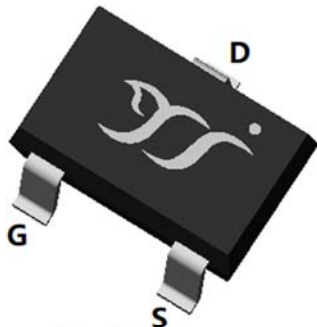
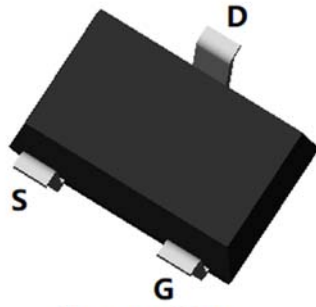


N-Channel Enhancement Mode Field Effect Transistor

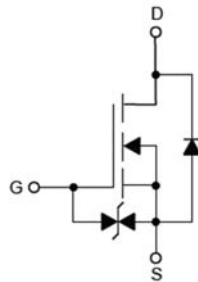


Top View



Bottom View

SOT-323



Product Summary

- V_{DS} 60V
- I_D 300mA
- $R_{DS(ON)}$ (at $V_{GS}=10V$) <2.0ohm
- $R_{DS(ON)}$ (at $V_{GS}=4.5V$) <2.5ohm
- ESD protected up to 2.0KV (HBM)

General Description

- Trench Power MV MOSFET technology
- Voltage controlled small signal switch
- Low input Capacitance
- Fast Switching Speed
- Low Input / Output Leakage
- Part no. with suffix "Q" means AEC-Q101 qualified

Applications

- Battery operated systems
- Solid-state relays
- Direct logic-level interface: TTL/CMOS
- 12V, 24V Automotive systems

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

Parameter	Symbol	Limit	Unit
Drain-source Voltage	V_{DS}	60	V
Gate-source Voltage	V_{GS}	± 20	V
Drain Current @ $T_A=25^\circ C$	I_D	300	mA
Pulsed Drain Current ^A	I_{DM}	1.5	A
Total Power Dissipation @ $T_A=25^\circ C$	P_D	416	mW
Thermal Resistance Junction-to-Ambient @ Steady State ^B	$R_{\theta JA}$	360	$^\circ C/W$
Junction and Storage Temperature Range	T_J, T_{STG}	-55~+175	$^\circ C$

■ Ordering Information (Example)

PREFERRED P/N	PACKING CODE	Marking	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
2N7002KDWHQ	F2	72KD.	3000	30000	120000	7" reel



2N7002KDWHQ

■ Electrical Characteristics (T_J=25°C unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Static Parameter						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} = 0V, I _D =250μA	60			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V, V _{GS} =0V			1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} = ±20V, V _{DS} =0V			±10	μA
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D =250μA	1.1	1.5	2.4	V
Static Drain-Source On-Resistance	R _{Ds(ON)}	V _{GS} = 10V, I _D =300mA		1.1	2.0	Ω
		V _{GS} = 4.5V, I _D =200mA		1.3	2.5	
Diode Forward Voltage	V _{SD}	I _S =115mA, V _{GS} =0V		0.9	1.2	V
Gate resistance	R _G	f=1MHz		150		Ω
Dynamic Parameters						
Input Capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, f=1MHZ		25		pF
Output Capacitance	C _{oss}			8		
Reverse Transfer Capacitance	C _{rss}			4		
Switching Parameters						
Total Gate Charge	Q _g	V _{GS} =10V, V _{DS} =30V, I _D =1A		1.75		nC
Gate Source Charge	Q _{gs}			1.00		
Gate Drain Charge	Q _{gd}			0.25		
Reverse Recovery Charge	Q _{rr}	I _{SD} =1A, di/dt=100A/us		3.9		nC
Reverse Recovery Time	t _{rr}			15		ns
Turn-on Delay Time	t _{D(on)}	V _{GS} =10V, V _{DS} =30V, I _D =1A, R _g =3Ω		4.6		ns
Turn-on Rise Time	t _r			20.0		
Turn-off Delay Time	t _{D(off)}			10.5		
Turn-off Fall Time	t _f			25.5		

A. Repetitive rating; pulse width limited by max. junction temperature.

B. The value of R_{θJA} is measured with the device mounted on the minimum recommend pad size, in the still air environment with T_A=25°C. The maximum allowed junction temperature of 175°C. The value in any given application depends on the user's specific board design.



