

## N-Channel Enhancement Mode Field Effect Transistor

### Product Summary

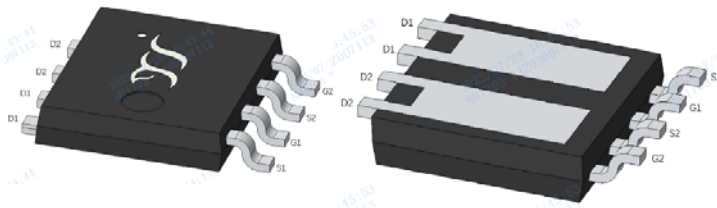
- $V_{DS}$  40V
- $I_D$  69A
- $R_{DS(ON)}$  (at  $V_{GS}=10V$ )  $<5.8m\Omega$
- 100% EAS Tested
- 100%  $\nabla V_{DS}$  Tested

### General Description

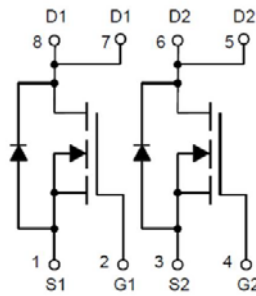
- Excellent package for heat dissipation
- High density cell design for low  $R_{DS(ON)}$
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free
- Part no. with suffix "Q" means AEC-Q101 qualified

### Applications

- 12V Automotive systems
- Motors, lamps and solenoid control



**LFPAK56D**



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

Parameter		Symbol	Limit	Unit
Drain-source Voltage		$V_{DS}$	40	V
Gate-source Voltage		$V_{GS}$	$\pm 20$	V
Continuous Drain Current (Note 1,2)	Steady-State	$T_A=25^\circ C, V_{GS}=10V$	14	A
		$T_A=100^\circ C, V_{GS}=10V$	10	
Continuous Drain Current (Note 1,3)	Steady-State	$T_C=25^\circ C, V_{GS}=10V$	69	
		$T_C=100^\circ C, V_{GS}=10V$	48	
Pulsed Drain Current	$T_C=25^\circ C, t_p=100\mu s$	$I_{DM}$	270	A
Avalanche energy	$V_G=10V, R_G=25\Omega, L=0.5mH, I_{AS}=16A$	EAS	64	mJ
Total Power Dissipation (Note 1,2)	Steady-State	$T_A=25^\circ C$	3	W
		$T_A=100^\circ C$	1.5	
Total Power Dissipation (Note 1,3)	Steady-State	$T_C=25^\circ C$	65	
		$T_C=100^\circ C$	32	
Junction and Storage Temperature Range		$T_J, T_{STG}$	$-55 \sim +175$	$^\circ C$

### ■ Thermal resistance

Parameter		Symbol	Typ	Max	Units
Thermal Resistance Junction-to-Ambient (Note 2)	Steady-State	$R_{\theta JA}$	40	50	$^\circ C/W$
Thermal Resistance Junction-to-Case	Steady-State	$R_{\theta JC}$	1.8	2.3	

### ■ Ordering Information (Example)

PREFERRED P/N	PACKING CODE	Marking	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
YJYAD5D8G04HRHQ	F1	YAD5D8G04HR	5000	10000	100000	13" reel



# YJYAD5D8G04HRHQ

## ■ Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
<b>Static Parameter</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> =250μA	40	-		V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V	-	-	1	μA
		V <sub>DS</sub> =40V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C	-		100	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20V, V <sub>DS</sub> =0V	-	-	±100	nA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0	2.9	4.0	V
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =20A	-	5	5.8	mΩ
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =20A, V <sub>GS</sub> =0V	-	-	1.2	V
Gate resistance	R <sub>G</sub>	f=1MHz	-	2.5	-	Ω
Maximum Body-Diode Continuous Current	I <sub>S</sub>		-	-	69	A
<b>Dynamic Parameters</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz	-	1017	-	pF
Output Capacitance	C <sub>oss</sub>		-	300	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	10.3	-	
<b>Switching Parameters</b>						
Total Gate Charge	Q <sub>g</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =20V, I <sub>D</sub> =30A	-	13.5	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	4.8	-	
Gate-Drain Charge	Q <sub>gd</sub>		-	2.9	-	
Reverse Recovery Charge	Q <sub>rr</sub>	I <sub>F</sub> =30A, di/dt=100A/us	-	94	-	nC
Reverse Recovery Time	t <sub>rr</sub>		-	68.4	-	ns
Turn-on Delay Time	t <sub>D(on)</sub>	V <sub>GS</sub> =10V, V <sub>DD</sub> =20V, I <sub>D</sub> =30A R <sub>GEN</sub> =2.5Ω	-	8.6	-	ns
Turn-on Rise Time	t <sub>r</sub>		-	104.7	-	
Turn-off Delay Time	t <sub>D(off)</sub>		-	11.56	-	
Turn-off fall Time	t <sub>f</sub>		-	10.5	-	

