



HITACHI Power Semiconductor Product

- **IGBT module**
- **High Voltage IC** (Motor driver, MOS/IGBT gate driver)
- **Surge Suppressor Power Diode**
- **High Voltage Fast Recovery Diode**

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Hitachi IGBT Modules



<http://www.hitachi.co.jp/Div/ise/pdevice/index.htm>

<http://store.iic.cc/>

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Features of Hitachi GS-Series IGBT Modules

1 Expansion of Large Current modules

- >> 1200V class ; up to 1200A
- >> 600V class ; up to 600A

2 Evolution of Characteristics

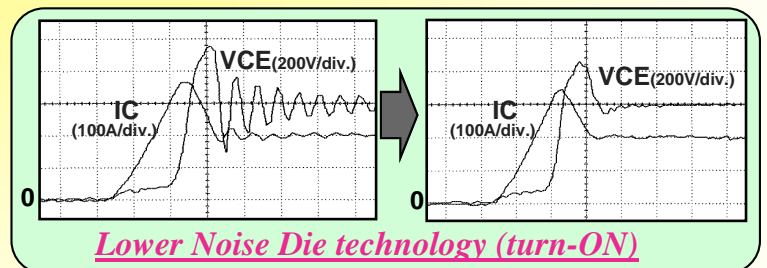
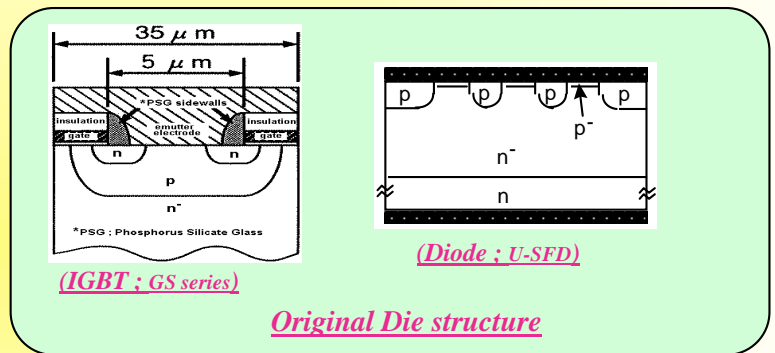
- >> $V_{CE(sat)} < 2V$ (for 600V)
- >> SAD MOS structure
- >> Punch Through IGBT Technology

3 Lower Loss & Noise Die technology

- >> Decreased turn-OFF Switching Loss
- >> Adv.U-SFD
- >> Non-punch Through Diode Technology

4 Higher Reliability module structure

- >> Original Soldering technology and Assembly process



HITACHI IGBT Module Package Line-up

High - Voltage High Power IGBT

Package	V _{CES}	I _C	400A	600A	1200A	1800A
Single	3,300 V		MBN400C33A	MBN600C33A	MBN1200D33A	
	2,500 V				MBN1200D25B	
	2,000 V		MBN400C20	MBN600C20		
	1,700 V					MBN1800D17A
			800A			
Chopper use	3,300 V			MBL800D33A	NEW	

