

# 03

## 智能功率模块 Intelligent Power Module

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为避免产品的可靠性受到储存环境和特性检查时摄取方式等因素的影响，请注意以下事项。

### 1、保管上的注意事项

- 确保产品保存环境温度范围为5~35°C，湿度范围为40~75%。避免保存在温度或湿度剧烈变化的场所。
- 避免将产品保存在有灰尘或者有害气体存在的场所，并且避免阳光直射。
- 重新检查已储存一段时间的产品引脚是否生锈与可焊性。

### 2、特性测试和摄取注意事项

- 在来料检验等项目需要对产品进行特性测试时，请注意来自测试仪器的浪涌电压、端子之间短路和错误连接等。另外，请避免进行最大额定值以上的测试。

### 3、扭力矩

- 旋拧到散热器的扭矩应是58.8~78.4N•cm (6.0~8.0kgf•cm)。

### 4、散热器使用硅胶脂注意事项

- 将本产品安装在散热器上使用硅胶脂时，请均匀的薄涂。如果硅胶脂涂得过多，就会给产品施加不合理的应力。
- 挥发型的硅胶脂时间长后会产生裂缝，导致散热性能降低。使用稠度小(坚硬)的硅胶脂，将产品旋拧在散热器时，会导致塑封树脂开裂。

### 5、产品焊接注意事项

- 当焊接产品时，请务必尽量减少焊接时间，在以下条件中。  
265±5°C 10sec.  
380±10°C 5sec. (电烙铁)

距离产品主体1.5毫米。

### 6、防止产品受到静电破坏摄取注意事项

- 当摄取产品时，操作者必须佩戴接地腕带。接地腕带，应该在操作者与地之间接有1MΩ的电阻，以防止发生触电危险。
- 放置器件的工作台应接地，并且提供防静电桌子以及防静电地板垫。
- 使用测试设备，如曲线追踪仪时，设备应接地。
- 当焊接器件时，电烙铁或者焊槽的头部，必须接地。以防止由它们产生的泄漏电压施加到器件上。
- 器件应始终保存在我们的集装箱或者导电的集装箱中运输，或者使用铝箔包裹起来。

Since reliability can be affected adversely by improper storage environment and handing methods during characteristic tests, please observe the following cautions.

### 1、Cautions for Storage

- Ensure that storage conditions comply with the standard temperature (5 to 35°C) and the standard relative humidity (around 40 to 75%) and avoid storage locations that experience the extreme changes in temperature or humidity.
- Avoid locations where dust or harmful gases are present and avoid direct sunlight.
- Reinspect for rust in leads and solderability that have been stored for a long time.

### 2、Cautions for characteristic Testing and Handling

When characteristic tests are carried out during inspection testing and other standard test periods, protect the devices from surge of power from the testing device, shorts between the devices and the heatsink.

### 3、Screwing Torque

- The torque of screwing to the heatsink shall be 58.8 to 78.4N•cm (6.0 to 8.0kgf•cm) .

### 4、Cautions for Using Silicone Grease in a Heatsink

- When silicone grease is used in mounting this product on a heatsink, it shall be applied evenly and thinly. If more silicone grease than required is applied, it may produce more forced stress.
- Volatile type silicone grease may produce cracks after elapse of long term, resulting in reducing heat radiation effect. Silicone grease with low consistency (hard grease) may cause cracks in the mold resin when screwing the product to a heatsink.

### 5、Cautions for Soldering

- When soldering the products, please be sure to minimize the working time, within the following conditions.  
265±5°C 10sec.  
380±10°C 5sec.(Soldering iron)

At a distance of 1.5mm from the main body of the products.

### 6、Considerations to protect the Products from Electrostatic Discharge

- When handling the devices, operator must be grounded. Grounded wrist straps be worn and should have at least 1MΩ of resistance near operators to ground to prevent shock hazard.
- Workbenches where the devices are handled should be grounded and be provided with conductive table and floor mats.
- When using measuring equipment such as a curve tracer, the equipment should also be grounded.
- When soldering the devices, the head of a soldering iron or a solder bath must be grounded in order to prevent leak voltage generated by them from being applied to the devices.
- The devices should always be stored and transported in our shipping containers or conductive containers, or be wrapped up in aluminum foil.

应用领域 APPLICATIONS

- 洗衣机、空调、冰箱等家用电器的压缩机或者马达驱动  
Compressor or motor drive for household appliances such as washing machine, air conditioner, refrigerator.
- 小功率工业传动  
Low power industrial drive.



性能特点 FEATURES

- 三相相互独立对称逆变器，包含栅极驱动和保护的控制IC  
3-phase mutually independent symmetric inverter bridge including control ICs for gate driver and protection circuit.
- 保护功能：欠压保护、短路保护、过热保护、防直通保护  
Protections include: undervoltage lockout, over current protection, thermal shutdown, simultaneous on-stage prevention.
- FO：故障信号输出  
FO: fault signal output.
- 内置带限流电阻的自举二极管  
Built-in bootstrap diodes with current limiting resistor.
- 可提供温度模拟输出功能(VOT)和过热保护功能(OT)  
Provide temperature information output function(VOT) and over-temperature protection function(OT).
- 绝缘级别2500Vrms/min  
Isolation rating: 2500 Vrms/min.
- 产品引脚与散热器贴合面之间设计为双台阶，增加爬电距离  
Double steps are designed between the pin and the heat sink contact surface to increase the creepage distance.
- 通过低热阻封装技术实现小型化  
Miniaturization is realized by low thermal resistance packaging technology.
- 独立的自举电源负端引脚,便于PCB布线  
Independent bootstrap pin for PCB wiring.
- 产品系列管脚封装完全兼容(包含SiC模块)，方便客户升级  
Product series pin package is fully compatible(including SiC module), convenient for customers to upgrade.