### Note:

- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
- The value of R<sub>θJA</sub> is measured with the device mounted on the 40mm\*40mm\*1.1mm single layer FR-4 PCB board with 1 in<sup>2</sup> pad of 2oz. Copper, in the still air environment with T<sub>A</sub> =25°C. The maximum allowed junction temperature of 175°C. The value in any given application depends on the user's specific board design.
- Thermal resistance from junction to soldering point (on the exposed drain pad).



## Typical Electrical and Thermal Characteristics Diagrams

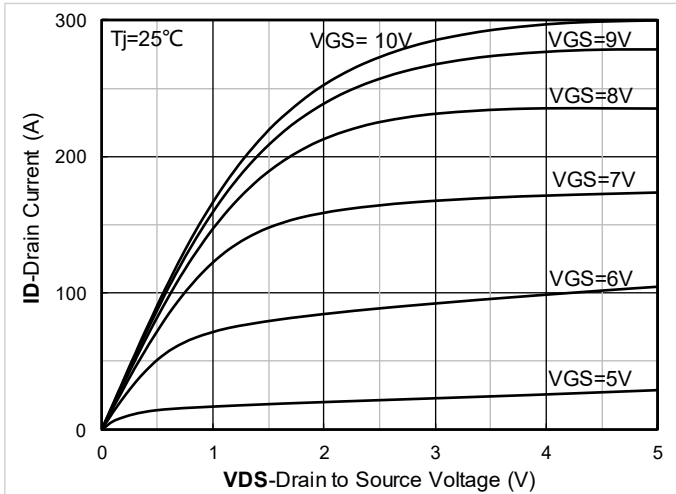


Figure 1. Output Characteristics

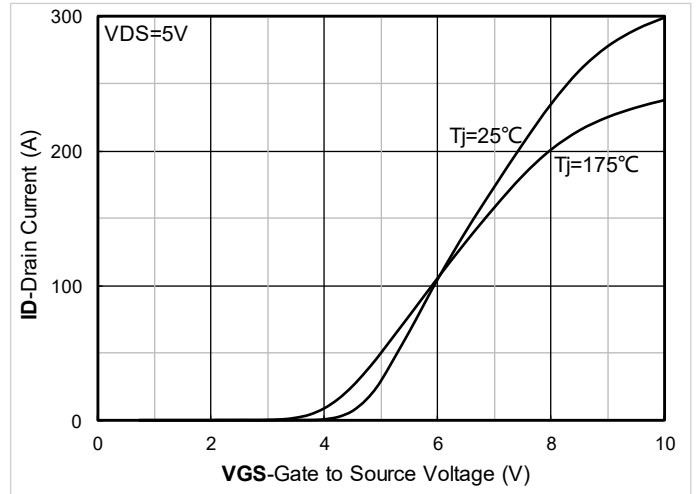


Figure 2. Transfer Characteristics

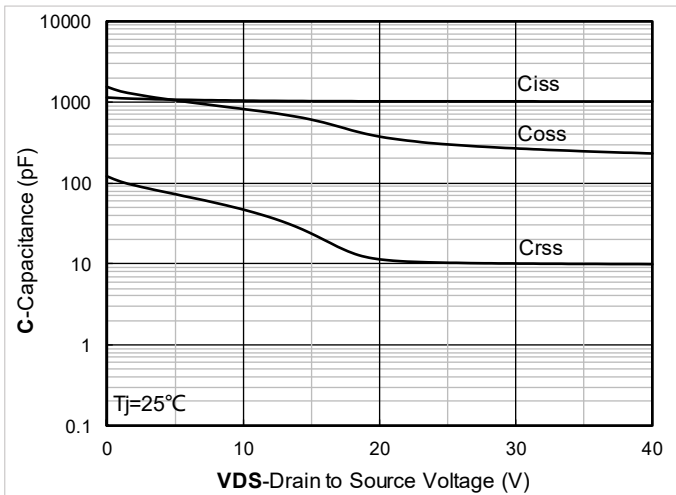


Figure 3. Capacitance Characteristics

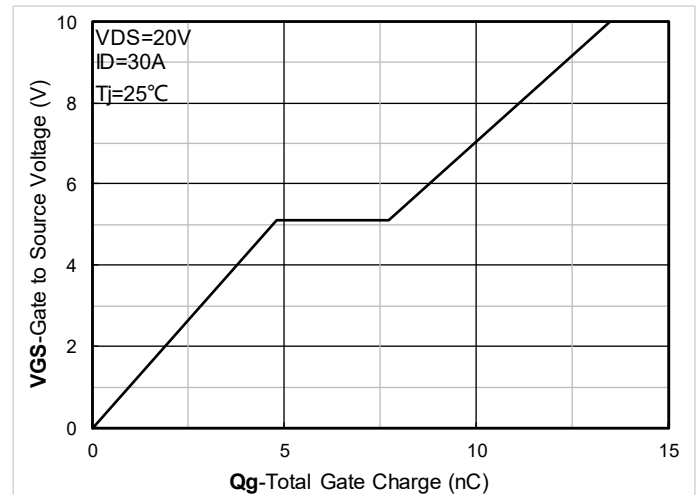


Figure 4. Gate Charge

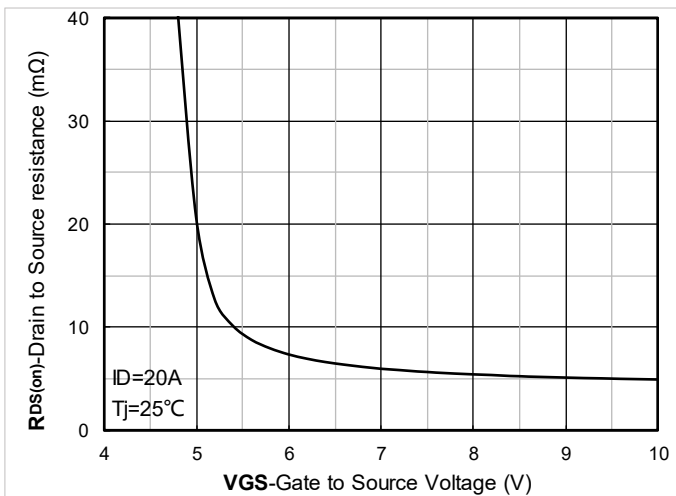


Figure 5. On-Resistance vs Gate to Source Voltage

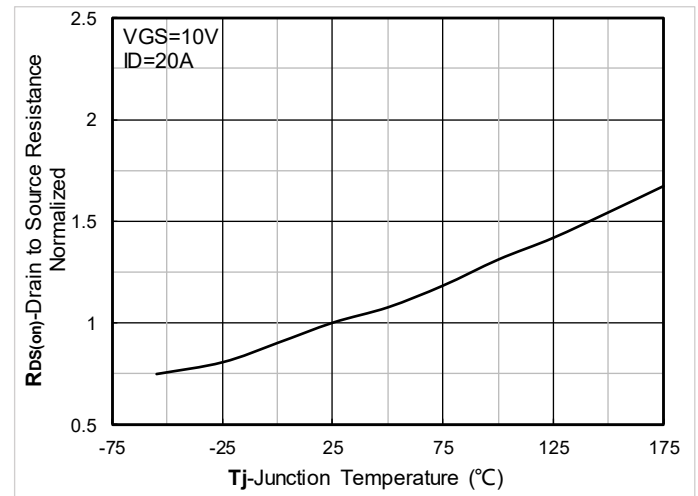


Figure 6. Normalized On-Resistance



# YJYAD5D8G04HRHQ

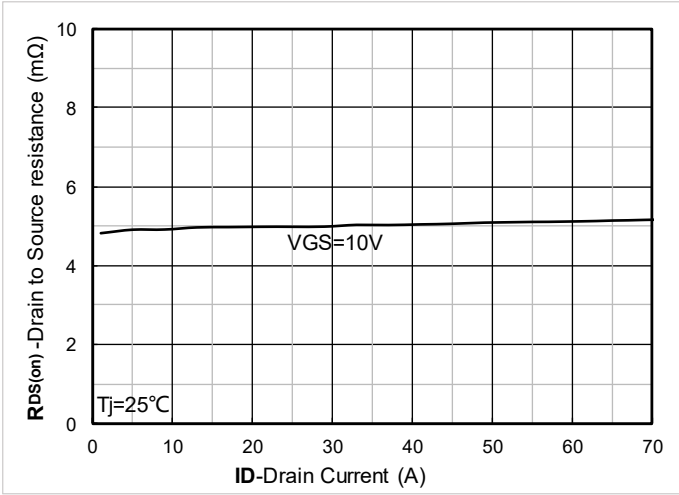


