Introducing 600 V CoolMOS™ PFD7 SJ MOSFETs for refrigerators

May 2022

Are you looking for increased efficiency of your low power home appliance drives?

Do you want to reduce their power consumption but you don’t know how?

The new **600 V CoolMOS™ PFD7 SJ MOSFETs** are an attractive solution for inverter stages, which do not only run in a quieter and smoother manner, but also reduce power consumption!

Let’s get started!

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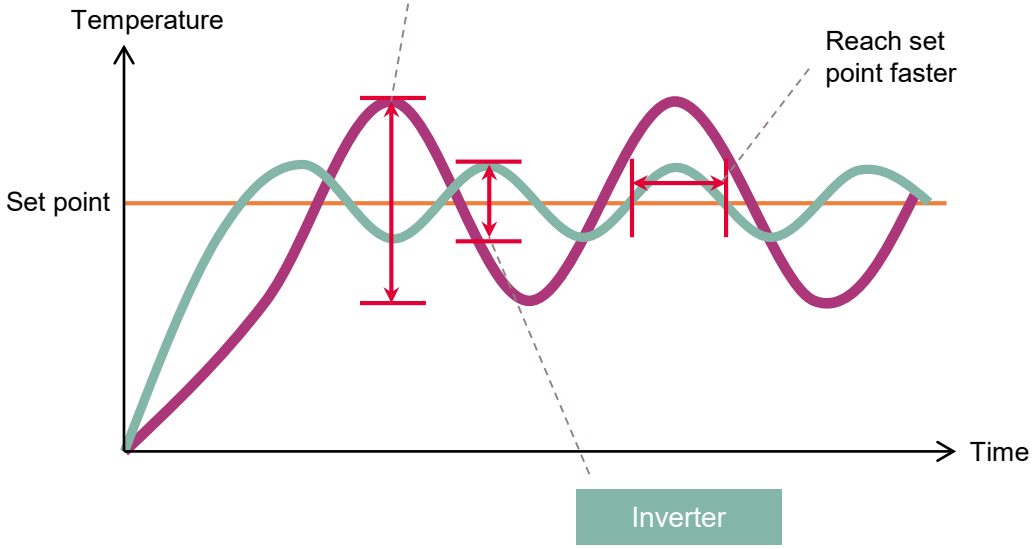
First, why is there the need for inverterization in Home Appliance drives?

Example: refrigerator

Non-inverter

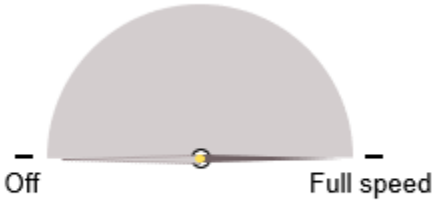
Inefficient energy consumption with over cooling and poor temperature control



Inverter

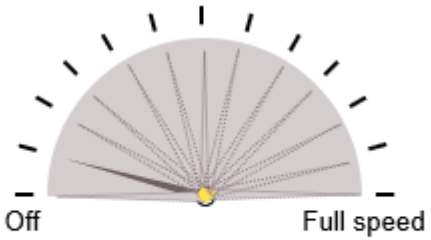
Efficient energy consumption with minimal temperature fluctuation

Non-inverter
(single speed motor)



Only two operating modes: „on“ or „off“

Inverter
(variable speed drive)



Gradual speed adjustment

.. because of **temperature control!**

- **Energy efficiency regulations** force the use of inverters for motor drives
- **Motor speed is automatically controlled** on inverter models and contributes to
  - Smaller **temperature** variations
  - Energy **efficiency**
  - Longer **lifetime**
  - Significant reduction in operating noise levels

Effect of regulations on system design and component selection: inverterization

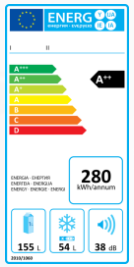
Inverterization in all fridges worldwide would save as much energy as Sweden consumes in a year...

