
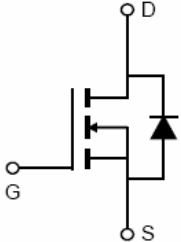


## QIAOXIN N-Channel Super Trench II Power MOSFET

<p><b>Description</b></p> <p>The series of devices uses <b>Super Trench II</b> 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 <math>R_{DS(ON)}</math> and <math>Q_g</math>. This device is ideal for high-frequency switching and synchronous rectification.</p> <p><b>Application</b></p> <ul style="list-style-type: none"> <li>● DC/DC Converter</li> <li>● Ideal for high-frequency switching and synchronous rectification</li> </ul>	<p><b>General Features</b></p> <ul style="list-style-type: none"> <li>● <math>V_{DS} = 120V, I_D = 63A</math> <math>R_{DS(ON)} = 11.5m\Omega</math>, typical (TO-220) @ <math>V_{GS} = 10V</math></li> <li>● Excellent gate charge x <math>R_{DS(on)}</math> product(FOM)</li> <li>● Very low on-resistance <math>R_{DS(on)}</math></li> <li>● 175 °C operating temperature</li> <li>● Pb-free lead plating</li> </ul>
<p><b>TO-220</b></p> 	 <p><b>Schematic Diagram</b></p>

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VCRR12N12	VCRR12N12	TO-220	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	120	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	63	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	45	A
Pulsed Drain Current	$I_{DM}$	252	A
Maximum Power Dissipation	$P_D$	100	W
Derating factor		0.67	W/ $^\circ C$
Single pulse avalanche energy <sup>(Note 4)</sup>	$E_{AS}$	288	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	$^\circ C$

### Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.5	$^\circ C/W$
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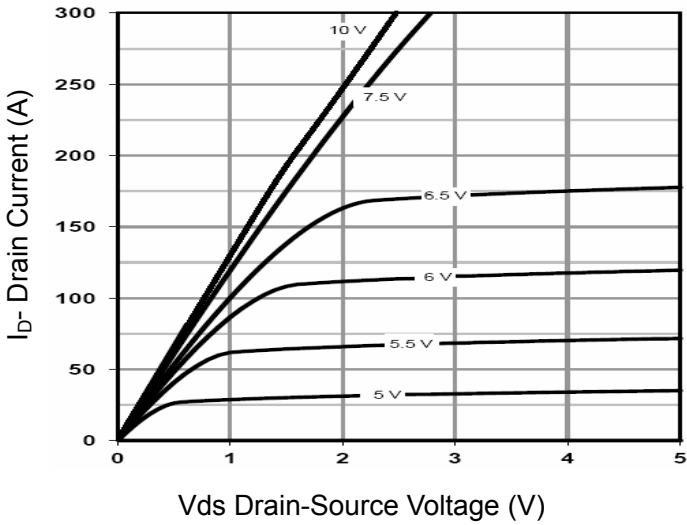
### Electrical Characteristics ( $T_C=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	120		-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=120V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b> (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	3.0	4.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=31.5A$	-	11.5	12.5	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=31.5A$		50	-	S
<b>Dynamic Characteristics</b> (Note 3)						
Input Capacitance	$C_{iss}$	$V_{DS}=60V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	2230	-	pF
Output Capacitance	$C_{oss}$		-	170	-	pF
Reverse Transfer Capacitance	$C_{rss}$		-	19	-	pF
<b>Switching Characteristics</b> (Note 3)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=60V, I_D=31.5A$ $V_{GS}=10V, R_G=1.6\Omega$	-	12	-	nS
Turn-on Rise Time	$t_r$		-	9	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	29	-	nS
Turn-Off Fall Time	$t_f$		-	7	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=60V, I_D=31.5A,$ $V_{GS}=10V$	-	45	-	nC
Gate-Source Charge	$Q_{gs}$		-	15	-	nC
Gate-Drain Charge	$Q_{gd}$		-	14.5	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 2)	$V_{SD}$	$V_{GS}=0V, I_S=31.5A$	-	-	1.2	V
Diode Forward Current	$I_S$		-	-	63	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^{\circ}\text{C}, I_F = 31.5A$ $di/dt = 100A/\mu s$ (Note 3)	-	55	-	nS
Reverse Recovery Charge	$Q_{rr}$		-	98	-	nC

