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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 Al₂O₃ 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

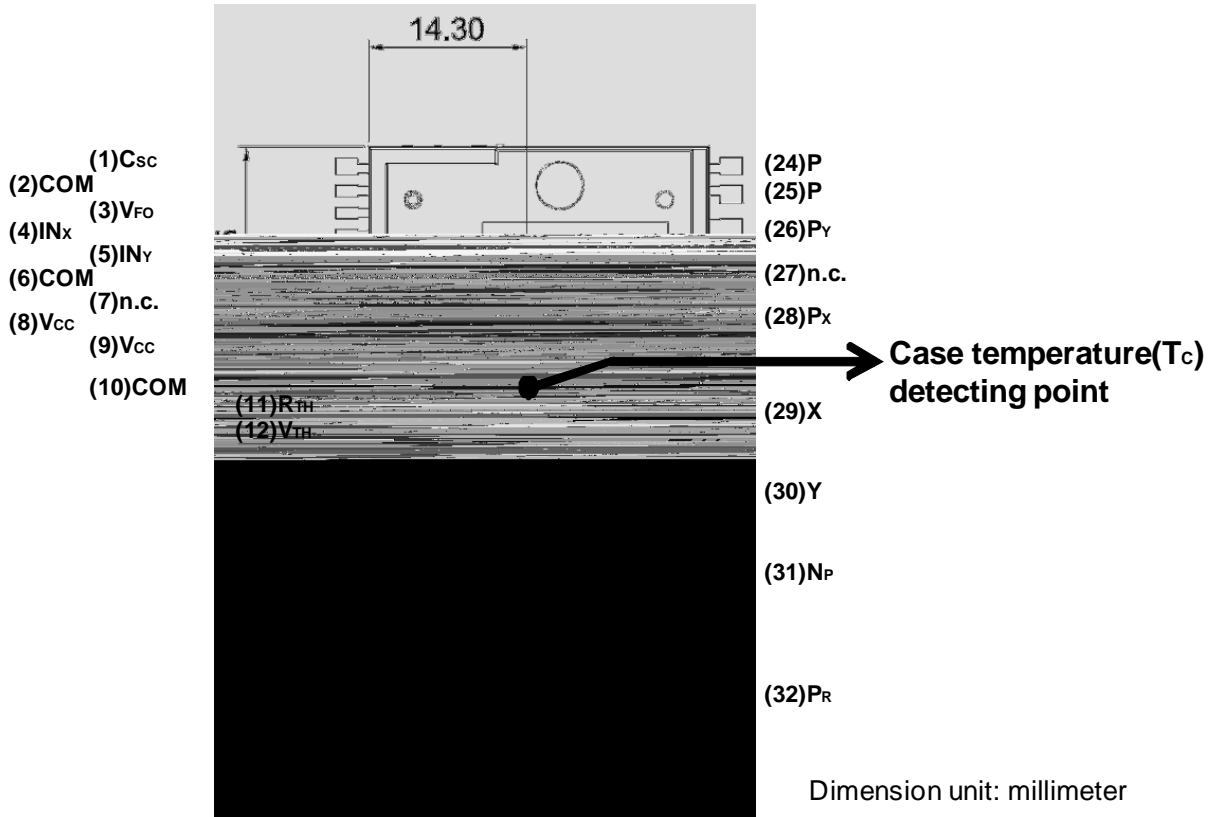