... And reduce CO2 emissions by around

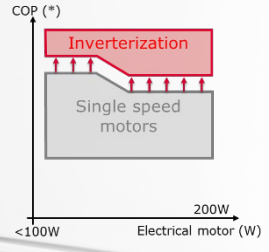
80,000,000 tons CO_2

Inverterization trend to replace single speed compressors has started on the **high-end and larger models** where manufacturers are willing to differentiate the end product

Energy star efficiency rating



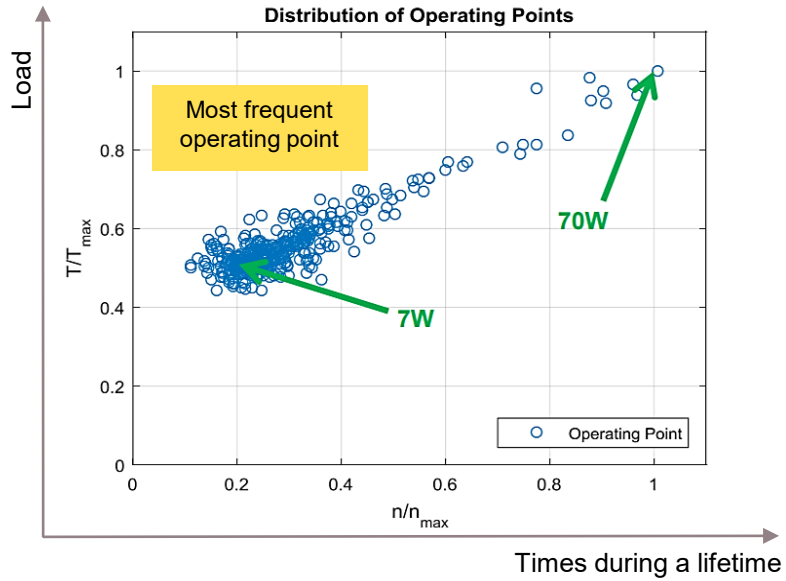
Improving system level COP:
Coefficient Of Performance: measure of performance of a refrigeration cycle

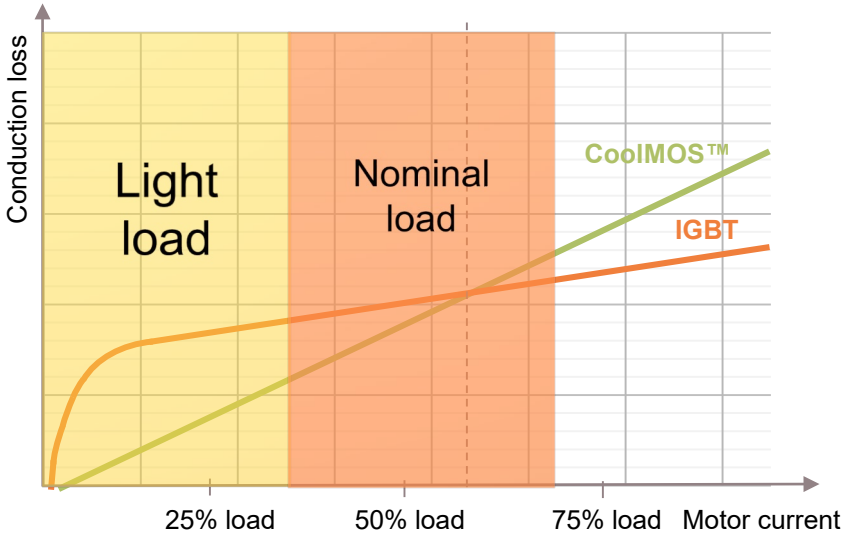


Cost effective way vs increasing **Vacuum Insulation Panel (VIP) with high efficiency** (also reducing cooling space…)

Improved light load efficiency of inverter stage with our 600V CoolMOS™ PFD7

Why SJ MOSFETs enable excellent light load efficiency in refrigerator compressors





Typical operating points over product lifetime in which **light load is the predominant operation mode**

The latest generation **CoolMOS™ 7 SJ MOSFETs** offer reduced conduction losses, especially at light load conditions due to the lower $R_{DS(on)}$

CoolMOS™ 7 SJ MOSFETs offer a **BIC $R_{DS(on)}$ x A,** enabling to meet application desired energy star rating and to reduce the inverter's cost

