



Package outline

Description

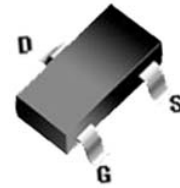
The FIR4P06LTG uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge .This device is well suited for use as a load switch or in PWM applications.

General Features

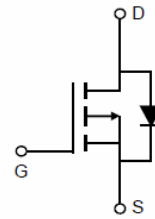
- $V_{DS} = -60V, I_D = -4A$   
 $R_{DS(ON)} < 120m\Omega @ V_{GS} = -10V$   
 $R_{DS(ON)} < 170m\Omega @ V_{GS} = -4.5V$
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation

Application

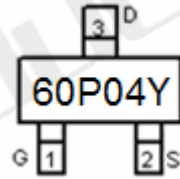
- Load switch
- PWM application



SOT-23-3L top view



Schematic diagram



Marking and pin Assignment

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
60P04Y	FIR4P06LTG	SOT-23-3L	Ø180mm	8 mm	3000 units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	-4	A
Pulsed Drain Current	$I_{DM}$	-12	A
Maximum Power Dissipation	$P_D$	1.5	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient <sup>(Note 2)</sup>	$R_{\theta JA}$	83.3	$^\circ C/W$
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**Electrical Characteristics (T<sub>C</sub>=25°C unless otherwise noted)**

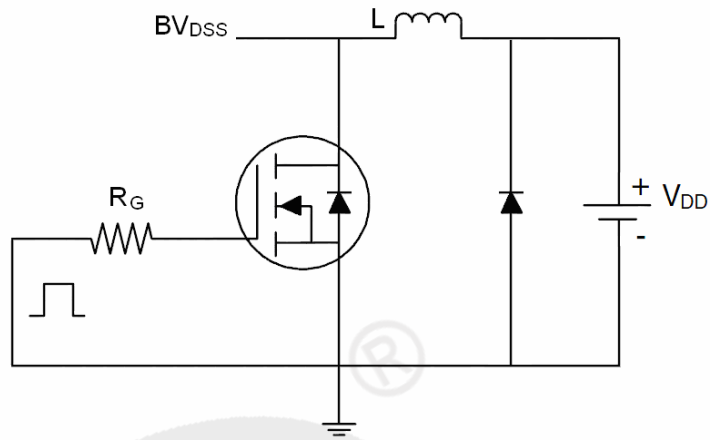
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA	-60	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =-60V, V <sub>GS</sub> =0V	-	-	-1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
<b>On Characteristics</b> (Note 3)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-1.5	-2.2	-3.0	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-4A	-	106	120	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A	-	135	170	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =-5V, I <sub>D</sub> =-4A	-	10	-	S
<b>Dynamic Characteristics</b> (Note 4)						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V, F=1.0MHz	-	930	-	PF
Output Capacitance	C <sub>oss</sub>		-	85	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	35	-	PF
<b>Switching Characteristics</b> (Note 4)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =-30V, R <sub>L</sub> =7.5Ω, V <sub>GS</sub> =-10V, R <sub>G</sub> =3Ω	-	8	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	4	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	32	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	7	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =-30, I <sub>D</sub> =-4A, V <sub>GS</sub> =-10V	-	25	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	3	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	7	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =-4A	-	-	-1.2	V
Diode Forward Current (Note 2)	I <sub>S</sub>		-	-	-4	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> = 25°C, I <sub>F</sub> = -4A	-	25		nS
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = -100A/μs (Note 3)	-	31		nC

**Notes:**

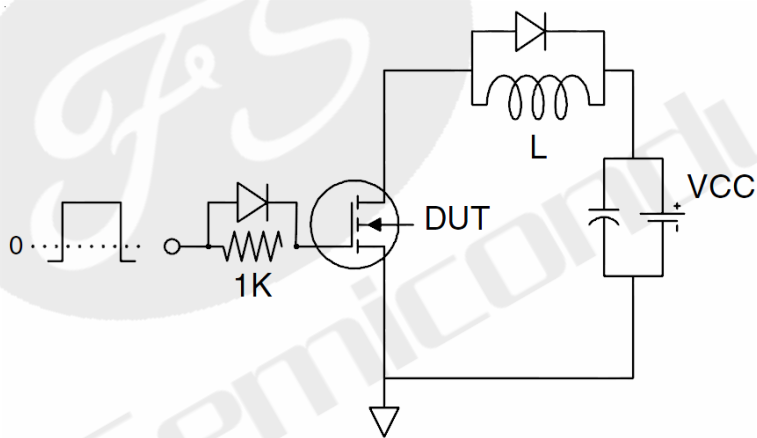
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production

