



# IGBT

Oct 2014

Power Device Production div.

# ROHM's Power Devices

ROHM's power item lineup covers wafers/bare dies, discrete packages, module, ICs and Intelligent Power Modules



As of Sep 01, 2014

# ROHM's Power Devices (High Breakdown Voltage items)

ROHM has Silicon based Super Junction MOSFETs, FRDs and IGBTs. SiC devices cover Schottky diodes and MOSFETs

Material	Si			SiC	
Item	Super Junction MOSFET	FRD	<b>IGBT</b>	SBD	MOSFET
Breakdown Voltage	500V ~800V	300V ~600V, ~1200V*	430V ~650V, ~1200V*	650V, 1200V, 1700V*	650V, 1200V, 1700V*

\*Under development

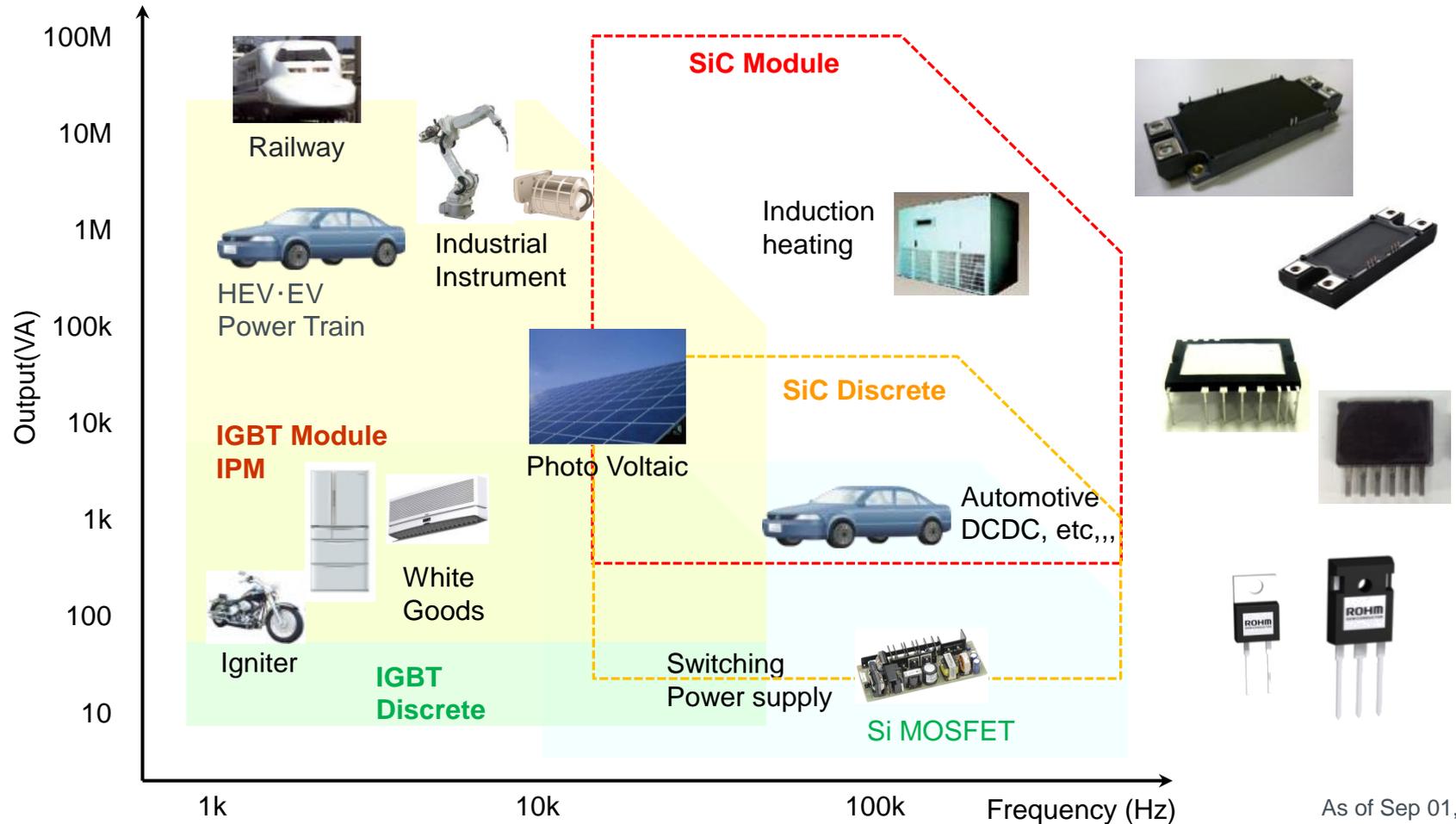


The table shows a product development plan as of today and is subject to change without notice.