2N7002KDWHQ

■ Typical Performance Characteristics

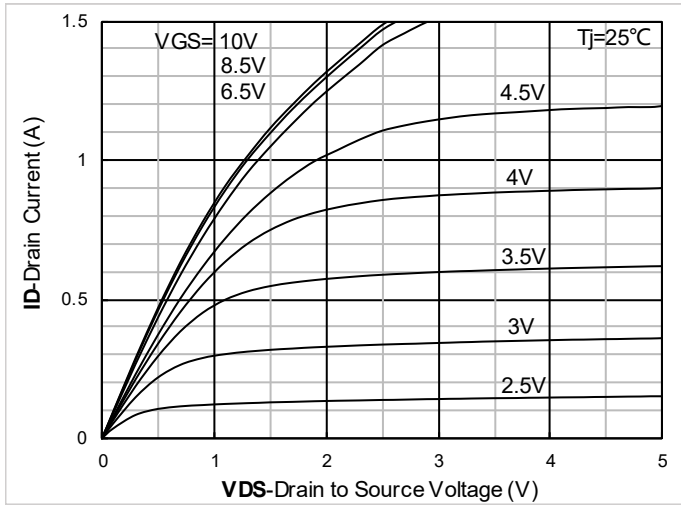


Figure1. Output Characteristics

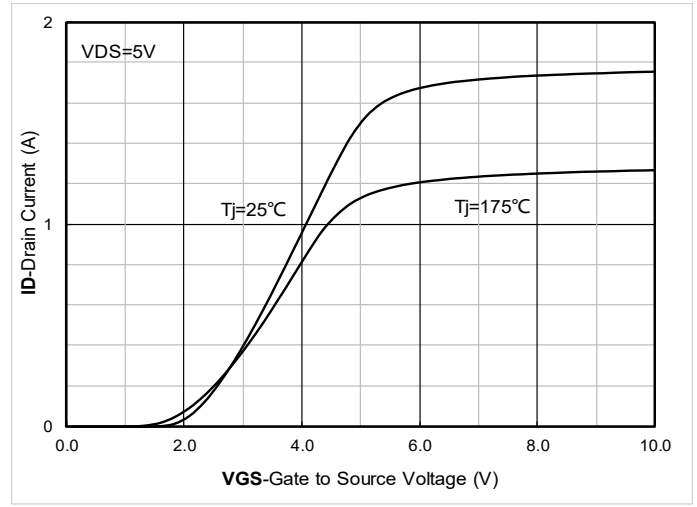


Figure2. Transfer Characteristics

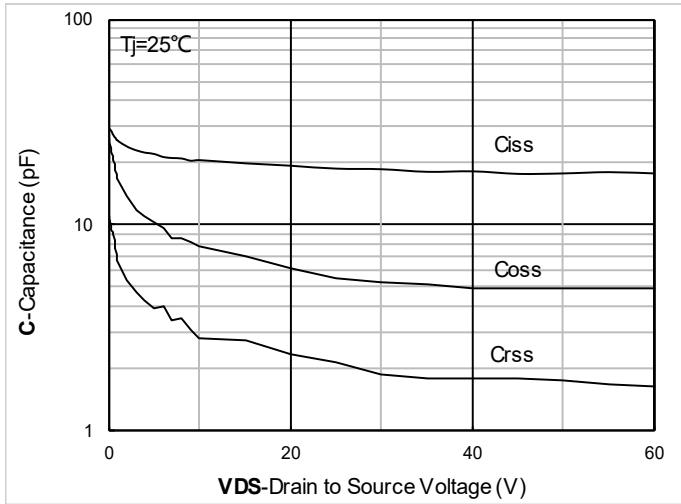


Figure3. Capacitance Characteristics

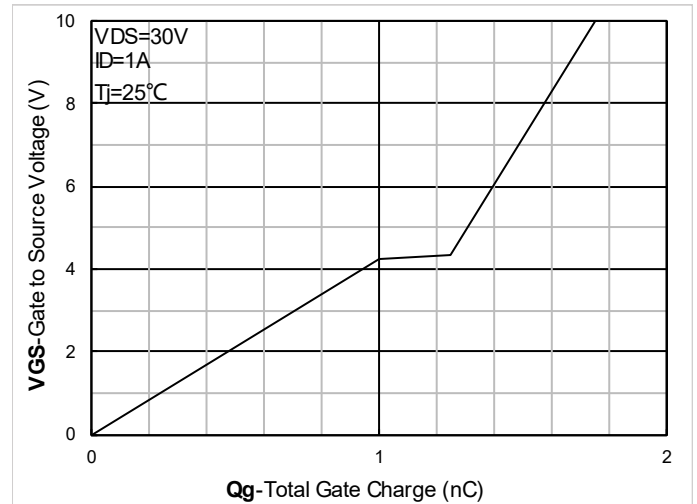


Figure4. Gate Charge

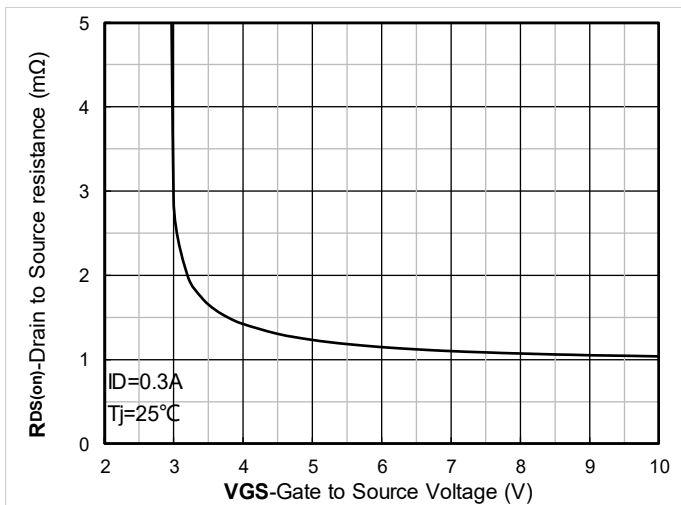


Figure5. On-Resistance vs Gate to Source Voltage

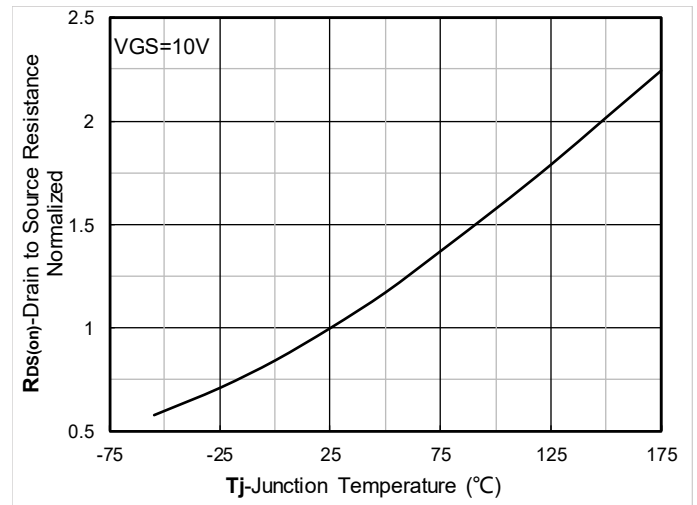


Figure6. Normalized On-Resistance



2N7002KDWHQ

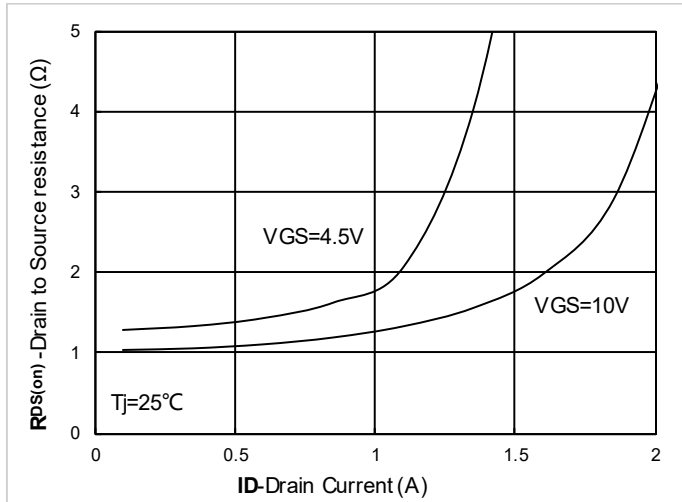


Figure 7. $R_{DS(on)}$ VS Drain Current

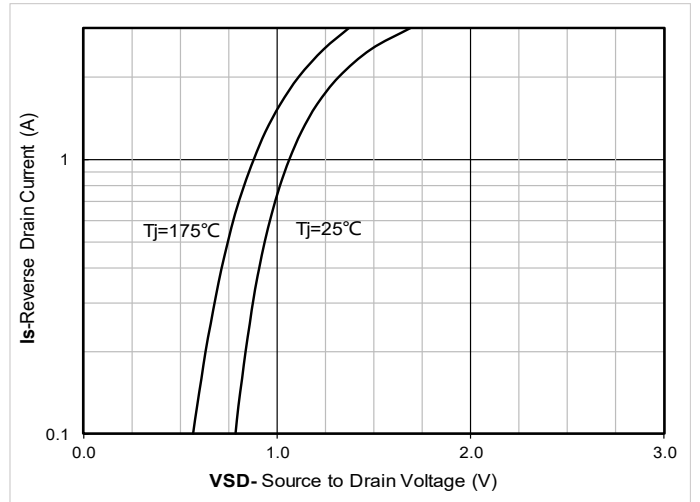


