

# RENESAS 8<sup>TH</sup> GEN IGBT PRESENTATION

2016/DEC

RENESAS ELECTRONICS CORPORATION  
2<sup>ND</sup> SOLUTION BUSINESS UNIT.

# AGENDA

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## 1. Renesas IGBT Brief Introduction

- Activity and Policy of Renesas IGBT
- Application Example (Online- UPS)
- Product portfolio by Voltage Rating and Application
- IGBT Product line-up by Application

## 2. NEW Product : 8<sup>th</sup> Gen. IGBT

- New Product List for Invertor circuit
- Comparison by other company

# ACTIVITY AND POLICY OF RENESAS IGBT

- High efficiency performance for energy saving
- Optimizing products and solution for each application
- Long product life and stable supply

## ✓ High Efficiency

- Low  $V_{ce(sat)}$
- High speed switching
- High Voltage



## ✓ Total Solution

- Other power devices (Si-FRD/SiC-SBD)
- Various products (MCU, PFC-IC, Photo-coupler)



## ✓ Miniaturization

- Built-in FRD
- Wafer & Bare-Die Products

## ✓ High Reliability

- High short circuit Withstands time (>10us)
- High temperature rating (175°C)

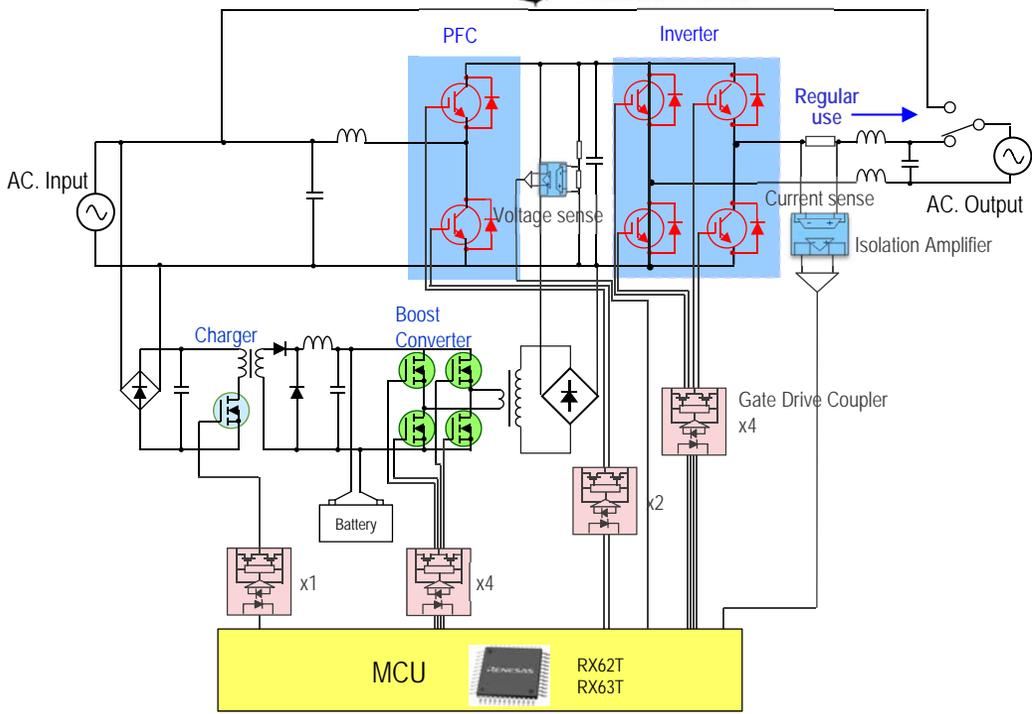
FRD; Fast recovery Diode

# Online UPS (Uninterruptible Power Supply)

Our recommend products are MCU, Coupler and IGBT of focus products.

- **MCU** : Renesas MCU enables optimal system configuration of full digital control.
- **Coupler** : We will propose the coupler of required for the system.  
(Gate-drive coupler, Isolation -amplifier, High Speed Optocoupler)
- **IGBT** : Optimize the balance of switching and conduction loss.  
Realize the efficiency improvement at high output that is required with the PFC, inverter.