As of Sep 01, 2014

# Applications and Power Devices

ROHM offers range of packages from discrete package to power modules to meet requirement from broad range of applications. We are also dedicated to the development of package for SiC devices which brings both high power output and high frequency



As of Sep 01, 2014

# ROHM's IGBT Lineup

\*Under development

Item	Low VCE(sat) and High speed SW type		Low VCE(sat) and SCSOA guaranteed type			Low VCE(sat) type	SCIS guaranteed type	Low VCE(sat) and SCSOA guaranteed type
Application	Converter		Inverter			Home Appliance	Igniter	EV / HEV
Series Name	<b>RGTH</b> series	<b>RGW</b> series (NextGen.)	<b>RGT</b> series	<b>RGS</b> series (NextGen.)	<b>RGTV</b> series (NextGen.)	<b>RGCL</b> series	<b>RGPx</b> series	-
Breakdown Voltage	<b>650V</b>	<b>650V</b> * 1200V *	<b>650V</b>	<b>650V</b> * <b>1200V</b> *	<b>650V</b> *	<b>600V</b> *	<b>430V</b> <b>560V</b>	600V * 1200V *
ShortCircuit Withstand Time	-	-	<b>5μsec</b>	<b>8~10μsec</b>	<b>2μsec</b>	-	-	8~10μsec
VCE(sat) typ.	1.6V	-	1.65V	1.7V	1.5V	1.4V	1.3V	-
Status	CS OK	Under Development	CS OK	Under Development	Under Development	Under Development	CS OK	Under Development

The table shows a product development plan as of today and is subject to change without notice.

As of Sep 01, 2014

# IGBT for Converter <RGTH-Series>

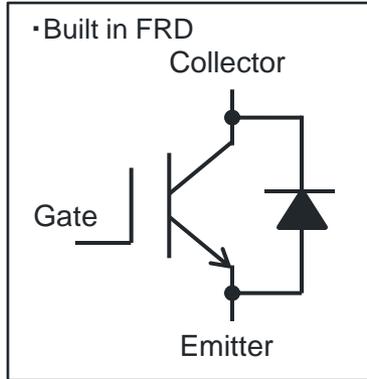
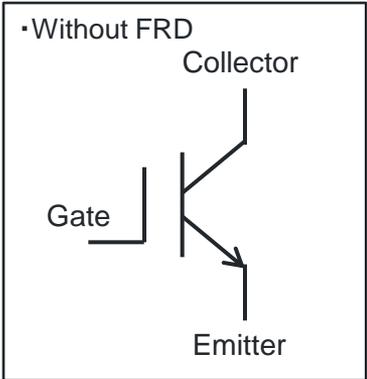
■ Features

- Trench Gate & Thin Wafer Technology
- Low VCE(sat) 1.6V typ.
- High Speed SW tf 50ns typ.
- Low SW Loss & Low SW Noise
- Low Gate Charge
- Built in Very Fast & Soft Recovery FRD

■ Applications

PFC , UPS , Power Conditioner , IH

■ Circuit



■ Package



TO-247N

TYPE	VCES [V]	IC[A]		VCE(sat)[V]		tf[ns]		Cies[pF]		Cres[pF]		FRD	VF[V]		trr[ns]		Package
		25°C	100°C	Typ.	IC [A]	Typ.	IC [A]	Typ.	VCE [V]	Typ.	VCE [V]		Typ.	IF [A]	Typ.	IF [A]	
RGTH40TS65	650	40	20	1.6	20	48	20	1060	30	18	30	-	-	-	-	-	TO-247N
RGTH40TS65D												○	1.45	20	58	20	
RGTH50TS65		50	25	1.6	25	50	25	1410	30	22	30	-	-	-	-	-	
RGTH50TS65D												○	1.45	20	58	20	
RGTH60TS65		58	30	1.6	30	47	30	1670	30	27	30	-	-	-	-	-	
RGTH60TS65D												○	1.35	20	58	20	
RGTH80TS65		70	40	1.6	40	47	40	2210	30	35	30	-	-	-	-	-	
RGTH80TS65D												○	1.35	20	58	20	
RGTH00TS65		85	50	1.6	50	50	50	2740	30	43	30	-	-	-	-	-	
RGTH00TS65D												○	1.45	30	54	30	

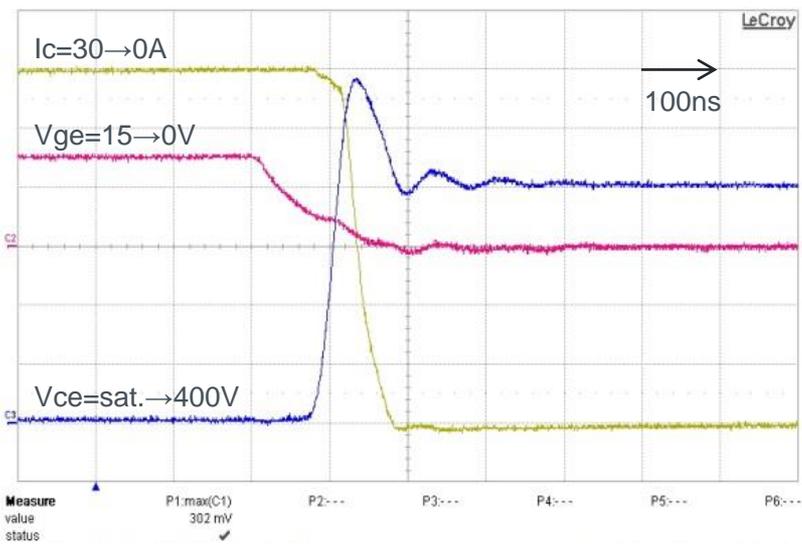
The data table above is shown as reference. Please be advised to check data sheets for consideration.