Figure 8. Forward characteristics of reverse diode

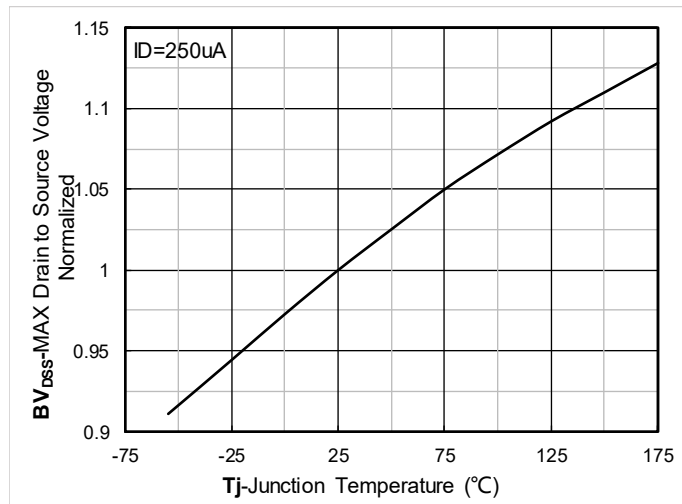


Figure 9. Normalized breakdown voltage

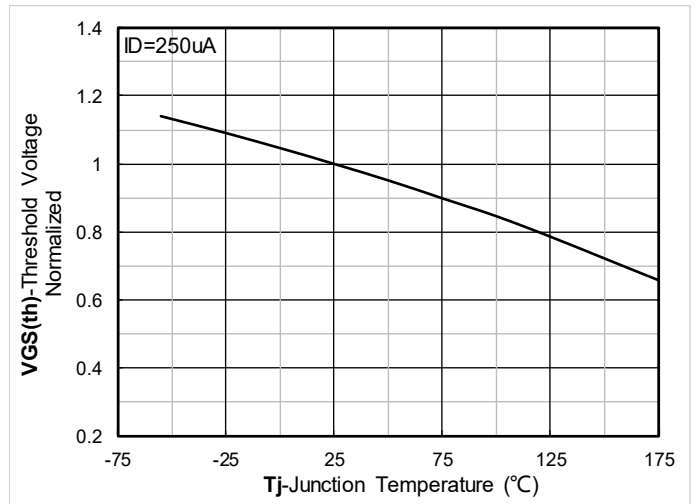


Figure 10. Normalized Threshold voltage

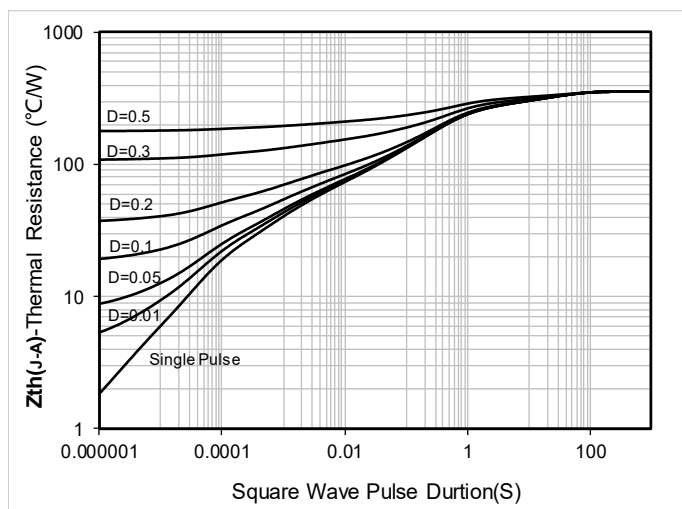


Figure 11. Maximum Transient Thermal Impedance

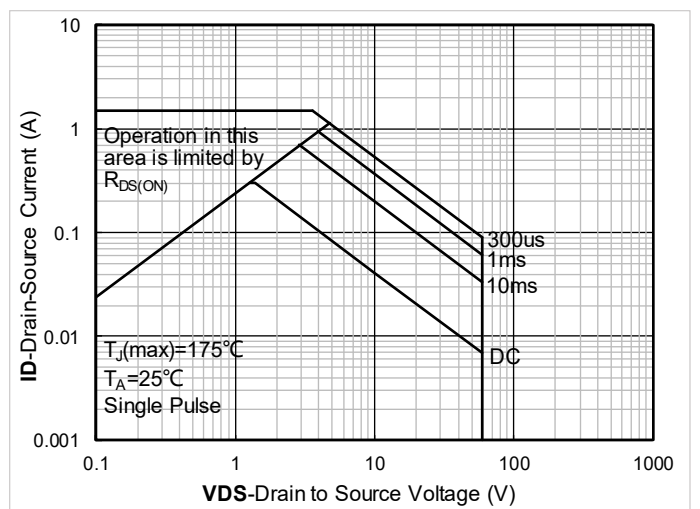


Figure 12. Safe Operation Area

■ Test Circuits & Waveforms

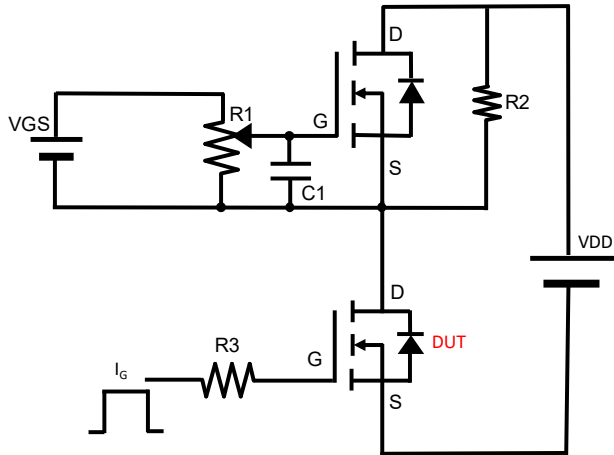


Figure A. Gate Charge Test Circuit & Waveform

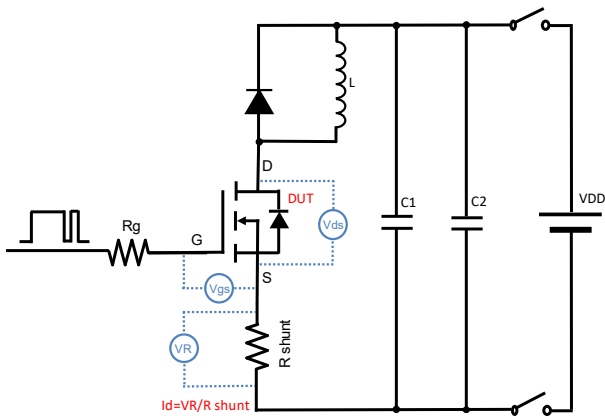


Figure B. Resistive Switching Test Circuit & Waveform

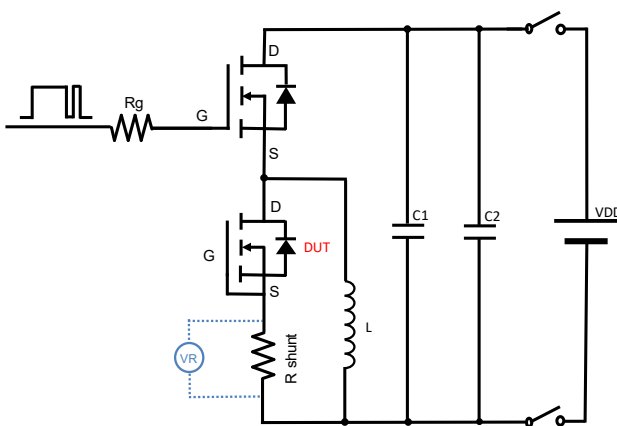