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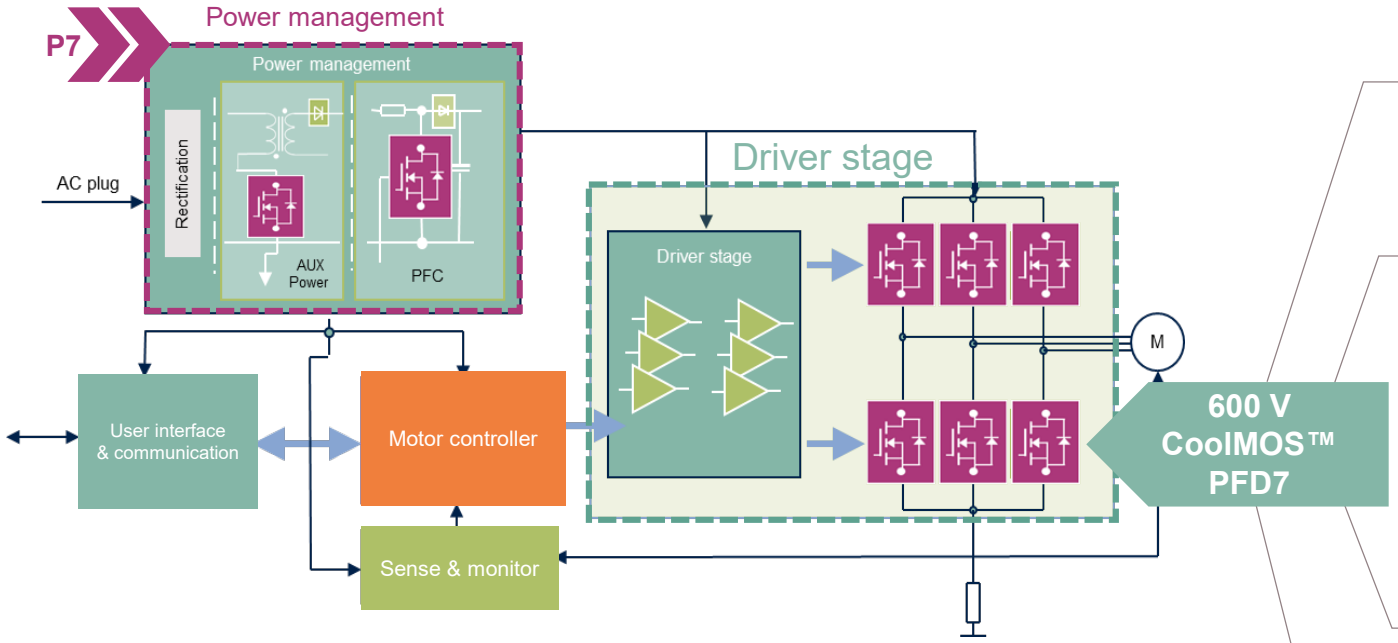
The unique features of 600 V CoolMOS™ PFD7 SJ MOSFETs bring excellent benefits for refrigerator compressors

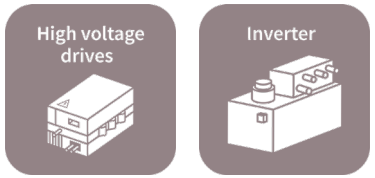


600 V CoolMOS™ PFD7

Features & Benefits

Light-load efficiency up to 300 W	**Improved efficiency & thermal behavior**
Integrated fast body diode with ultra low Q_{rr}	**Robustness & Reliability Reduced switching losses**
ESD Protection ≤ 2kV (HBM Class 2)	**Eliminated ESD related yield loss**
Right-fit portfolio wide range of $R_{DS(on)}$ values	**Reduced BOM cost Easy manufacturing**

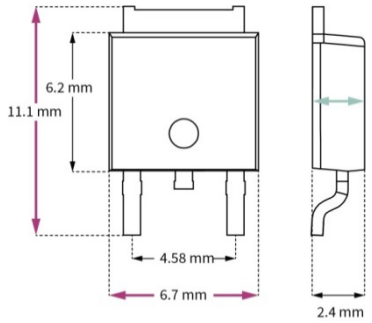
Suitable for **Inverter stages (VSI)** up to 300 W