UPS Solution



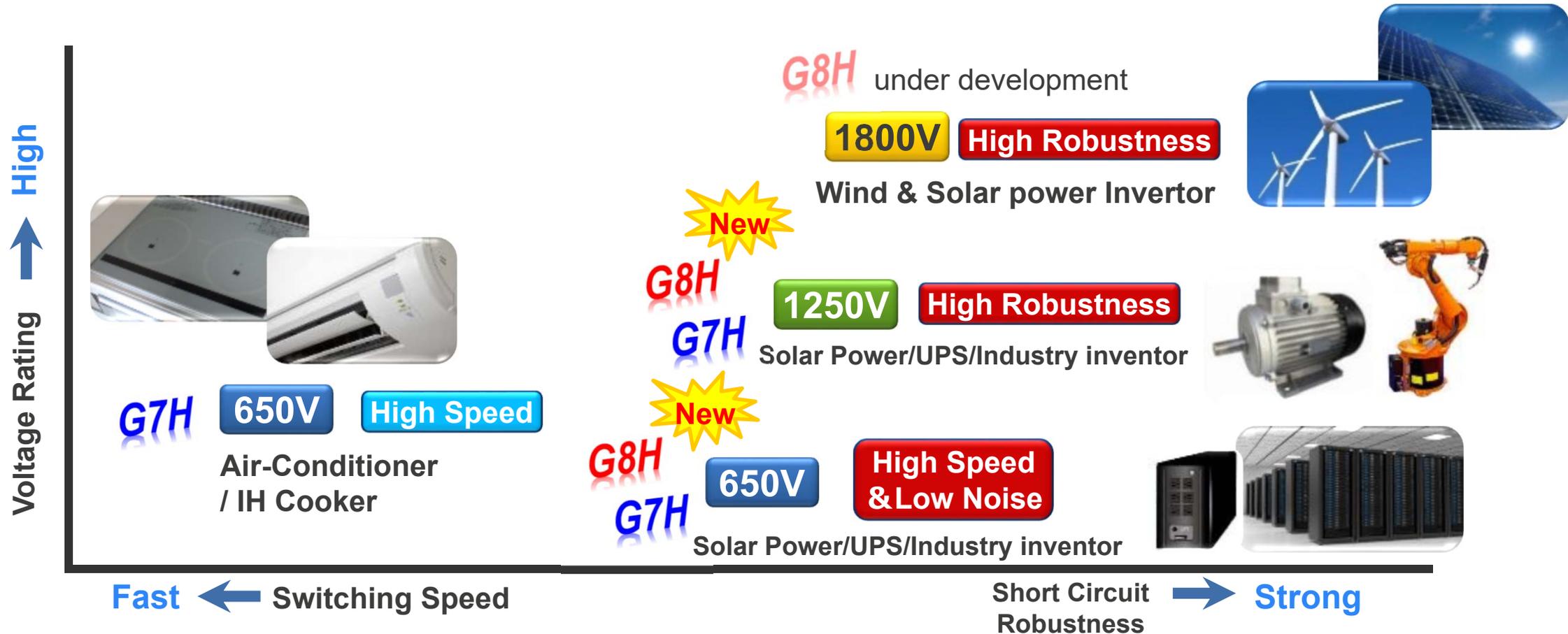
## Recommend products

  : focus products

Block	Device	Recommend products	Features
Controller	MCU	RX62T,63T	Ideal for continuous inverter power supply system. Three-phase PWM timer, 5V operation, A / D strengthening
		RX62G	Ideal for continuous inverter power supply system. Three-phase PWM timer, 5V operation, A / D enhanced, high-resolution PWM
PFC (Converter)	IGBT	RJH65T4xDPQ	Ideal for active filter system, high-speed switching
Step-down converter	MOSFET	RJK50xxDPK, RJK60xxDPK	Low RDS(on), High-speed switching
Boost converter	MOSFET	RJK1003DPN, NP70N10KUF ,Other	Low RDS(on), High-speed switching
Inverter	IGBT	RBN40H65T1FPQ (40A @Tc=100°C) RBN50H65T1FPQ (50A @Tc=100°C) RBN75H65T1FPQ (75A @Tc=100°C)	High-speed switching, Low VCE(sat), Low Noise Built-in FRD, Tj 175°C guarantee
PFC Step-dow/Boost converter Inverter	Gate-drive coupler	PS9031 (LSO5, 2.5A output) PS9402 (SO-16, with Protective function)	Noise immunity (CMR ≥ 50kV/us)(PS9031) Desat (non-saturation detection), active mirror clamp (PS9402)
Current/Voltage sense	Photo coupler	PS8352A	High precision (gain ± 1%)
Power Supply, Other	OPamp	HA1630xxx	Small package, Low power consumption
		μ PC358	