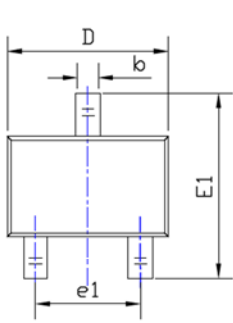


Figure C. Diode Recovery Test Circuit & Waveform

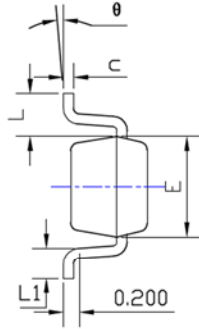


2N7002KDWHQ

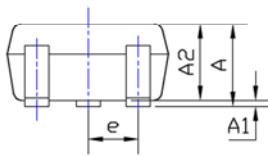
■ SOT-323 Package Outline Dimensions



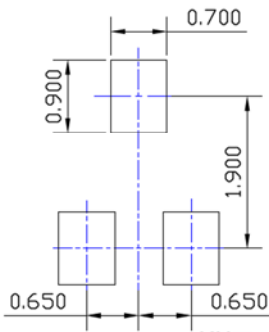
TOP VIEW



SIDE VIEW



SIDE VIEW



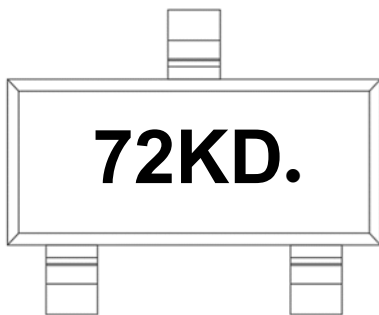
UNIT: mm

SUGGESTED SOLDER PAD LAYOUT

SYMBOL	DIMENSIONS			
	INCHES		Millimeter	
	MIN.	MAX.	MIN.	MAX.
A	0.035	0.043	0.900	1.100
A1	0.000	0.004	0.000	0.100
A2	0.035	0.039	0.900	1.000
b	0.006	0.016	0.150	0.400
c	0.004	0.010	0.100	0.250
D	0.071	0.087	1.800	2.200
E	0.045	0.053	1.150	1.350
E1	0.085	0.096	2.150	2.450
e	0.026TYP		0.650TYP	
e1	0.047	0.055	1.200	1.400
L	0.021REF		0.525REF	
L1	0.010	0.018	0.260	0.460
theta	0°	8°	0°	8°

NOTE:
 1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
 2. TOLERANCE 0.1mm UNLESS OTHERWISE SPECIFIED.
 3. THE PAD LAYOUT IS FOR REFERENCE PURPOSES ONLY.

■ Marking Information



Note:

1. All marking is at middle of the product body
2. All marking is in laser marking
3. 72KD is Marking Code
4. Body color: Black



2N7002KDWHQ

Disclaimer

The information presented in this document is for reference only. Yangzhou Yangjie Electronic Technology Co., Ltd. reserves the right to make changes without notice for the specification of the products displayed herein to improve reliability, function or design or otherwise.

The product listed herein is designed to be used with automotive electronics. They are not designed for use in medical, life-saving, life-sustaining, or military, Yangjie or anyone on its behalf, assumes no responsibility or liability for any damages resulting from such improper use of sale.

This publication supersedes & replaces all information previously supplied. For additional information, please visit our website [http:// www.21yangjie.com](http://www.21yangjie.com) , or consult your nearest Yangjie's sales office for further assistance.