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March 2014

FBA42060

PFC SPM® 45 Series for Single-Phase Boost PFC

Features

- UL Certified No. E209204 (UL1557)
- 600 V - 20 A Single-Phase Boost PFC with Integral Gate Driver and Protection
- Low Thermal Resistance Using Ceramic Substrate
- Full-Wave Bridge Rectifier and High-Performance Output Diode
- Optimized for 20kHz Switching Frequency
- Built-in NTC Thermistor for Temperature Monitoring
- Isolation Rating: 2000 Vrms/min.

Applications

- Single-Phase Boost PFC Converter

Related Source

- *AN-9091 - Boost PFC Inductor Design Guide*
- *AN-9072 - Motion SPM® 45 Series Mounting Guidance*

General Description

The FBA42060 is an advanced PFC SPM® 45 module providing a fully-featured, high-performance Boost PFC (Power Factor Correction) input power stage for consumer, medical, and industrial applications. These modules integrate optimized gate drive of the built-in IGBT to minimize EMI and losses, while also providing multiple on-module protection features including under-voltage lockout, over-current shutdown, thermal monitoring, and fault reporting. These modules also feature a full-wave rectifier and high-performance output diode for additional space savings and mounting convenience.

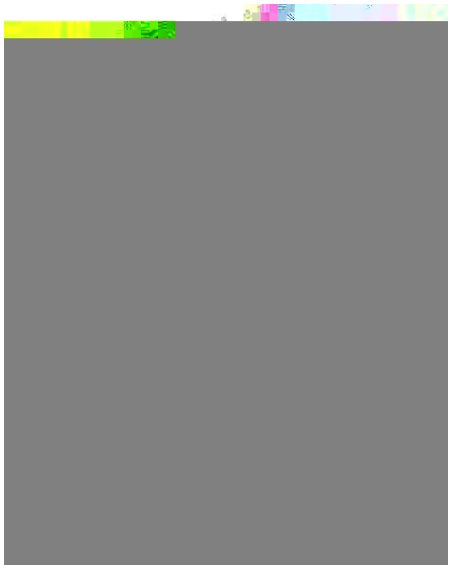

Figure 1. Package Overview

Package Marking & Ordering Information

Device	Device Marking	Package	Packing Type	Quantity
FBA42060	FBA42060	SPMAA-F26	Rail	12

Integrated Drive, Protection and System Control Functions

- For IGBTs: gate drive circuit, Over-Current Protection (OCP), control supply circuit Under-Voltage Lock-Out (UVLO) Protection
- Fault signal: corresponding to OC and UV fault
- Built-in NTC thermistor: temperature monitoring
- Input interface: active-HIGH interface, works with 3.3 / 5 V logic, Schmitt trigger input

Pin Configuration

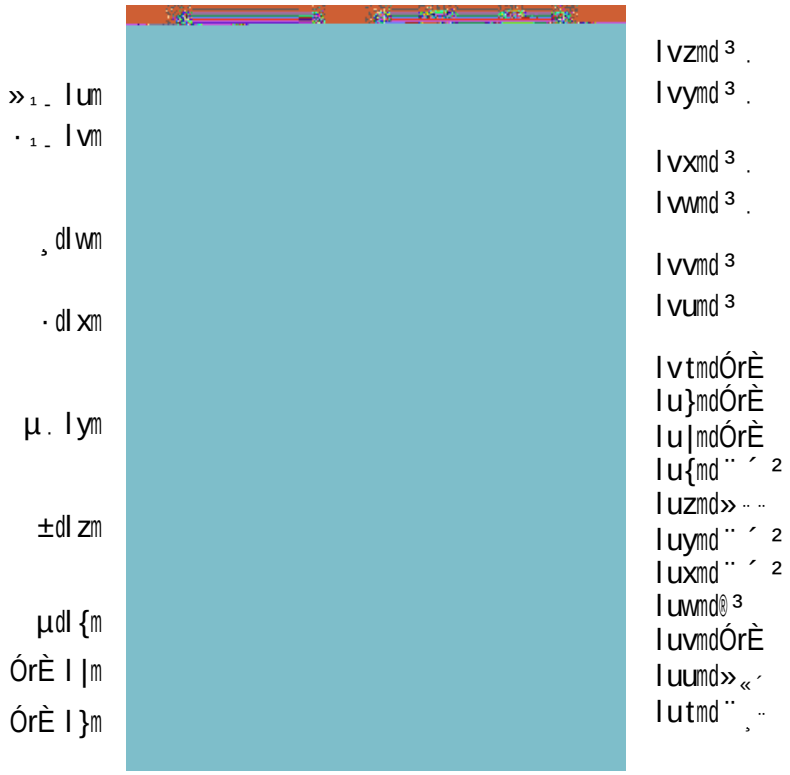

Figure 2. Top View

Absolute Maximum Ratings

Converter Part

Electrical Characteristics (T_J = 25°C, unless otherwise specified.)