GS Series W-Version

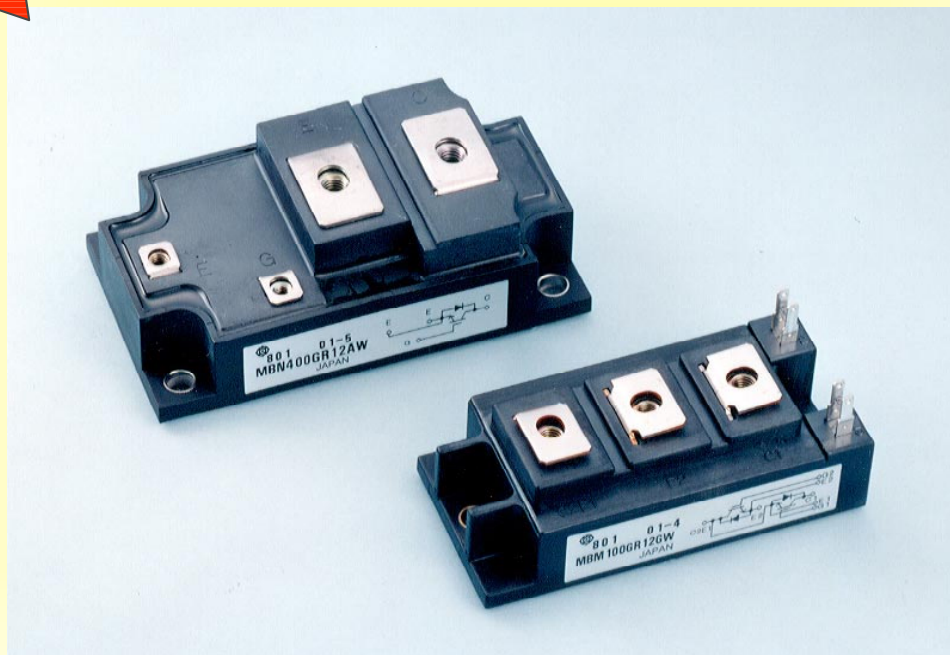
Package	V _{CES}	I _C	75A	100A	150A	200A	300A	400A	600A	800 -1200 A
Single	1,200 V						MBN300GS12AW	MBN400GS12AW MBN400GS12BW	MBN600GS12AW	MBN800GS12BW MBN1200GS12AW NEW
Dual	600 V				MBM150GS6AW	MBM200GS6AW	MBM300GS6AW	MBM400GS6AW MBM400JS6AW	MBM600GS6CW	
	1,200 V		MBM75GS12AW *	MBM100GS12AW * NEW	MBM150GS12AW MBM150GS12EBW* NEW	MBM200GS12AW MBM200JS12AW MBM200JS12EW MBM200GS12EBW	MBM300GS12AW MBM300NS12AW	MBM400QS12AW	MBM600QS12AW	
6-pack	600 V					MBB200GS6AW				
	1,200 V		MBB75GS12AW	MBB100GS12AW						
Chopper use	600 V				MBL150GS6P MBL150GS6N				MBL600GS6PBW MBL600GS6NBW	

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SOON !!

Hitachi GR-series IGBT Module



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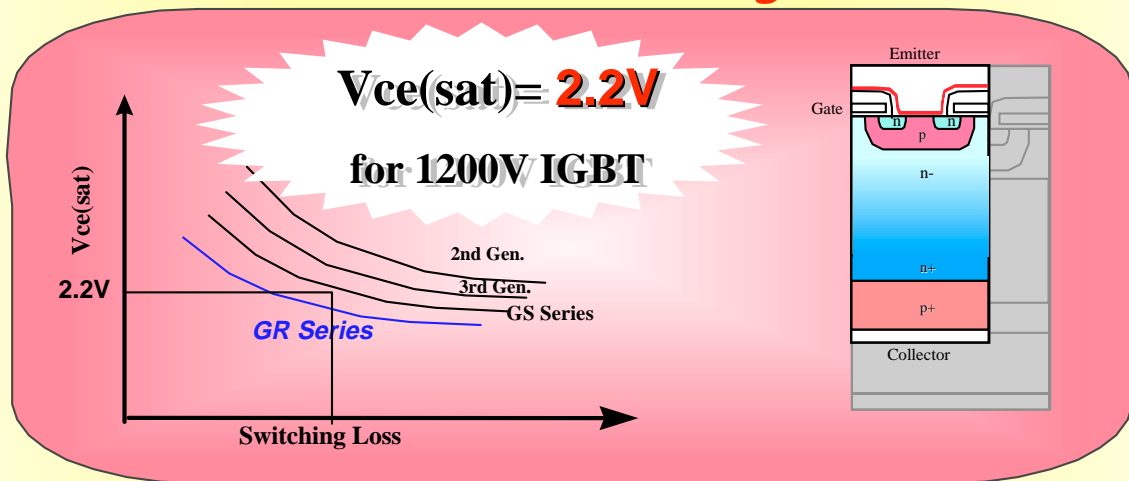
GR-Series IGBT Modules

SOON !!

Improved $V_{ce(sat)}$ -switching loss Trade off relation

>> *Advanced Punch Through Technology Realised*

$V_{ce(sat)} = 2.2V$ for 1200V IGBT !
with Lower Switching Loss



$V_{ce(sat)} = 2.2V$
for 1200V IGBT

Higher Reliability

>> **High Power Cycle Durability**

2 times improved Durability !

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GR-Series IGBT Modules

SOON !!

