QIAOXIN N-Channel **Super Trench II** **Power MOSFET**

Description

The series of devices uses **Super Trench II** 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.

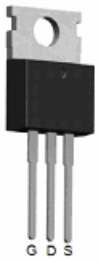
Application

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

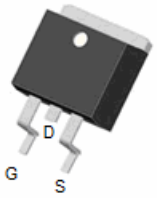
General Features

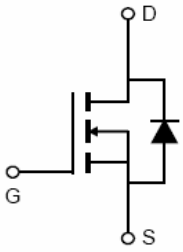
- V_{DS} =100V,I_D =125A
  $R_{DS(ON)}$=4.2mΩ , typical (TO-220)@ V_{GS}=10V
  $R_{DS(ON)}$=4.0mΩ , typical (TO-263)@ V_{GS}=10V
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175°C operating temperature
- Pb-free lead plating

TO-220



TO-263





Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VCRR045N10	VCRR045N10	TO-220-3L	-	-	-
VCRR045N10D	VCRR045N10D	TO-263	-	-	-

Absolute Maximum Ratings (T_C=25℃unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	125	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	95	A
Pulsed Drain Current	I_{DM}	500	A
Maximum Power Dissipation	P_D	200	W
Derating factor		1.33	W/℃
Single pulse avalanche energy (Note 5)	E_{AS}	871	mJ
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 175	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case (Note 2)	$R_{\theta JC}$	0.75	℃/W

Electrical Characteristics (T_C=25℃unless otherwise noted)

Parameter	Symbol	Condition		Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA		100		-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=100V,V_{GS}=0V		-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V		-	-	±100	nA
On Characteristics (Note 3)							
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA		2	3	4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=60A	TO-220	-	4.2	4.5	mΩ
			TO-263		4.0	4.5	
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=60A			120	-	S
Dynamic Characteristics (Note4)							
Input Capacitance	C_{lss}	V_{DS}=50V,V_{GS}=0V, F=1.0MHz		-	5500	-	PF
Output Capacitance	C_{oss}			-	590	-	PF
Reverse Transfer Capacitance	C_{rss}			-	25	-	PF
Switching Characteristics (Note 4)							
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=50V,I_D=60A, V_{GS}=10V,R_G=3Ω		-	21	-	nS
Turn-on Rise Time	t_r			-	13	-	nS
Turn-Off Delay Time	$t_{d(off)}$			-	40	-	nS
Turn-Off Fall Time	t_f			-	12	-	nS
Total Gate Charge	Q_g	V_{DS}=50V,I_D=60A, V_{GS}=10V		-	92	-	nC
Gate-Source Charge	Q_{gs}			-	27		nC
Gate-Drain Charge	Q_{gd}			-	21		nC
Drain-Source Diode Characteristics							
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=60A		-		1.2	V
Diode Forward Current (Note 2)	I_S			-	-	125	A
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F =60A di/dt = 100A/μs (Note3)		-	72	-	nS
Reverse Recovery Charge	Qrr			-	140	-	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 : Tj=25℃,V_{DD}=50V,V_G=10V,L=0.5mH,Rg=25Ω