产品性能 PERFORMANCE

型号 Model	V <sub>CES</sub> (V)	I <sub>c</sub> (A)	f <sub>c</sub> (kHz) Max.	V <sub>iso</sub> (V <sub>rms</sub> )	V <sub>CE(sat)</sub> (V) @I <sub>c</sub> =I <sub>c</sub> (rating), T <sub>j</sub> =25°C		Typ. Switching @I <sub>c</sub> =I <sub>c</sub> (rating), T <sub>j</sub> =25°C					结温 T <sub>j</sub> (°C)	热阻 R <sub>th(j-c)</sub> (°C/W)	
					t <sub>on</sub> (μs)	t <sub>tr</sub> (ns)	t <sub>don</sub> (μs)	t <sub>off</sub> (μs)	t <sub>doff</sub> (μs)	IGBT	FRD			
GAM10A060	600	10	20	2500	1.7	2.2	0.82	90	0.71	1.1	1.02	-30~150	3.7	4.5
GAM15A060	600	15	20	2500	1.7	2.2	0.82	90	0.71	1.3	1.20	-30~150	3.0	4.0
GAM20A060	600	20	20	2500	1.7	2.2	0.80	90	0.78	1.2	1.10	-30~150	3.0	4.0

产品一览表 PRODUCT SCHEDULE

型号 Model	V <sub>CES</sub> (V)	I <sub>c</sub> (A)	空调 AIR-CONDITIONER (HP)	封装编号 NO.	
OT/VOT	GAM10A060	600	10	1	DIP33
	GAM15A060	600	15	1.5	DIP33
	GAM20A060	600	20	2	DIP33

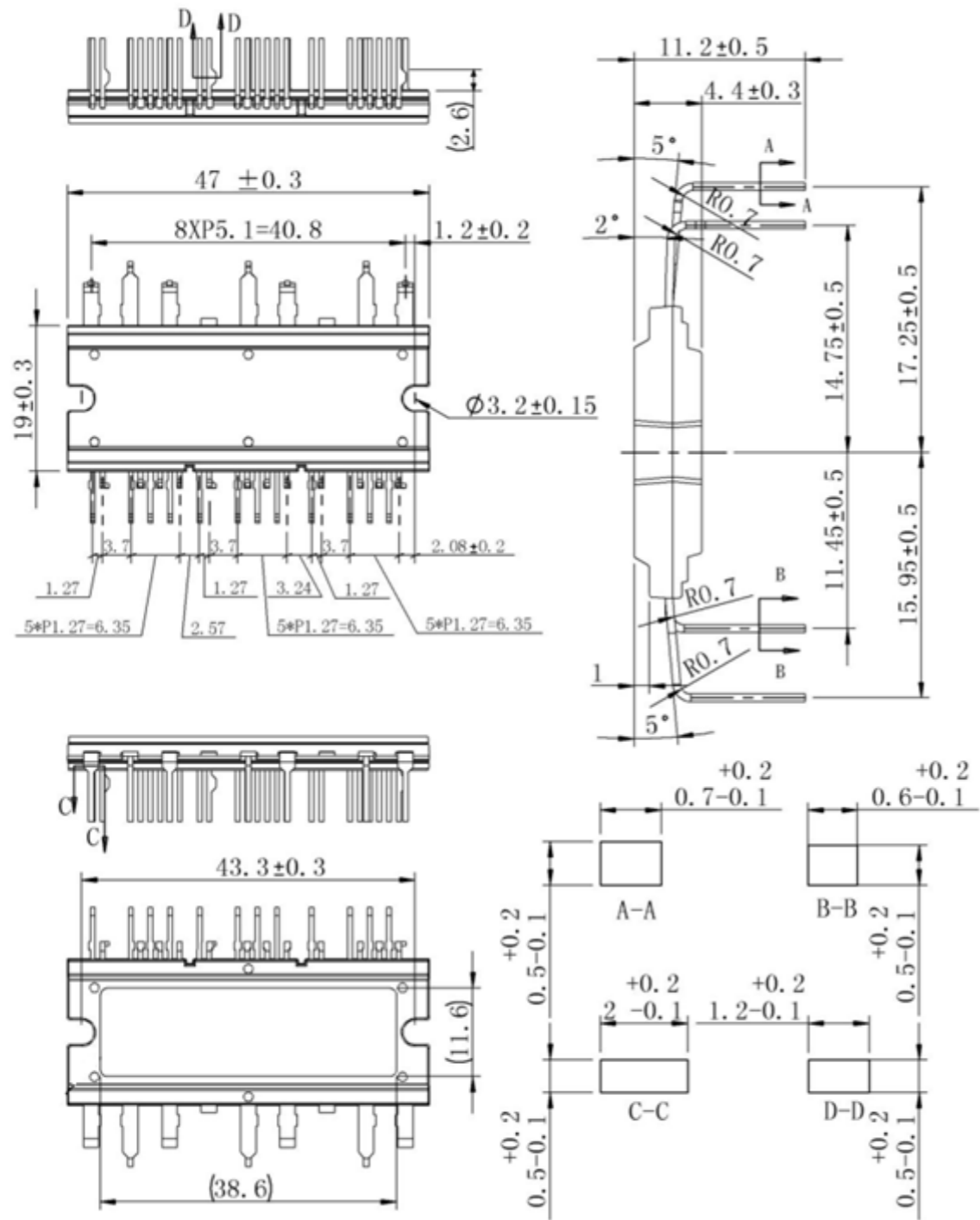
产品应用最大额定条件(Ta=25°C) MAXIMUM RATED CONDITIONS(Ta=25°C)