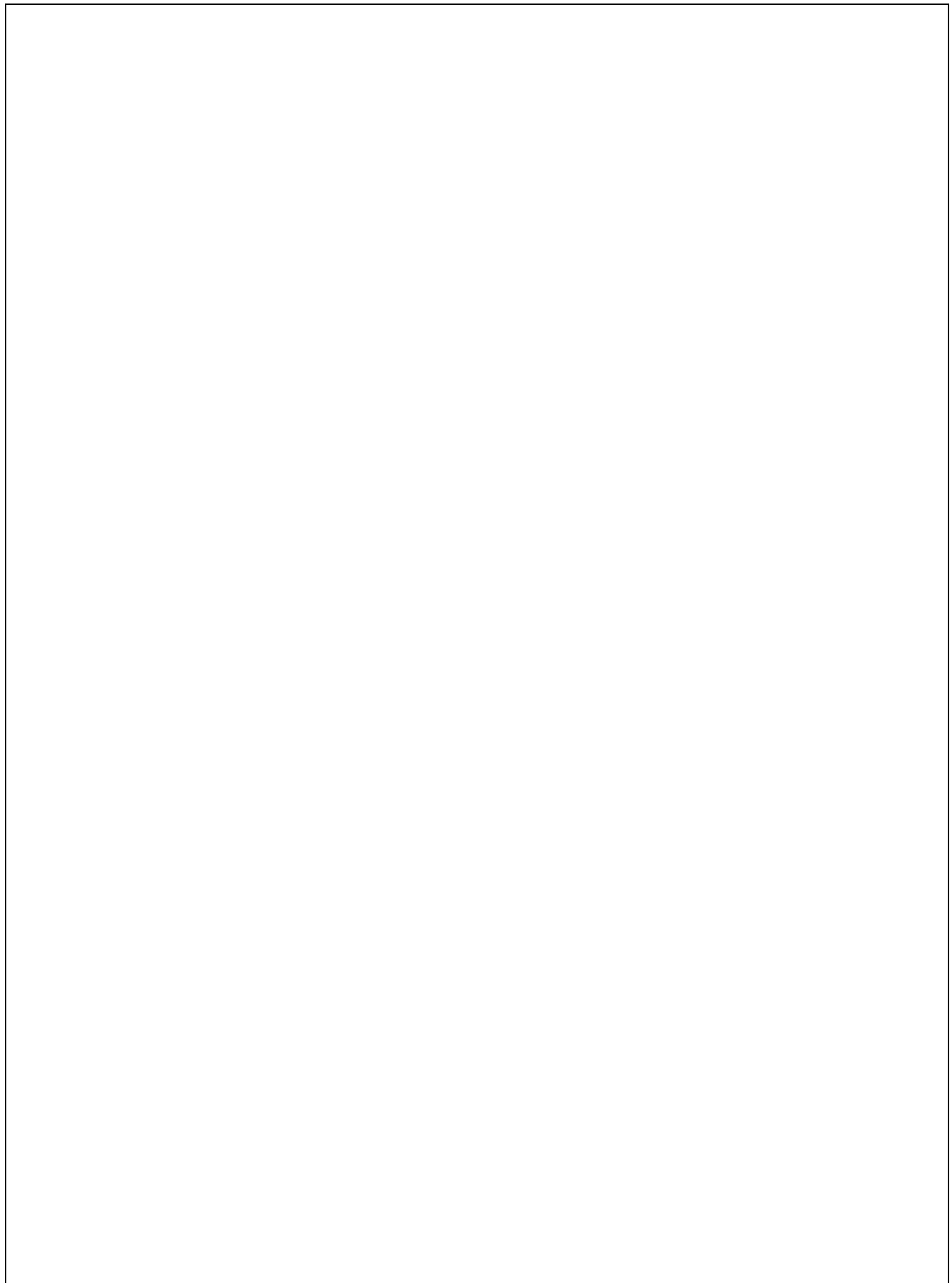
Figure 2. Top View

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 ($T_J = 25^\circ\text{C}$, unless otherwise specified.)