		PS23xxSeries PS27xxSeries PS28xxSeries	High isolation voltage (5kVr.m.s.), 4p-LSOP, Ta=115°C High isolation voltage(3.75kVr.m.s.), 4p-SOP, Ta=110°C High isolation voltage(2.5kVr.m.s.), 4p-SSOP, Ta=110°C

# PRODUCT PORTFOLIO BY VOLTAGE RATING AND APPLICATION

Six new product versions, rated at 650V/1250V as 8<sup>th</sup> Generation IGBTs



# IGBT Product line-up by Application

- Mass Production
- Under Develop.

Process	Voltage (V)	Product Series	Application								
			Air-conditioner (PFC/partial SW)	Air-conditioner (PFC/full SW)	Power Conditioner for PV / UPS (Inverter)		Small Fan Motor for H.A.	Renewal Energy Inventor	IH Cooker Microwave (Current Resonance)	IH Cooker Microwave (Voltage Resonance)	
			Application Required Features	Low $V_{CE(sat)}$	Fast Switch	Low $V_{CE(sat)}$ Fast SW	Low $V_{CE(sat)}$ Tsc>3us	Fast SW Tsc>5us	Fast SW Tsc>3us	Low $V_{CE(sat)}$ Fast SW Tsc>10us	Low $V_{CE(sat)}$ Built-in FRD
PKG	TO3PF	TO247	TO247	TO247	Wafer	Wafer	TO252 TO263	TO247	TO247	TO247	
G7H	650	RJH65T0x/RJH65T1x								●	
		RJH65T4x/RJP65T4x		●							
		RJP65T5x	○								
		RJH65D27/RJP65Dxx				●					
		RJP65Mx						●			
		RJP65Sx							● (Wafer)		
	1,250	RJP1CSxx							● (Wafer)		
G8H	650	RBNxxH65yy						planning	planning		
	1,250	RBNxxH125yy							<b>New</b> ○		planning
	1,800	RBNxxN180yy							○		

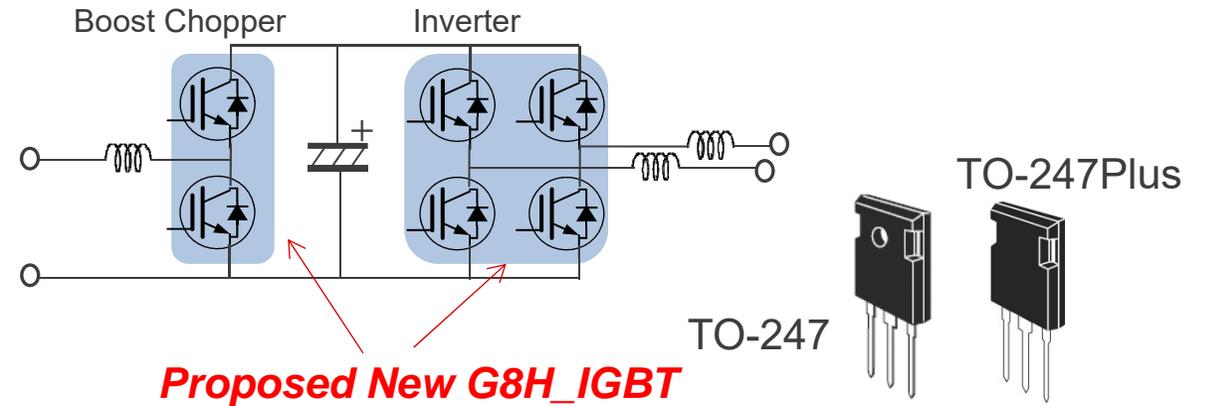
# NEW PRODUCT : 8<sup>TH</sup> GEN. IGBT