Typical Electrical and Thermal Characteristics

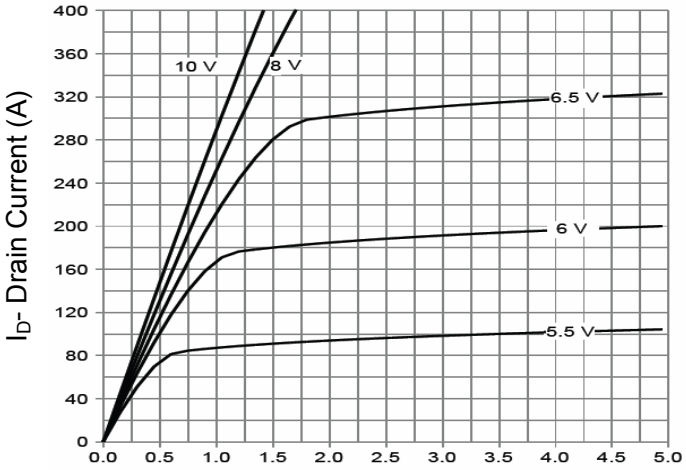


Figure 1 Output Characteristics

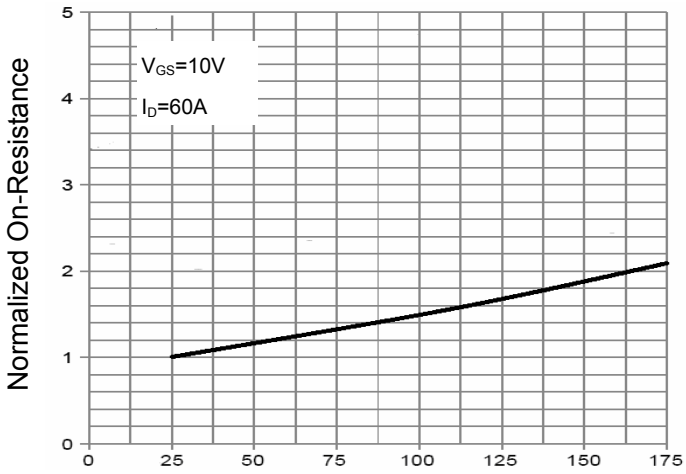


Figure 4 Rdson-Junction Temperature

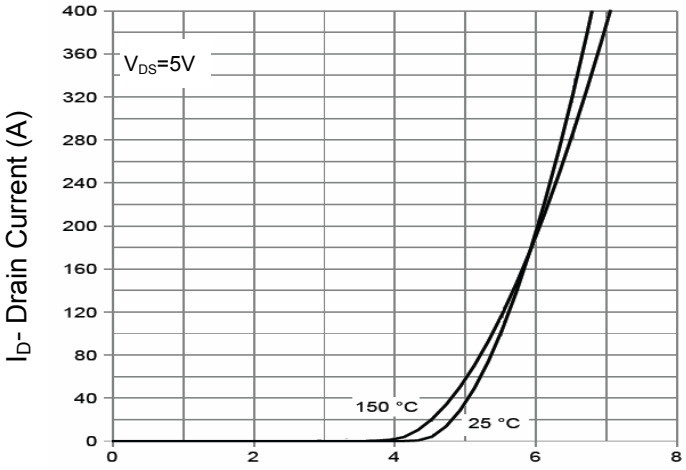


Figure 2 Transfer Characteristics