**Test Circuit**

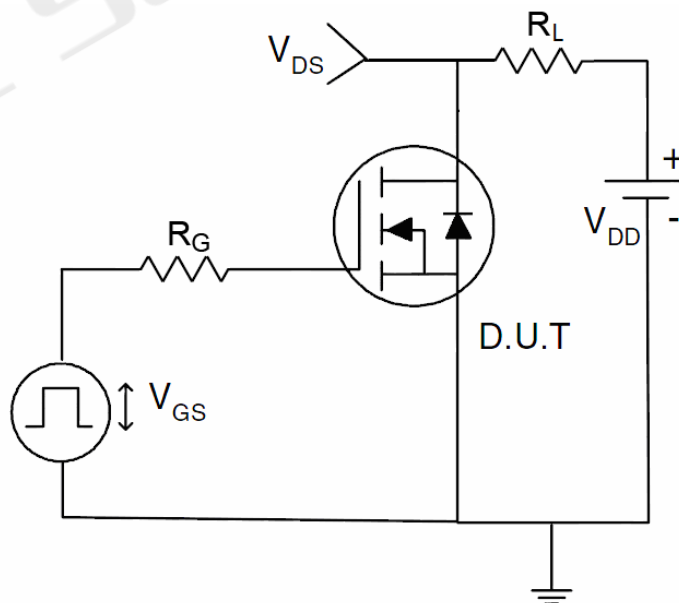
**1) E<sub>AS</sub> test Circuit**



**2) Gate charge test Circuit**



**3) Switch Time Test Circuit**





Typical Electrical and Thermal Characteristics (Curves)