Figure 7. RDS(on) VS Drain Current

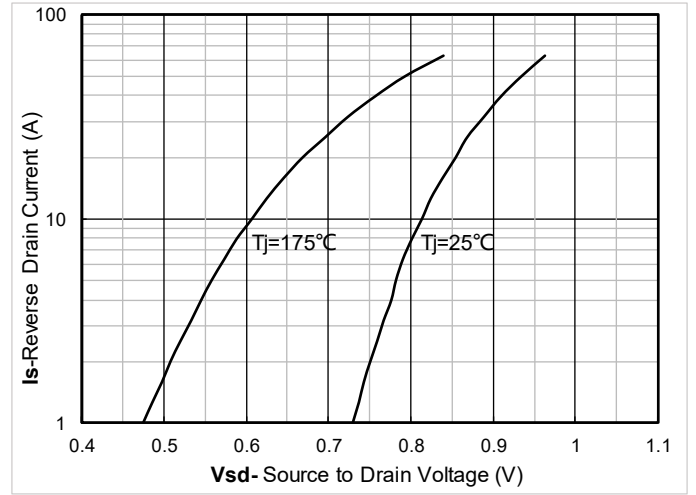


Figure 8. Forward characteristics of reverse diode

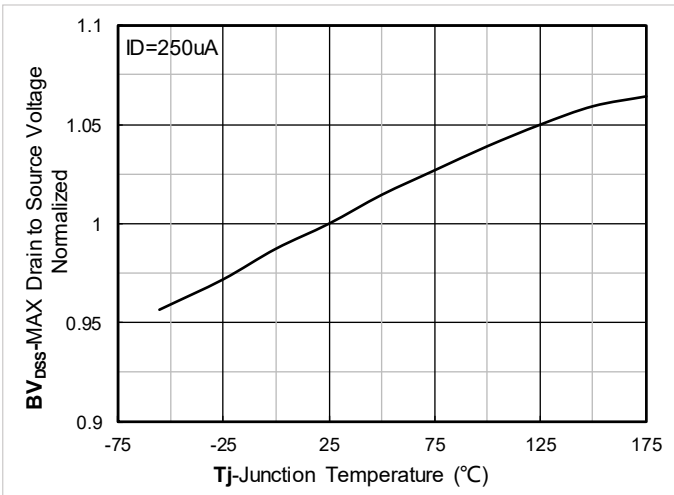


Figure 9. Normalized breakdown voltage

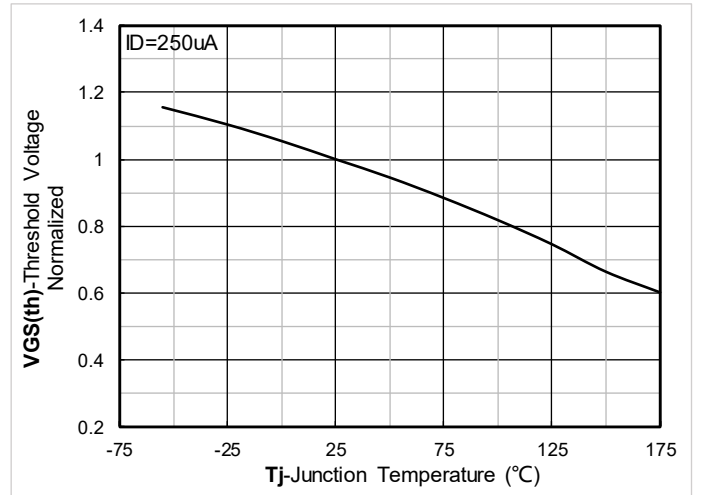


Figure 10. Normalized Threshold voltage

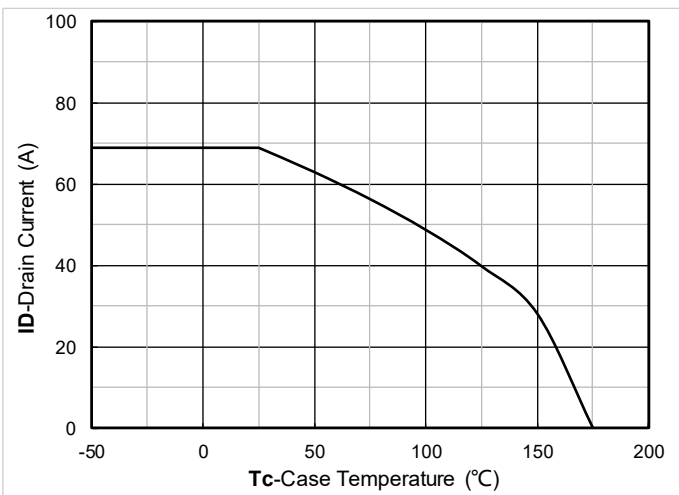


Figure 11. Current dissipation

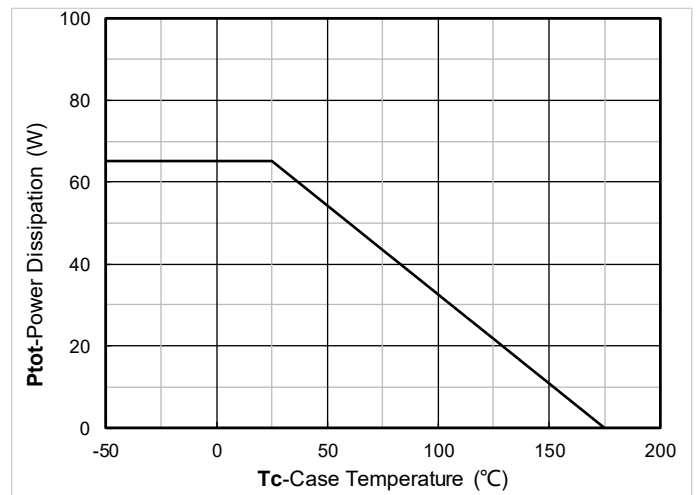


Figure 12. Power dissipation



# YJYAD5D8G04HRHQ

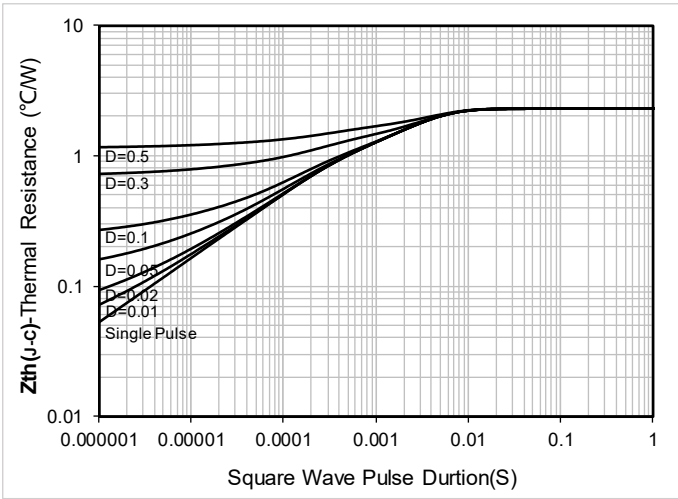