Our recommendation: the cost effective SOT-223 package offers smaller footprint while being pin-to-pin compatible with DPAK

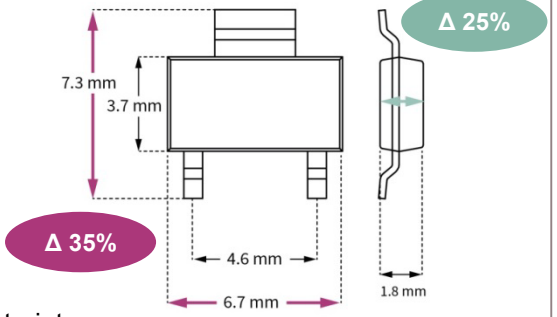
DPAK

Area: **74.7 mm²**



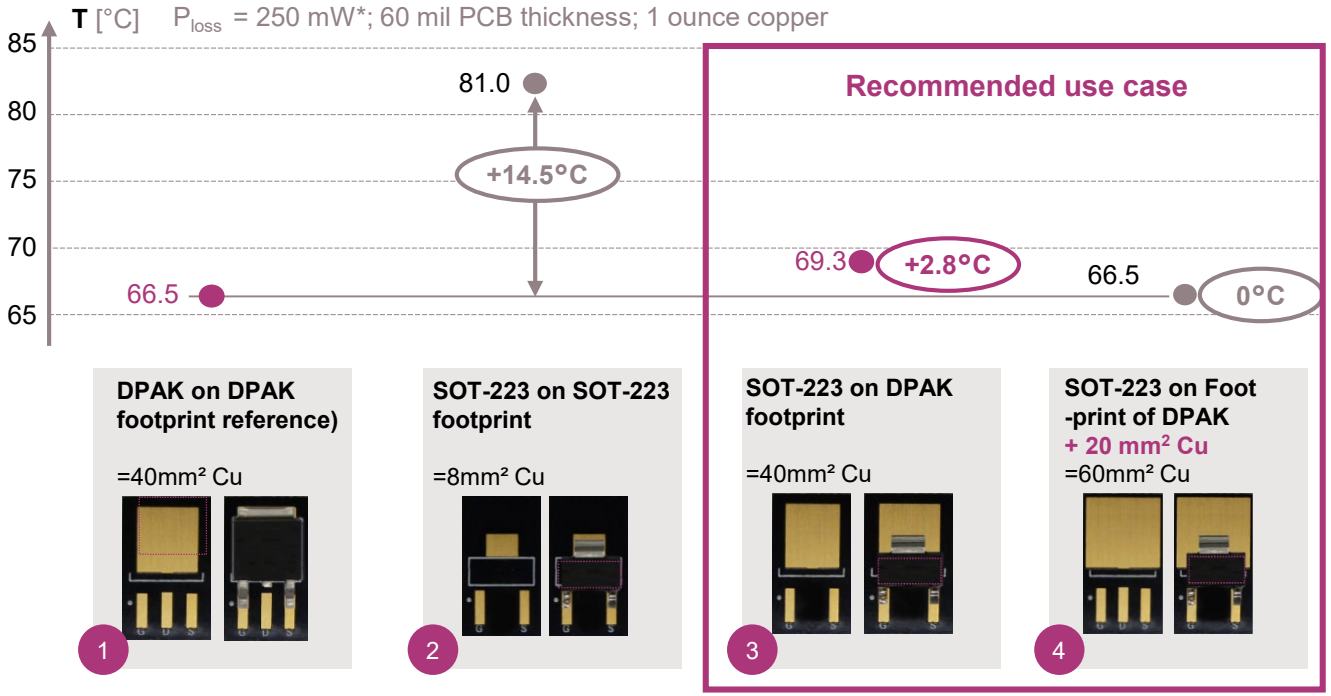
SOT-223

Area: **48.9 mm²**
at optimal usage/minimal footprint



Thermal performance similar to DPAK

› The thermal behavior of the SOT-223 depends on layout of the board and on the power dissipated:



* Evaluated on internal IFX test PCBs; results independent of technology

The SOT-223 package is a suitable drop-in replacement for DPAK at lower cost, enabling space savings in designs with low power dissipation.