参数 Parameter	符号 Symbol	条件 Conditions	规格值 Rating	单位 Unit	备注 Remarks
电源电压 Main Supply Voltage	V <sub>DC</sub>	VBB-LSx	450	V	
电源电压(浪涌) Main Supply Voltage(Surge)	V <sub>DC(surge)</sub>	VBB-LSx	500	V	
IGBT耐压 IGBT Breakdown Voltage	V <sub>CES</sub>	V <sub>CC</sub> =15V, I <sub>c</sub> =1mA, V <sub>in</sub> =0V	600	V	
控制电源电压 Logic Supply Voltage	V <sub>CC</sub>	VCCx-COMx	20	V	
	V <sub>BS</sub>	VBx-HSx	20		
输出电流 Output Current	I <sub>O</sub>	T <sub>c</sub> =25°C, T <sub>j</sub> <150°C	10	A	GAM10A060
			15		GAM15A060
			20		GAM20A060
			20		GAM10A060
输出电流(脉冲) Output Current(Pulse)	I <sub>OP</sub>	T <sub>c</sub> =25°C, P <sub>w</sub> <1ms, single pulse	30	A	GAM15A060
			45		GAM20A060
输入电压 Input Voltage	V <sub>IN</sub>	HINx-COMx, LINx-COMx	-0.5 to 7	V	
FO 输入电压 FO Pin Voltage	V <sub>FO</sub>	FOx-COMx	-0.5 to 7	V	
OCP输入电压 OCP Pin Voltage	V <sub>OCP</sub>	OCPx-COMx	-10 to 5	V	
运行外壳温度 Operating Case Temperature	T <sub>C(OP)</sub>		-30 to 100	°C	
结温 Junction Temperature	T <sub>j</sub>		150	°C	
保存温度 Storage Temperature	T <sub>STG</sub>		-40 to 150	°C	
绝缘耐压 Isolation Voltage	V <sub>ISO(RMS)</sub>	引脚-塑封体之间, AC, 60Hz, 1min Between pin and surface, AC, 60Hz, 1min	2500	V	

产品推荐应用条件 RECOMMENDED OPERATING CONDITIONS

参数 Parameter	符号 Symbol	条件 Conditions	Min.	Typ.	Max.	单位 Unit	备注 Remarks
电源电压 Main Supply Voltage	V <sub>DC</sub>	COM1=COM2=COM3 VBB-COM	—	300	400	V	
控制电源电压 Logic Supply Voltage	V <sub>CC</sub>	VCCx-COMx	13.5	—	16.5	V	
	V <sub>BS</sub>	VBx-HSx	13.5	—	16.5		
分流电阻 Shunt Resistor	R <sub>S</sub>	I <sub>P</sub> ≤20A	27	—	—	mΩ	GAM10A060
		I <sub>P</sub> ≤30A	18	—	—		GAM15A060
		I <sub>P</sub> ≤45A	12	—	—		GAM20A060
RC 滤波电容 FO Filter Capacitor	C <sub>O</sub>		1000	—	10000	pF	GAM10A060
			1000	—	2200		GAM15A060 GAM20A060
RC 滤波电阻 RC Filter Resistor	R <sub>O</sub>		—	—	100	Ω	
输入电压 Input Voltage	V <sub>IN</sub>	HINx, LINx, FOx	0	—	5.5	V	
最小输入脉宽 Minimum Input Pulse Width	t <sub>IN(MIN)ON</sub> t <sub>IN(MIN)OFF</sub>		0.5	—	—	μs	
			0.5	—	—		
死区时间 Dead Time of Input Signal	t <sub>DEAD</sub>		1.5	—	—	μs	
FO 上拉电阻 FO Pull-up Resistor	R <sub>FO</sub>		1	—	22	kΩ	
FO 上拉电压 FO Pull up voltage	V <sub>FO</sub>		3.0	—	5.5	V	
FO 滤波电容 FO Filter Capacitor	C <sub>FO</sub>		0.001	—	0.01	μF	
自举电容 Bootstrap Capacitor	C <sub>BOOT</sub>		10	—	220	μF	
PWM载波频率 PWM Carrier Frequency	f <sub>c</sub>		—	—	20	kHz	
运行壳温 Operating Case Temperature	T <sub>C(OP)</sub>		—	—	100	°C	

GAM系列产品外形尺寸图  
• OUTLINE DRAWING OF GAM SERIES



安全认证 SAFETY CERTIFICATE



UL/CUL ( U.S.A./Canada )

应用领域 APPLICATIONS

- 洗衣机、空调、冰箱等家用电器的压缩机或者马达驱动  
Compressor or motor drive for household appliances such as washing machine, air conditioner, refrigerator.
- 小功率工业传动  
Low power industrial drive.



性能特点 FEATURES

- 三相逆变器，内部集成PFC电路及三相逆变器桥，并且包含栅极驱动和保护的控制IC以及温度检测用热敏电阻  
3-phase inverter, integrated PFC circuit and three-phase inverter bridge, including control ICs for gate driver and protection circuit, and NTC.
- 保护功能：欠压保护、短路保护（逆变部与PFC部）、过热保护、防直通保护  
Protections include: undervoltage lockout, over current protection(inverter and PFC), thermal shutdown, simultaneous on-stage prevention.
- FO：故障信号输出  
FO: fault signal output.
- 内置带限流电阻的自举二极管  
Built-in bootstrap diodes with current limiting resistor.
- 单驱动芯片控制逆变器及PFC电路，实现联动保护  
The single driver chip controls the inverter bridge and PFC circuit to realize linkage protection.
- 绝缘级别2000Vrms/min  
Isolation rating: 2000 Vrms/min.
- 内置NTC热敏电阻进行温度检测，解决目前分立IGBT搭建PFC电路无温度保护的缺陷  
Built-in NTC thermistor for temperature detection, to solve the discrete IGBT PFC circuit without temperature protection defects.
- 通过低热阻封装技术实现小型化  
Miniaturization is realized by low thermal resistance packaging technology.
- 独立的自举电源负端引脚,便于PCB布线  
Independent bootstrap pin for PCB wiring.
- 产品系列管脚封装完全兼容(包含SiC模块)，方便客户升级  
Product series pin package is fully compatible(including SiC module), convenient for customers to upgrade.

