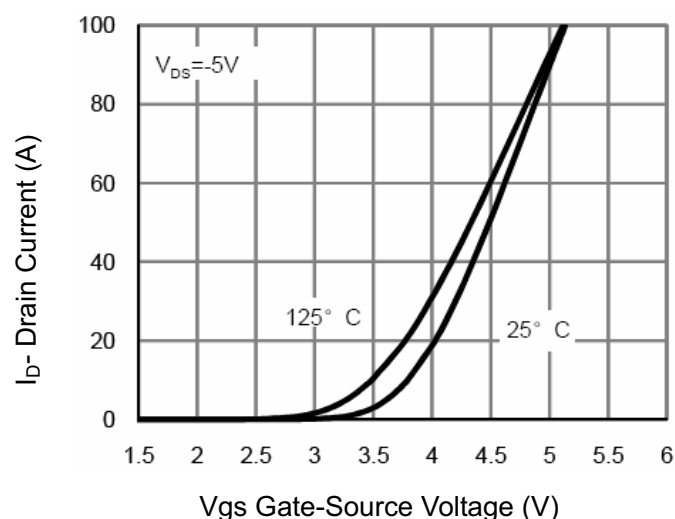
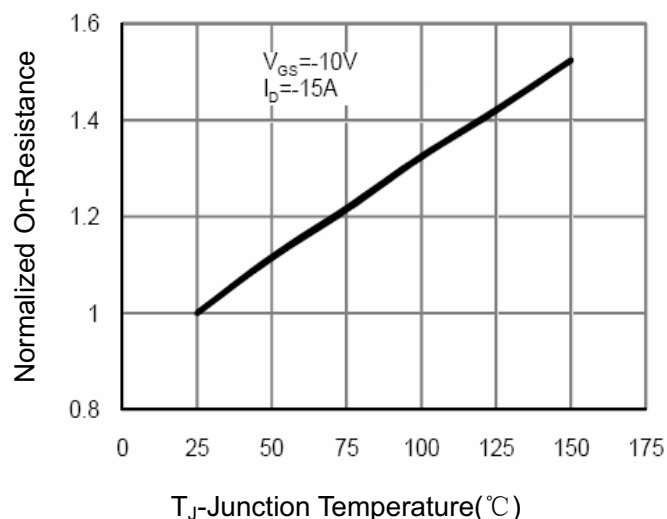


