

工业型号	公司型号	通俗命名	H	封装标识	包装方式	每管数量	每盒数量	每箱数量
FQP12N65C FQPF12N65C	H12N65P H12N65F	12N65	HAOHAII	P: TO-220AB F: TO-220FP	条管装 盒装箱装	50Pcs	1000Pcs	5000Pcs

■ Features Originative New Design Superior Avalanche Rugged Technology Robust Gate Oxide Technology Very Low Intrinsic Capacitances Excellent Switching Characteristics Unrivalled Gate Charge: 38nC(Typ.) Extended Safe Operating Area Lower $R_{DS(ON)}$: 0.67Ω(Typ.) @ V_{GS} =10V 100% Avalanche Tested Package: TO-220AB & TO-220F		12N65 Series Pin Assignment Series Symbol:
■ 特点 导通电阻低、开关速度快、驱动简单、可并联使用、输入阻抗高、符合RoHS规范		
■ 应用范围 开关电源、LCD电源、LED驱动电源、机箱电源、UPS电源、各种充电器、电子整流器、电子变压器、逆变器、控制器、转换器、风扇控制板、以及电源适配器、汽车稳压器等线性放大和功率开关电路		
■ 封装形式 TO-220P 或 TO-220AB (半塑封) TO-220F 或 TO-220FP (全塑封)		

Absolute Maximum Ratings ($T_c=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value		Units
		TO-220AB	TO-220F	
V_{DSS}	Drain-Source Voltage	650	600	V
I_D	Drain Current—Continuous ($T_c=25^\circ\text{C}$)	12	12*	A
	Drain Current—Continuous ($T_c=100^\circ\text{C}$)	7.4	7.4*	
I_{DM}	Drain Current – Pulsed (Note 1)	48	48*	
V_{GS}	Gate-Source Voltage	± 30	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	860	870	mJ
I_{AR}	Avalanche Current (Note 1)	12	12	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	22.5	22.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	4.5	V/ns
P_D	Power Dissipation ($T_c=25^\circ\text{C}$)	225	51	W
	Power Dissipation - Derate above 25°C	1.78	0.41	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	$-50 \sim +150$		$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300		

* Drain current limited by maximum junction temperature (TO-220F)

Thermal Resistance Characteristics

Symbol	Parameter	TO-220AB		TO-220F		Units
		Typ.	Max.	Typ.	Max.	
$R_{\theta JC}$	Junction-to-Case	--	0.56	--	2.43	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Case-to-Sink	0.5	--	--	--	
$R_{\theta JA}$	Junction-to-Ambient	--	62.5	--	62.5	

■ Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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On Characteristics

V_{GS}	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	2.0	--	4.0	V
$R_{DS(\text{ON})}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=6\text{A}$	--	0.67	0.78	Ω

Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0\text{V}$, $I_D=250\mu\text{A}$	650	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D=250\mu\text{A}$, Referenced to 25°C	--	0.5	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=650\text{V}$, $V_{GS}=0\text{V}$	--	--	1	μA
		$V_{DS}=520\text{V}$, $T_C=125^\circ\text{C}$	--	--	10	
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS}=+30\text{V}$, $V_{DS}=0\text{V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS}=-30\text{V}$, $V_{DS}=1\text{V}$	--	--	-100	

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS}=25\text{V}$ $V_{GS}=0\text{V}$ $f=1.0\text{MHz}$	--	1835	2385	pF
C_{oss}	Output Capacitance		--	185	240	
C_{rss}	Reverse Transfer Capacitance		--	16	21	

Switching Characteristics

$t_{d(on)}$	Turn-On Time	$V_{DS}=325\text{V}$ $I_D=12\text{A}$ $R_G=25\Omega$ (Note 4,5)	--	30	70	nS
t_r	Turn-On Rise Time		--	85	180	
$t_{d(off)}$	Turn-Off Delay Time		--	140	280	
t_f	Turn-Off Fall Time		--	90	190	
Q_g	Total Gate Charge	$V_{DS}=520\text{V}$ $I_D=12\text{A}$, $V_{GS}=10\text{V}$ (Note 4,5)	--	38	49	nC
Q_{gs}	Gate-Source Charge		--	8	--	
Q_{gd}	Gate-Drain Charge		--	13	--	

