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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to _____

July 2016

FPAM30LH60

PFC SPM® 2 Series for 2-Phase Interleaved PFC

Features

- UL Certified No.E209204 (UL1557)
- 600 V - 30 A 2-Phase Interleaved PFC with Integral Gate Driver and Protection
- Very Low Thermal Resistance Using Al_2O_3 DBC Substrate
- Full-Wave Bridge Rectifier and High-Performance Output Diode
- Optimized for 20kHz Switching Frequency
- Built-in NTC Thermistor for Temperature Monitoring
- Isolation Rating: 2500 V_{rms}/min

Applications

- 2-Phase Interleaved PFC Converter

General Description

The FPAM30LH60 is a PFC SPM® 2 module providing a fully-featured, high-performance Interleaved PFC (Power Factor Correction) input power stage for consumer, medical, and industrial applications. These modules integrate optimized gate drive of the built-in IGBTs to minimize EMI and losses, while also providing multiple on-module protection features including under-volt-

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 thermistor: temperature monitoring
- Input interface : active-HIGH interface, works with 3.3 / 5 V logic, Schmitt trigger input

Pin Configuration

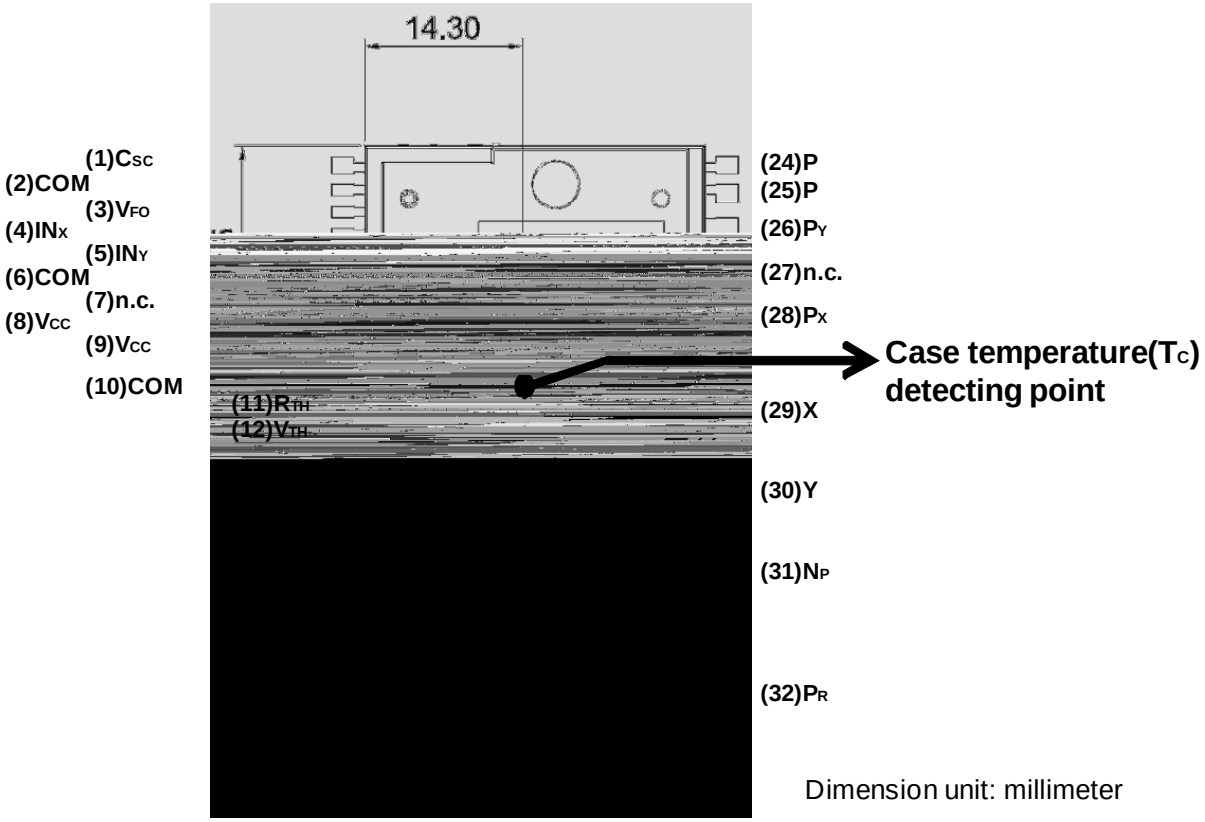

Figure 2. Top View

Pin Descriptions

Pin Number	Pin Name	Pin Description
1	C_{SC}	Signal Input for Over-Current Detection
2,6,10	COM	Common Supply Ground
3	V_{FO}	Fault Output
4	IN_X	PWM Input for X IGBT Drive
5	IN_Y	PWM Input for Y IGBT Drive
7	N.C	No Connection
8,9	V_{CC}	