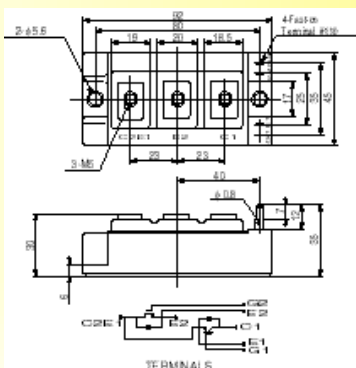
Compatible to HITACHI GS series

>> Dual : 1200V, 100A - 300A >> Single : 1200V, 400A

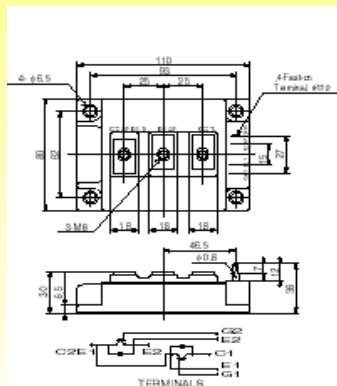
Samples will be available soon !

Type No.	Connection	Absolute Maximum Ratings		Characteristics (Typ. Value)		Sample Available	
		V_{CES}	I_C	$V_{CE(sat)}$	t_r	WS	ES
MBM100GR12GW	dual-pack M1	1200V	100A	2.2V	0.25 μ s	Dec. '98	1Q '99
MBM150GR12GW	dual-pack M1	1200V	150A	2.2V	0.25 μ s	Dec. '98	1Q '99
MBM200GR12GW	dual-pack M1	1200V	200A	2.2V	0.25 μ s	Dec. '98	1Q '99
MBM300GR12GW	dual-pack M3	1200V	300A	2.2V	0.25 μ s	Dec. '98	1Q '99
MBN400GR12AW	single-pack N5	1200V	400A	2.2V	0.25 μ s	Dec. '98	1Q '99

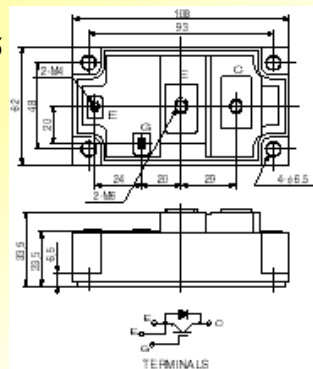
M1



M3



N5



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HITACHI Product Information Support

Material available:

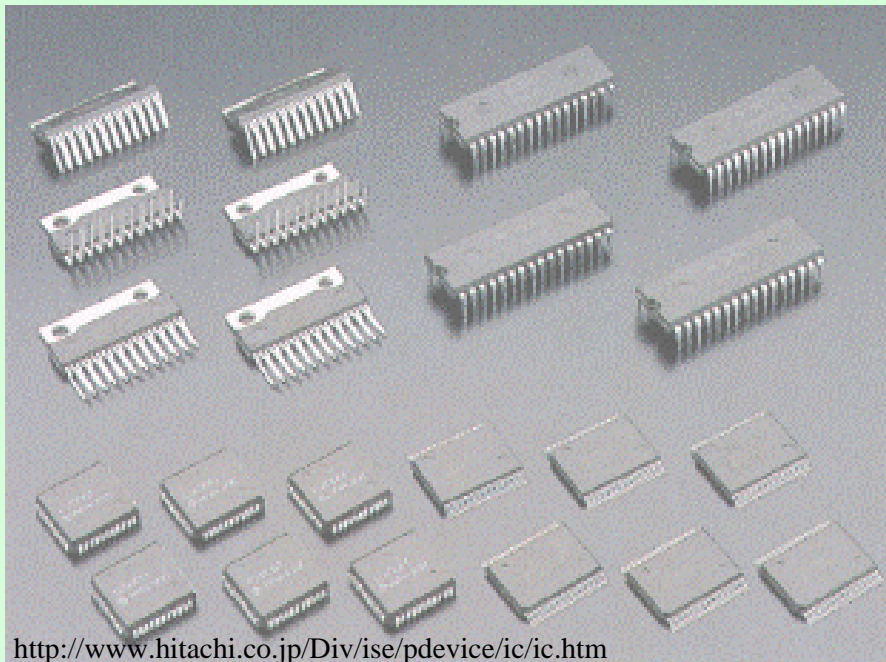
- ❑ *Databook (ordercode: EC-E704Q 0998)*
- ❑ *Hitachi High-Power IGBT Modules (ordercode: EC-E707 1197)*
- ❑ *Hitachi IGBT Module (Application Note)*
- ❑ *IGBT Reliability Data*

please contact your local sales office!