产品性能 PERFORMANCE

型号 Model	V <sub>CEs</sub> (V)	I <sub>c</sub> (A)	f <sub>c</sub> (kHz) Max.	V <sub>iso</sub> (Vrms)	Part	V <sub>CE(sat)</sub> (V) @I <sub>c</sub> =I <sub>c</sub> (rating), T <sub>j</sub> =25°C		Typ. Switching @I <sub>c</sub> =I <sub>c</sub> (rating), T <sub>j</sub> =25°C					结温 T <sub>j</sub> (°C)	热阻 R <sub>th(j-c)</sub> (°C/W)	
						ton(μs)	tr(ns)	tdon(μs)	toff(μs)	tdoff(μs)	IGBT	FRD			
GM00115A060	600	15	20	2000	INV	1.7	2.2	0.80	90	0.70	1.4	1.30	-30~150	4.0	4.0
					PFC	1.3	1.8	0.051	19	0.039	0.376	0.367		3.5	3.5

产品一览表 PRODUCT SCHEDULE

型号 Model	V <sub>CEs</sub> (V)	I <sub>c</sub> (A)	空调 AIR-CONDITIONER (HP)	封装编号 NO.
OT/NTC	600	15	1.5	DIP29

## 产品应用最大额定条件(Ta=25°C) MAXIMUM RATED CONDITIONS(Ta=25°C)

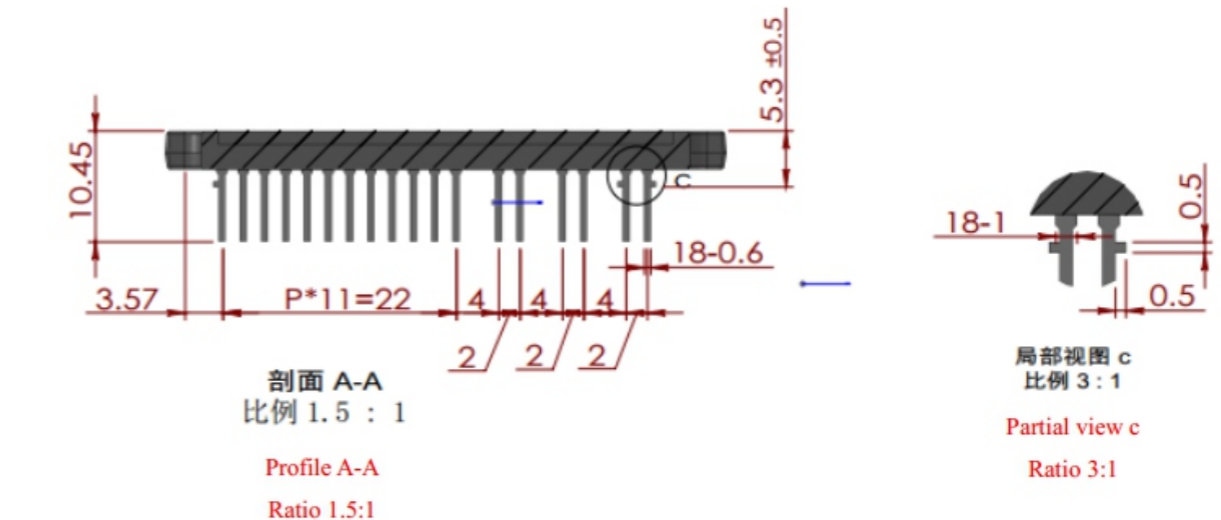
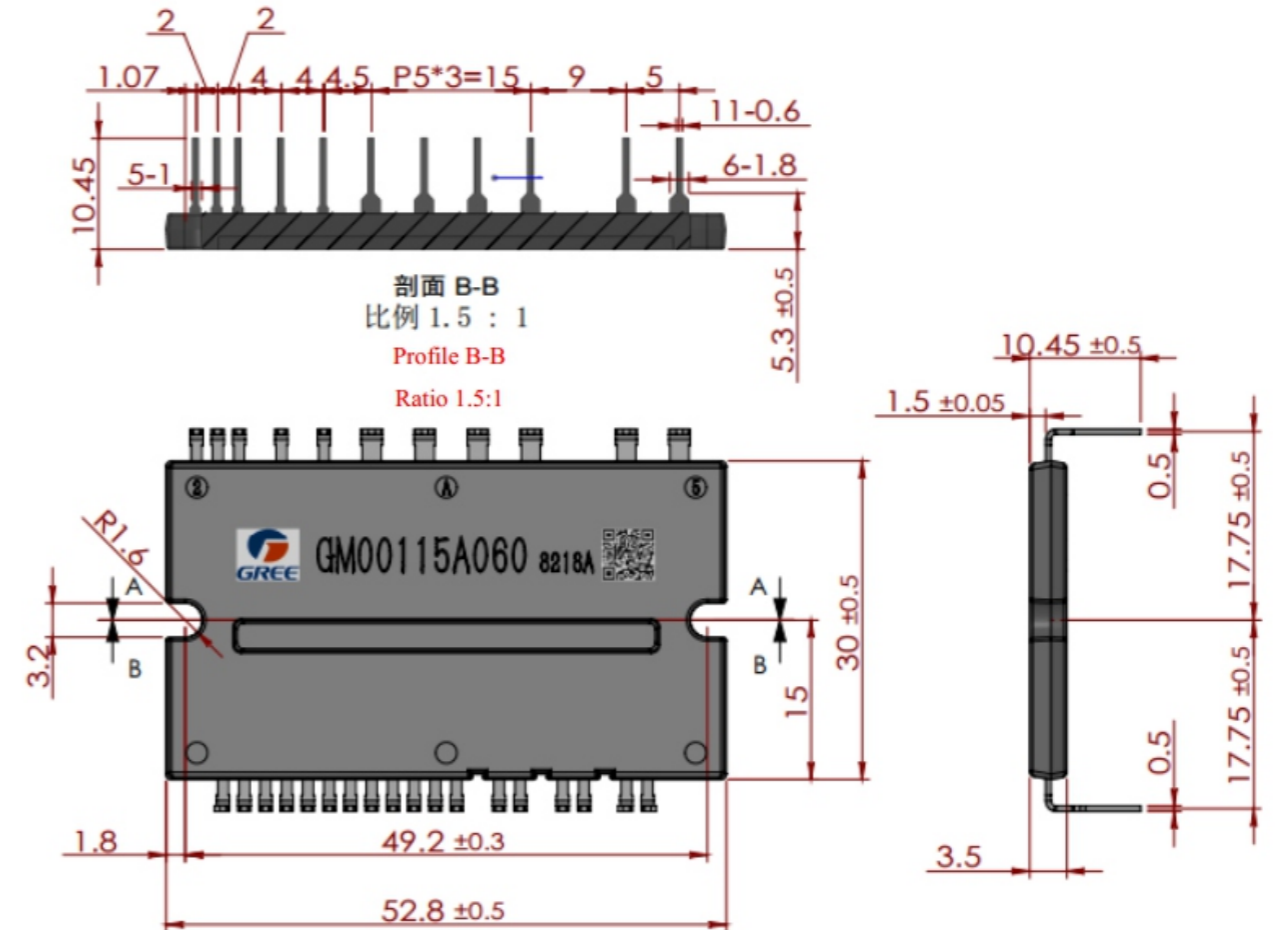
参数 Parameter	符号 Symbol	条件 Conditions	规格值 Rating	单位 Unit	备注 Remarks
电源电压 Main Supply Voltage	V <sub>DC</sub>	P+(PFC)-LSx(P-)	450	V	
电源电压(浪涌) Main Supply Voltage(Surge)	V <sub>DC(surge)</sub>	P+(PFC)-LSx(P-)	500	V	
IGBT耐压(INV/PFC) IGBT Breakdown Voltage(INV/PFC)	V <sub>CEs</sub>	V <sub>CC</sub> =15V, I <sub>c</sub> =1mA, V <sub>in</sub> =0V	600	V	
控制电源电压 Logic Supply Voltage	V <sub>CC</sub>	VCC-COM	20	V	
	V <sub>BS</sub>	VBx-HSx	20		
输出电流 Output Current	I <sub>o</sub>	T <sub>c</sub> =25°C, T <sub>j</sub> <150°C	15	A	INV
			50		PFC
输出电流(脉冲) Output Current(Pulse)	I <sub>OP</sub>	T <sub>c</sub> =25°C, P <sub>w</sub> <1ms, single pulse	30	A	INV
			90		PFC
输入电压 Input Voltage	V <sub>IN</sub>	HINx-COM, LINx-COM, PFC_IN-COM	-0.5 to 7	V	
FO 输入电压 FO Pin Voltage	V <sub>FO</sub>	FO-COM	-0.5 to 7	V	