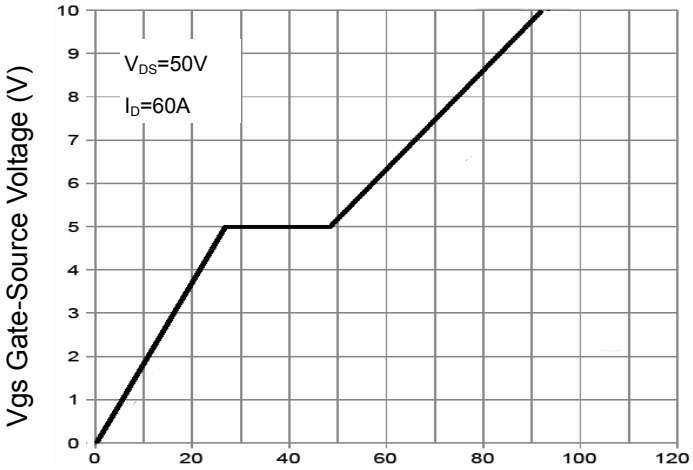


Figure 5 Gate Charge

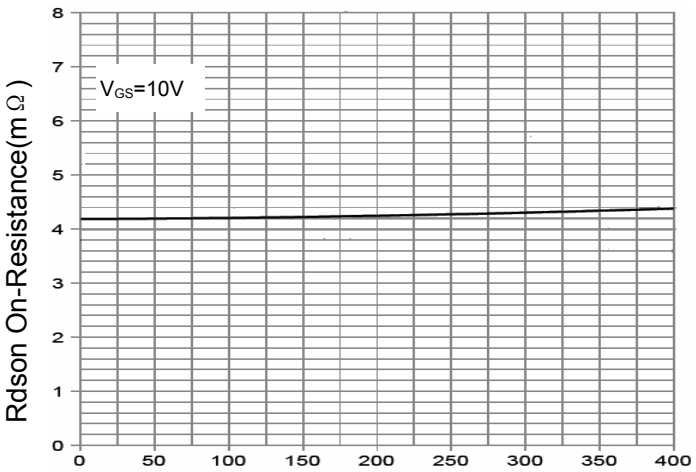


Figure 3 Rdson- Drain Current

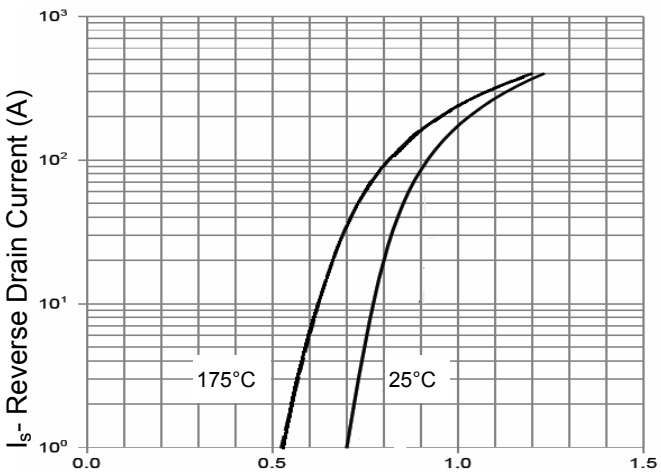


Figure 6 Source- Drain Diode Forward

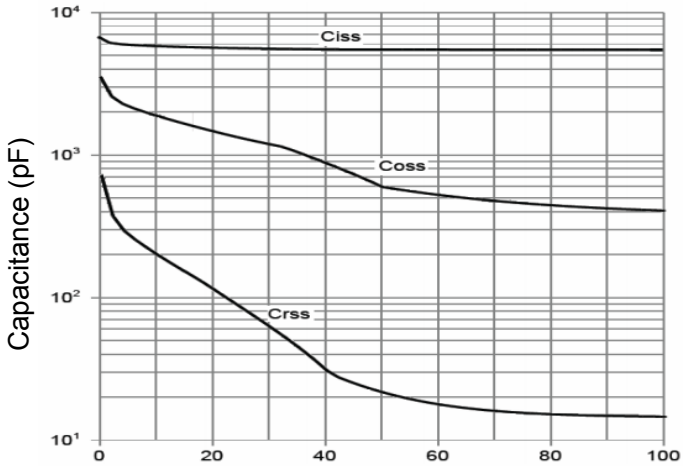


Figure 7 Capacitance vs Vds