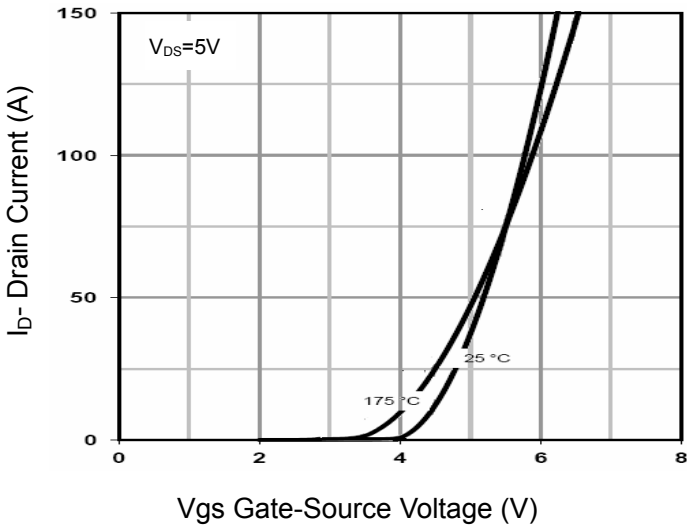
#### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
3. Guaranteed by design, not subject to production
4. EAS condition :  $T_J=25^{\circ}\text{C}, V_{DD}=50V, V_G=10V, L=0.25\text{mH}, R_g=25\Omega$

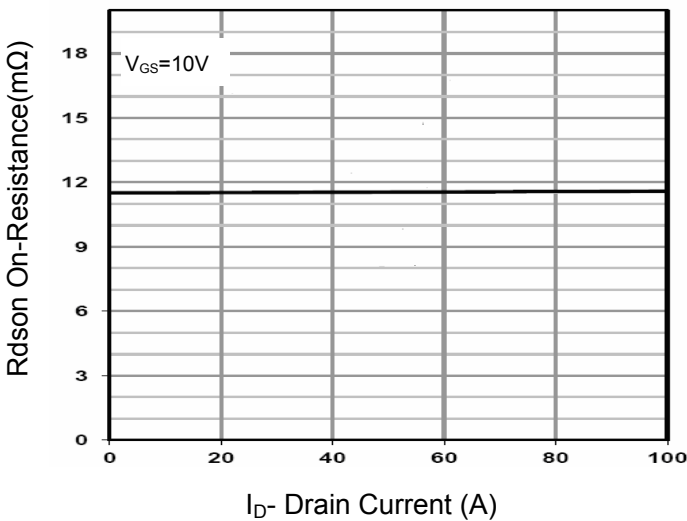
**Typical Electrical and Thermal Characteristics**