Figure 13. Maximum Transient Thermal Impedance

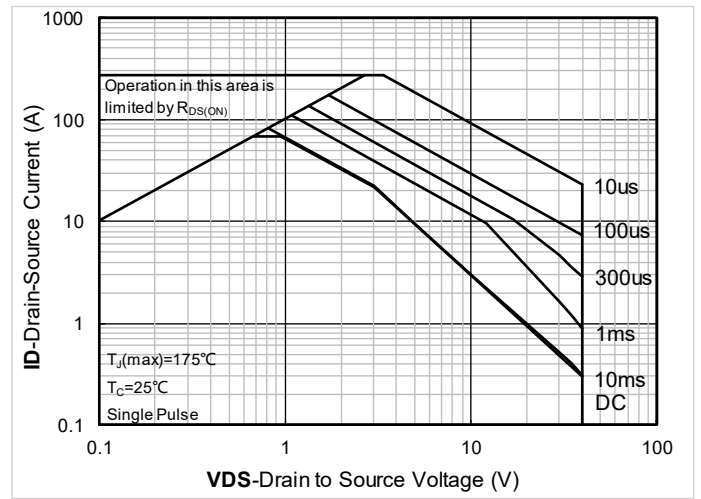
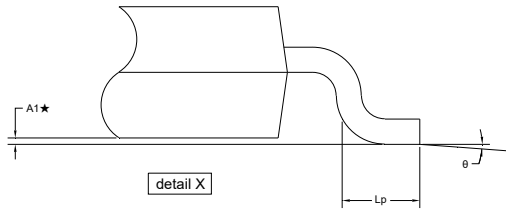
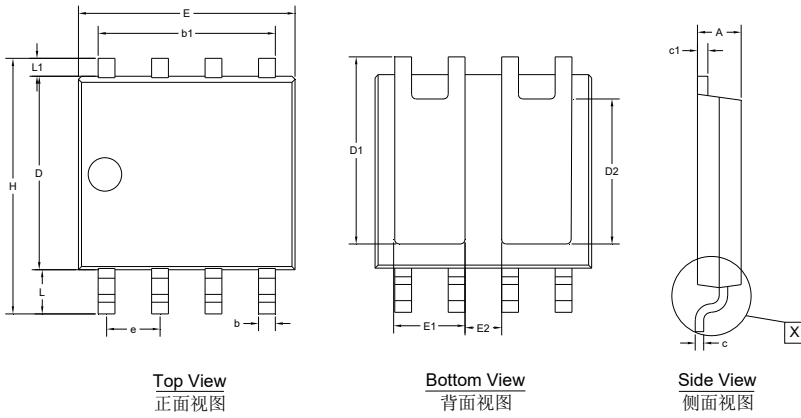


Figure 14. Safe Operation Area



# YJYAD5D8G04HRHQ

## ■ LFPAK56D Package information



- Note:
1. Controlling dimension: in millimeters.
  2. General tolerance:  $\pm 0.10\text{mm}$ .
  3. The pad layout is for reference purposes only.
  4. ★ It is the key size.

SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.0200	1.0400	1.0500
A1 ★	0.00	0.0500	0.10
b	0.3500		0.5500
b1	4.10	4.2500	4.40
c	0.1900	0.2200	0.2500
c1	0.2400	0.2700	0.30
D	4.4500	4.6000	4.70
D1	4.3500	4.4500	4.5500
D2	3.40	3.4500	3.50
E	4.9500	5.1500	5.30
E1	1.60	1.7000	1.80
E2	0.77	0.8700	0.97
e	1.2700		
H	5.90		6.20
L	0.80	1.0500	1.30
L1	0.30	0.4250	0.55
Lp	0.40	0.6250	0.85
$\theta$	0°		8°



## 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, are not designed for use in medical, life-saving, lifesustaining, 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>, or consult your nearest Yangjie's sales office for further assistance.