Converter Part

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CE(SAT)}$	IGBT Collector - Emitter Saturation Voltage	V_{CC} = 15 V, V_{IN} = 5V, I_C = 20 A	-	2.2	2.7	V
V_{FF}	FRD Forward Voltage	I_F = 20 A	-	2.1	2.6	V
V_{FR}	Rectifier Forward Voltage	I_F = 20 A	-	1.1	1.4	V
t_{ON}	Switching Characteristic	V_{PN} = 300 V, V_{CC} = 15 V, I_C = 20 A, V_{IN} = 0 V 5 V, Inductive Load (1st Note 1)	-	770	-	ns
t_{OFF}			-	640	-	ns
$t_{C(ON)}$			-	130	-	ns
$t_{C(OFF)}$			-	50	-	ns
trr			-	40	-	ns
Irr			-	4.0	-	A
I_{CES}	Collector - Emitter Leakage Current	V_{CE} = V_{CES}	-	-	1	mA

1st Notes:

1. t_{ON} and t_{OFF} include the propagation delay of the internal drive IC. $t_{C(ON)}$ and $t_{C(OFF)}$ are the switching time of IGBT itself under the given gate driving condition internally. For the detailed information, please see Figure 4.

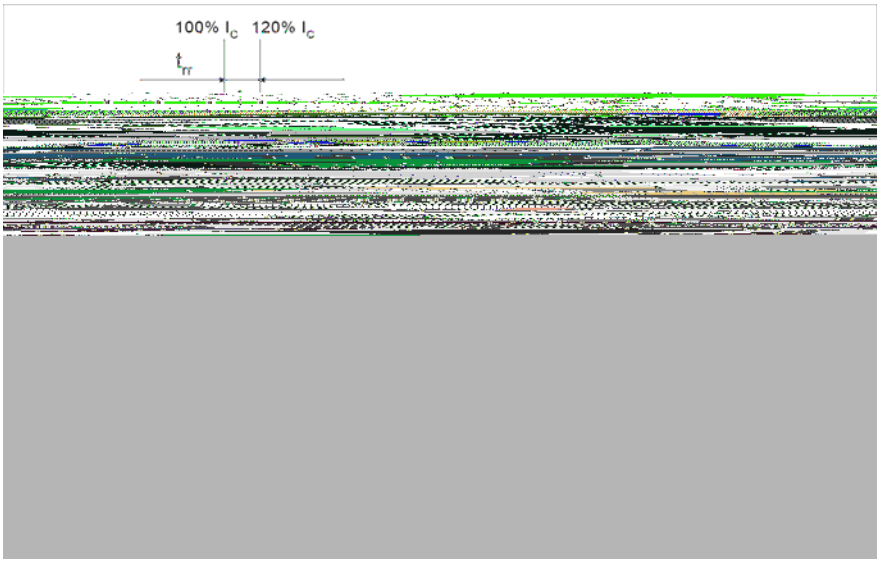

Figure 4. Switching Time Definitions

Control Part

1st Notes:

2. Over-current protection is functioning on IGBT.

3. T_{TH} is the temperature of thermister itself. To know case temperature (T_C), please make the experiment considering your application.

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Time Charts of Protective Function

