

# MJ N-Channel Super Trench II Power MOSFET

## Description

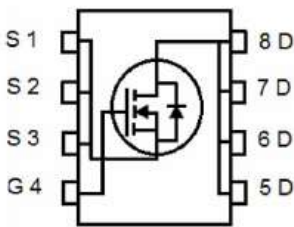
The MJXP038N10GU uses Super Trench technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of  $R_{DS(ON)}$  and  $Q_g$ . This device is ideal for high-frequency switching and synchronous rectification.

## General Features

- ◆  $V_{DS}=100V, I_D=135A$   
 $R_{DS(ON)}=3.45m\Omega$  (Typ.) @  $V_{GS}=10V$
- ◆ Excellent gate charge x  $R_{DS(on)}$  product(FOM)
- ◆ Very low on-resistance  $R_{DS(on)}$
- ◆ 150°C operating temperature
- ◆ Pb-free lead plating

## Application

- ◆ DC/DC Converter
- ◆ Ideal for high-frequency switching and synchronous rectification



Schematic Diagram



Top View



Bottom View

DFN 5X6

100% UIS TESTED! 100%  $\Delta V_{ds}$  TESTED!

## Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
P038N10GU	MJXP038N10GU	DFN5X6-8L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	100	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	135	A
Drain Current-Continuous ( $T_c=100^{\circ}C$ )	$I_{D(100^{\circ}C)}$	108	A
Pulsed Drain Current <sup>(Note 1)</sup>	$I_{DM}$	540	A
Maximum Power Dissipation	$P_D$	170	W
Derating factor		1.36	W/ $^{\circ}C$
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	750	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^{\circ}C$

## Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	0.74	$^{\circ}C/W$
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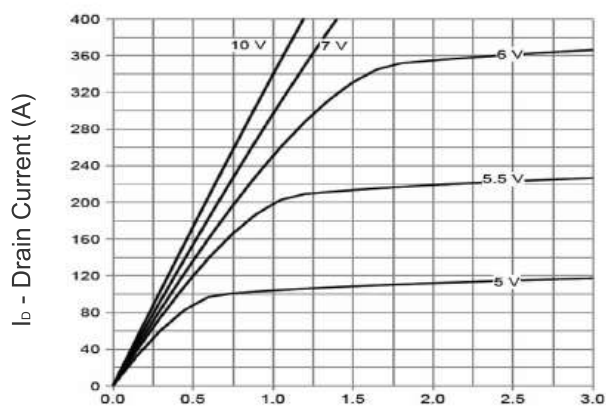
Electrical Characteristics (T<sub>c</sub>=25°C unless otherwise noted)

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	100	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =100V,V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> =±20V,V <sub>GS</sub> =0V	-	-	±100	nA
On Characteristics <small>(Note 3)</small>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =250μA	2	3	4	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =67.5A	-	3.45	3.8	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V,I <sub>D</sub> =67.5A	-	130	-	S
Dynamic Characteristics <small>(Note 4)</small>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =50V,V <sub>GS</sub> =0V F=1.0MHz	-	6300	-	PF
Output Capacitance	C <sub>oss</sub>		-	560	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	40	-	PF
Switching Characteristics <small>(Note 4)</small>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =50V,I <sub>D</sub> =67.5A V <sub>GS</sub> =10V,R <sub>G</sub> =3Ω	-	23	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	15	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	48	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	16	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =50V,I <sub>D</sub> =67.5A V <sub>GS</sub> =10V	-	110	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	33	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	30	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage <small>(Note 3)</small>	V <sub>SD</sub>	V <sub>GS</sub> =0V,I <sub>S</sub> =67.5A	-	-	1.2	V
Diode Forward Current <small>(Note 2)</small>	I <sub>S</sub>		-	-	135	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> =25°C,I <sub>F</sub> =67.5A di/dt= 100A/μs <small>(Note 3)</small>	-	70	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>		-	117	-	nC