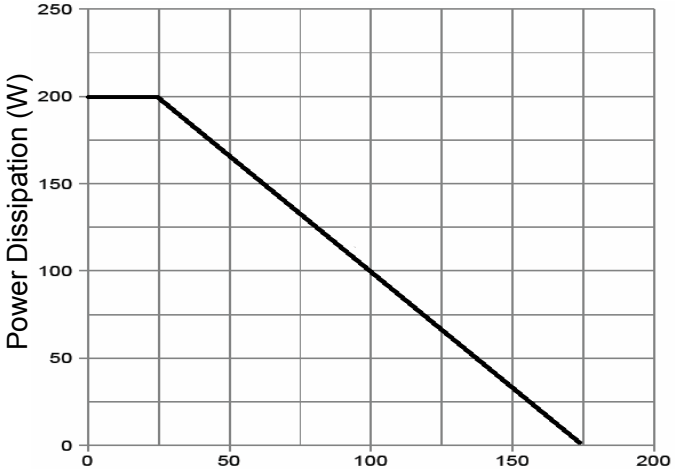


Figure 9 Power De-rating

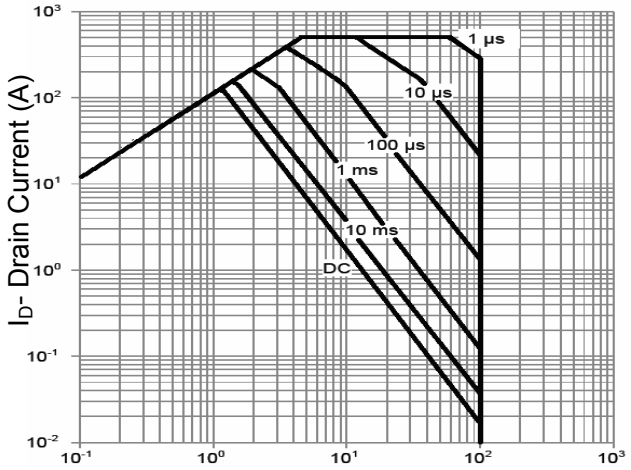


Figure 8 Safe Operation Area

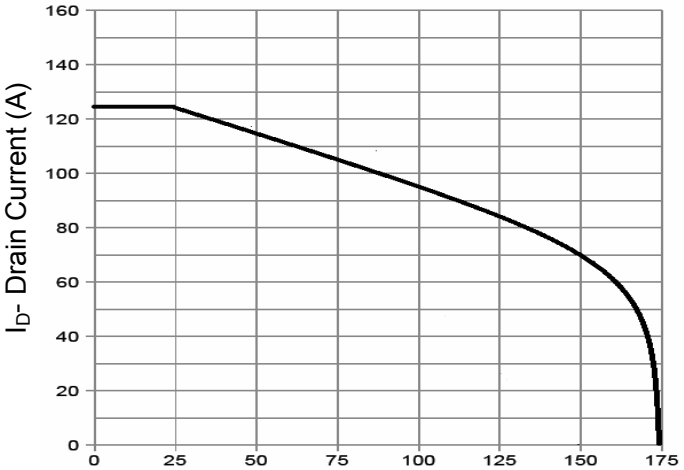


Figure 10 Current De-rating

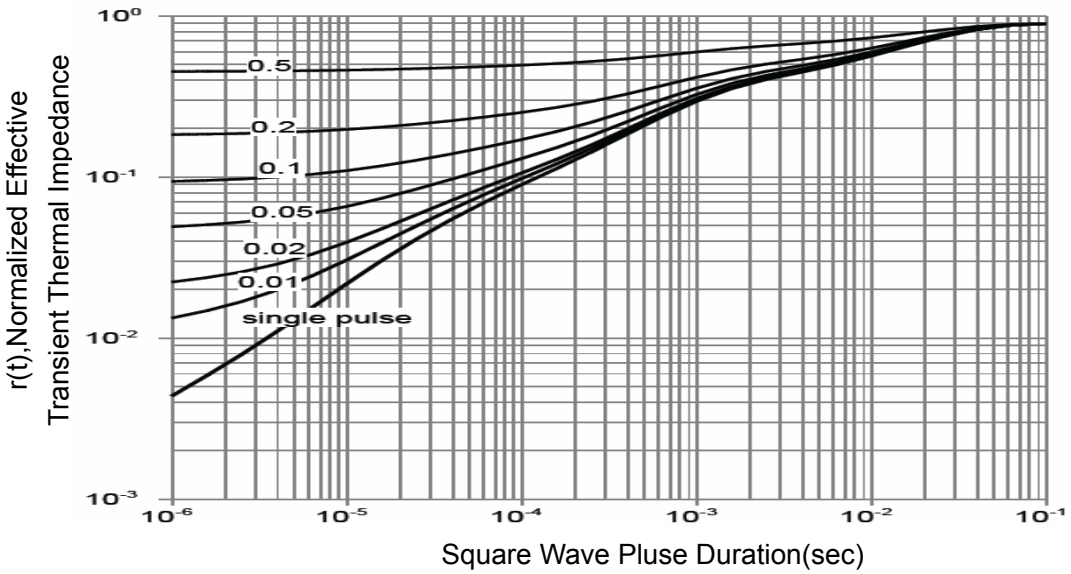
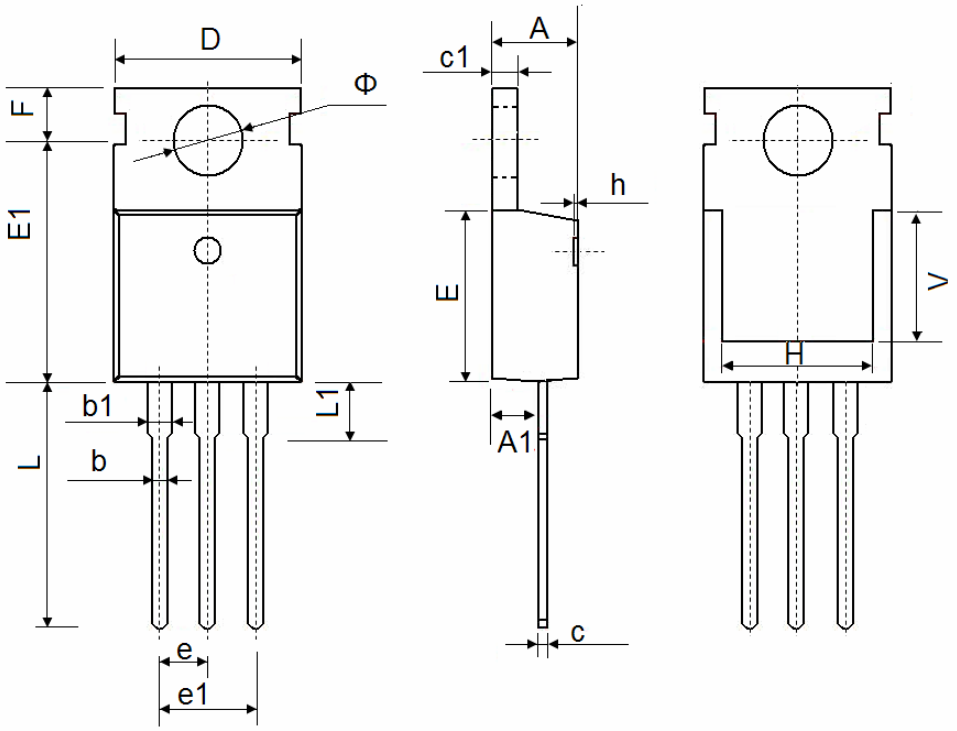