Source-Drain Diode Maximum Ratings and Characteristics

I_s	Continuous Source-Drain Diode Forward Current	--	--	12	A	
I_{SM}	Pulsed Source-Drain Diode Forward Current	--	--	48		
V_{SD}	Source-Drain Diode Forward Voltage	$I_s=12\text{A}$, $V_{GS}=0\text{V}$	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$I_s=12\text{A}$, $V_{GS}=0\text{V}$ $dI/dt=100\mu\text{A}/\mu\text{s}$ (Note 4)	--	420	--	nS
Q_{rr}	Reverse Recovery Charge		--	4.9	--	μC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L=11\text{mH}$, $I_{AS}=12\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$
3. $I_{SD} \leq 12\text{A}$, $dI/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J=25^\circ\text{C}$
4. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$
5. Essentially Independent of Operating Temperature

Typical Performance Characteristics

Fig-1. On Region Characteristics

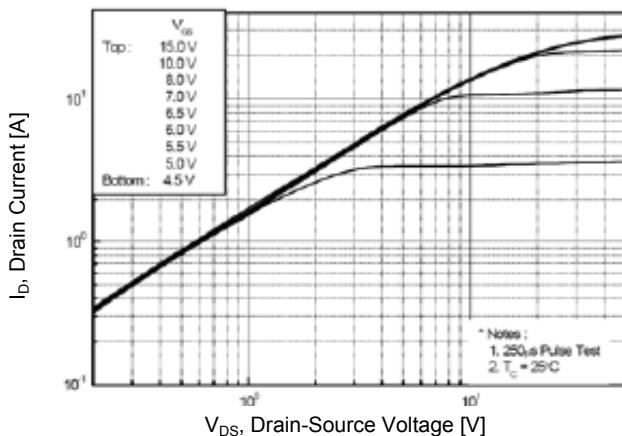


Fig-2. Transfer Characteristics

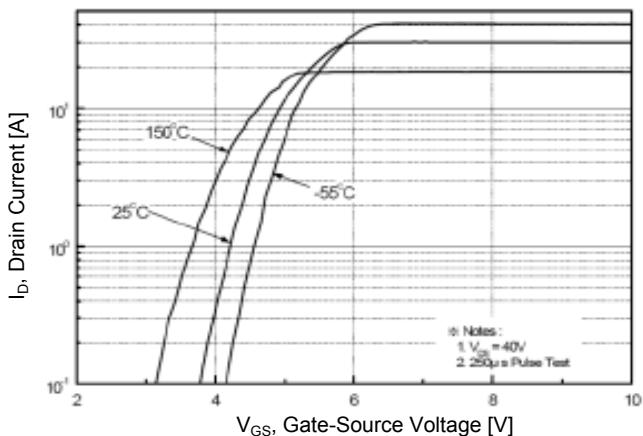


Fig-3. On Resistance Variation vs
Drain Current and Gate Voltage

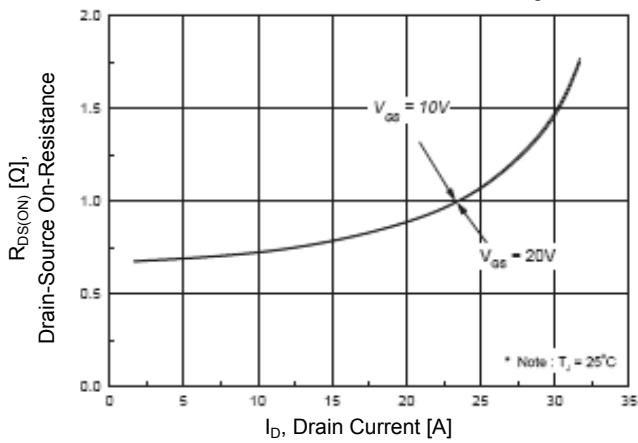


Fig-4. Body Diode Forward Voltage Variation
with Source Current and Temperature

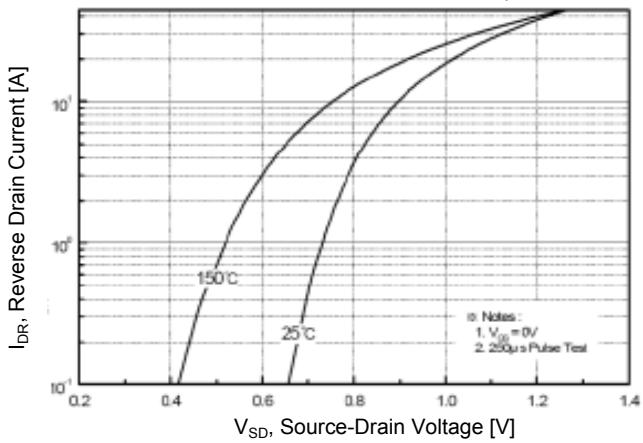


Fig-5. Capacitance Characteristics

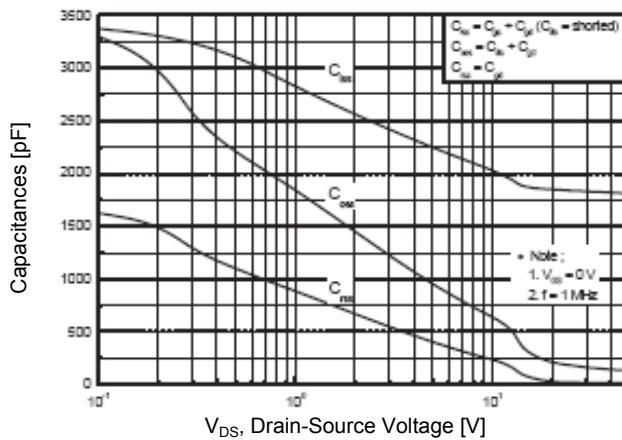
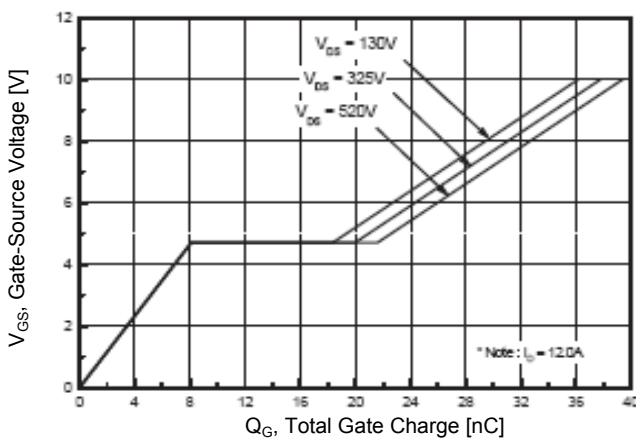


Fig-6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Fig-7. Breakdown Voltage Variation vs Temperature