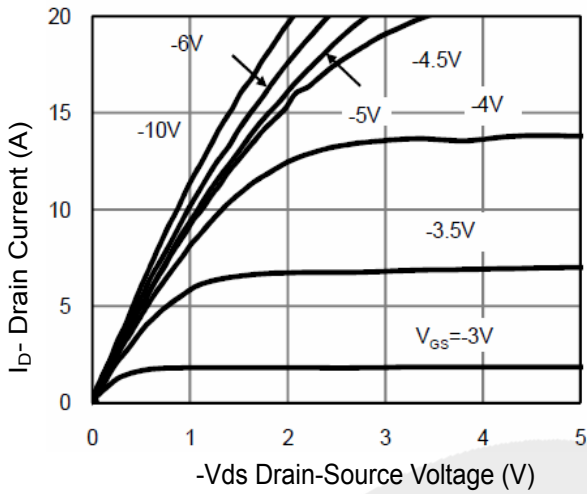


Figure 1 Output Characteristics

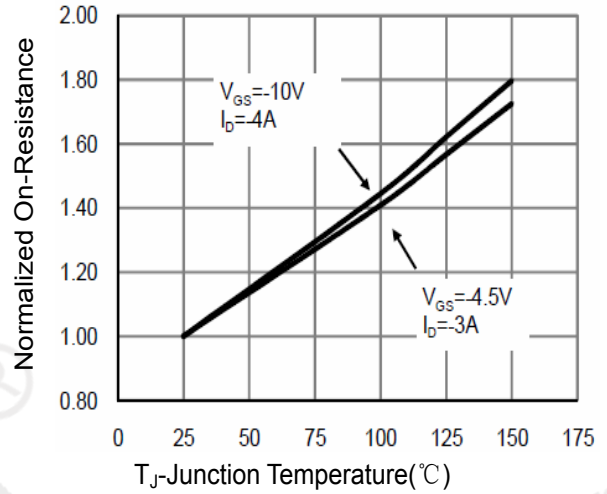


Figure 4 Rdson-Junction Temperature

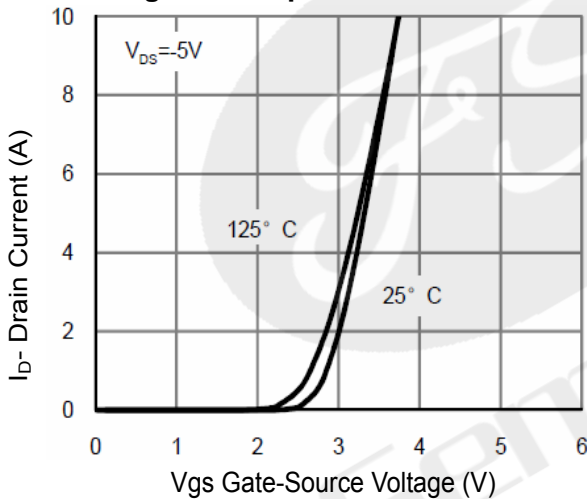


Figure 2 Transfer Characteristics

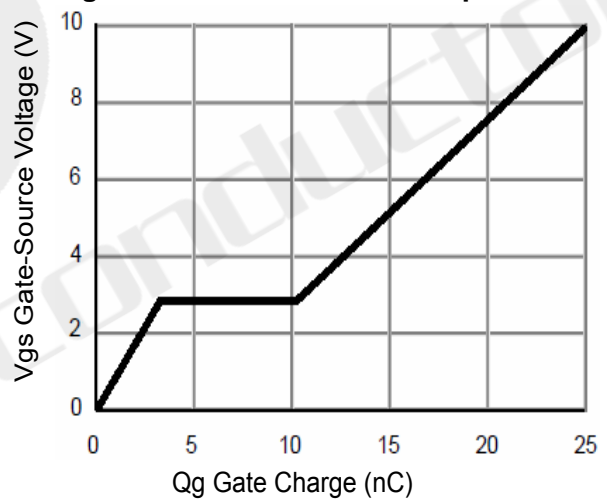


Figure 5 Gate Charge

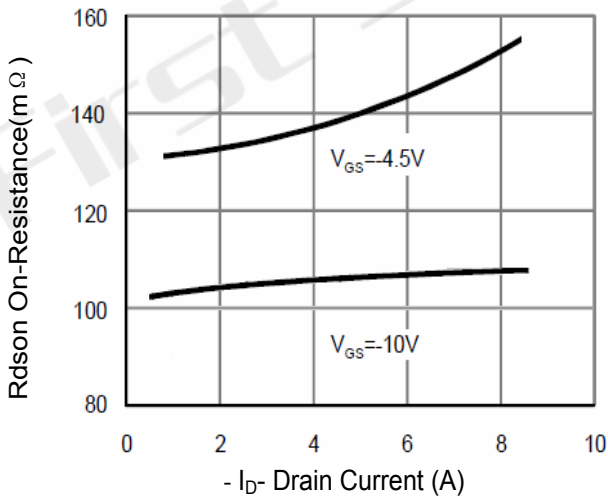


Figure 3 Rdson- Drain Current

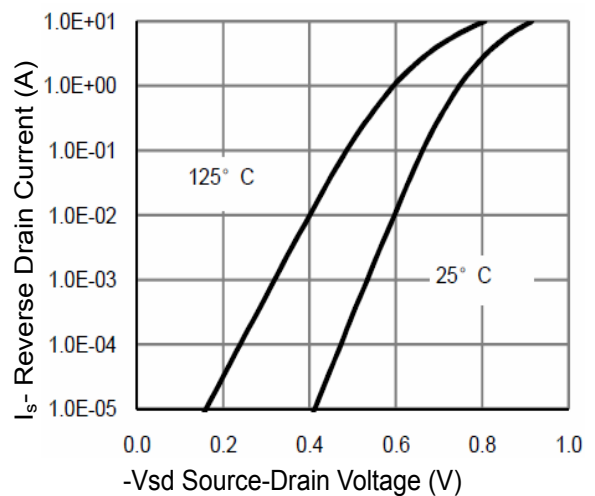


Figure 6 Source- Drain Diode Forward

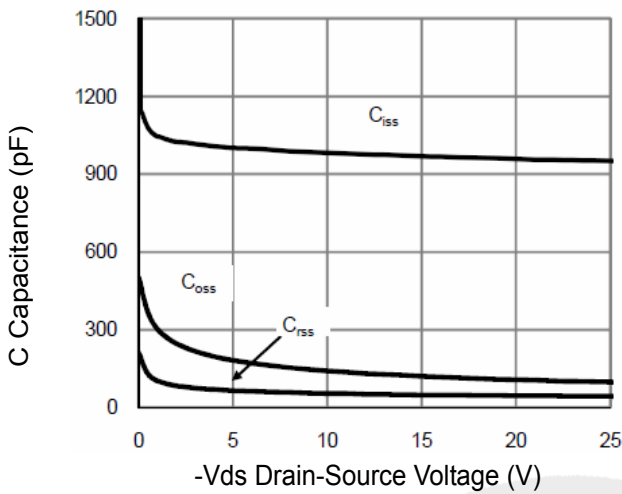


Figure 7 Capacitance vs Vds

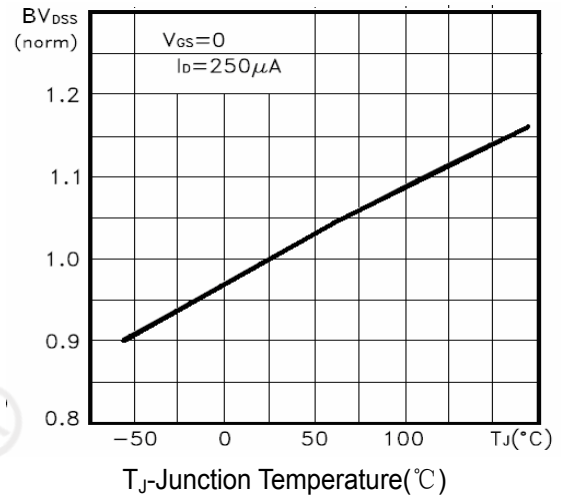


Figure 9  $BV_{DSS}$  vs Junction Temperature

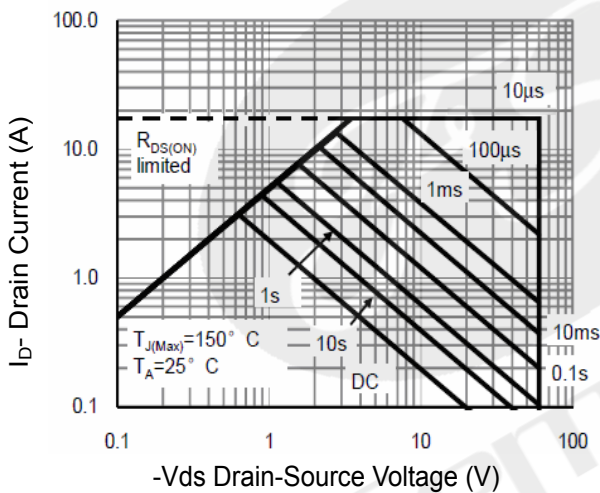


Figure 8 Safe Operation Area