Internal Equivalent Circuit

Figure 3. Internal Block Diagram

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

Converter Part

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CE(SAT)}$ V_{FF}	IGBT Saturation Voltage	V_{CC} = 15 V, V_{IN} = 5 V, I_C = 30 A	-	1.7	2.2	V

1st Notes:

3. 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 Definition

Recommended Operating Conditions (T_J = 25°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_i	Input Supply Voltage	Applied between R - S	187	-	253	V_{rms}
I_i	Input Current	T_C < 100°C, V_i = 220 V, V_O = 360 V, f_{PWM} = 20 kHz per IGBT	-	-	21	A_{rms}
V_{PN}	Supply Voltage	Applied between X - N_P, Y - N_P, P - P_X, P - P_Y	-	-	400	V
V_{CC}	Control Supply Voltage	Applied between V_{CC} - COM	13.5	15.0	16.5	V
dV_{CC}/dt	Supply Variation		-1	-	1	V / μs
I_{FO}	Fault Output Current	Sink Current at V_{FO} Pin	-	-	1	mA
f_{PWM}	PWM Input Frequency	-40°C < T_J < 125°C per IGBT	-	20	-	kHz

Mechanical Characteristics and Ratings

Parameter	Conditions		Min.	Typ.	Max.	Unit
Mounting Torque	Mounting Screw: M4	Recommended 0.98 N•m	0.78	0.98	1.17	N•m
		Recommended 10 kg•cm	8	10	12	kg•cm
Device Flatness	See Figure 6		0	-	+150	μm
Weight			-	32	-	g

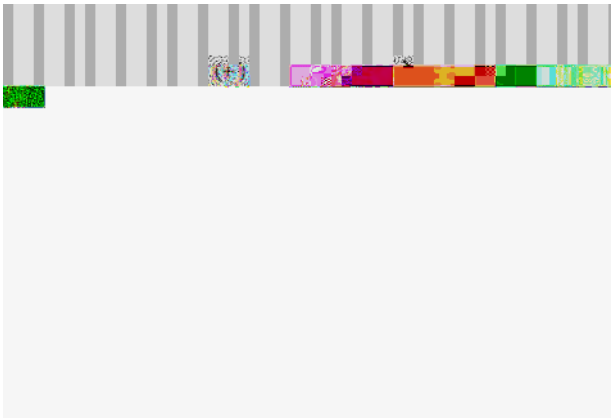

Figure 6. Flatness Measurement Position

Time Charts of Protective Function

a1 : Control supply voltage rises: after the voltage rises UV_{CCR}, the circuits start to operate when the next input is applied.

a2 : Normal operation: IGBT ON and carrying current.

a3 : Under-voltage detection (UV_{CCD}).

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 control power supply with a resistor that makes I_{FO} up to 1 mA.
3. Input signal is active-HIGH type. There is a 5 kΩ 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. $R_F C_F$ constant should be selected in the range 50~150ns(recommended R_F = 100 Ω, C_F = 1 nF).
4. To prevent error of the protection function, the wiring related with R_{SCF} and C_{SCF} should be as short as possible.
5. In the over current protection circuit, please select the R_{SCF} , C_{SCF} time constant in the range 1.5 ~ 2 μs.
6. Each capacitors should be mounted as close to the PFC SPM® product pins as possible.
7. Relays are used at almost every systems of electrical equipments of home appliances. In these cases, there should be sufficient distance between the MCU / controller and the relays.
8. Internal NTC thermistor can be used for monitoring of the case temperature and protecting the device from the overheating operation. Select an appropriate resistor R_T according to the application.
9. It is recommended that anti-parallel diode(D_X or D_Y) be connected with each IGBT.

Detailed Package Outline Drawings

NOTES: UNLESS OTHE ٢

PUBLICATION ORDERING INFORMATION

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