Infineon Discrete IGBTs for air-condition
Infineon Discrete IGBTs

- Infineon discrete IGBTs
  - #1 World wide supplier
  - 1 in every 4 discrete IGBTs sold comes from Infineon

- Key IGBT Features that make Infineon #1
  - Low Vce(sat) due to thin wafer technology
  - Low switching losses
  - High efficiency (cooler packages)
  - Huge portfolio (current, voltage and package types)
  - Excellent EMI behaviour
  - Technical support for customers
  - Solid logistic support
  - Highest quality standards
  - Leaders in IGBT Innovation
General Purpose Inverter Market

- Known fact that
  - General purpose inverter market extremely price driven
  - Many customers are changing to discrete solution

- Due to reduction in sales due to current financial crisis many companies are implementing cost down programs
  - Discrete solution seen as low hanging fruit for cost down
  - Discrete solution offers best PCB optimization
  - Infineon quality - <0.1ppm failure rate

- Infineon’s new family to support the market
  - Reverse conducting for hard switching applications
NEW INNOVATION – Reverse Conducting Technology for Drives

- **RC-Drives**: Infineon now offers the free wheeling diode monolithically integrated into the TRENCHSTOP IGBT-die for hard switching applications (Reverse Conducting for DRIVES)

- Same DC current rating of diode and IGBT

- This leads to current classes [<15A] being available in new package classes.
Thanks to groundbreaking innovation - Monolithically Integrated Diode

Key differentiators

- 4A, 6A, 10A and 15A devices now available in IPAK or DPAK
  - Major price advantage
  - Space saving
- Lowest Vce(sat) for low conduction losses

Additional features

- Wide range of turn-off/-on time controllability via gate resistor
- Very good EMI behaviour
- Soft switching
- 5us Short Circuit capability
- Tj(max) = 175°C
Example of Inverter Size Optimization
D²Pak 3-phase inverter

DPAK 3-phase inverter
Infineon and the Consumer Drive Market at a Glance

Reverse Conduction IGBT for Drives

Solutions for Room Air conditioner

Product Portfolio

Summary
Market drivers and size for inverterized RAC

- Energy efficiency guidelines are driving AC inverterization
- In Japan >90% of AC units are already inverterized

Share of inverterized Airconditioners by Region

Source: Nomura survey, July 2010

RAC ww market forecast

Source: IMS, July 2009; IFX marketing
Motor used in air-conditioning System

Indoor Fan Unit
- PG/BLDC/PMSM
- Low noise
- 30W

Out door unit
- ACIM/BLDC/PMSM
- High efficiency, low noise
- Reliability, anti Typhoon
- <100W

Compressor
- ACIM/BLDC/PMSM
- High efficiency
- Inverter control
- 500W to 800W
System configuration & products for inverterized AC

- **PFC**
  - **Indoor fan**
    - IGW30N60H3, IGW50N60H3, IGW75N60T, IDW75E60, IDW30E60A, IDW100E60,
  - IKD04N60R IKD04N60RF

- **Outdoor fan**
  - IKD04N60R IKD06N60R IKD04N60RF

- **Comp.**
  - IKA15N60T, IKD15N60R, IKB15N60T, IKP20N60T, IKP15N60T
Dual motor kit for 1 kW Aircon Split systems:

Compressor stage 1 kW with 6-channel EICEDRIVER and 15A RC-Drives IGBTs in D-PAK

Fan stage 200W with 6-channel EICEDRIVER and 4A RC-Drives IGBTs in D-PAK

PFC switch with High speed 3 IGBT and Emcon boost diode

XC165 16Bit MCU card
Fan stage 200W with 6-channel EICEDRIVER and 4A RC Drives IGBTs in DPAK PFC switch with High speed 3 IGBT and Emcon boost diode.