As of Sep 01, 2014

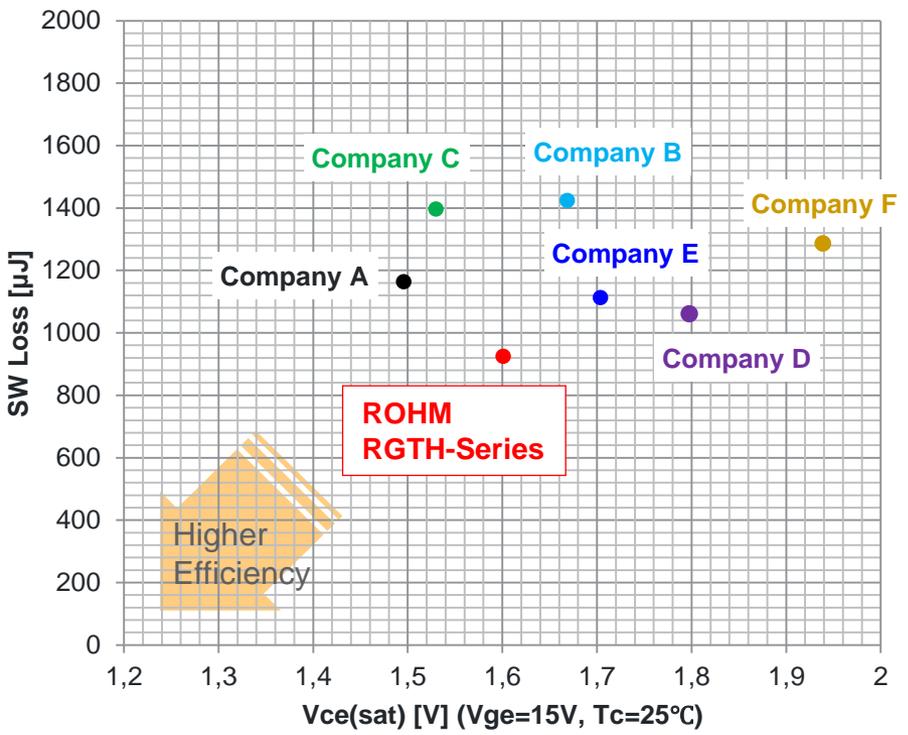


# IGBT for Converter <RGTH-Series>

### ■ Turn off Waveform



### ■ VCE(sat) vs. Switching Loss Comparison Trade-off with products from companies



SW Condition :  
 $I_c=30A, V_{cc}=400V, V_{ge}=15V, R_g=10\Omega, L=1mH, T_c=25^\circ C$

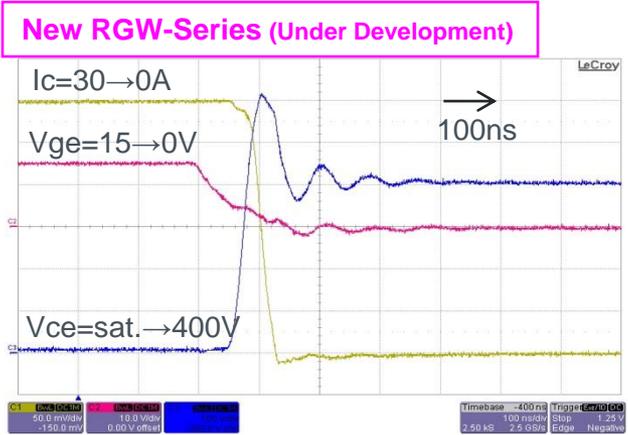
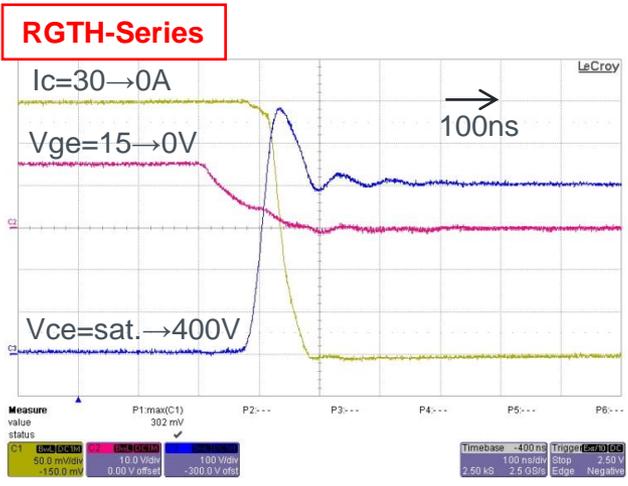
These data are provided to show a result of evaluation done by ROHM for your reference. ROHM does not guarantee any of the characteristics shown here.