Figure 4 Drain-Source On-Resistance

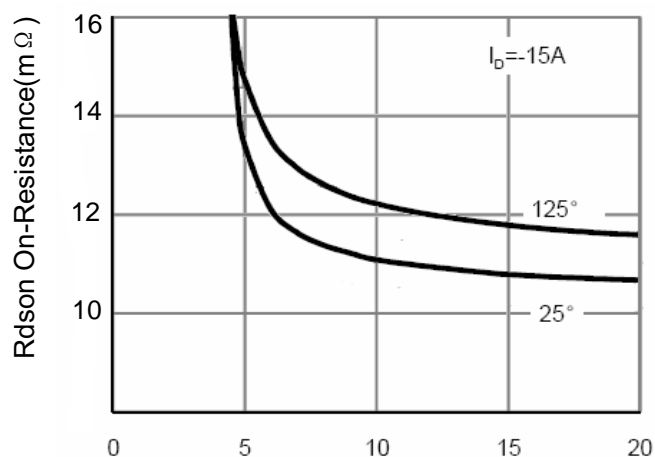


$V_{GS}$  Gate-Source Voltage (V)  
Figure 5 Transfer Characteristics

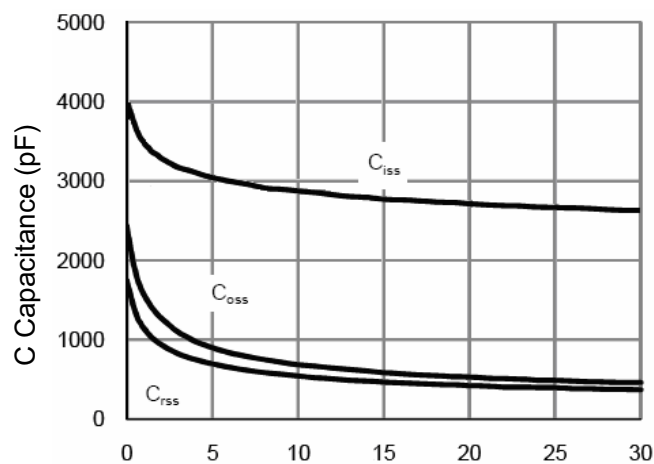


$T_J$ -Junction Temperature ( $^\circ\text{C}$ )  
Figure 6 Drain-Source On-Resistance

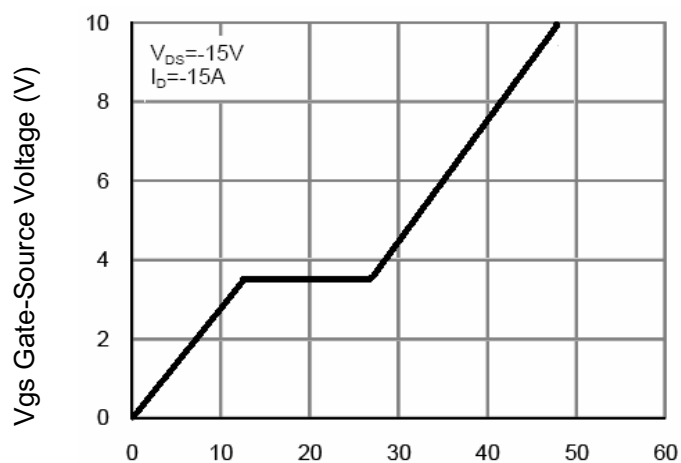
## Characteristics Curve ( $T_A=25^\circ\text{C}$ , unless otherwise noted)



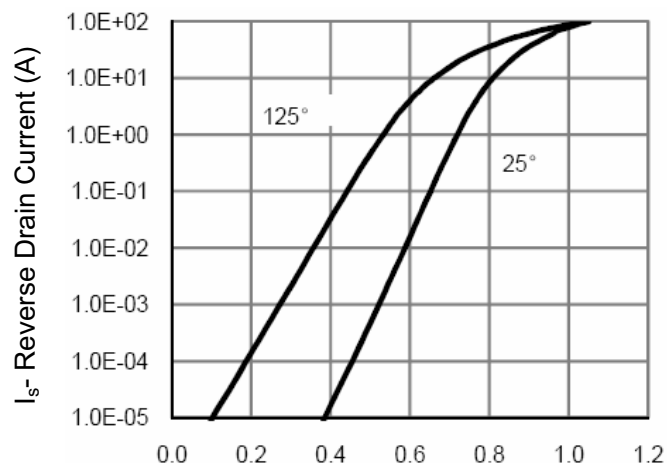
Vgs Gate-Source Voltage (V)  
**Figure 7 Rdson vs Vgs**



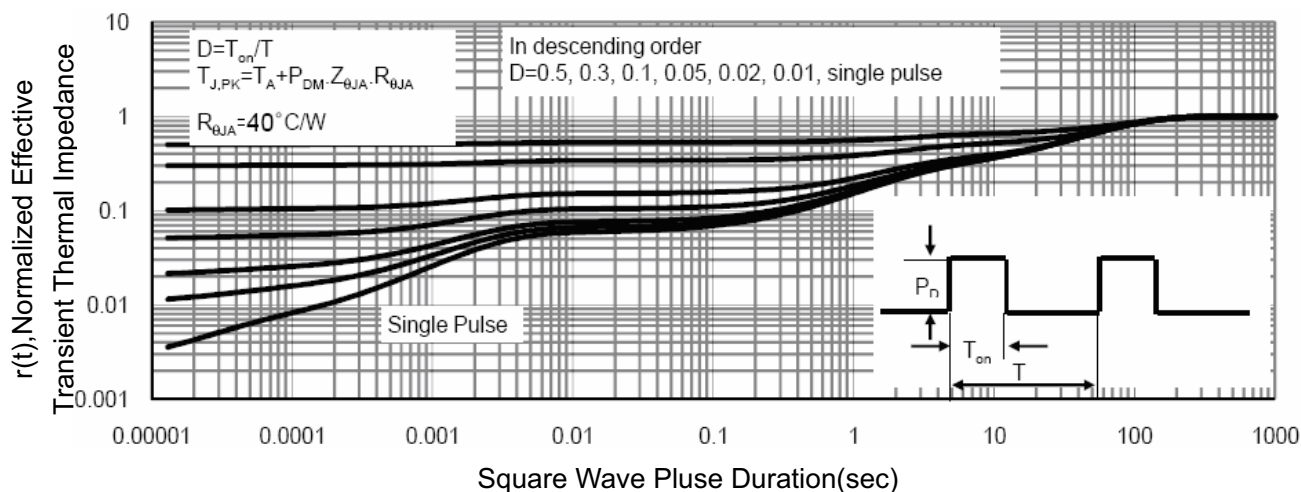
Vds Drain-Source Voltage (V)  
**Figure 8 Capacitance vs Vds**