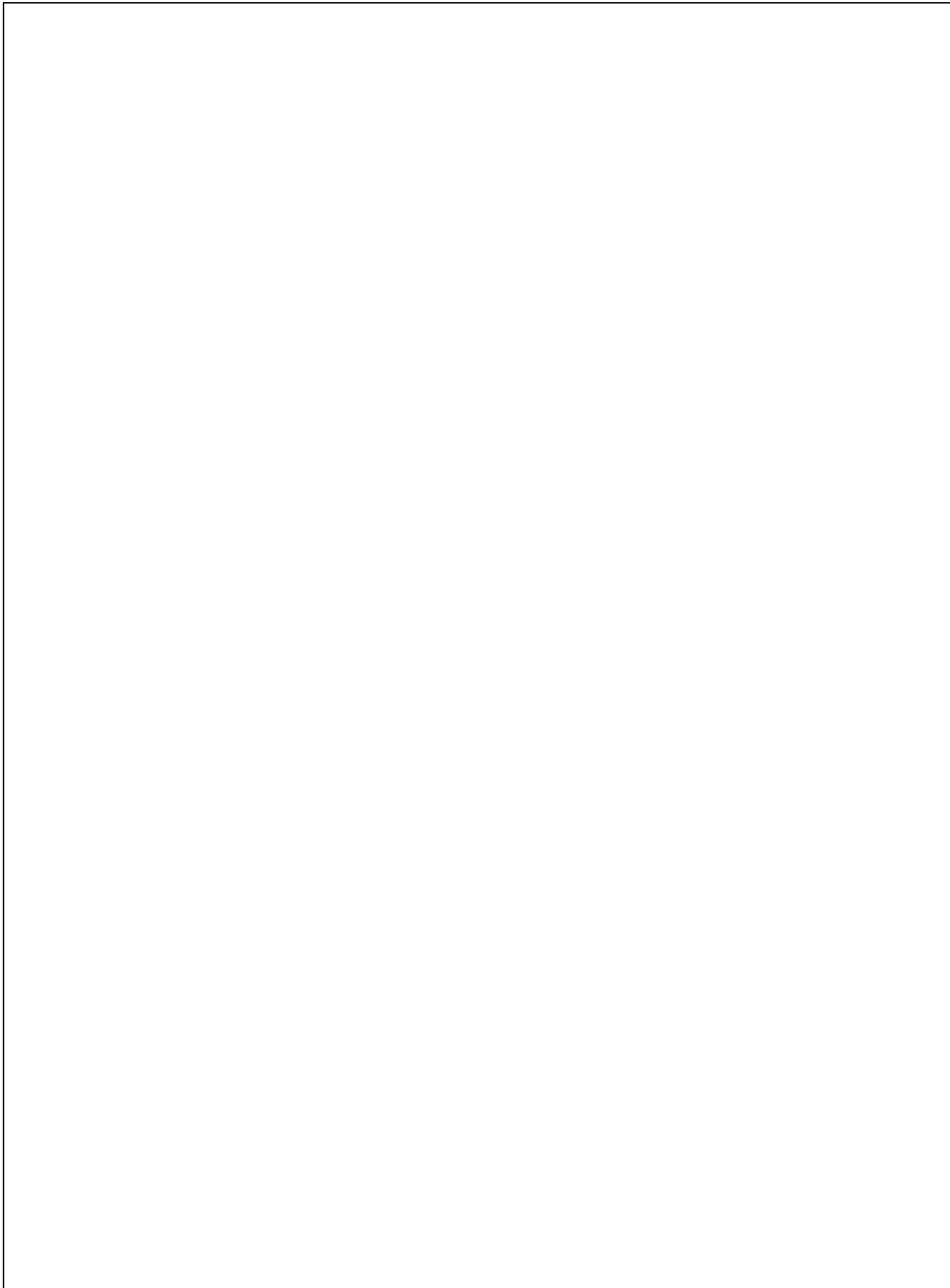
Converter Part

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CE(SAT)}$ V_{FF}	IGBT Saturation Voltage	$V_{CC} = 15\text{ V}$, $V_{IN} = 5\text{ V}$, $I_C = 80\text{ A}$	-	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 ($T_J = 25^\circ\text{C}$, 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	$T_C < 100^\circ\text{C}$, $V_i = 220\text{ V}$, $V_O = 360\text{ V}$, $f_{PWM} = 20\text{ kHz}$ 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	$V / \mu\text{s}$
I_{FO}	Fault Output Current	Sink Current at V_{FO} Pin	-	-	1	mA
f_{PWM}	PWM Input Frequency	$-40^\circ\text{C} < T_J < 125^\circ\text{C}$ 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	

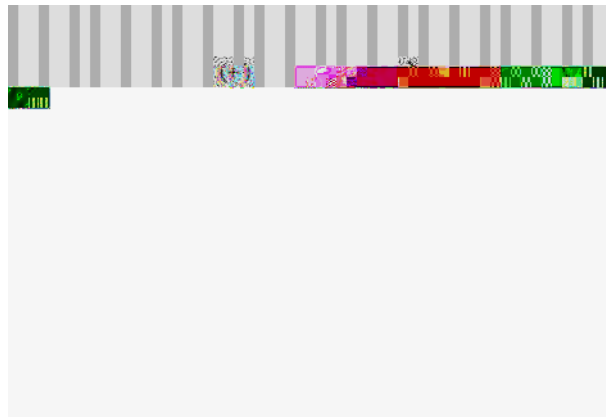


Figure 6. Flatness Measurement Position

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}).

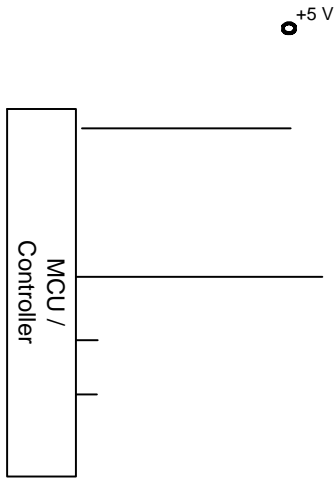


Figure 9. Typical Application Circuit

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 k Ω resistor inside the IC to pull-down each input signal line to GND. RC coupling circuits is recommended for the prevention of input signal oscillation. $R_F C_F$ constant should be selected in the range 50~150ns (recommended $R_F = 100 \Omega$, $C_F = 1$ 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 μ s.
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 (D_Y) be connected with each IGBT.

Detailed Package Outline Drawings

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