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Hitachi Single Chip High Voltage IC



<http://www.hitachi.co.jp/Div/ise/pdevice/ic/ic.htm>

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Single Chip High Voltage IC Line-up

Three-Phase DC Brushless Motor Driver

T type	Voltage(V)		Start-up current (A)	Output current (A)	Package	Remarks
	VCC	VSM				
ECN3018SP,SPV,SPR	15	250	1.8	1.0	SP-22T A/B/R	Three-phase distributor, charge pump
ECN3021SP,SPV,SPR	15	500	1.0	0.7	SP-21T A/B/R	Three-phase distributor, charge pump
ECN3022SP,SPV,SPR	15	500	1.5	0.7	SP-22T A/B/R	Three-phase distributor, charge pump
ECN3061SP,SPV,SPR	15	250	1.8	1.0	SP-23T A/B/R	6-input, charge pump
ECN3063SP,SPV,SPR	15	500	1.0	0.7	SP-23T A/B/R	6-input, charge pump
ECN3064SP,SPV,SPR	15	500	1.5	0.7	SP-23T A/B/R	6-input, charge pump
ECN3067	15	500	5.0	2.5	NP-4	6-input, charge pump

NEW!

Three-phase Power MOS/GBT Driver

T type	Voltage(V)		Output current(A)		Package	Remarks
	VCC	VbV	Source	Sink		
ECN3051PL,P,FP	15	620	0.25	0.5	PLCC44 DIP32 SOP28	6-input, bootstrap
ECN3053PL,P,FP	15	620	0.25	0.5	PLCC44 DIP32 SOP28	6-input, bootstrap, op-amp.
ECN3030,3031FP	15	250	0.2	0.2	FP28DJ	Three-phase distributor, Charge pump
ECN3035,3036FP	15	500	0.2	0.2	FP28DJ	Three-phase distributor, Charge pump

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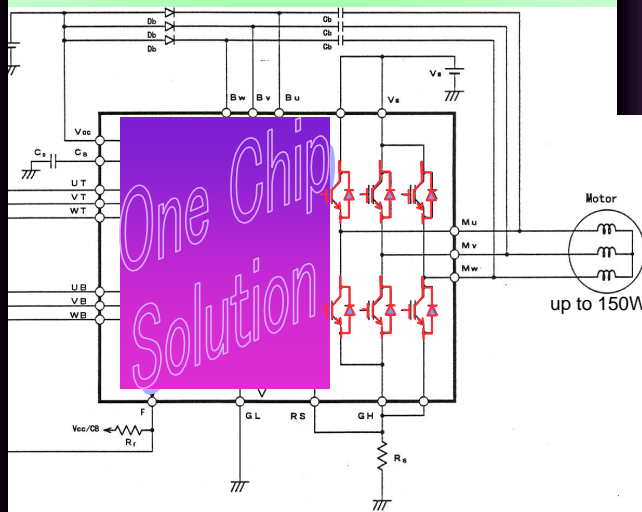
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NEW PRODUCT!

Single Chip Inverter IC : ECN3067

ECN3067 is a single chip full-bridge inverter IC including 6 IGBTs and protection function.

Output Device Breakdown Voltage : 500V
Output Current : 2.5A
(Peak Output Current : 5.0A)

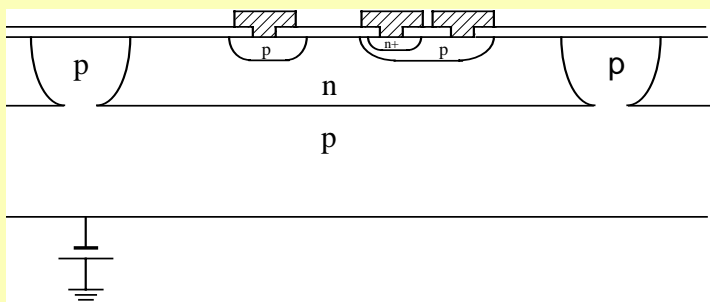


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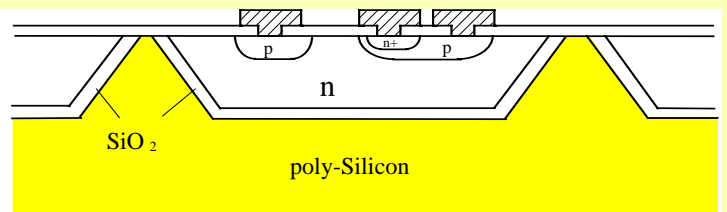
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Features of DI(Dielectric Isolation)