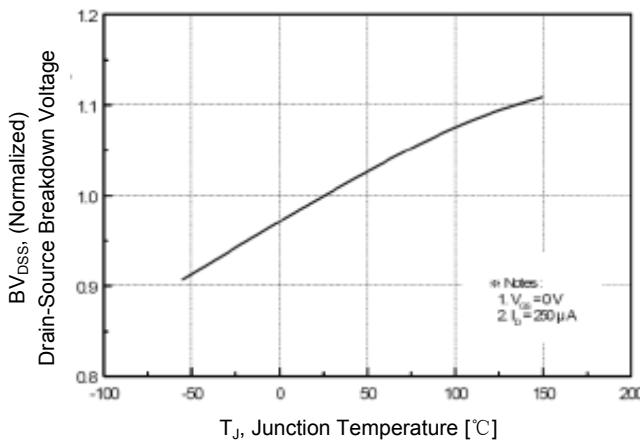


Fig-8. On-Resistance Variation vs Temperature

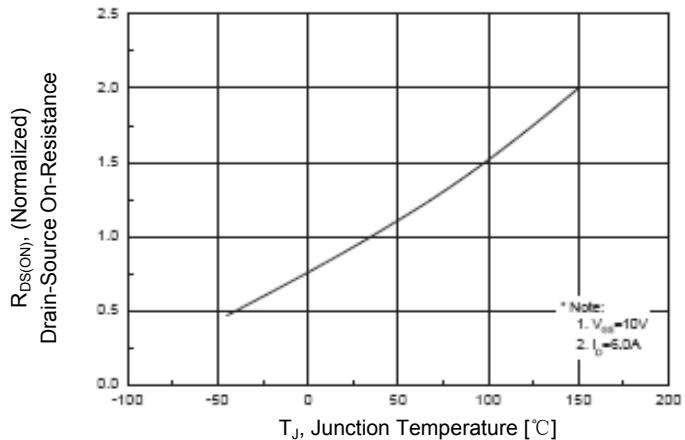


Fig-9. Maximum Safe Operating Area

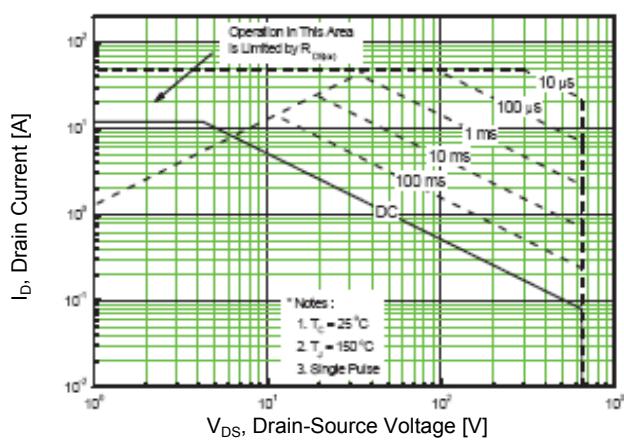


Fig-10. Maximum Drain Current vs Case Temperature

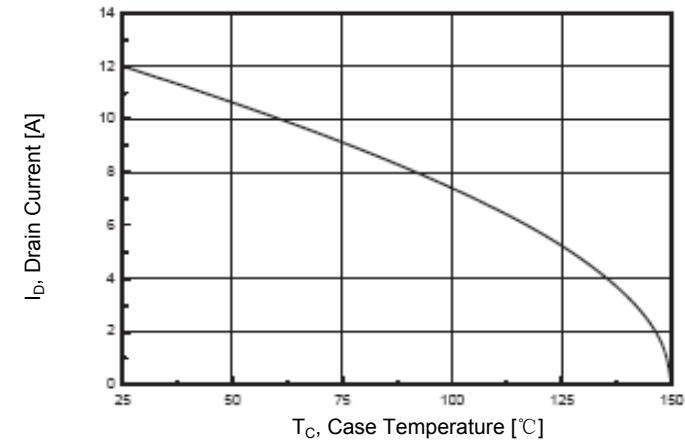


Fig-11. Transient Thermal Response Curve

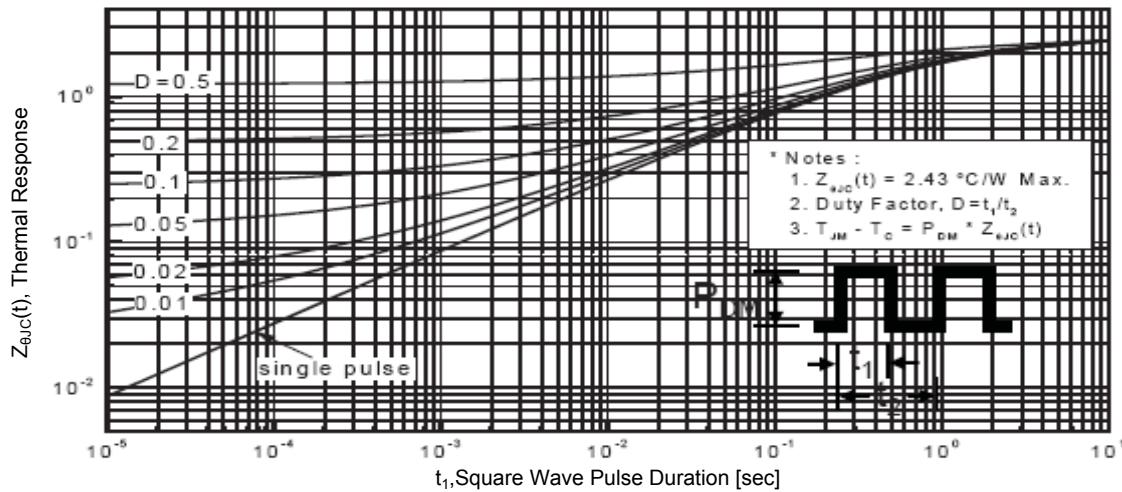


Fig-12. Gate Charge Test Circuit & Waveform

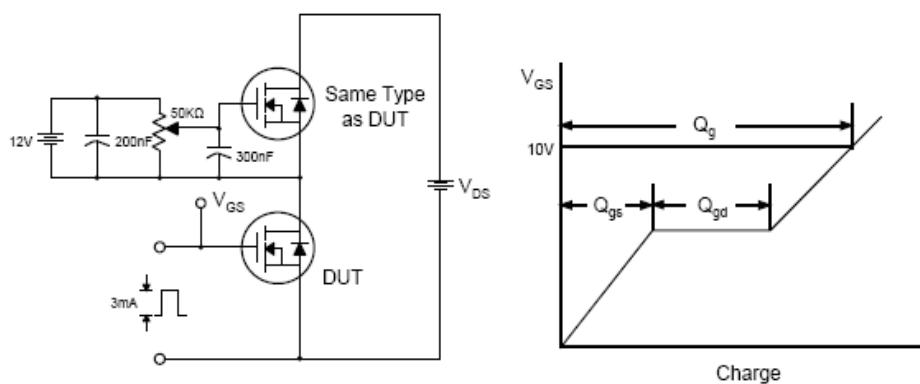


Fig-13. Resistive Switching Test Circuit & Waveforms

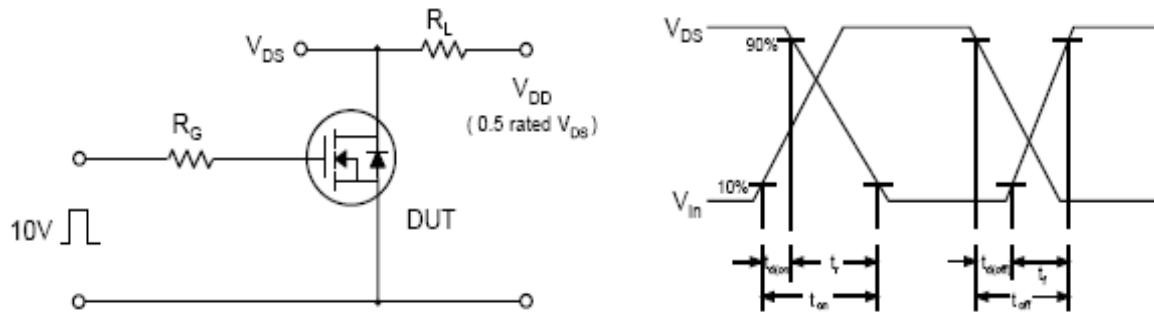