## Notes:

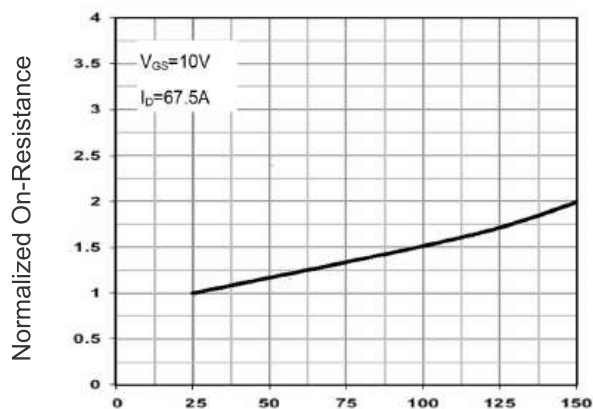
- ① Repetitive Rating: Pulse width limited by maximum junction temperature.
- ② Surface Mounted on FR4 Board, t ≤ 10 sec.
- ③ Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
- ④ Guaranteed by design, not subject to production
- ⑤ EAS condition : T<sub>J</sub>=25°C,V<sub>DD</sub>=50V,V<sub>G</sub>=10V,L=0.5mH,R<sub>g</sub>=25Ω

## Typical Electrical and Thermal Characteristics



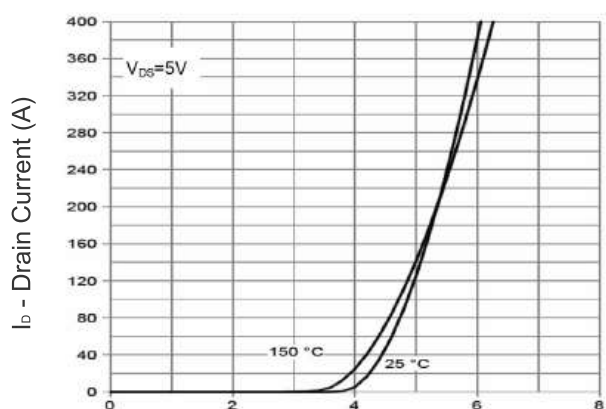
$V_{DS}$  Drain-Source Voltage (V)

Figure 1 Output Characteristics



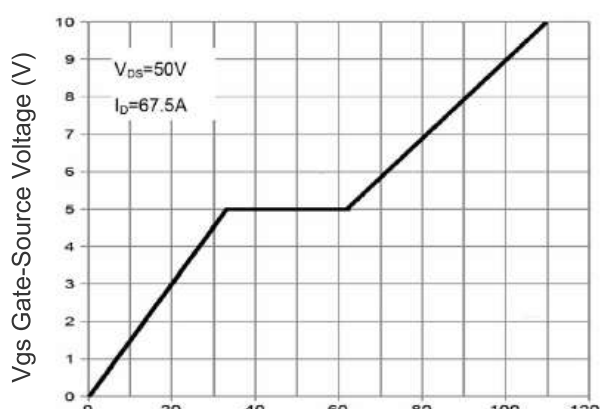
$T_J$ -Junction Temperature ( $^{\circ}\text{C}$ )

Figure 4  $R_{DS(on)}$ -Junction Temperature



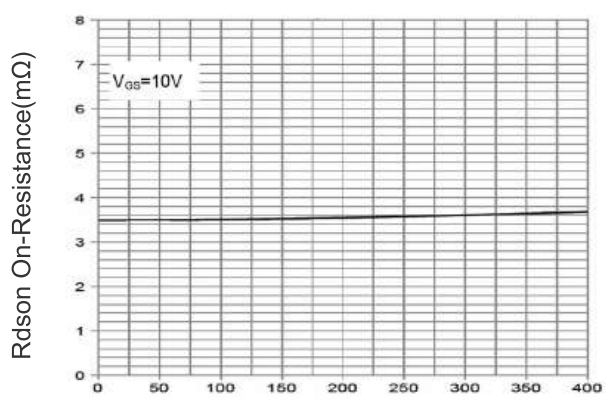
$V_{GS}$  Gate-Source Voltage (V)

