

# MT3212N5

## N-Channel Enhancement Mode Field Effect Transistor

### Product Summary

- $V_{DS} = 30V$
- $I_D = 150A$
- $R_{DS(ON)} = 1.6 m\Omega @ V_{GS} = 10V$
- $R_{DS(ON)} = 2.5 m\Omega @ V_{GS} = 4.5V$

### Features

- Advanced Trench Process Technology.
- High Density Cell Design for Ultra Low On-Resistance.
- Lead free product is acquired.
- RoHS Compliant.
- PDFN5x6-8L Package

### Applications

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

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

Symbol	Parameter		Steady State	Units
V <sub>DS</sub>	Drain-Source Voltage		30	V
V <sub>GS</sub>	Gate-Source Voltage		± 20	V
I <sub>D</sub>	Continuous Drain Current <sup>1</sup>	T <sub>C</sub> = 25°C	150	A
I <sub>DM</sub>	Pulsed Drain Current <sup>2</sup>		360	A
I <sub>S</sub>	Continuous Source Current (Diode Conduction) <sup>1</sup>		150	A
E <sub>AS</sub>	Single Pulse Drain-Source Avalanche Energy <sup>3</sup>		332	mJ
P <sub>D</sub>	Maximum Power Dissipation	T <sub>C</sub> = 25°C	110	W
T <sub>J</sub> , T <sub>STG</sub>	Operating Junction and Storage Temperature Range		-55~150	°C

Notes:

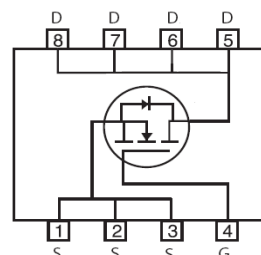
1. Surface Mounted on 1" x 1" FR4 Board,  $t \leq 10$  Sec.
2. Pulse width limited by maximum junction temperature.
3. The test condition is  $T_J = 25^\circ C$ ,  $V_{DD} = 30V$ ,  $V_{GS} = 10V$ ,  $L = 0.1mH$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 50A$ .



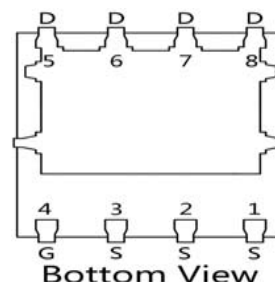
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### Simplified Schematic



### MARKING DIAGRAM & PIN ASSIGNMENT



## Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.15	$^{\circ}\text{C/W}$
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## Electrical Characteristics ( $T_C=25^{\circ}\text{C}$ unless otherwise noted)

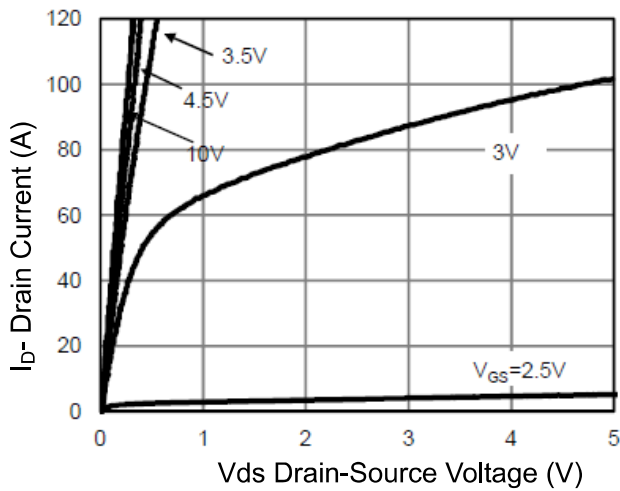
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	30	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =24V, V <sub>GS</sub> =0V	-	-	1	uA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V	-	-	100	nA
On Characteristics						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.0	1.6	2.5	V
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(ON)</sub>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A	-	2.5	3.0	mΩ
		V <sub>GS</sub> =10V, I <sub>D</sub> =15A	-	1.6	2.0	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =20A	100	-	-	S
Dynamic Characteristics <sup>b</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, F=1.0MHz	-	6300	-	PF
Output Capacitance	C <sub>oss</sub>		-	3100	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	2100	-	PF
Switching Characteristics						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =10V, I <sub>D</sub> =2A, R <sub>L</sub> =15Ω V <sub>GS</sub> =10V, R <sub>G</sub> =2.5Ω	-	12	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	10	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	45	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	22	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =20A, V <sub>GS</sub> =10V	-	70		nC
Gate-Source Charge	Q <sub>gs</sub>		-	16		nC
Gate-Drain Charge	Q <sub>gd</sub>		-	20		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =20A	-	0.75	1	V
Diode Forward Current	I <sub>S</sub>		-	-	150	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> = 25°C, I <sub>F</sub> = 20A di/dt = 500A/μs	-	33	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>		-	18	-	nC
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Note:

