



CIPOS™ IPM in residential air conditioners

Infineon Technologies AG
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Intelligent Power Modules in appliances

Global trends are driving demand for new power semiconductor solutions



Energy efficiency



Reduction of energy consumption is needed, enabling systems that our lives and work greener. This requires inverterization which is the key field for IPMs

Integration of power semiconductors provides essential advantages compared to discrete solutions



Customer benefits



- Reduced development efforts & faster time-to-market
- Optimized system performance & less parts
- Higher system reliability compared to single components
- Full portfolio of new technologies upcoming (e.g. GaN, SiC)

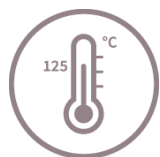
- › Following slides are just an example of key requirements for WM, RAC and Fridges and possible IPM solutions from IFX and their key features and thermal performance measurement as one of the examples how we test our products to meet the customer requirements.
- › There are more requirements e.g. also customer specific ones as well additional measurements and comparison tables but all these documents are under NDA

Requirements for power stage in Aircon

General requirements



Energy savings



Thermal performance :
 $T_c > 75\text{ °C}$ @ $T_a = 43\text{ °C}$ and
 $T_j > 125\text{ °C}$ @ all conditions



ESD: Min 2 kV JS-001
 and GJB (standard)



Package robustness



Ease of design in and
 pin compatibility

Specific requirements subsystems

Voltage class: 600 V

Current classes:



Compressor (ODU)

- > 15 A
- > 20 A
- > 30 A



Fan

- > 2 A (IDU)
- > 5 A (ODU)



PFC (integrated IPM)

- > 30 A for 10 A compressor
- > 30 A for 15 A compressor

Product offerings



Compressor and PFC

CIPOS™ Mini

- > IKCMxxL60Gx
 - 10/15 A
- > IFCMxxS60GD series
 - 10/15/20 A for compressor with single boost PFC 20/40 kHz
- > IM564-X6D
 - 20 A for compressor with single boost PFC >60 kHz

CIPOS™ Tiny

- > IM323
 - 15 A

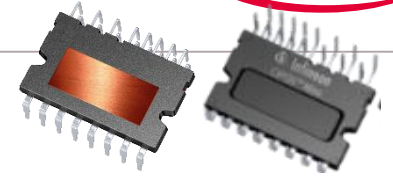


Fan

CIPOS™ Micro

- > IM241 series
 - 2/4/6 A

Why CIPOS™ Mini IPM in residential air conditioner?



Key requirement

Values to customers

Market proven and reliable solution

Market proven solution with historical high volume shipment to global RAC OEMs/ODMs.

Best optimized performance

The best optimized 600 V IPM to provide **high performance and best efficiency for residential aircon** from 1HP to 3HP. Meeting ESD requirement of Min 2kV JS-001 and GJB (optional standard for China)

Wide current coverage for multiple inverter

One package platform covers **wide current rating** up to 30A and it allows **easy & fast platform design** from small to larger power including active PFC.

High integration

High integration of bootstrap circuit, thermistor, and single boost PFC **reduces system size and assembly cost** as well as **improves manufacturability and system reliability**.

Cost optimized thermal performance

Two package types – **DIP 36x21 (full-pack)** of cost effective ideal solution for **low-to medium power** applications and **DIP 36x21D** (with DCB) for the **high power applications**.

Product line-up

Series	Sub	Product name	Inverter Current [A]
Single boost PFC +3Ph Inverter	~ 20 KHz (IGBT)	IFCM10S60GD IFCM15S60GD	10/15 A
	~ 40 KHz (IGBT)	IFCM10P60GD IFCM15P60GD	10/15 A
	> 60 KHz (CoolMOS™)	IM564-X6D	20 A
PFC interleave	2 phase	IFCM20T65GD IFCM30T65GD	20 A/ 30 A
	3 phase	IFCM20U65GD IFCM30U65GD	20 A/ 30 A
3phase inverter	Cost Optimized (DIP 36x21)	IKCM15L60GA	15 A
		IKCM20L60GA	20 A
		IKCM30F60GA	30 A
	Performance Optimized (DIP 36x21D)	IKCM15L60GD	15 A
		IKCM20L60GD	20 A
		IM535-U6D	30 A