- Latch-up free at high current
- Smaller leakage current at high temperature
- Higher noise immunity



Jl (Junction Isolation)

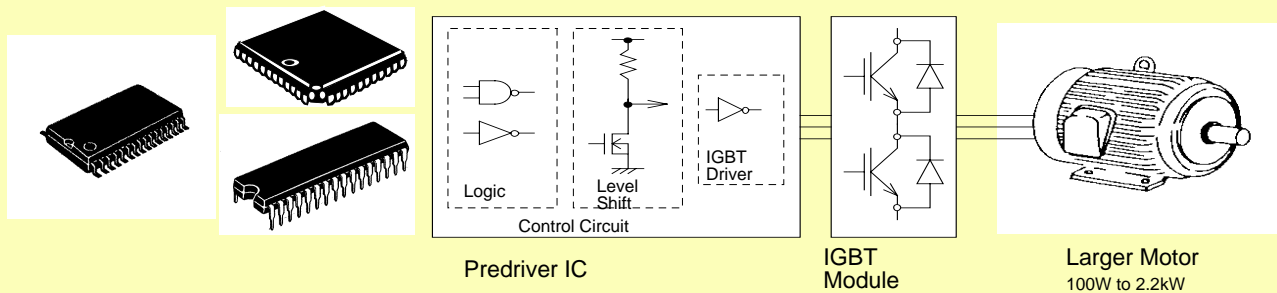
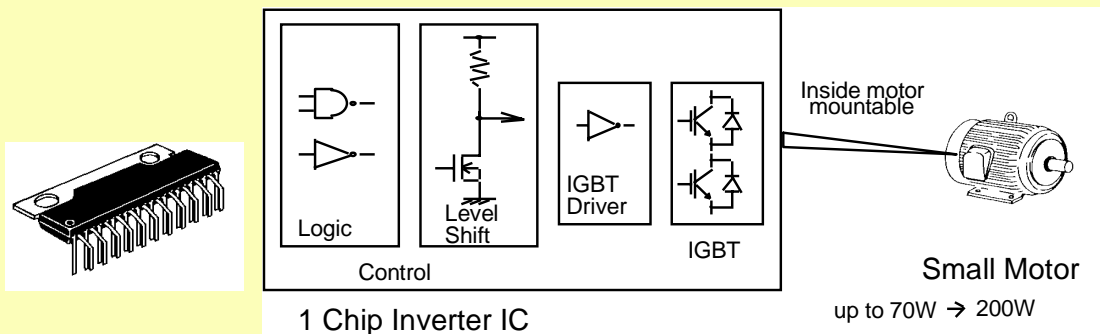


DI (Dielectric Isolation)

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Concept of Inverter IC

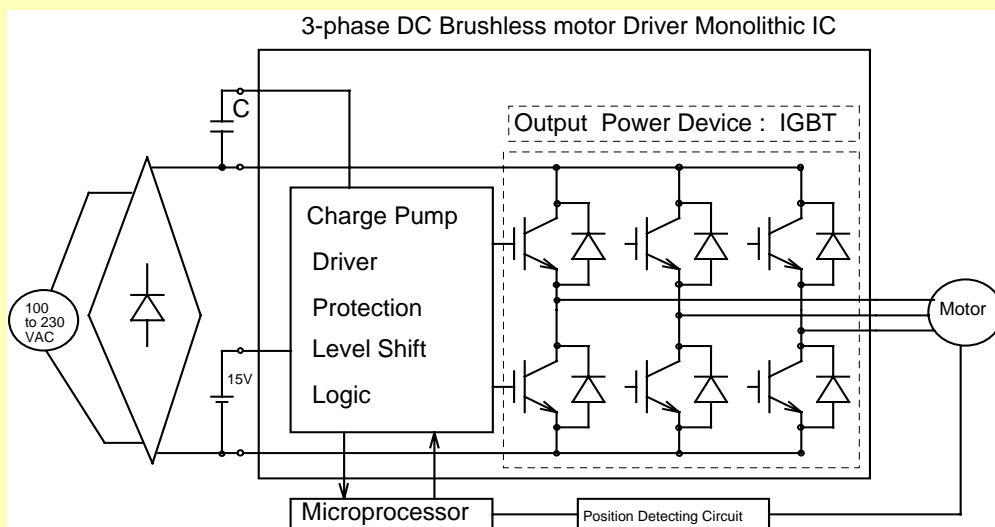


Variable motor speed control for:
 Energy Saving
 Comfortable operation of consumer products