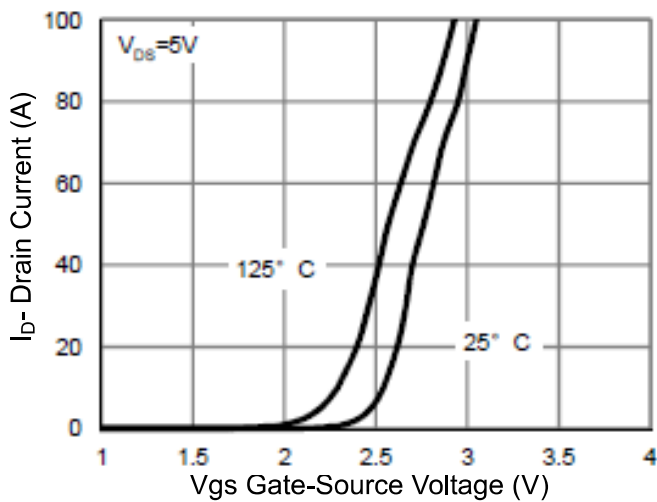
a. Pulse test; pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .

b. Guaranteed by design, not subject to production testing.

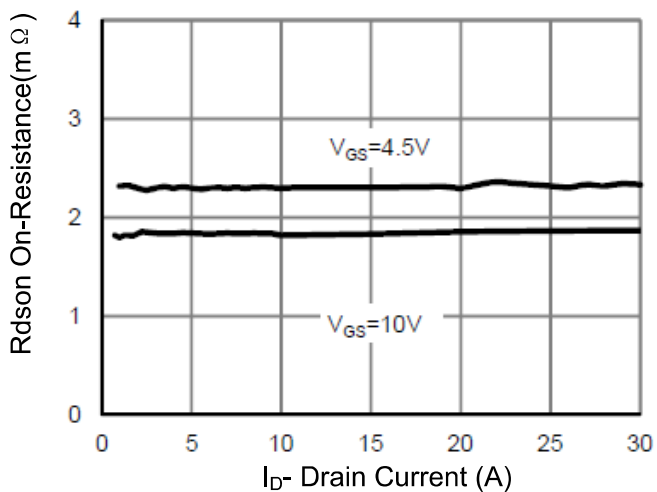
### Typical Electrical and Thermal Characteristics (Curves)