CIPOS™ Mini: PFC integrated IPM

600V 10 - 20A

Key Features

- › Inverter + PFC in one package
- › Various inverter current rating available: 10/15/20 A
- › Various PFC switching available:
~20 kHz, ~40 kHz, and >60 kHz with various switch technologies for PFC
- › Enable high power density with smaller system size
- › Robust gate driver in SOI technology
- › Power capability over 2 kW

Value Proposition

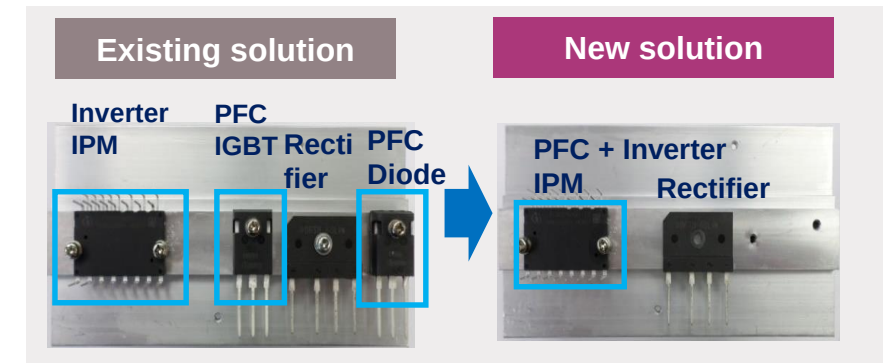
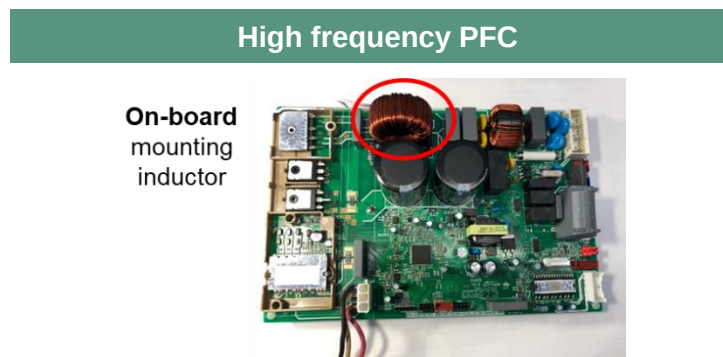
- › System size reduction with PFC integration into inverter module
- › Significant inductor size reduction by use of high PFC switching
- › Cost improvement from lower BOM count, reduced assembly cost, and smaller system size
- › Customer can design switching performance of PFC by using external driver circuit

Product line-up

Topology	PFC switching	Product name	Inverter Current [A]
Single boost PFC + 3phase inverter	~20 KHz (IGBT)	IFCM10S60GD	10
		IFCM10P60GD	
	~40 KHz (IGBT)	IFCM15S60GD	15
		IFCM15P60GD	
	>60 KHz (CoolMOS™)	IM564-X6D	20

Solution configuration on a heatsink

Existing	New (High-end model)	Future
		
2 mH → 400 uH		400 uH → 200 uH
f _{sw} = 20 kHz	f _{sw} = 40 kHz	f _{sw} > 60 kHz



Why CIPOS™ Tiny IPM in residential air conditioner?

Key requirement

Values to customers

Best optimized performance

Infineon's new 600V IPM package to provide **the best optimized performance with compact form factor** for inverter power rating up to 1.5HP.

Robust package

Strong package robustness against external mechanical stress or mis-handling during assembly or transportation process.

Energy saving

Excellent energy efficiency by Latest TRENCHSTOP™ Reverse Conducting (RC) technology for lower losses

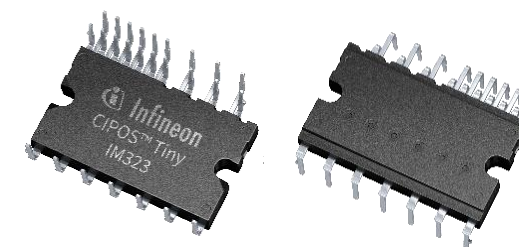
Pin compatibility

Pin compatible package to enable faster design-in and reuse existing PCB for time to market.

Product line-up

Product name	Current [A]	Package
IM323-S6G*	6	DIP 33x19
IM323-M6G*	10	
IM323-L6G	15	

* Coming soon





Part of your life. Part of tomorrow.