Learn more: www.infineon.com/sot-223 www.infineon.com/600v-pfd7

Recommended 600 V CoolMOS™ PFD7 SJ MOSFETs

	600 V CoolMOS™ PFD7 SJ MOSFETs				
$R_{DS(on)}$ [mΩ]	 TO-220 FullPAK Narrow leads	 IPAK Short leads	 DPAK	 SOT-223	 ThinPAK 5x6
2000			IPD60R2K0PFD7S	IPN60R2K0PFD7S	
1500			IPD60R1K5PFD7S	IPN60R1K5PFD7S	IPLK60R1K5PFD7
1000		IPS60R1K0PFD7S	IPD60R1K0PFD7S	IPN60R1K0PFD7S	IPLK60R1K0PFD7
600		IPS60R600PFD7S	IPD60R600PFD7S	IPN60R600PFD7S	IPLK60R600PFD7
360	IPAN60R360PFD7S	IPS60R360PFD7S	IPD60R360PFD7S	IPN60R360PFD7S	IPLK60R360PFD7
280	IPAN60R280PFD7S	IPS60R280PFD7S	IPD60R280PFD7S		
210	IPAN60R210PFD7S	IPS60R210PFD7S	IPD60R210PFD7S		
125	IPAN60R125PFD7S				

www.infineon.com/600V-PFD7

Recommended for low power drives applications

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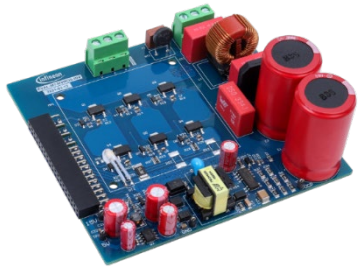
Infineon provides state-of-the-art evaluation boards to ensure fast time-to-market for customers

Click on the board image to know more

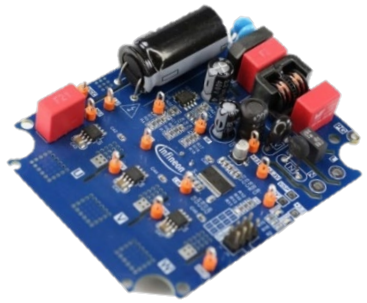


EVAL-M7-HVMOS-INV

- Ready-to-use **power stage** to drive **3-phase motor,** scalable in **power ratings** and **operating voltages**
- Wide range of **iMOTION™ MADK** power boards with matching M7 platform interface
- **High flexibility** for motor control tuning and system functionality

REF_FRIDGE_D111T_MOS

- Compact **3-phase 150 W** motor drive system
- System solution enable **compact** and **scalable** designs optimized for light load efficiency and EMI performance
- Designed for **sensorless FOC** motor control using single shunt
- Easy to design-in – fast time to market



EVAL_DRIVE_3PH_PFD7

- Compact **3-phase 100 W** motor drive system
- Designed for **sensorless FOC** motor control
- **Spin your motor** with easy-to-use

Summary of benefits

- High efficiency
- Cost effective solution
- Simplified design
- Smooth startup
- Download software free of charge

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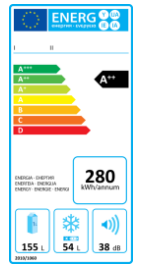
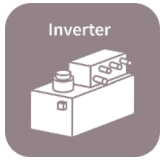
600 V CoolMOS™ PFD7 SJ MOSFETs
The next level of refrigerators

600 V CoolMOS™ PFD7
an attractive solution for motor inverter stages:

- Addressing the trend of **high star rating** in **energy savings** for Major home appliances with inverterized motors



- Overall attractive solution for applications **below 300 W**



- Offering **improved efficiency,** especially at light load conditions

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CoolMOS™ 7 for Home Appliance
Find all available support documentation online

Part of your life. Part of tomorrow.