# NEW PRODUCT LIST FOR INVERTOR CIRCUIT

- Target Application:  
Invertor Circuit (UPS, Solar Power etc.)

- Strong Point

- Applied Newly developed G8H IGBT
- Low VCE(sat) and High SW Speed
  - VGE ±30V Rating
  - Tj 175 degC



- Spec Table

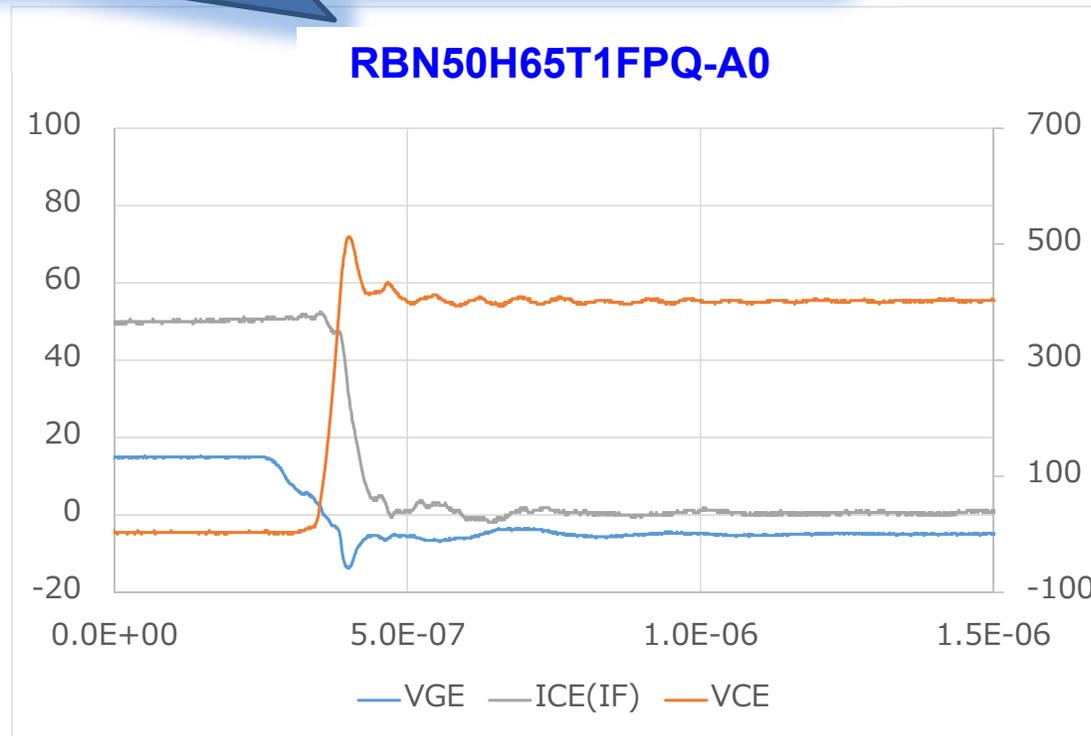
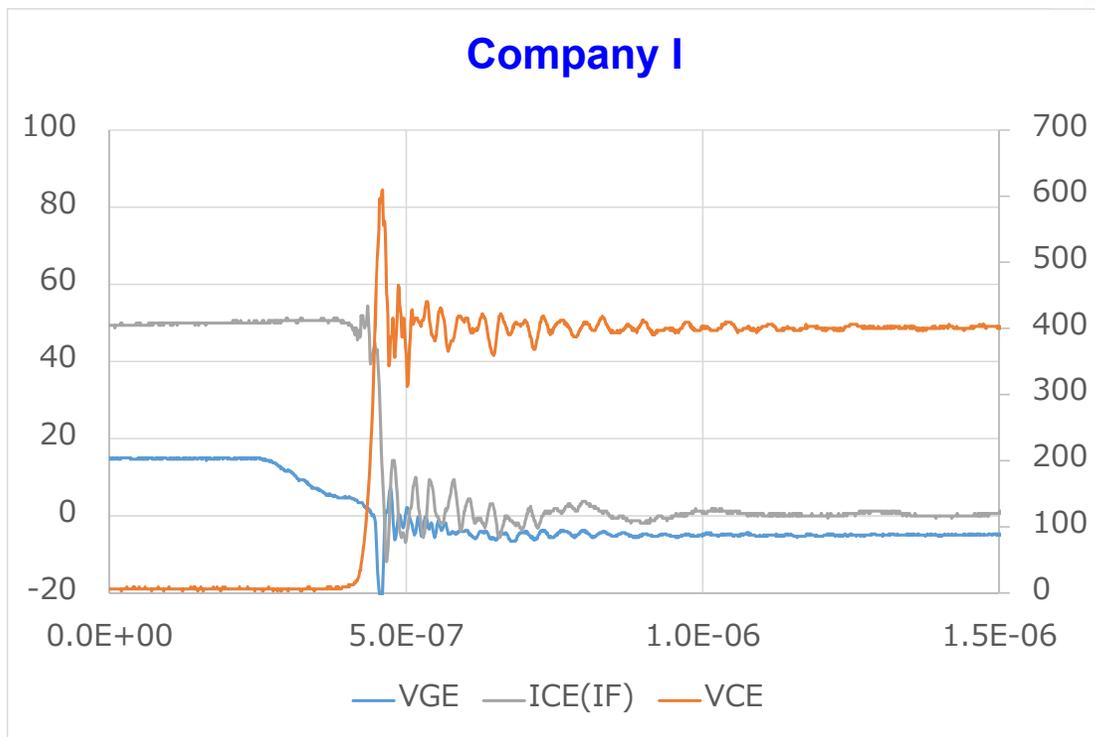
P/N	VCE [V]	VGE [V]	IC [A]	IF [A]	VCE(sat) [V]		VF [V]		Tsc [us]	PKG
					Typ	Max	Typ	Max		
RBN40H65T1FPQ-A0	650V	±30	40A	30A	1.5V	2.0V	1.7V	2.2V	-	TO-247
RBN50H65T1FPQ-A0	650V	±30	50A	50A	1.5V	2.0V	2.0V	2.6V	-	TO-247
RBN75H65T1FPQ-A0	650V	±30	75A	50A	1.5V	2.0V	1.7V	2.2V	-	TO-247
RBN25H125S1FPQ-A0	1250V	±30	25A	15A	1.8V	2.34V	2.9V	3.77V	10us	TO-247
RBN40H125S1FPQ-A0	1250V	±30	40A	25A	1.8V	2.34V	2.8V	3.64V	10us	TO-247
RBN75H125S1FP4-A0	1250V	±30	75A	50A	1.8V	2.34V	2.4V	3.2V	10us	TO-247Plus