<http://store.infoc.cc>

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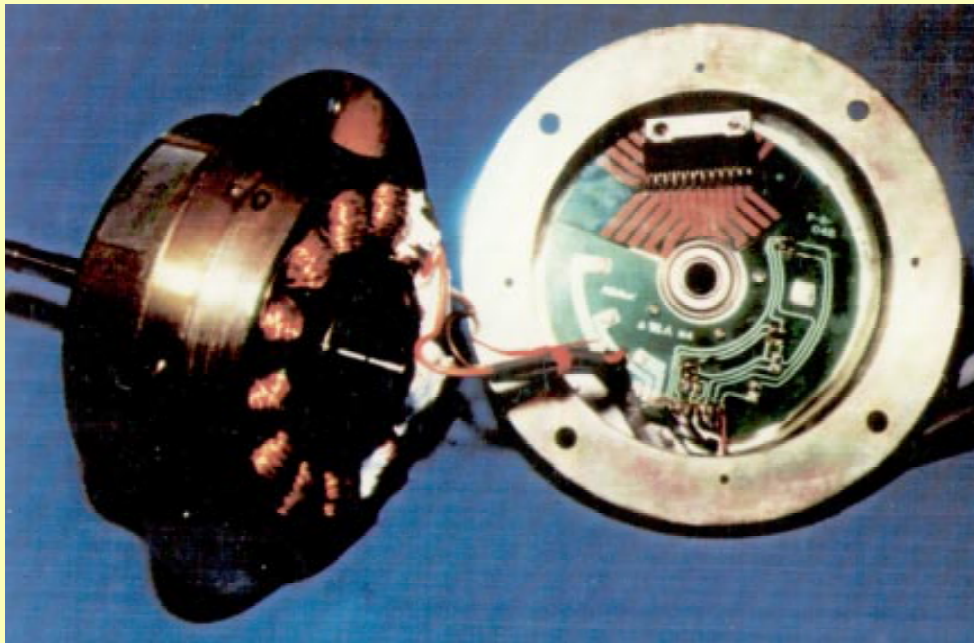
Block Diagram of 1-chip inverter IC



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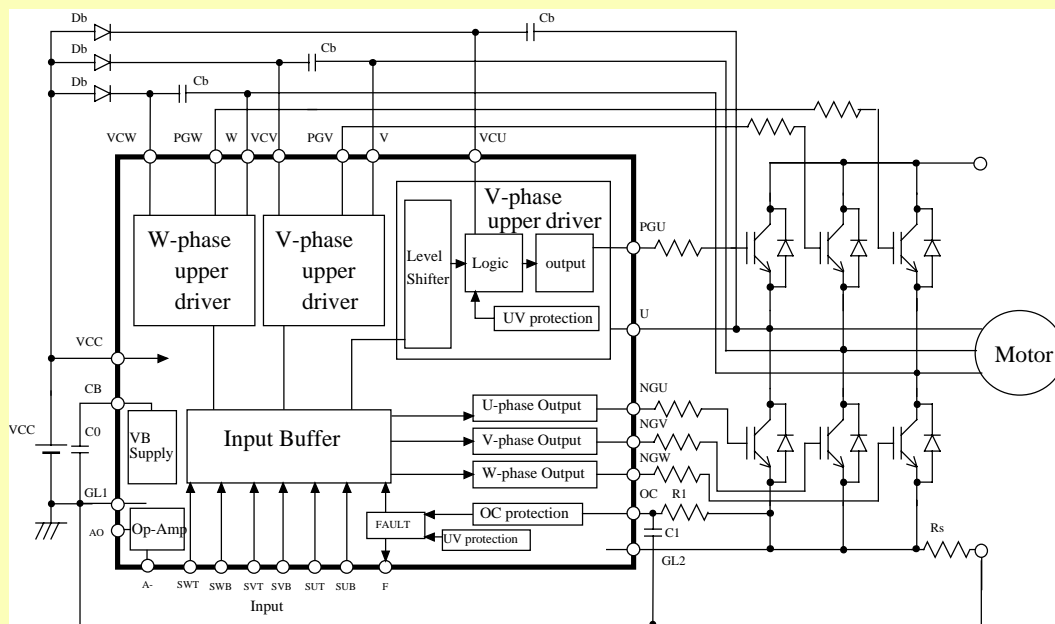
One Chip Inverter IC mounted inside a motor