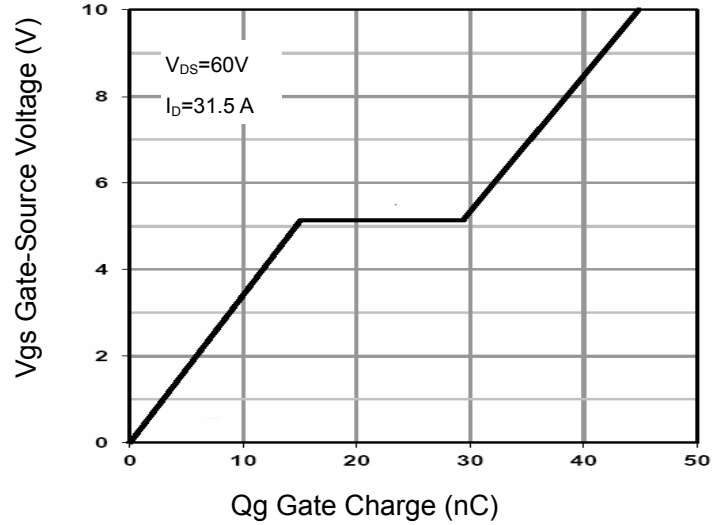
**Figure 1 Output Characteristics**



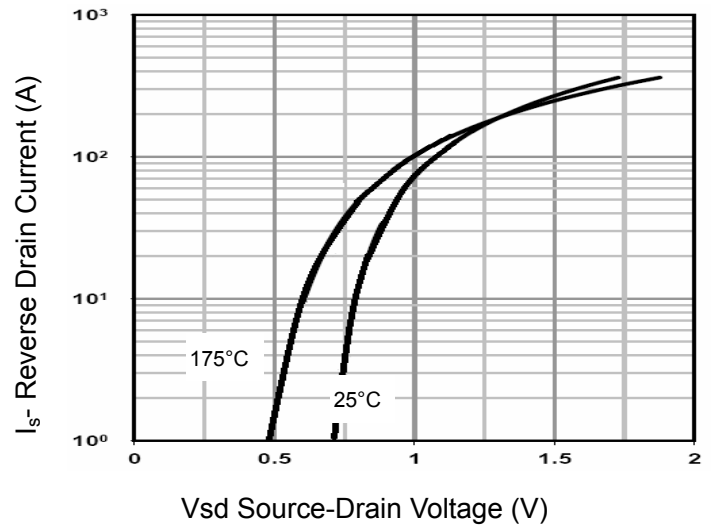
**Figure 2 Transfer Characteristics**



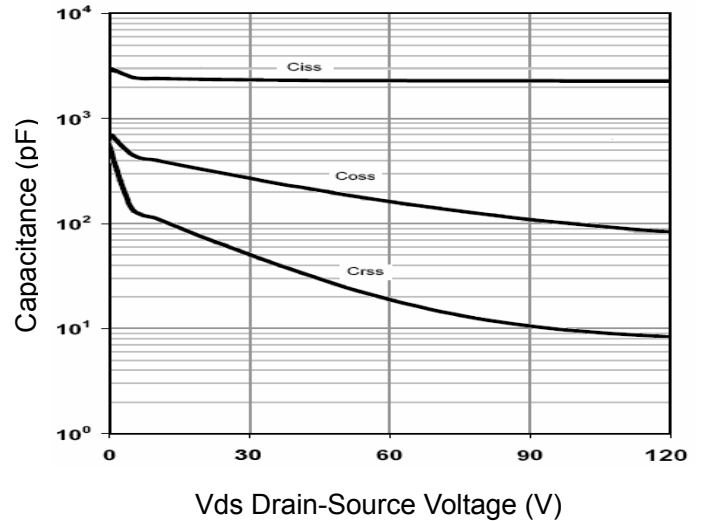
**Figure 3 Rdson- Drain Current**



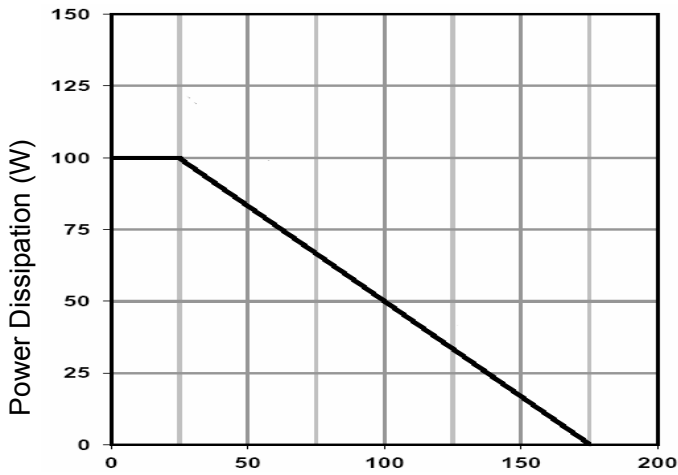
**Figure 4 Gate Charge**



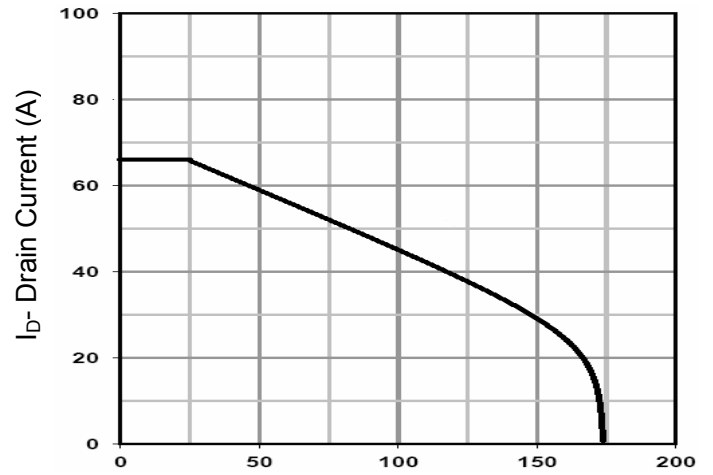
**Figure 5 Source- Drain Diode Forward**