As of Sep 01, 2014

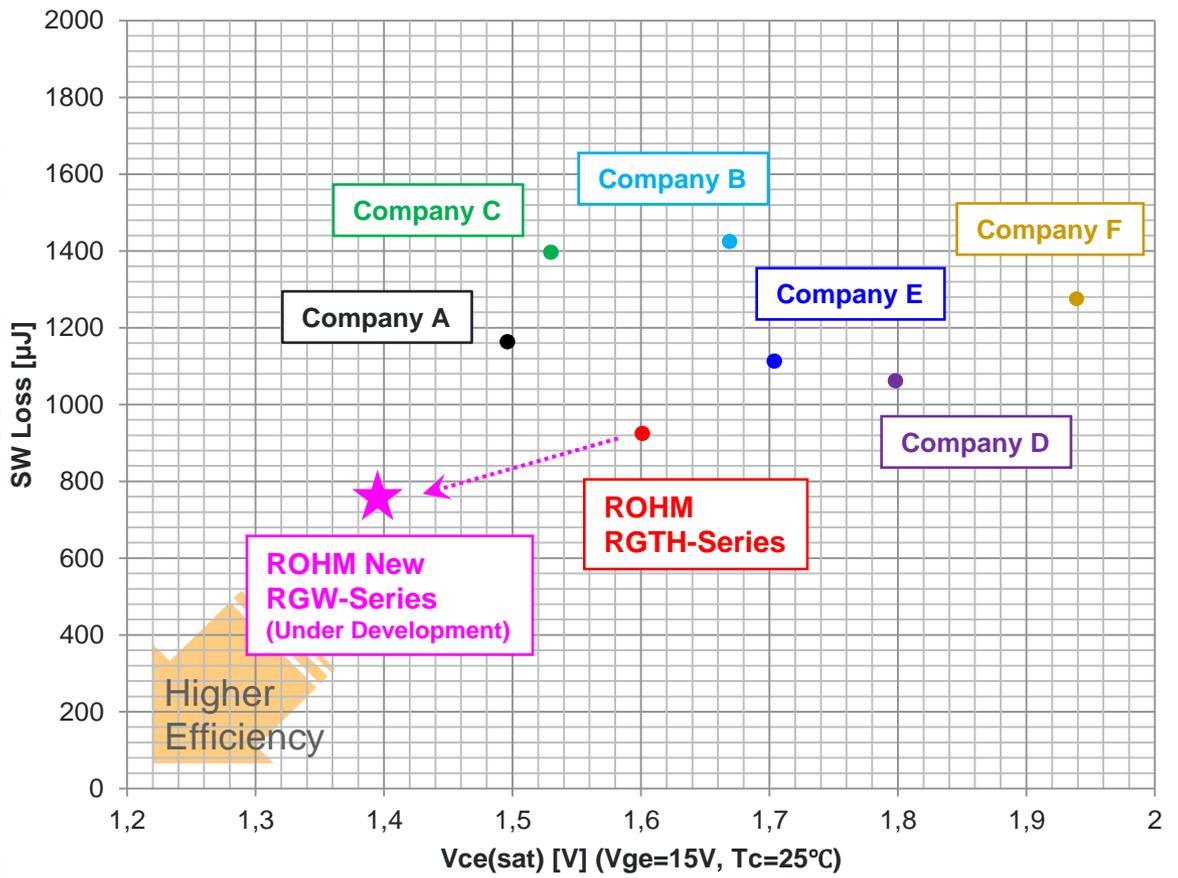


# New Product for Converter <RGW-Series>

### Turn off Waveform



### VCE(sat) v.s. Switching Loss Comparison Trade-off with products from competitors



SW Condition : Ic=30A, Vcc=400V, Vge=15V, Rg=10Ω, L=1mH, Tc=25°C

The data include underdeveloped products and are subject to change without notice. These data are provided to show a result of evaluation done by ROHM for your reference. ROHM does not guarantee any of the characteristics shown here. As of Sep 01, 2014

# IGBT for Inverter <RGT-Series>

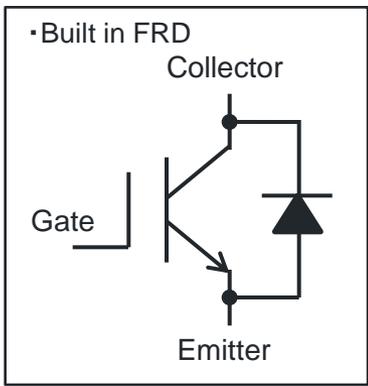
■ Features

- Trench Gate & Thin Wafer Technology
- Short Circuit SOA 5μs min.
- Low VCE(sat) 1.65V typ.
- High Speed SW
- Low SW Loss & Low SW Noise
- Low Gate Charge
- Built in Very Fast & Soft Recovery FRD

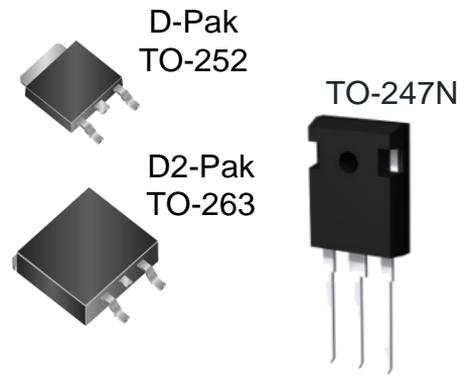
■ Applications

White Goods , UPS , Solar Inverters , Welding Machine

■ Circuit



■ Package



TYPE	VCES [V]	tsc [μs]	IC[A]		VCE(sat)[V]		tf[ns]		Cies[pF]		Cres[pF]		FRD	VF[V]		trr[ns]		Package
			25°C	100°C	Typ.	IC [A]	Typ.	IC [A]	Typ.	VCE [V]	Typ.	VCE [V]		Typ.	IF [A]	Typ.	IF [A]	
RGT8BM65D	650	5	8	4	1.65	4	71	4	220	30	4.5	30	○	1.45	4	40	4	D-Pak
RGT8NS65D	650	5	8	4	1.65	4	71	4	220	30	4.5	30	○	1.45	4	40	4	D2-Pak
RGT16NS65D			16	8	1.65	8	95	8	450		8			1.4	8	42	8	
RGT30NS65D			30	15	1.65	15	75	15	780		13			1.5	15	55	15	
RGT40NS65D			40	20	1.65	20	60	20	1070		18			1.45	20	58	20	
RGT40TS65D	650	5	40	20	1.65	20	60	20	1070	30	18	30	○	1.45	20	58	20	TO-247N
RGT50TS65D			48	25	1.65	25	65	25	1400		22			1.45	20	58	20	
RGT60TS65D			55	30	1.65	30	60	30	1730		29			1.35	20	58	20	
RGT80TS65D			70	40	1.65	40	55	40	2210		36			1.35	20	58	20	
RGT00TS65D			85	50	1.65	50	62	50	2770		43			1.45	30	54	30	

The data table above is shown as reference. Please be advised to check data sheets for consideration.