Fig-14. Unclamped Inductive Switching Test Circuit & Waveforms

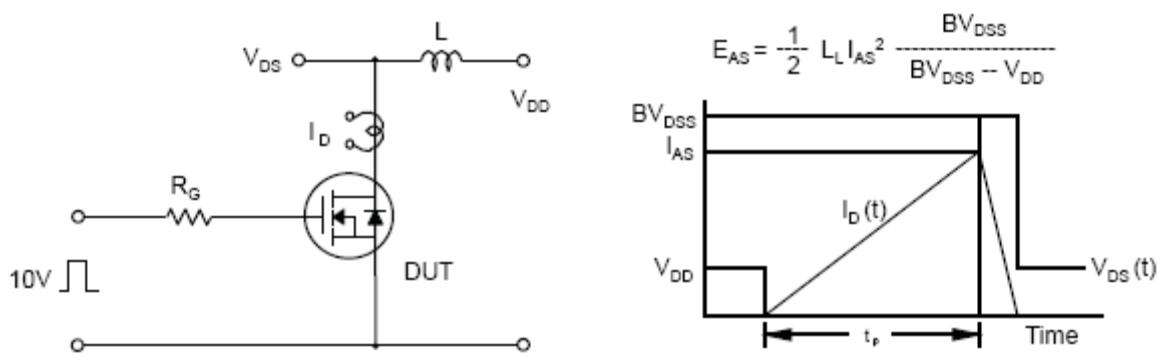
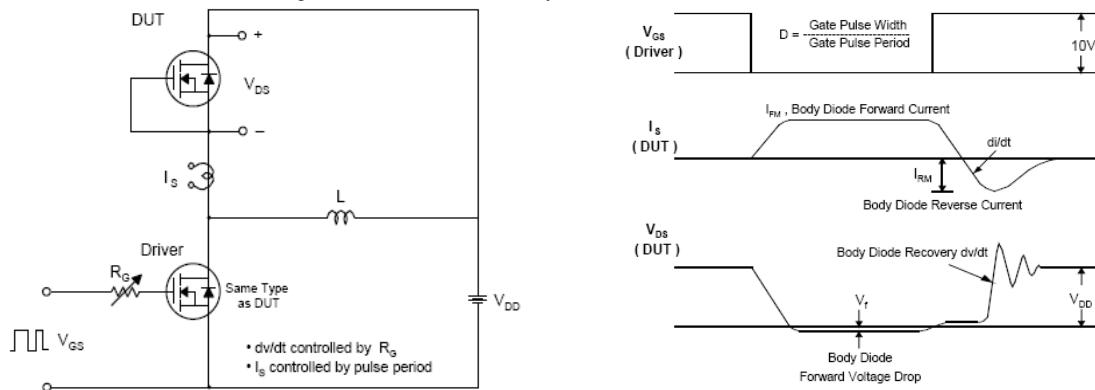


Fig-15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



PACKAGE DIMENSIONS

■ TO-220P (TO-220AB) Dimension (封装尺寸数据, 单位: mm)			元件打印标识
	DIM	Min.	Max.
A	6.48	7.40	
C	4.40	4.90	
D	2.34	3.00	
E	0.45	0.80	
F	9.80	10.36	
G	3.10	3.60	
I	2.70	3.43	
J	0.60	1.00	
K	2.34	2.74	
L	12.48	13.60	
M	15.67	16.20	
N	0.90	1.47	
O	2.00	2.96	
$\alpha 1/2/4/5$	-	*5°	
$\alpha 3$	-	*27°	

左上角: LOGO
 AAA: 芯片代码
 BBBBB: 批次识别码
 aabb: 生产批号
 其中:
 aa: 出厂年份
 bb: 出厂自然周
 (01~53)
 XXXXXXXX: 器件型号

■ TO-220F (TO-220FP) Dimension (封装尺寸数据, 单位: mm)			元件打印标识
	DIM	Min.	Max.
A	5.58	7.49	
B	8.38	8.90	
C	4.40	4.70	
D	1.15	1.39	
E	0.35	0.60	
F	2.03	2.92	
G	9.66	10.28	
H	--	*16.25	
I	--	*3.83	
J	3.00	4.00	
K	0.75	0.95	
L	2.54	3.42	
M	1.14	1.40	
N	--	*2.54	
O	12.70	14.27	
P	14.48	15.87	

左上角: LOGO
 AAA: 芯片代码
 XXXXXXXX: 器件型号
 BBBBB: 批次识别码
 aabb: 生产批号
 其中:
 aa: 出厂年份
 bb: 出厂自然周
 (01~53)

Manufacturers version information

2010-07-05 , HAOHAI™ Product Data-S1.0

2014-06-05 , HAOHAI™ Product Data-S1.1



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