OCP输入电压 OCP Pin Voltage	V <sub>OCP</sub>	OCP-COM	-10 to 7	V	
运行外壳温度 Operating Case Temperature	T <sub>C(OP)</sub>		-30 to 100	°C	
结温 Junction Temperature	T <sub>j</sub>		150	°C	
保存温度 Storage Temperature	T <sub>STG</sub>		-40 to 150	°C	
绝缘耐压 Isolation Voltage	V <sub>ISO(RMS)</sub>	引脚-塑封体之间, AC, 60Hz, 1min Between pin and surface, AC, 60Hz, 1min	2000	V	

## 产品推荐应用条件 RECOMMENDED OPERATING CONDITIONS

参数 Parameter	符号 Symbol	条件 Conditions	Min.	Typ.	Max.	单位 Unit	备注 Remarks
电源电压 Main Supply Voltage	V <sub>DC</sub>	P+(PFC)-LSx(P-)	—	300	400	V	
控制电源电压 Logic Supply Voltage	V <sub>CC</sub>	VCC-COM	13.5	—	16.5	V	
	V <sub>BS</sub>	VBx-HSx	13.5	—	16.5		
分流电阻 Shunt Resistor	R <sub>s</sub>	I <sub>p</sub> ≤30A	15	—	—	mΩ	INV
		I <sub>p</sub> ≤45A	10	—	—		PFC
RC 滤波电容 FO Filter Capacitor	C <sub>o</sub>		—	—	2200	pF	
RC 滤波电阻 RC Filter Resistor	R <sub>o</sub>		—	—	100	Ω	
输入电压 Input Voltage	V <sub>IN</sub>	HINx, LINx, FO, PFC_IN	0	—	5.5	V	
最小输入脉宽 Minimum Input Pulse Width	t <sub>IN(MIN)ON</sub>		0.5	—	—	μs	
		t <sub>IN(MIN)OFF</sub>	0.5	—	—		
死区时间 Dead Time of Input Signal	t <sub>DEAD</sub>		1.5	—	—	μs	
FO 上拉电阻 FO Pull-up Resistor	R <sub>FO</sub>		1	—	22	kΩ	
FO 上拉电压 FO Pull up voltage	V <sub>FO</sub>		3.0	—	5.5	V	
FO 滤波电容 FO Filter Capacitor	C <sub>FO</sub>		0.001	—	0.01	μF	
自举电容 Bootstrap Capacitor	C <sub>BOOT</sub>		10	—	220	μF	
PWM载波频率 PWM Carrier Frequency	f <sub>c</sub>		—	—	20	kHz	INV
			—	40	—		PFC
运行壳温 Operating Case Temperature	T <sub>C(OP)</sub>		—	—	100	°C	

## GM 001系列产品外形尺寸图

• OUTLINE DRAWING OF GM001 SERIES



## 应用领域 APPLICATIONS

应用范围包含家用和商用电器的电机控制  
Applications include residential home applications and commercial appliance motor control.