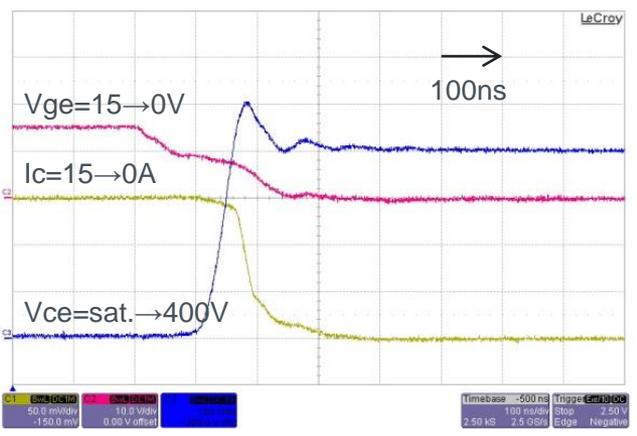
As of Sep 01, 2014



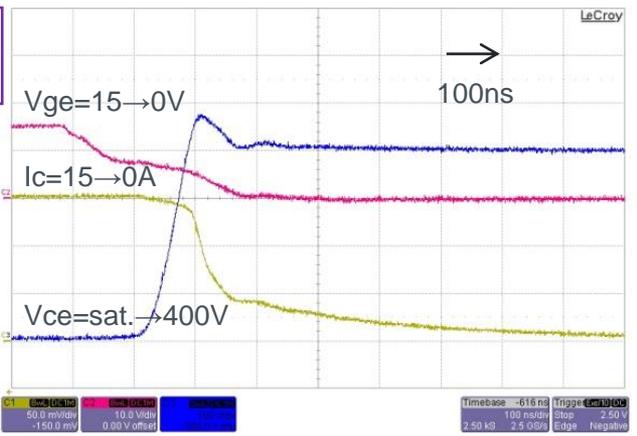
# IGBT for Inverter <RGT-Series>

### Turn off Waveform

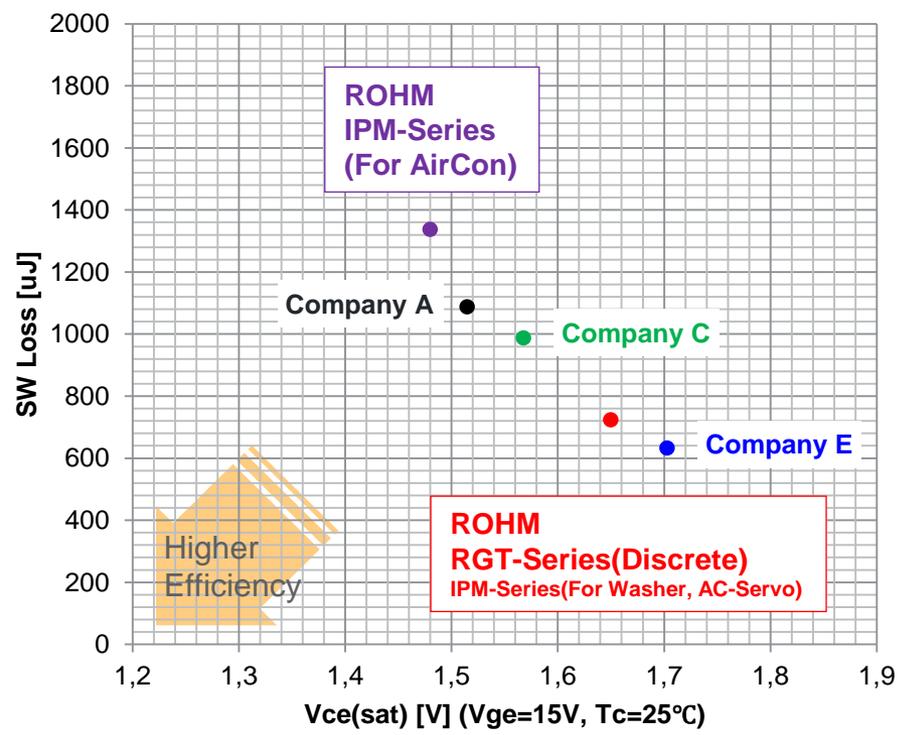
**RGT-Series**



**IPM-Series (For AirCon)**



### VCE(sat) v.s. Switching Loss Comparison Trade-off with products from competitors



SW Condition :  
Ic=15A, Vcc=400V, Vge=15V, Rg=50Ω, L=1mH, Tc=25°C

These data are provided to show a result of evaluation done by ROHM for your reference. ROHM does not guarantee any of the characteristics shown here.