Figure 2 Transfer Characteristics



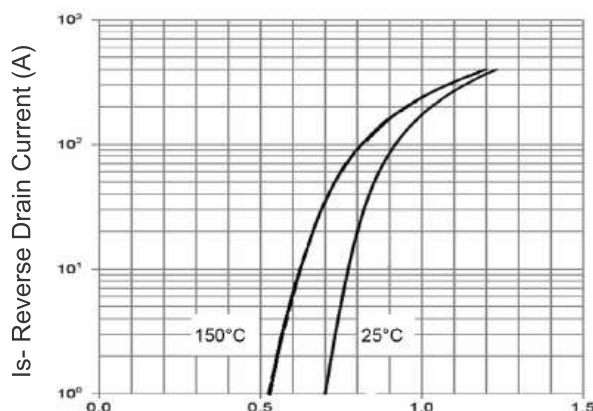
$Q_g$  Gate Charge (nC)

Figure 5 Gate Charge



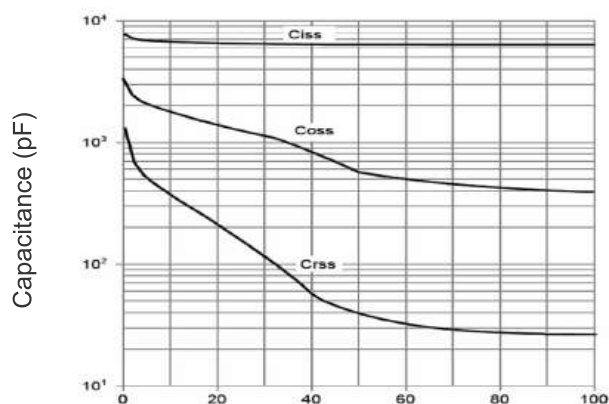
$I_D$  - Drain Current (A)

Figure 3  $R_{DS(on)}$ - Drain Current

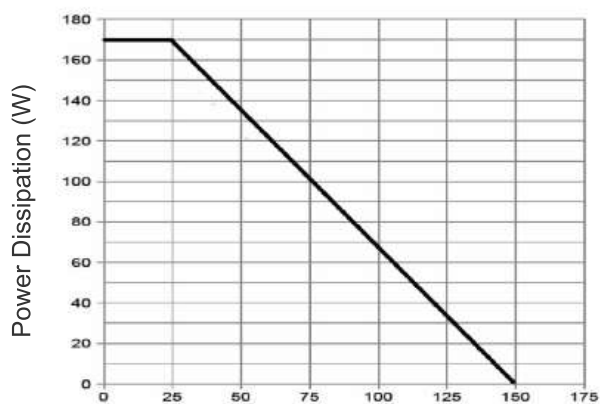


$V_{SD}$  Source-Drain Voltage (V)