Qg Gate Charge (nC)  
**Figure 9 Gate Charge**

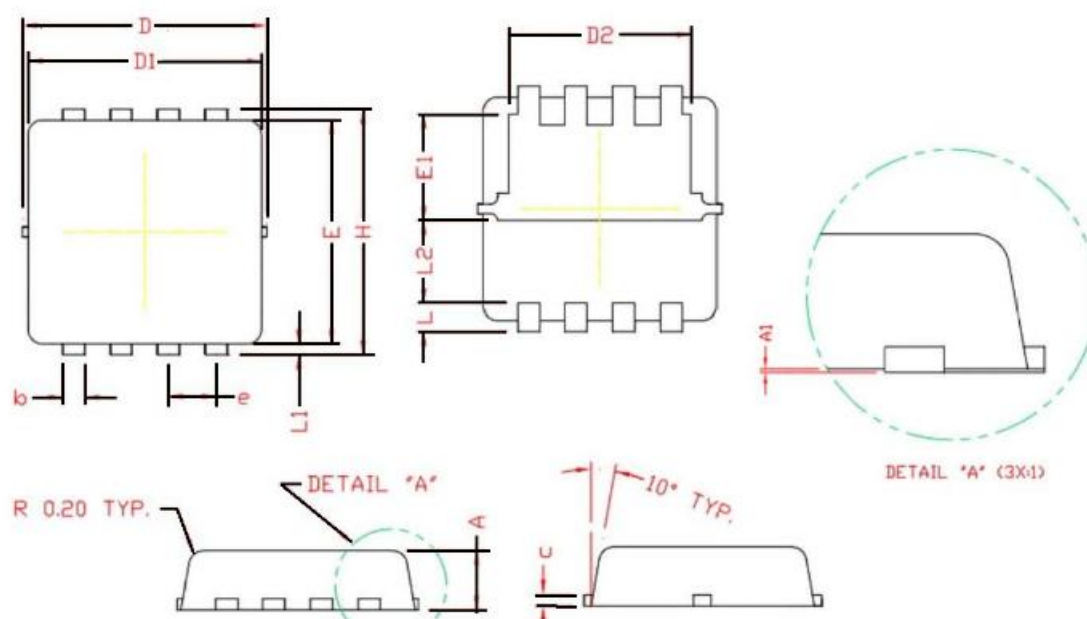


Vsd Source-Drain Voltage (V)  
**Figure 10 Source-Drain Diode Forward**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

## PDFN3.3X3.3-8L Package Information



## COMMON DIMENSIONS

(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.70	0.80	0.90
A1	0.00	0.03	0.05
b	0.24	0.30	0.35
c	0.10	0.15	0.20
D	3.25	3.32	3.40
D1	3.05	3.15	3.25
D2	2.40	2.50	2.60
E	3.00	3.10	3.20
E1	1.35	1.45	1.55
e	0.65 BSC.		
H	3.20	3.30	3.40
L	0.30	0.40	0.50
L1	0.10	0.15	0.20
L2	1.13 REF.		

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