As of Sep 01, 2014



# IGBT for Inverter <RGS-Series>

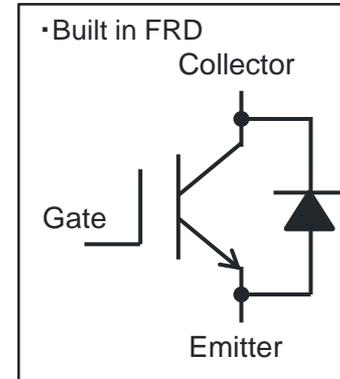
## ■ Features

- Trench Gate & Thin Wafer Technology
- Short Circuit SOA 8-10μs min.
- Low SW Loss & Low SW Noise
- Low Gate Charge
- Built in Very Fast & Soft Recovery FRD
- Based upon AEC-Q101

## ■ Applications

General Inverters

## ■ Circuit



## ■ Package

TO-247N



TYPE	VCES [V]	tsc [μs]	IC[A]		VCE(sat)[V]		tf[ns]		Cies[pF]		Cres[pF]		FRD	VF[V]		trr[ns]		Package	
			25°C	100°C	Typ.	IC [A]	Typ.	IC [A]	Typ.	VCE [V]	Typ.	VCE [V]		Typ.	IF [A]	Typ.	IF [A]		
RGS60TS65D	650	8	60	30	1.7	30	87	30	980	30	13	30	○	1.45	30	79	30	TO-247N	
RGS80TS65D			73	40	1.7	40	86	40			1240			16.4	1.45	30	79		30
RGS00TS65D			90	50	1.7	50	75	50			1570			24	30	1.45	30		79
RGS50TSX2D	1200	10	50	25	1.7	25	TBD	25	TBD	TBD	TBD	TBD	1.65	25	TBD	25			
RGS80TSX2D			80	40	1.7	40	TBD	40	TBD	TBD	TBD	TBD	1.65	40	TBD	40			

The data table above is shown as reference. Please be advised to check data sheets for consideration.

As of Sep 01, 2014

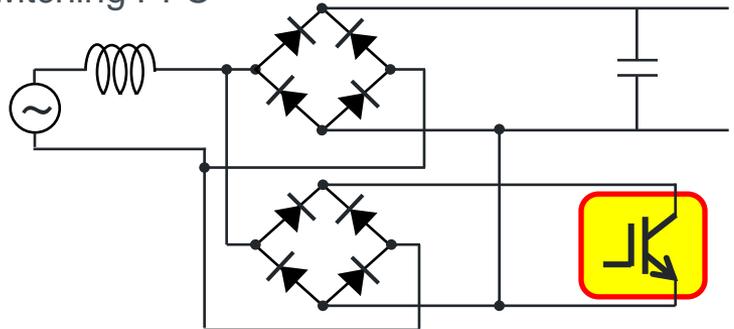
# IGBT for Partial SW PFC <RGCL-Series>

### ■ Features

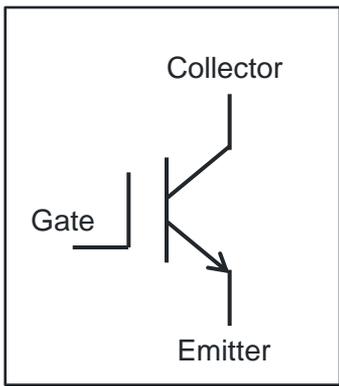
- Trench Gate & Thin Wafer Technology
- **Low VCE(sat) 1.4V typ.**
- Low SW Noise

### ■ Applications

Partial Switching PFC



### ■ Circuit



### ■ Package

TO-247N



TO-3PFM



TYPE	VCES [V]	IC [A]	VCE(sat) [V]		tf [ns]		Cies [pF]		Cres [pF]		Package
			Typ.	IC [A]	Typ.	IC [A]	Typ.	VCE [V]	Typ.	VCE [V]	
RGCL60TS60	600	30	1.4	30	200	30	1600	30	29	30	TO-247N
RGCL80TS60		40	1.4	40	200	40	2340		43		
RGCL60TK60	600	TBD(15)	1.4	30	200	30	1600	30	29	30	TO-3PFM
RGCL80TK60		TBD(20)	1.4	40	200	40	2340		43		

The data table above is shown as reference. Please be advised to check data sheets for consideration.