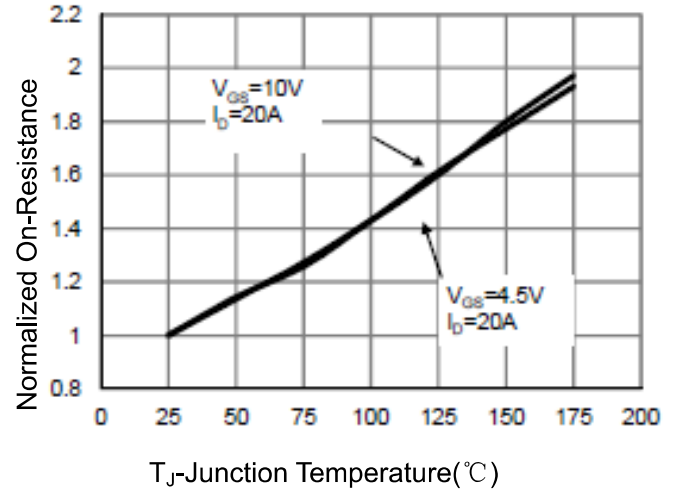
**Figure 1 Output Characteristics**



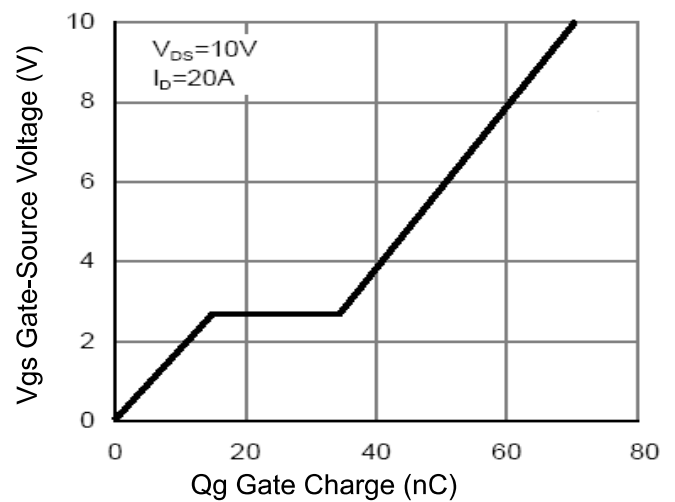
**Figure 2 Transfer Characteristics**



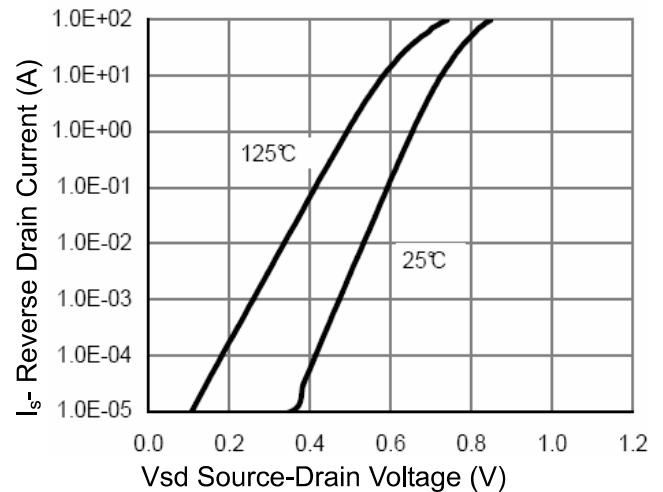
**Figure 3 Rdson- Drain Current**



**Figure 4 Rdson-Junction Temperature**



**Figure 5 Gate Charge**



**Figure 6 Source- Drain Diode Forward**

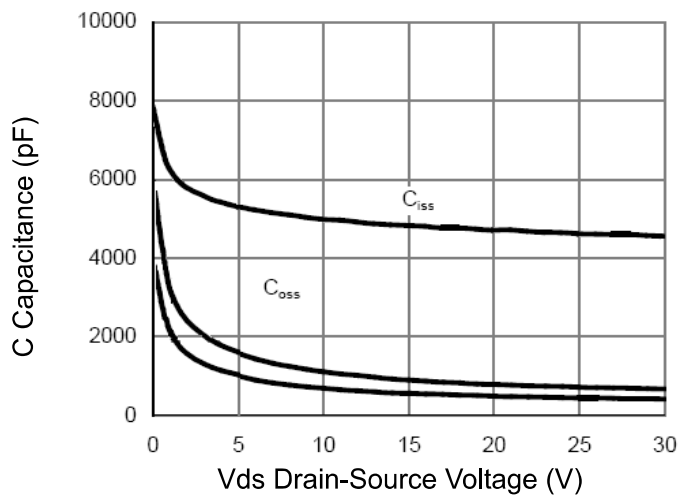


Figure 7 Capacitance vs Vds