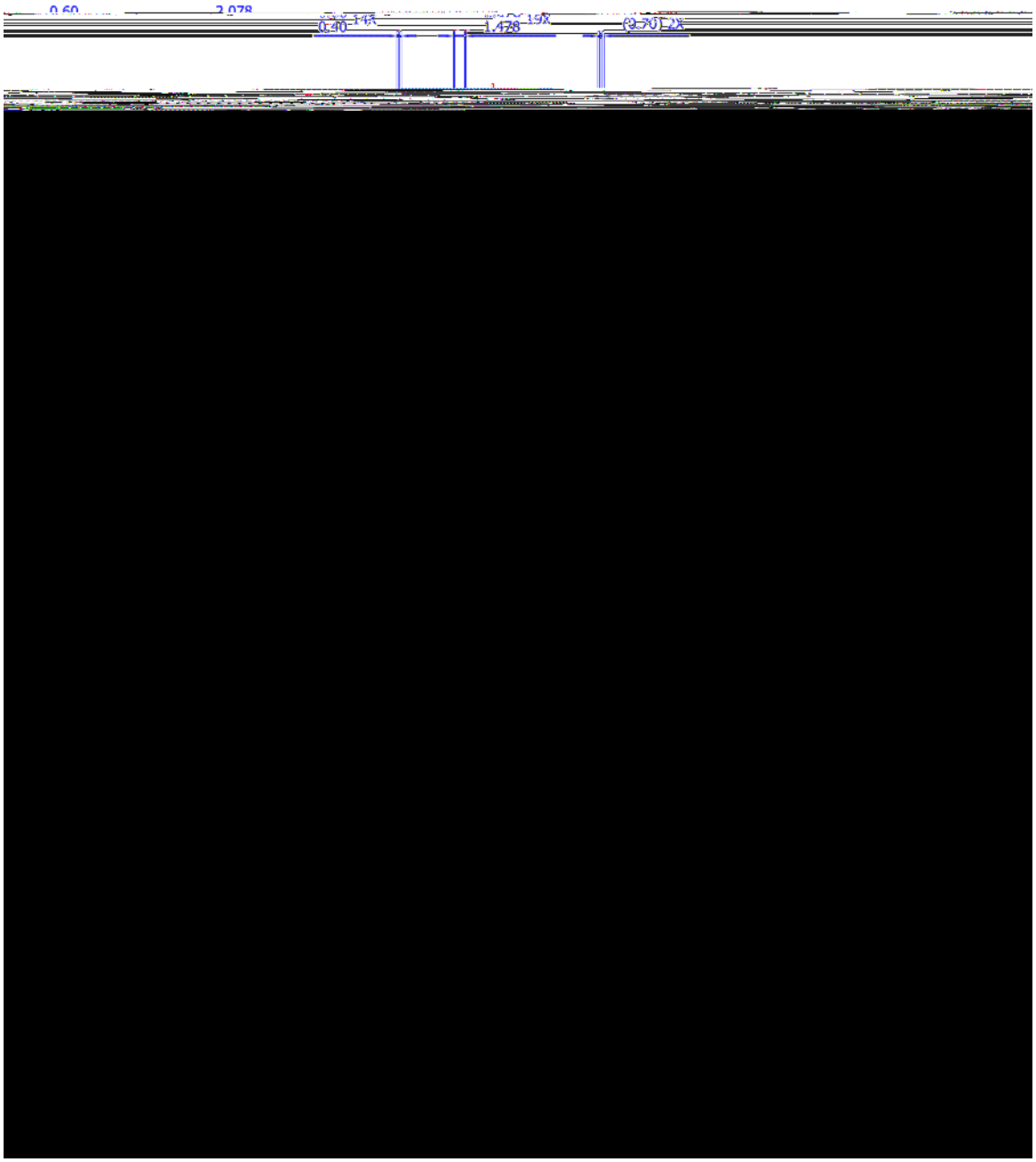
Recommand circuit for Application

Figure 9. Typical Application Circuit

2nd Notes:

1. To avoid malfunction, the wiring of each input should be as short as possible (less than 2 - 3 cm).
2. V_{FO} output is open-drain type. This signal line should be pulled up to the positive side of the MCU or PFC controller power supply with a resistor that makes I_{FO} up to 1 mA.
3. Input signal is active-HIGH type. There is a 5 k resistor inside the IC to pull-down each input signal line to GND. RC coupling circuits is recommanded for the prevention of input signal oscillation. $R_S C_{PS}$ time constant should be selected in the range 50 ~ 150 ns (recommended R_S = 100 Ω, C_{PS} = 1 nF).
4. To prevent errors of the protection function, the wiring around R_F and C_{SC} should be as short as possible.
5. In the over-current protection circuit, please select the R_F, C_{SC} time constant in the range 1~2 μs.
6. Each capacitors should be mounted as close to the pins as possible.
7. Relays are used in almost every systems of electrical equipment in home appliances. In these cases, there should be sufficient distance between the MCU and the relays.
8. Internal NTC thermistor can be used for monitoring the case temperature and protecting the device from the over-heating operation. Please select an appropriate resistor RTH according to the application. For example, use R_{TH} = 4.7 kΩ that will make the voltage across R_{TH} to be 2.5 V at 85°C of the case temperature.
9. Please use an appropriate shunt resistor R_{SH} to protect the intenal IGBT from the over-current operation.
10. It's recommended that anti-parallel diode should be connected with IGBT.

Detailed Package Outline Drawings



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http://www.fairchildsemi.com/dwg/MO/MOD23AA.pdf