- 空调风机  
Air conditioner fan.
- 小功率通风设备  
Small ventilation fan.
- 洗碗机泵  
Dishwasher pump.

## 性能特点 FEATURES

- 内置驱动IC  
Built-in pre-drive IC.
- 内置MOSFET或者IGBT功率芯片  
MOSFET or IGBT power element.
- FO : 故障信号输出  
FO: fault signal output.
- 内置带限流电阻的自举二极管  
Built-in bootstrap diodes with current limiting resistor.
- 调整内部集成电阻, 降低了噪音  
Alleviate noise generation by adjusting an internal resistor.
- 保护功能: 欠压保护、短路保护、过热保护、防直通保护、过电流限制  
Protections include: undervoltage lockout, over current protection, thermal shutdown, simultaneous on-stage prevention, over current limiting.
- 绝缘级别1500Vrms/min  
Isolation rating: 1500 Vrms/min.
- 输出电流2.5A与5A  
Output current 2.5 A, 5 A.
- 产品系列管脚封装完全兼容(包含SiC模块), 方便客户升级  
Product series pin package is fully compatible(including SiC module), convenient for customers to upgrade.

## 产品性能 PERFORMANCE

型号 Model	V <sub>DSS</sub> /V <sub>CES</sub> (V)	I <sub>D</sub> /I <sub>C</sub> (A)	f <sub>c</sub> (kHz) Max.	V <sub>iso</sub> (V <sub>rms</sub> )	R <sub>DS(ON)</sub> (Ω)/V <sub>CE(sat)</sub> (V) @I <sub>D</sub> /I <sub>C</sub> =I <sub>D</sub> /I <sub>C</sub> (rating), T <sub>j</sub> =25°C		Typ. Switching @I <sub>D</sub> /I <sub>C</sub> =I <sub>D</sub> /I <sub>C</sub> (rating), T <sub>j</sub> =25°C					结温 T <sub>j</sub> (°C)	热阻 R <sub>th(j-c)</sub> (°C/W) MOSFET/IGBT FRD	备注 Remarks	
					t <sub>on</sub> (μs)	t <sub>tr</sub> (ns)	t <sub>don</sub> (μs)	t <sub>off</sub> (μs)	t <sub>doff</sub> (μs)						
GFM2A5050	500	2.5	20	1500	2.0	2.4	1.00	140	0.90	0.04	0.70	-30~150	3.6	/	MOSFET
GFM05A060	600	5	20	1500	1.75	2.2	0.81	80	0.74	0.67	0.57		3.6	4.2	IGBT

## 产品一览表 PRODUCT SCHEDULE

型号 Model	V <sub>DSS</sub> /V <sub>CES</sub> (V)	I <sub>D</sub> /I <sub>C</sub> (A)	电机I <sub>rms</sub> 范围I <sub>rms</sub> Range (Arms)	封装编号 NO.	
MOSFET	GFM2A5050	500	2.5	up to 2.0	DIP40
IGBT	GFM05A060	600	5.0	up to 5.0	DIP40