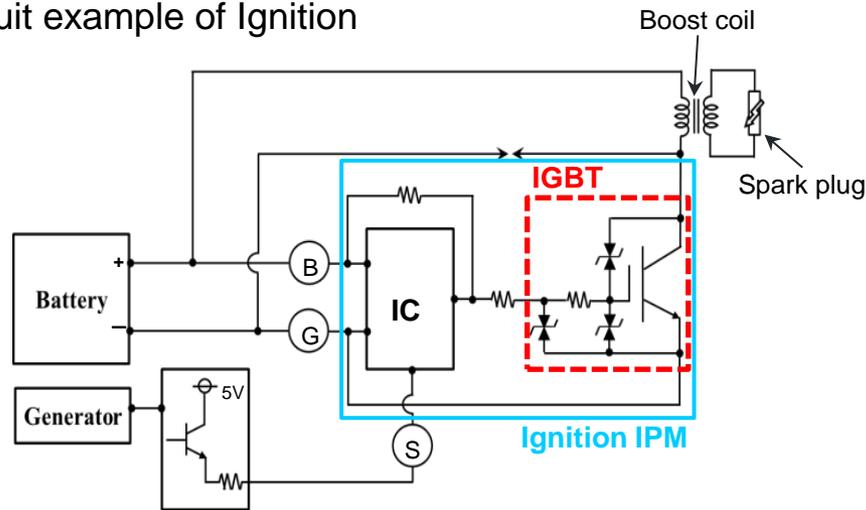
As of Sep 01, 2014



# IGBT for Igniter <RGPx-Series>

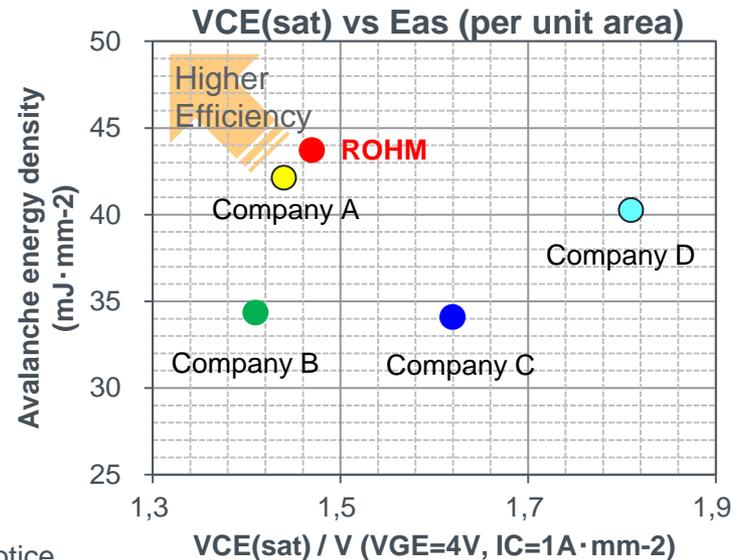
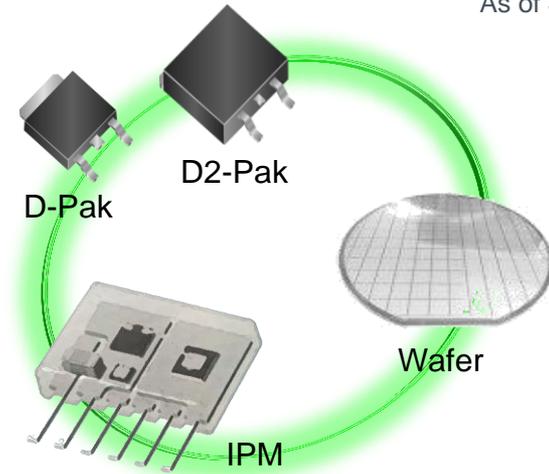
As of Sep 01, 2014

## ■ Circuit example of Ignition



## ■ Feature

- Package : D-Pak, D2-Pak
- BVCES=430±30V
- Low Saturation Voltage  
 $V_{CE(sat)}=1.3V_{typ.}@I_c=4A, V_{GE}=4.5V$
- Avalanche Energy : guaranteed 250mJ ( $T_j=25^{\circ}C$ )
- Built-in ESD protection Diode for Gate
- Built-in Resistor between Gate and Emitter (Option)
- Based upon AEC-Q101



This is development plan, so it might be changed target specification without notice.

# IGBT for Igniter <RGPx-Series>

As of Sep 01, 2014

### Line-up (Current)

Item	Package	BVCES	VGE	Eas	Comment	Status
RGPZ10BM40	D-Pak	430±30V	±10V	250mJ	-	CS OK
RGPR10BM40	D-Pak	430±30V	±10V	250mJ	Built-in Resistor between G-E	CS OK
RGPZ20BM56	D-Pak	560±30V	±10V	300mJ	-	DS OK

### Development plan (tentative)

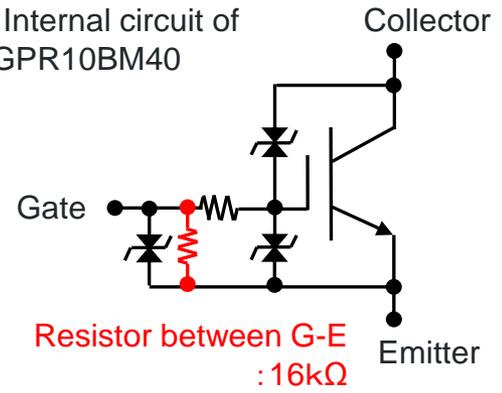
		Eas (Tj=25°C)				
		200mJ	250mJ	300mJ	350mJ	
BVCES	350V	✓	✓	✓	✓	D-Pak
	430V	✓	✓	✓	✓	
	560V	✓	✓	✓	✓	D2-Pak
	600V			✓	✓	

✓ Under Development

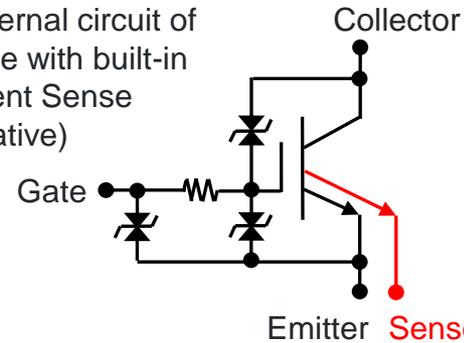
New items with higher Breakdown voltage / Eas and built-in Current Sense are underdeveloped.

The plan and specifications are subject to change without notice.

### Internal circuit of RGPR10BM40



### Internal circuit of device with built-in Current Sense (tentative)



# IGBT products at ROHM's Home page

**ROHM Home page** <http://www.rohm.com>

The image illustrates the navigation path on the ROHM website:

- Home Page:** The 'IGBT' link is highlighted in the 'Products' menu.
- IGBT products page:** The 'Standard IGBT (20)' link is highlighted.
- Products page:** The 'IGBT' link is highlighted in the 'Products' menu.