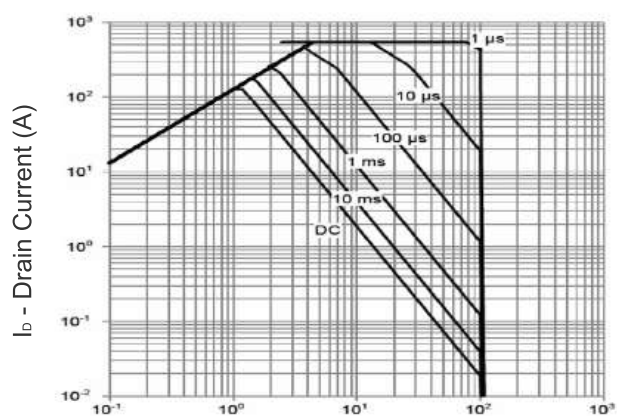
Figure 6 Source- Drain Diode Forward



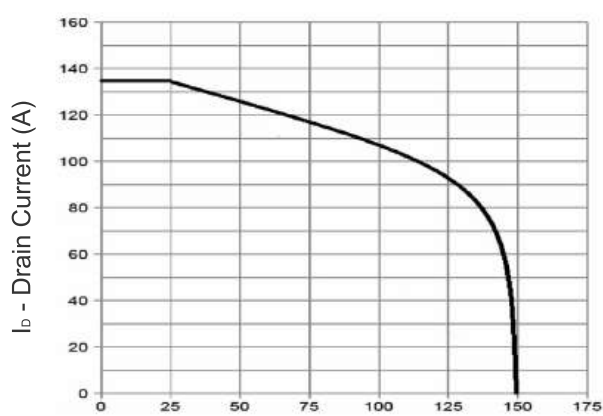
Vds Drain-Source Voltage (V)  
Figure 7 Capacitance vs Vds



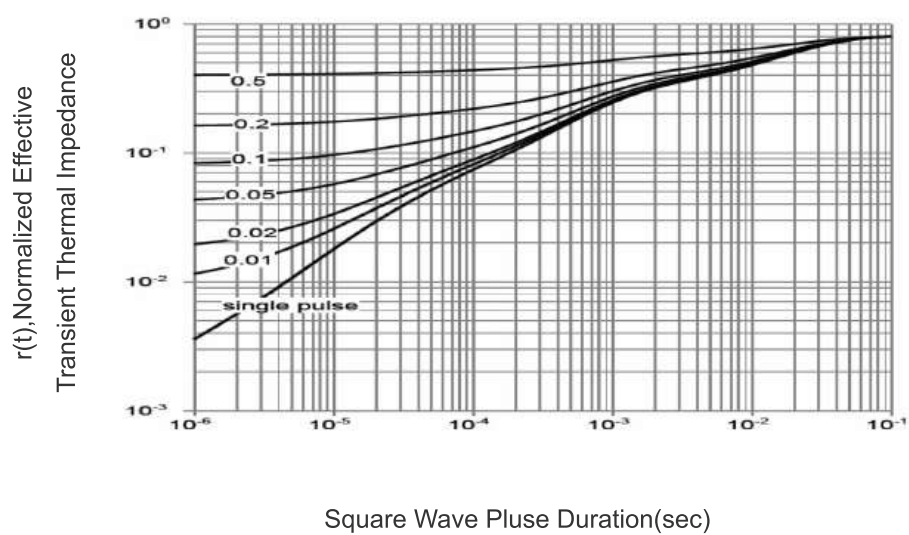
Tj-Junction Temperature(°C)  
Figure 9 Power De-rating