## 产品应用最大额定条件(Ta=25°C) MAXIMUM RATED CONDITIONS(Ta=25°C)

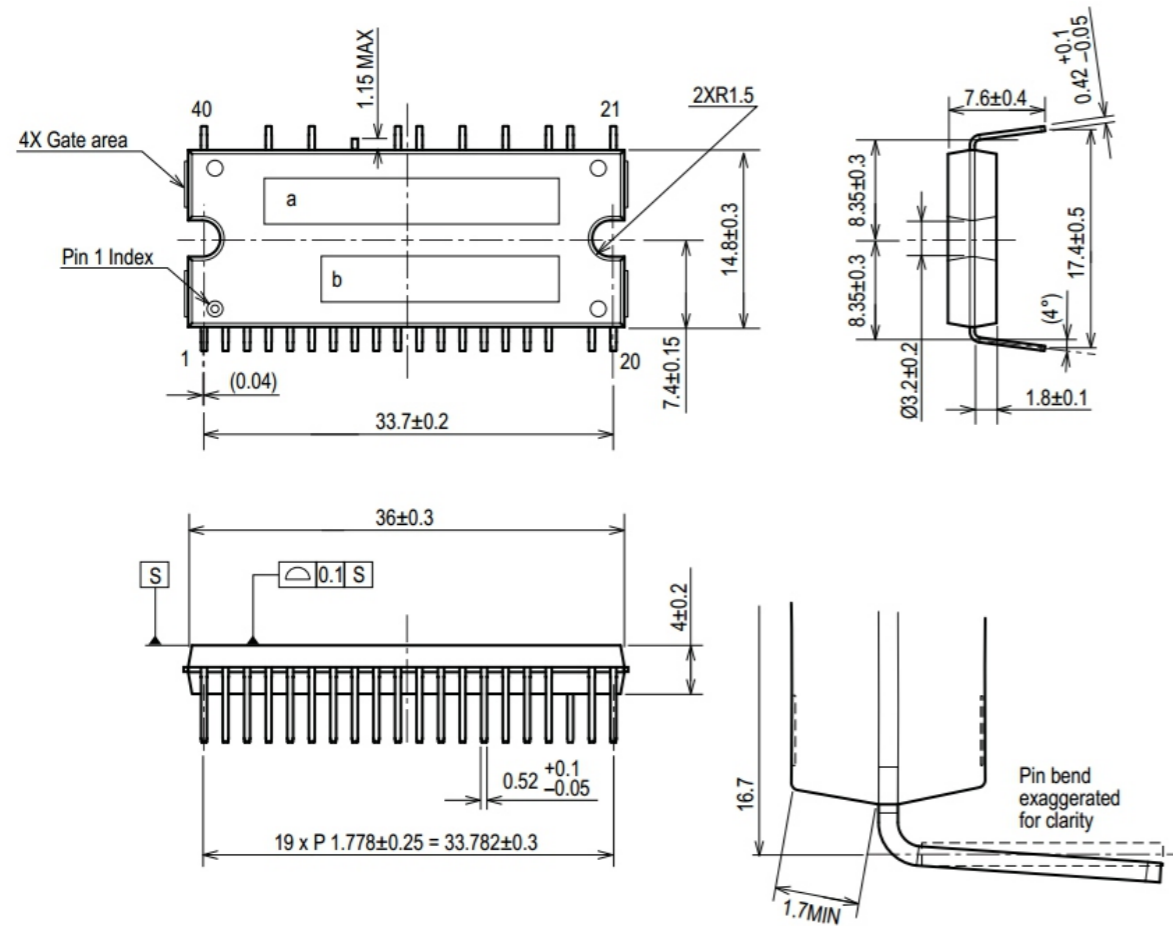
参数 Parameter	符号 Symbol	条件 Conditions	规格值 Rating	单位 Unit	备注 Remarks
电源电压 Main Supply Voltage	V <sub>DC</sub>	VBB-LSx	450	V	
电源电压(浪涌) Main Supply Voltage(Surge)	V <sub>DC(surge)</sub>	VBB-LSx	500	V	
MOSFET/IGBT耐压 MOSFET/IGBT Breakdown Voltage	V <sub>DSS</sub> /V <sub>CES</sub>	V <sub>CC</sub> =15V, I <sub>D</sub> =0.1mA, V <sub>in</sub> =0V	500	V	GFM2A5050
		V <sub>CC</sub> =15V, I <sub>C</sub> =1mA, V <sub>in</sub> =0V	600		GFM05A060
控制电源电压 Logic Supply Voltage	V <sub>CC</sub>	VCCx-COM	20	V	
	V <sub>BS</sub>	VBx-HSx(U/V/W)	20		
输出电流 Output Current	I <sub>O</sub>	T <sub>c</sub> =25°C, T <sub>j</sub> < 150°C	2.5	A	GFM2A5050
			5.0		GFM05A060
输出电流(脉冲) Output Current(Pulse)	I <sub>OP</sub>	T <sub>c</sub> =25°C, P <sub>w</sub> < 100μs, single pulse	3.75	A	GFM2A5050
			7.5		GFM05A060
输入电压 Input Voltage	V <sub>IN</sub>	HINx-COM, LINx-COM, OCP-COM	-0.5 to 7	V	
FO 输入电压 FO Pin Voltage	V <sub>FO</sub>	FO-COM	-0.5 to 7	V	
OCP输入电压 OCP Pin Voltage	V <sub>OCP</sub>	OCP-COM	-10 to 5	V	
SD 输入电压 SD Pin Voltage	V <sub>SD</sub>	SD-COM	-0.5 to 7	V	
运行外壳温度 Operating Case Temperature	T <sub>C(OP)</sub>		-30 to 100	°C	
结温 Junction Temperature	T <sub>j</sub>		150	°C	
保存温度 Storage Temperature	T <sub>STG</sub>		-40 to 150	°C	
绝缘耐压 Isolation Voltage	V <sub>ISO(RMS)</sub>	引脚-塑封体之间, AC, 60Hz, 1min Between pin and surface, AC, 60Hz, 1min	1500	V	

## 产品推荐应用条件 RECOMMENDED OPERATING CONDITIONS

参数 Parameter	符号 Symbol	条件 Conditions	Min.	Typ.	Max.	单位 Unit	备注 Remarks
电源电压 Main Supply Voltage	V <sub>DC</sub>	VBB-LSx	—	300	400	V	
控制电源电压 Logic Supply Voltage	V <sub>CC</sub>	VCCx-COM	13.5	—	16.5	V	
	V <sub>BS</sub>	VBx-HSx(U/V/W)	13.5	—	16.5		
分流电阻 Shunt Resistor	R <sub>S</sub>	I <sub>p</sub> ≤ 3.75A	270	—	—	mΩ	GFM2A5050
		I <sub>p</sub> ≤ 7.5A	150	—	—		GFM05A060
RC 滤波电容 FO Filter Capacitor	C <sub>O</sub>		1000	—	10000	pF	GFM2A5050
			1000	—	2200		GFM05A060
RC 滤波电阻 RC Filter Resistor	R <sub>O</sub>		—	—	100	Ω	
输入电压 Input Voltage	V <sub>IN</sub>	HINx, LINx, FO, OCP, SD	0	—	5.5	V	
最小输入脉宽 Minimum Input Pulse Width	t <sub>IN(MIN)ON</sub> t <sub>IN(MIN)OFF</sub>		0.5	—	—	μs	
			0.5	—	—		
死区时间 Dead Time of Input Signal	t <sub>DEAD</sub>		1.5	—	—	μs	
FO 上拉电阻 FO Pull-up Resistor	R <sub>FO</sub>		3.3	—	10	kΩ	
FO 上拉电压 FO Pull up voltage	V <sub>FO</sub>		3.0	—	5.5	V	
FO 滤波电容 FO Filter Capacitor	C <sub>FO</sub>		0.001	—	0.01	μF	
自举电容 Bootstrap Capacitor	C <sub>BOOT</sub>		1	—	220	μF	
PWM载波频率 PWM Carrier Frequency	f <sub>c</sub>		—	—	20	kHz	
运行壳温 Operating Case Temperature	T <sub>C(OP)</sub>		—	—	100	°C	