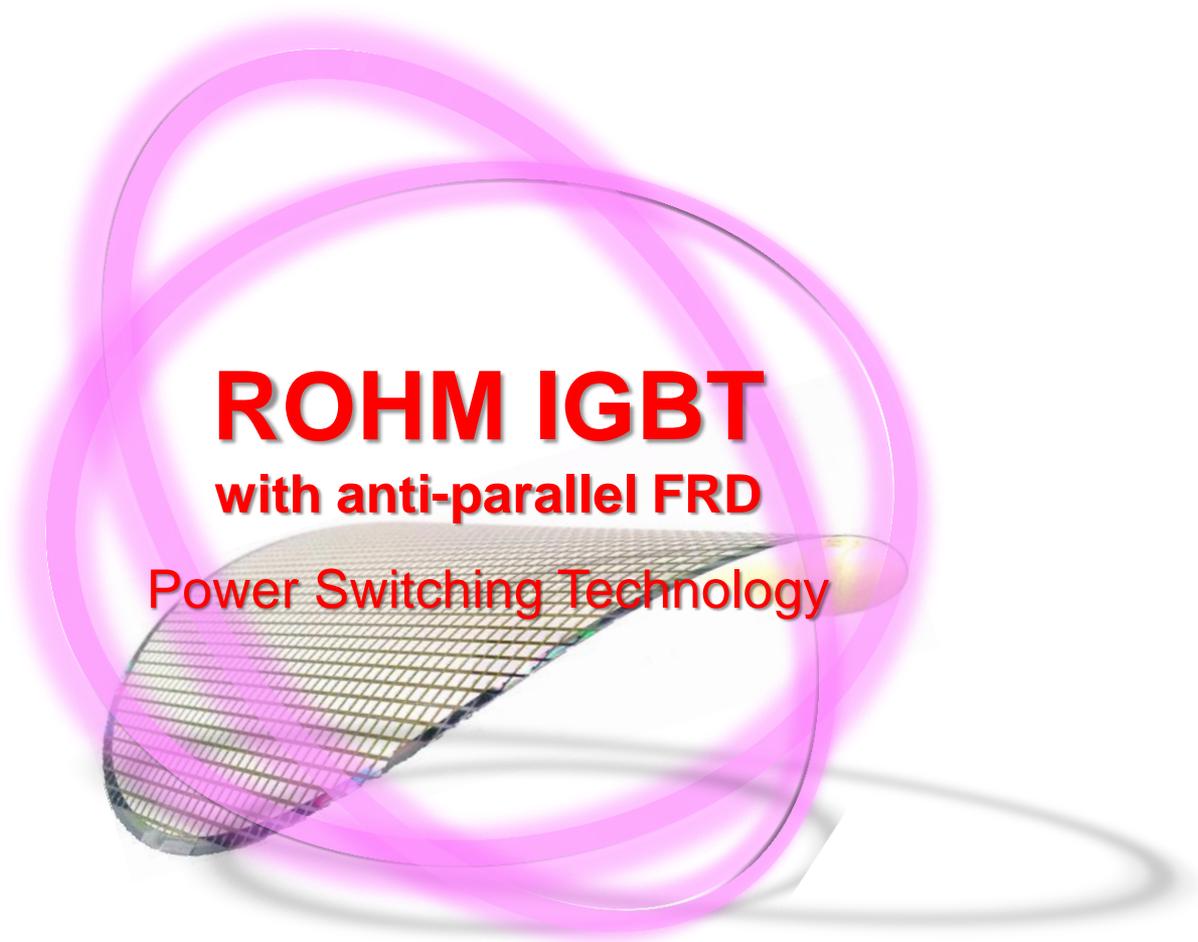
The final Products page displays a table of IGBT models with the following columns: Product Name, Common Standard, Spice Model, Thermal Model, V<sub>CE(sat)</sub> [V], I<sub>C</sub>(100°C), V<sub>CE(sat)</sub>(Typ.), I<sub>CE</sub>(Min.), Built-in Diode, V<sub>CE(sat)</sub>(Min.) [V], Package, and Distribution Inventory.

Product Name	Common Standard	Spice Model	Thermal Model	V <sub>CE(sat)</sub> [V]	I <sub>C</sub> (100°C)	V <sub>CE(sat)</sub> (Typ.)	I <sub>CE</sub> (Min.)	Built-in Diode	V <sub>CE(sat)</sub> (Min.) [V]	Package	Distribution Inventory
RGT10T86SD (New *)	-	-	-	650	8	1.65	5	FRD	5	TO-247	Buy Sample
RGT16T86SD (New *)	-	-	-	650	15	1.65	5	FRD	5	LPDS	Buy Sample
RGT30T86SD (New *)	-	-	-	650	20	1.65	5	FRD	5	LPDS	Buy Sample
RGT40T86SD (New *)	-	-	-	650	20	1.65	5	FRD	5	LPDS	Buy Sample
RGT40T86SD (New *)	-	-	-	650	20	1.65	5	FRD	5	TO-247	Buy Sample
RGT50T86SD (New *)	-	-	-	650	25	1.65	5	FRD	5	TO-247	Buy Sample

As of Sep 01, 2014



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# **ROHM IGBT**

## **with anti-parallel FRD**

**Power Switching Technology**