# COMPARISON WITH OTHER COMPANY(650V/50A)

**Test condition**  
Double pulse Switching test  
Ta=150°C  
Vin=400VDC, VG=-5V/15V  
Rg:on=16Ω

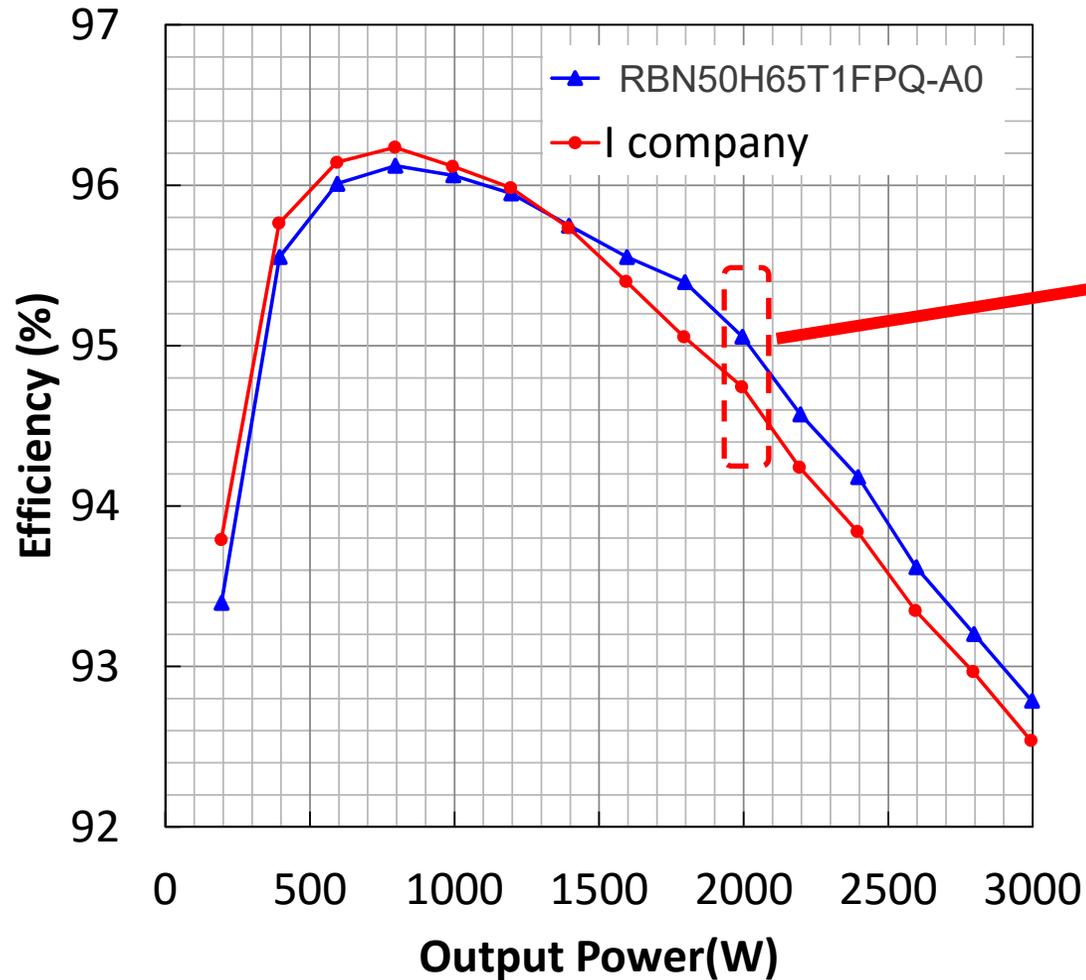
- Turn OFF Waveform

Low Switching Noise by Same condition

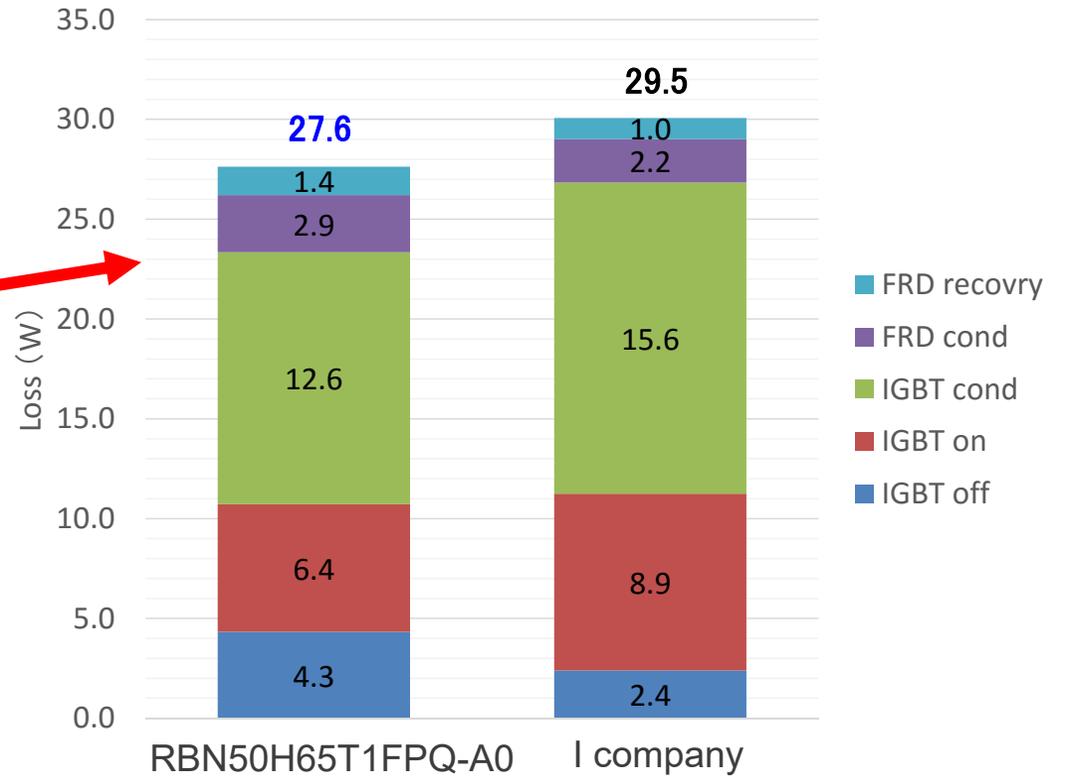