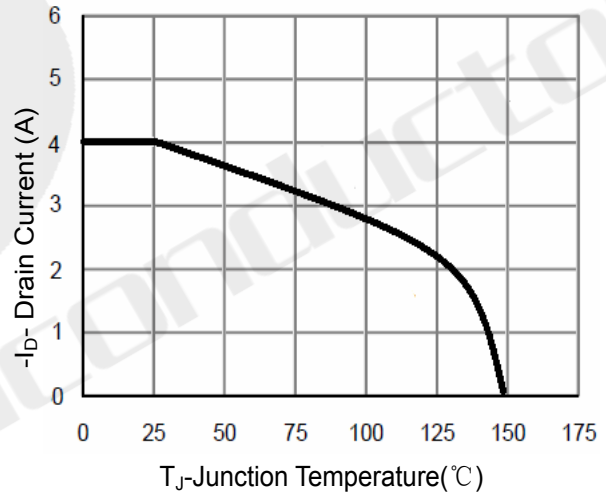


Figure 10  $I_D$  Current De-rating

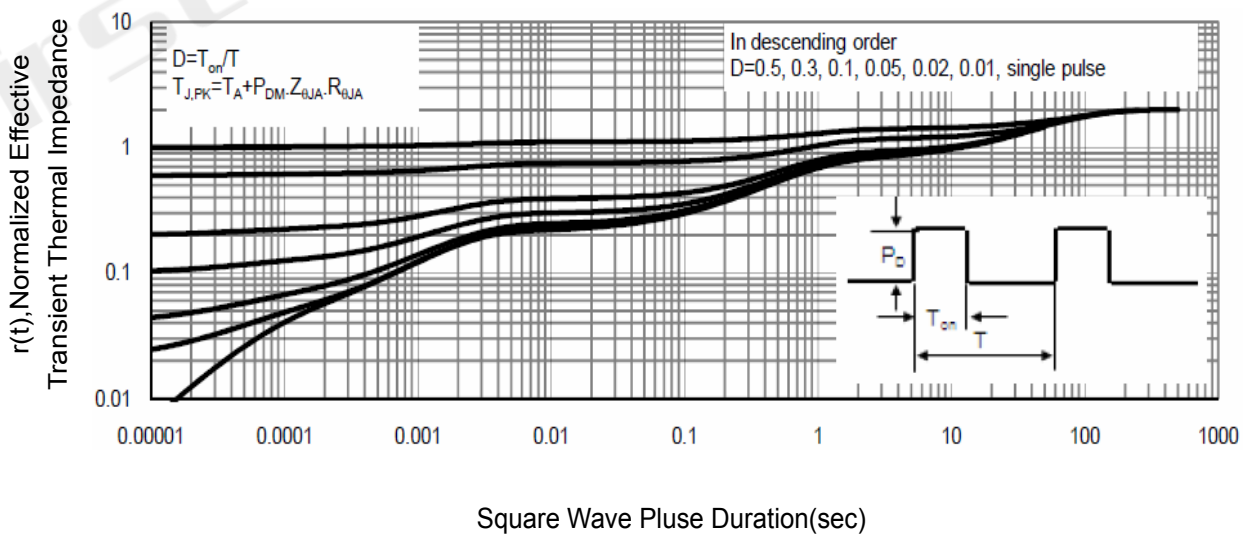
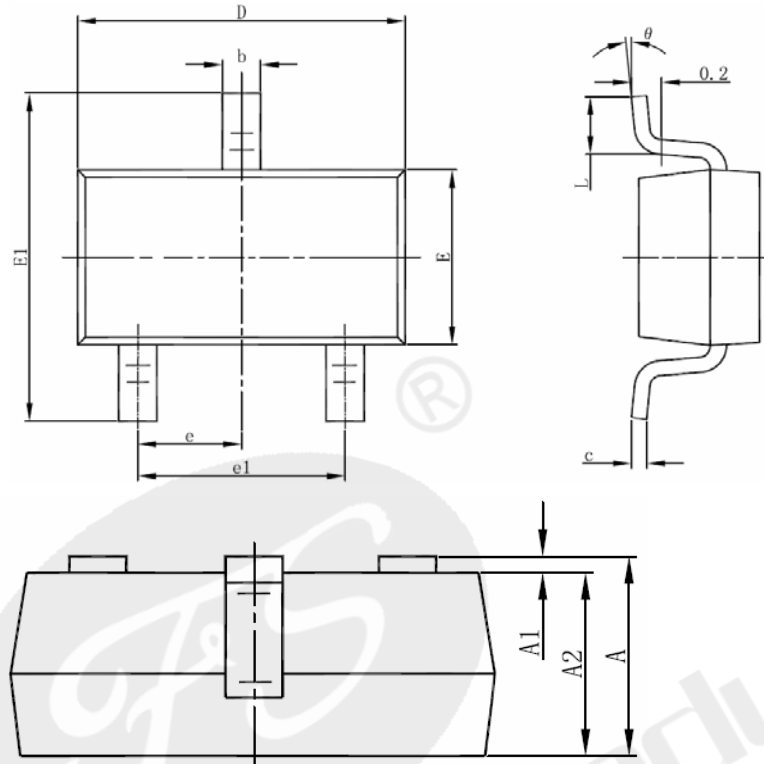


Figure 11 Normalized Maximum Transient Thermal Impedance

SOT-23-3L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
$\theta$	0°	8°	0°	8°

Notes

1. All dimensions are in millimeters.
2. Tolerance  $\pm 0.10\text{mm}$  (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.



Declaration

- FIRST reserves the right to change the specifications, the same specifications of products due to different packaging line mold, the size of the appearance will be slightly different, shipped in kind, without notice! Customers should obtain the latest version information before ordering, and verify whether the relevant information is complete and up-to-date.
- Any semiconductor product under certain conditions has the possibility of failure or failure, The buyer has the responsibility to comply with safety standards and take safety measures when using FIRST products for system design and manufacturing, To avoid To avoid potential failure risks, which may cause personal injury or property damage!
- Product promotion endless, our company will wholeheartedly provide customers with better products!

**ATTACHMENT**

Revision History

Date	REV	Description	Page
2018.01.01	1.0	Initial release	