GFM系列产品外形尺寸图

• OUTLINE DRAWING OF GFM SERIES

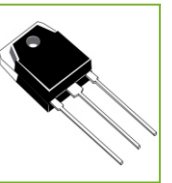


Unit: mm  
Leadframe Material: Cu  
Pin treatment: Solder Plating

a: Part #:  
b: Lot number 5 digits  
1<sup>st</sup> letter: Last digit of year  
2<sup>nd</sup> letter: Month  
Jan to September: Numeric  
October: O  
November: N  
December: D  
3<sup>rd</sup> and 4<sup>th</sup> letter: Day  
01 to 31  
5<sup>th</sup> letter: Reference number



Pb-free. Device composition compliant with the RoHS directive.



应用领域 APPLICATIONS

- 功率因素校正器(PFC)  
Power factor corrector (PFC).

性能特点 FEATURES

- 最大结温,  $T_j = 175^\circ\text{C}$   
Maximum junction temperature:  $T_j = 175^\circ\text{C}$ .
- 最小化拖尾电流  
Minimized tail current.
- 饱和压降  $V_{CE(sat)} = 1.6\text{V}(\text{typ.})$ , @  $I_c = 40\text{A}$   
 $V_{CE(sat)} = 1.6\text{V}(\text{typ.})$ , @  $I_c = 40\text{A}$ .
- 严格的参数分布  
Tight parameter distribution.
- 内置用于保护的二极管  
Co-packed diode for protection.
- 安全的并联特性  
Safe paralleling.
- 低热阻特性  
Low thermal resistance.
- IGBT采用了先进的Trench+FS结构  
IGBT developed using an advanced proprietary trench gate field-stop structure.
- 产品系列管脚封装完全兼容(包含SiC器件), 方便客户升级  
Product series pin package is fully compatible(including SiC device), convenient for customers to upgrade.

产品性能 PERFORMANCE

型号 Model	$V_{CES}$ (V)	$I_c$ (A)	$V_{GE(th)}$ (V)	$V_{CE(sat)}$ (V)		Typ. Switching @ $I_c = I_c(\text{rating})$ , $T_j = 175^\circ\text{C}$			结温 $T_j$ ( $^\circ\text{C}$ )	热阻 $R_{th(j-c)}$ ( $^\circ\text{C}/\text{W}$ )		
				@ $I_c = I_c(\text{rating})$ , $T_j = 25^\circ\text{C}$	@ $I_c = I_c(\text{rating})$ , $T_j = 175^\circ\text{C}$	$E_{off}(\mu\text{J})$	$t_r(\mu\text{s})$	$t_{doff}(\mu\text{s})$		IGBT	FRD	
GDD40A065	650	40	6	1.6	2.2	1.8	764	0.061	0.141	-55~175	0.53	5.0

产品一览表 PRODUCT SCHEDULE

型号 Model	$V_{CES}$ (V)	$I_c$ (A)	开关频率(kHz) Switching Frequency(kHz)	封装编号 NO.	
DISCRETE	GDD40A065	650	40	16~60	TO-3P

## 产品应用最大额定条件(Ta=25°C) MAXIMUM RATED CONDITIONS(Ta=25°C)

参数 Parameter	符号 Symbol	条件 Conditions	规格值 Rating	单位 Unit	备注 Remarks
IGBT耐压 IGBT Breakdown Voltage	V <sub>CES</sub>	V <sub>GE</sub> =0V	650	V	
集电极电流 Continuous Collector Current	I <sub>C</sub>	Ta=25°C	80	A	
		Ta=100°C	40		
集电极电流(脉冲) Continuous Collector Current(Pulse)	I <sub>CP</sub>		160	A	
门极-发射极电压 Gate-emitter Voltage	V <sub>GE</sub>		±30	V	
二极管正向导通电流 Continuous Forward Current	I <sub>F</sub>	Ta=25°C	5	A	
		Ta=100°C	5		
二极管正向导通电流(脉冲) Continuous Forward Current(Pulse)	I <sub>FP</sub>		10	A	
总功耗 Total Dissipation	P <sub>TOT</sub>	Ta=25°C	283	W	
保存温度 Storage Temperature Range	T <sub>STG</sub>		-55~155	°C	
结温 Junction Temperature	T <sub>J</sub>		-55~175	°C	

## 动态特性 DYNAMIC CHARACTERISTICS

参数 Parameter	符号 Symbol	条件 Conditions	Min.	Typ.	Max.	单位 Unit	备注 Remarks
输入电容 Input Capacitance	C <sub>ies</sub>	V <sub>CE</sub> =25V, f=1MHz V <sub>GE</sub> =0V	—	5412	—	pF	
输出电容 Output Capacitance	C <sub>oes</sub>		—	198	—		
反向传输电容 Reverse Transfer Capacitance	C <sub>res</sub>		—	107	—		
总门极电荷 Total Gate Charge	Q <sub>g</sub>	V <sub>CC</sub> =520V, I <sub>C</sub> =40A V <sub>GE</sub> =15V	—	210	—	nC	
门极-发射极电荷 Gate-emitter Charge	Q <sub>ge</sub>		—	39	—		
门极-集电极电荷 Gate-collector Charge	Q <sub>gc</sub>		—	82	—		

## 分立器件产品外形尺寸图 OUTLINE DRAWING OF DISCRETE DEVICE