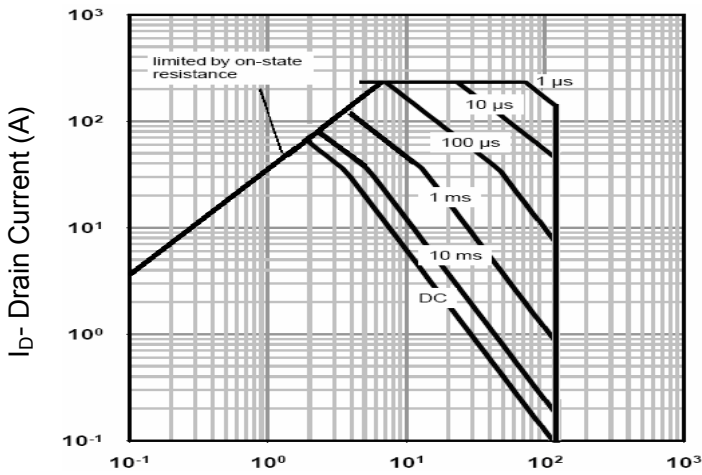
**Figure 6 Capacitance vs Vds**



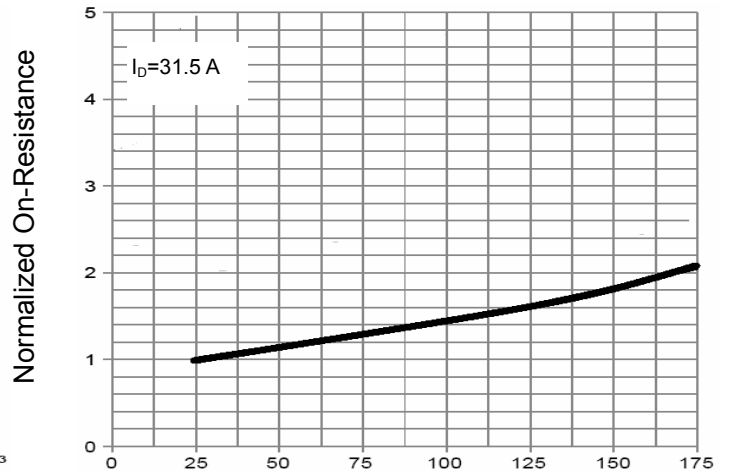
T<sub>J</sub>-Junction Temperature(°C)  
**Figure 7 Power De-rating**



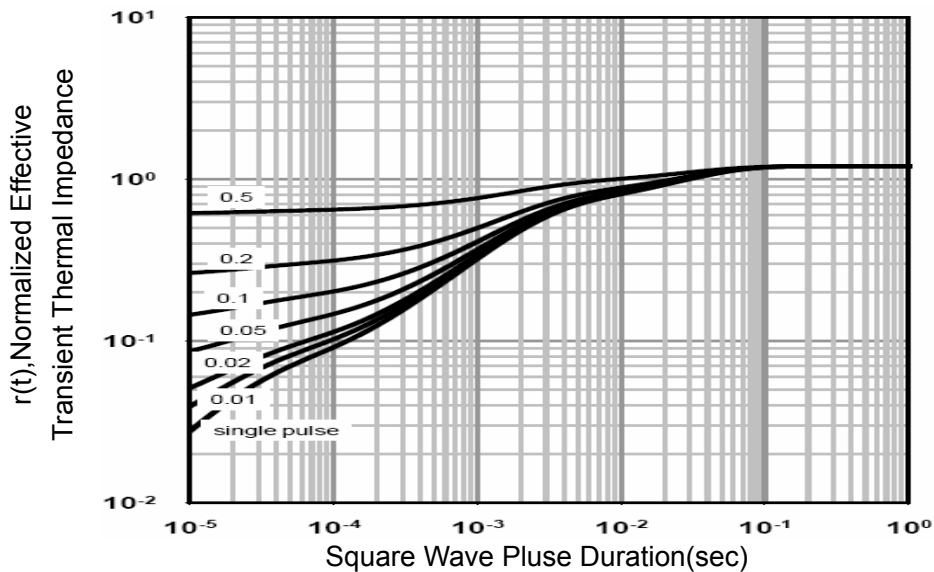
T<sub>J</sub>-Junction Temperature (°C)  
**Figure 9 Current De-rating**



V<sub>ds</sub> Drain-Source Voltage (V)  
**Figure 8 Safe Operation Area**



T<sub>J</sub>-Junction Temperature(°C)  
**Figure 10 Rdson-Junction Temperature**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

**TO-220-3L Package Information**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.9500	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	6.900 REF.		0.276 REF.	
Φ	3.400	3.800	0.134	0.150

### **Attention**

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