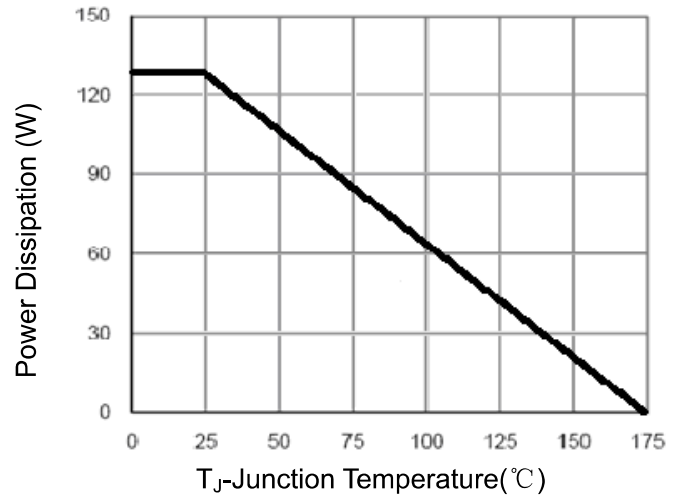


Figure 9 Power De-rating

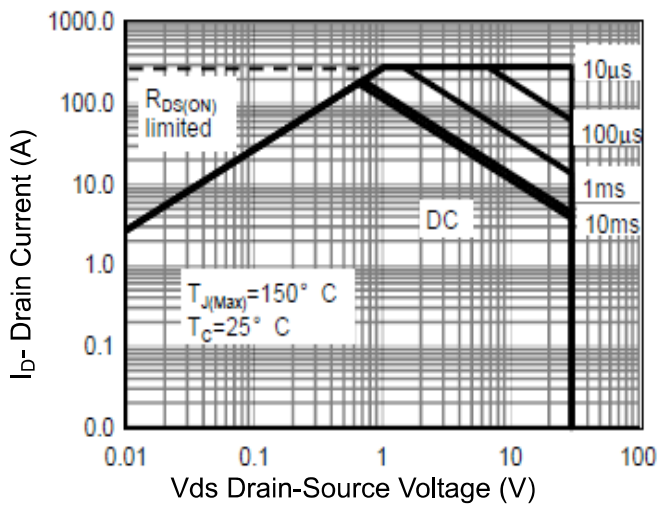


Figure 8 Safe Operation Area

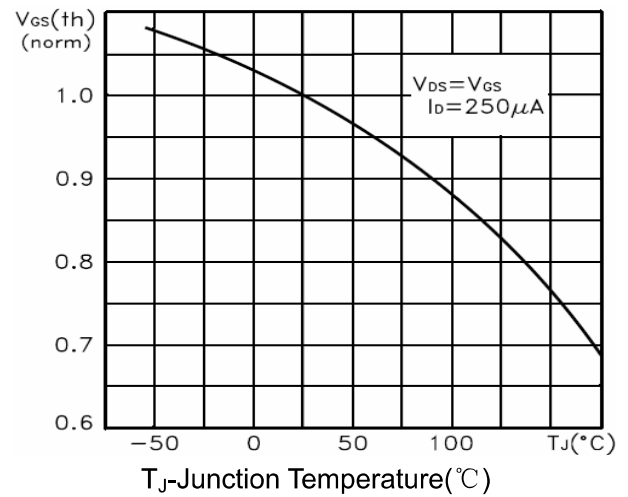
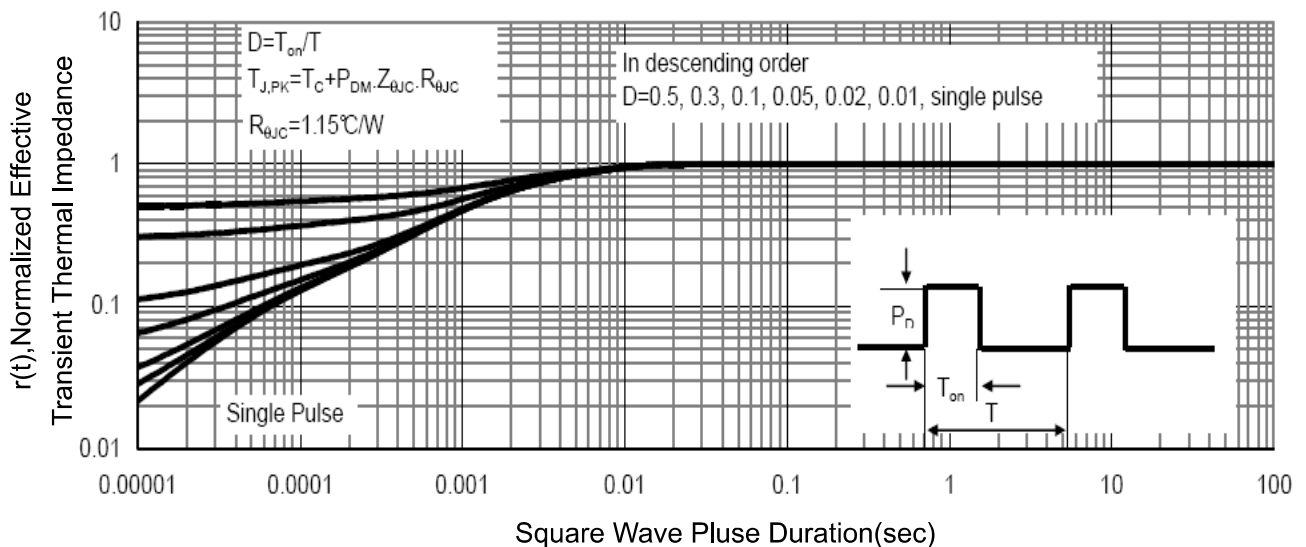
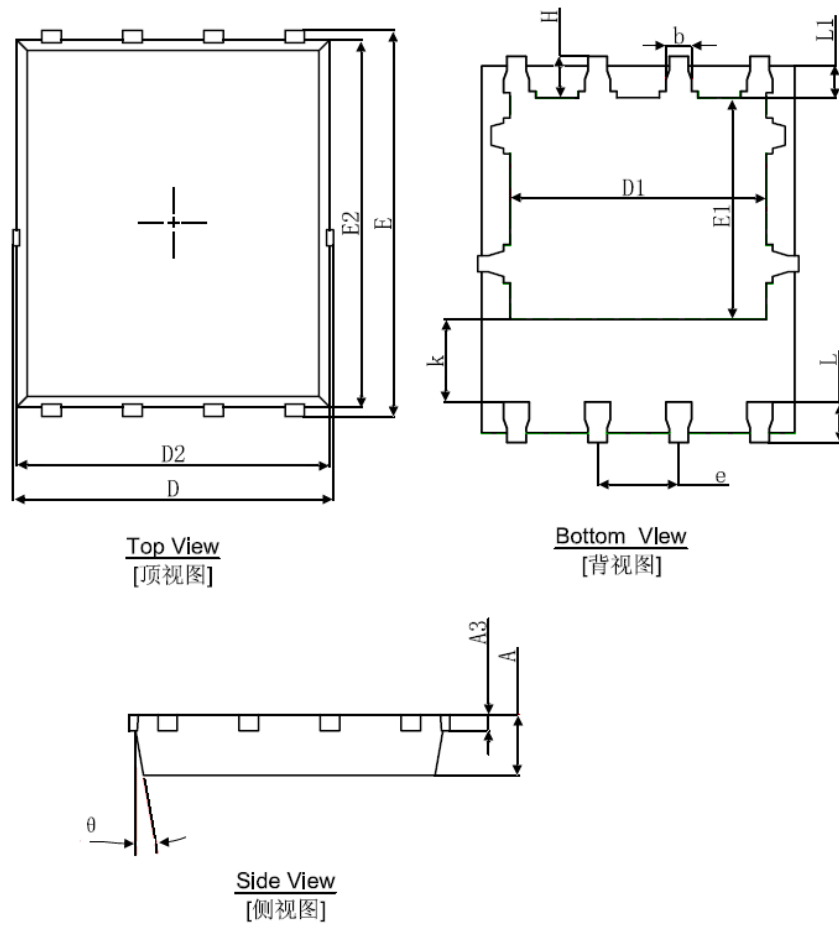
Figure 10  $V_{GS(th)}$  vs Junction Temperature

Figure 11 Normalized Maximum Transient Thermal Impedance

## PDFN5X6-8L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.254REF.		0.010REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	3.910	4.110	0.154	0.162
E1	3.375	3.575	0.133	0.141
D2	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
K	1.190	1.390	0.047	0.055
b	0.035	0.450	0.014	0.018
e	1.270(TYP.)		0.050(TYP.)	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
$\theta$	8°	12°	8°	12°

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