Dual motor kit for 1 kW Aircon Split systems
Dual motor kit for 1 kW Aircon Split systems
IGBT selection guide

**FREQUENCY RANGE**
- 2 – 20 kHz TRENCHSTOP™
- 20 – 100 kHz High Speed
- 2 – 20 kHz TRENCHSTOP™ (Duopack)
- 8 – 60 kHz RC series (monolithic)
- 2 – 20 kHz TRENCHSTOP™
- 20 – 100 kHz High Speed

**VOLTAGE RANGE**
- 600V 1000V 1200V
- 600V 1000V 1200V
- 600V 900V 1000V 1200V 1600V
- 600V 600V 1200V

**PART NUMBER**
- IGpcN6oT.., IGpcN100T, IGpcT120...
- IGpcN6oH3, IGpcN120H2, IGpcN120H3
- IHpccN6oT.., IHpccT60....
- IHpccN9oT, IHpccN100T, IHpccT120...
- IHpccNvRv, IHpccNvVvR2, IHpccNvVvR3
- IHpccNvVvRA, IHpccNvVvVRF
- IKpccN6oR, IKpccN6oT..., IKpccT120....
- IKpccN120H2, IKpccN120H3

**APPLICATION**
- **Hard switching topologies** with / without Anti-parallel diode
- **Welding Inverter**
  1.A) Full Bridge
  1.B) Two Transistor Forward
- **Induction Heating**
  2.A) Half Bridge Resonant (Current resonance - 600V parts)
  2.B) Single Switch (Voltage resonance > 600V parts)
  Microwave
  Multifunction Printers
- **Solar Inverter**:
  3.A) Asymmetrical Bridge
  3.B) Symmetrical full bridge
  3.C) Three level type I or
  3.D) Three level type II converter
- **Motor Control**:
  4.A) Three phase inverter - Full bridge inverter
  4.B) Interruptable Power Supply
  **UPS Bridge**
  5.D) Three level type II converter
- **Welding Inverter**:
  1.A) Full bridge inverter
  1.B) Two Transistor Forward
  Major Home Appliance
IGBT for Consumer Drive Applications - General

- **50W**
  - Fan
  - Room AirCon
  - Pumps
  - Refry
- **150W**
  - Tread Mill
  - Washing Mach.
  - Vacuum Cleaner
- **500W**
  - Door
  - Public AirCon
  - Fan
- **1kW**
  - Public AirCon
  - Industrial Drives
- **2kW**
  - Industrial Drives
- **5kW**
  - PFC

- **1200V**
  - Duo-pak – performance optimised
  - Trenchstop2 – performance optimised
  - RC-Drives – price advantage
### Discrete IGBTs inside applications

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<th>Application</th>
<th>Rev. Cond. (Hard)</th>
<th>Rev. Cond. (Soft)</th>
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**Best fit**

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600V Product Family
TRENCHSTOP™ DuoPack™ & RC-D

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<tr>
<th>Single IGBT</th>
<th>TO-251 (I-PAK)</th>
<th>TO-252 (D-PAK)</th>
<th>TO-263 (D²-PAK)</th>
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| DuoPack™               | IKU04N60R      | IKU06N60R      | IKU06N60R      | IKP04N60T | IKI04N60T |        |        |
| 4A                     | IKD04N60R      | IKD06N60R      | IKD06N60R      |        |        |                 |        |
| 6A                     | IKU06N60R      | IKU10N60R      | IKU10N60R      | IKP06N60T | IKA06N60T |        |        |
| 10A                    | IKD06N60R      | IKD10N60R      | IKD10N60R      |        |        |                 |        |
| 15A                    | IKU10N60R      | IKU15N60R      | IKU15N60R      | IKP06N60T | IKA10N60T |        |        |
| 20A                    | IKD10N60R      | IKD15N60R      | IKD15N60R      |        |        |                 |        |
| 30A                    | IKU15N60R      | IKU15N60R      | IKU15N60R      | IKP15N60T | IKA15N60T |        |        |
| 50A                    | IKD15N60R      | IKD20N60R      | IKD20N60R      |        |        |                 |        |
| 75A                    | IKU15N60R      | IKU15N60R      | IKU15N60R      | IKP15N60T | IKA15N60T |        |        |

Comprehensive portfolio for hard switching applications

Continuous collector current at $T_c=100°C$
Infineon and the Consumer Drive Market at a Glance

Reverse Conduction IGBT for Drives

Solutions for Room Air conditioner

Product Portfolio

Summary
Discrete IGBTs summary

- Price and performance optimised design using discrete devices
- Space can be optimised on PCB
- Infineon quality
- Design support available
- Infineon offers comprehensive portfolio for
  - General purpose inverters
  - Solar inverters
  - UPS
  - Induction heating
  - Microwave Ovens
  - Air-condition
Innovative semiconductor solutions for energy efficiency, mobility and security.