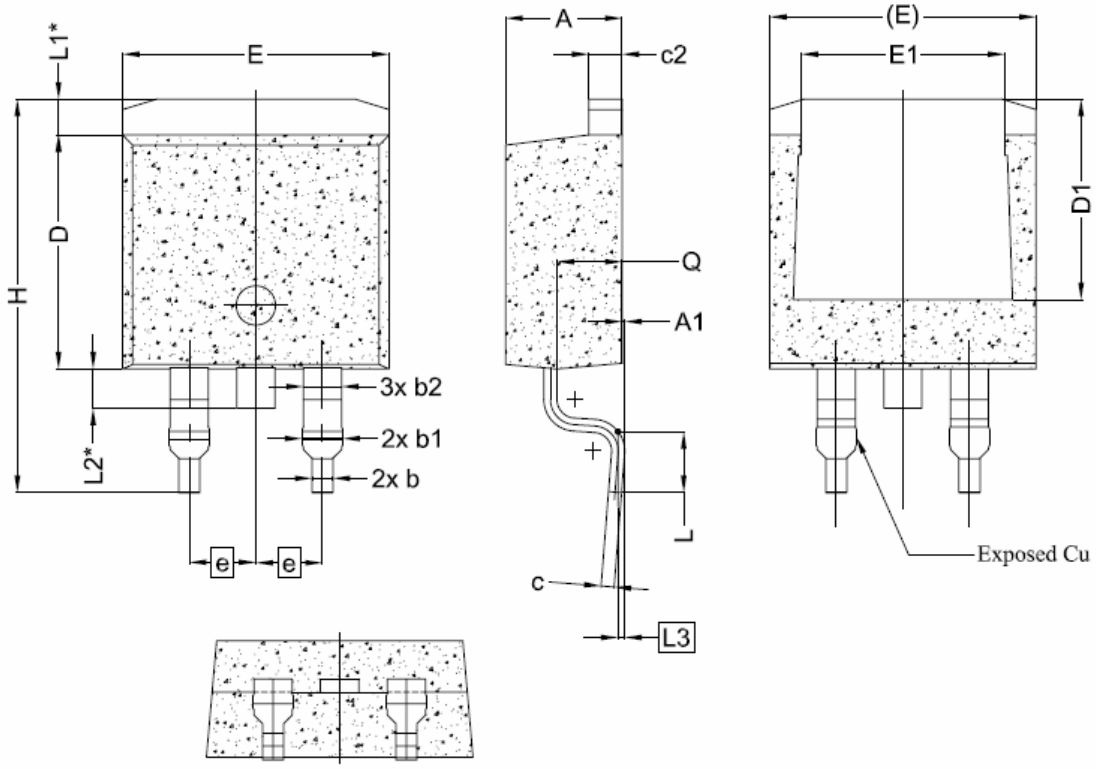
Figure 11 Normalized Maximum Transient Thermal Impedance

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

TO-263-2L Package Information



Symbol	Dimensions In Millimeters		
	Min.	Nom.	Max.
A	4.24	4.44	4.64
A1	0.00	0.10	0.25
b	0.70	0.80	0.90
b1	1.20	1.55	1.75
b2	1.20	1.45	1.70
c	0.40	0.50	0.60
c2	1.15	1.27	1.40
D	8.82	8.92	9.02
D1	6.86	7.65	-
E	9.96	10.16	10.36
E1	6.89	7.77	7.89
e	2.54BSC		
H	14.61	15.00	15.88
L	1.78	2.32	2.79
L1	1.36 REF.		
L2	1.50 REF.		
L3	0.25 BSC		
Q	2.30	2.48	2.70

Attention

QIAOXIN assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all QIAOXIN products described or contained herein. QIAOXIN products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. QIAOXIN reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.