# TEST RESULT (650V/50A)

Measurement result of efficiency

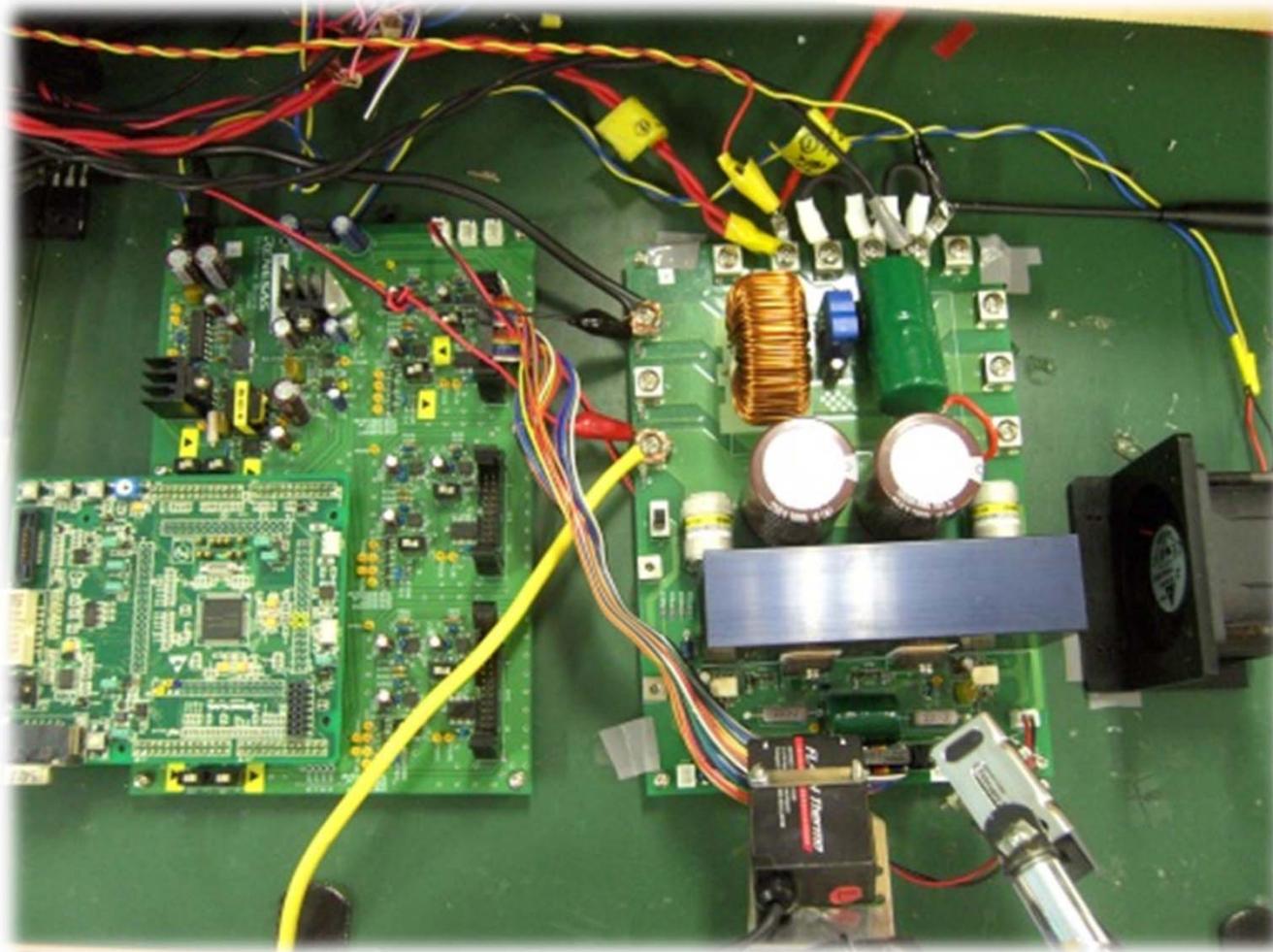


Result of loss analysis



Low Noise Switching and low Loss  
**Achieving Higher Efficiency**

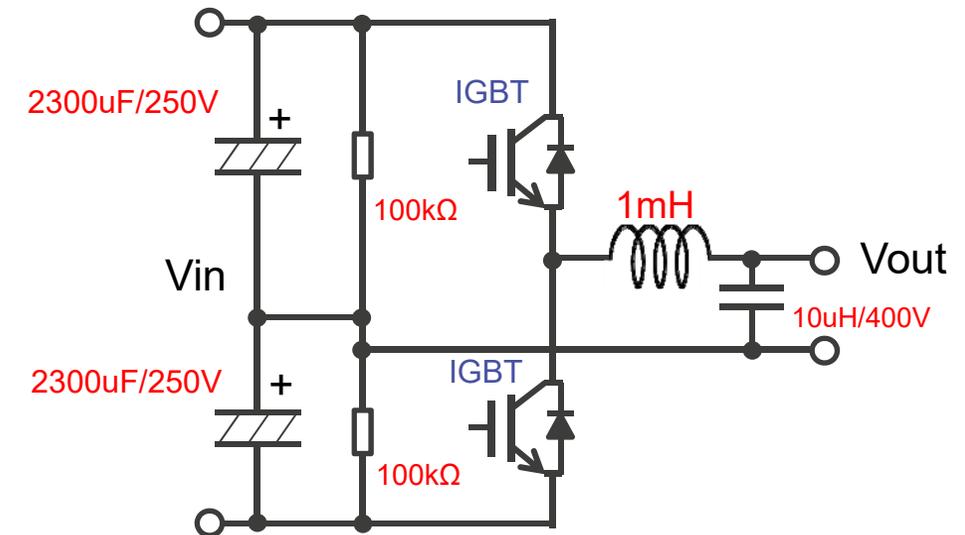
# INVERTOR EVALUATION BOARD



## Test condition

$T_a=25 \text{ degC}$   
 $V_{in}=410\text{VDC}$   
 $V_{out}=100\text{VAC}(50\text{Hz})$   
 $V_G=-5\text{V}/15\text{V}$   
 $R_{g:on}=15\Omega/\text{off}=15\Omega$   
 $f_{sw}=20\text{KHz}$   
Driver:PS9531

## Circuit of power line



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[www.renesas.com](http://www.renesas.com)