Vds Drain-Source Voltage (V)  
Figure 8 Safe Operation Area



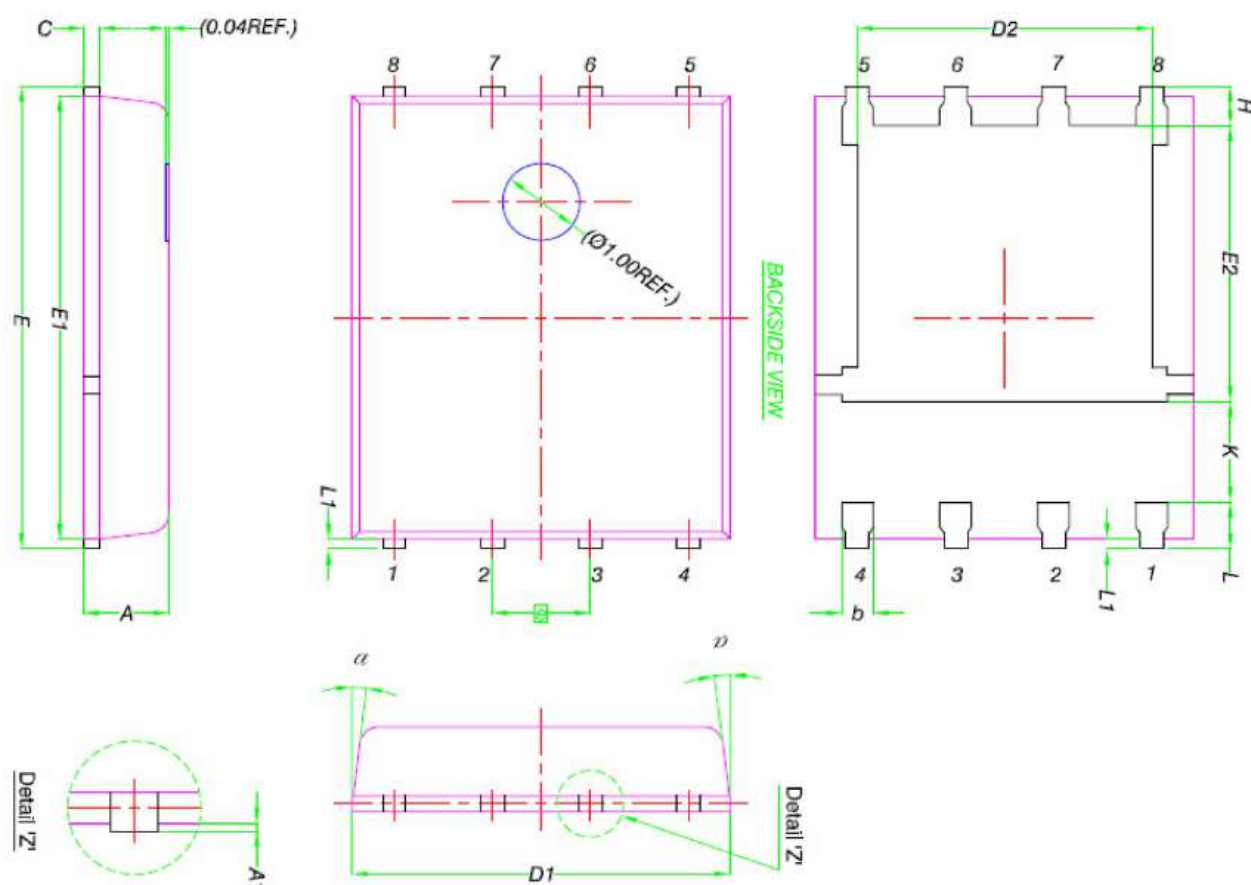
Tj-Junction Temperature(°C)  
Figure 10 Current De-rating



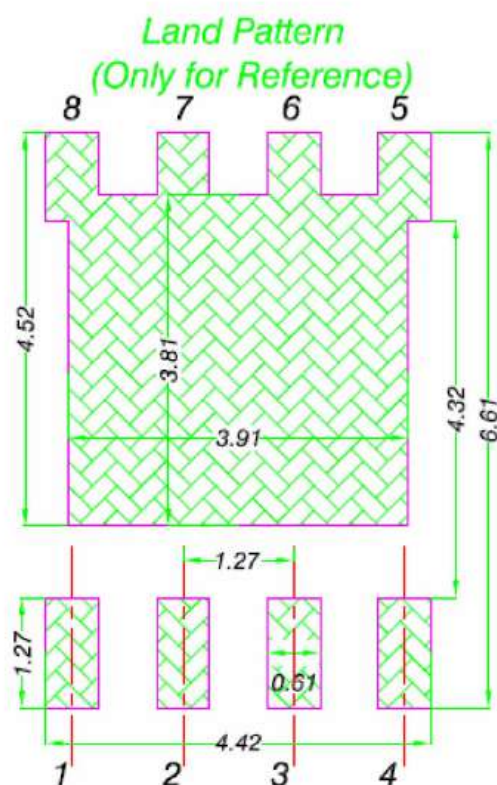
Square Wave Pluse Duration(sec)  
Figure 11 Normalized Maximum Transient Thermal Impedance



## DFN5X6-8L Package Information



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0	-	0.05
b	0.33	0.41	0.51
C	0.20	0.25	0.30
D1	4.80	4.90	5.00
D2	3.61	3.81	3.96
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.38	3.58	3.78
e	1.27 BSC		
H	0.41	0.51	0.61
K	1.10	-	-
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
α	0°	-	12°



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