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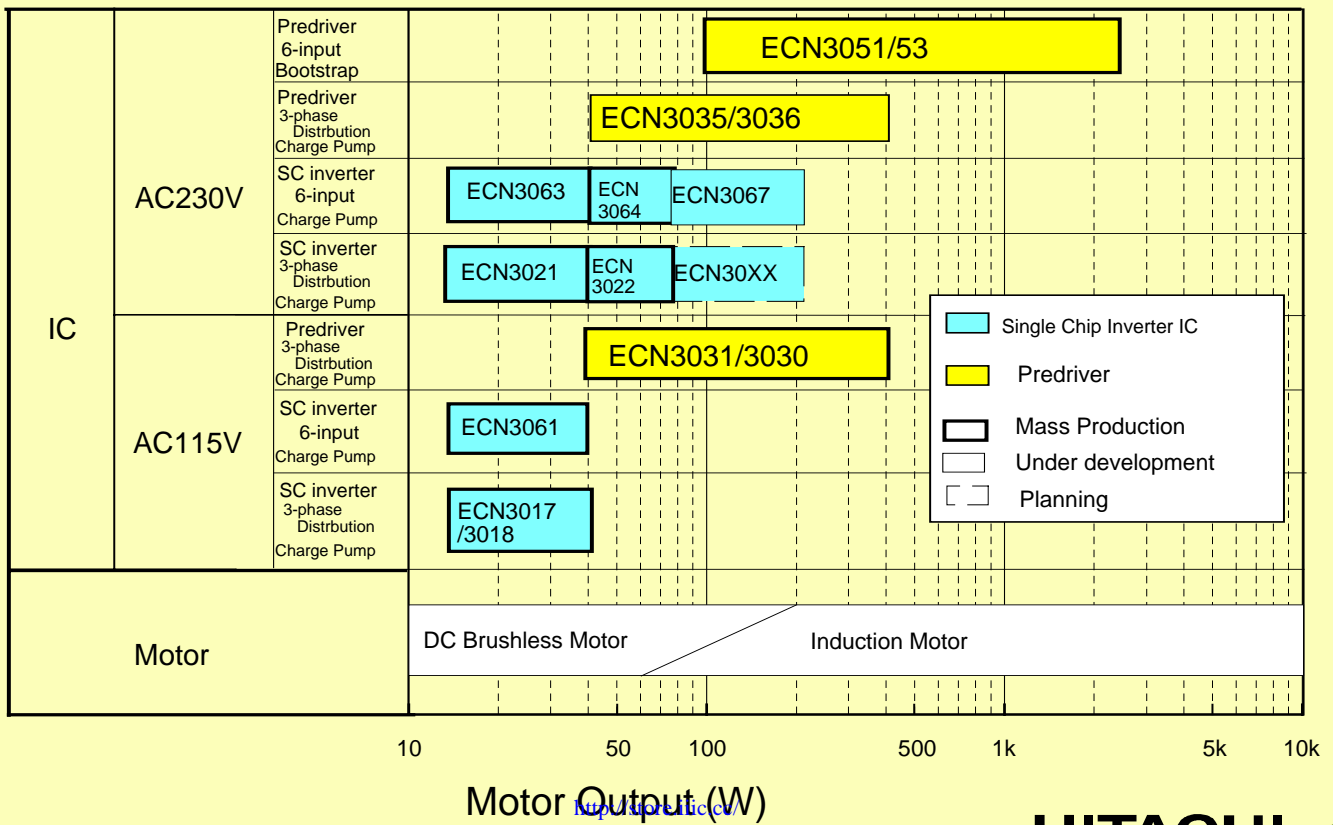
Block Diagram of Predriver IC



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Inverter IC Series Road Map



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Introduction of ECN3018

ECN3018 is a single chip three-phase bridge inverter IC which has 6 IGBTs in the circuit. It is suitable for controlling 3-phase DC brushless motors to which converted AC100V power supply is applied up to 45W

Main Application

- Indoor fan of air conditioner
- Combustion fan of hot water supply equipment
- Small pump

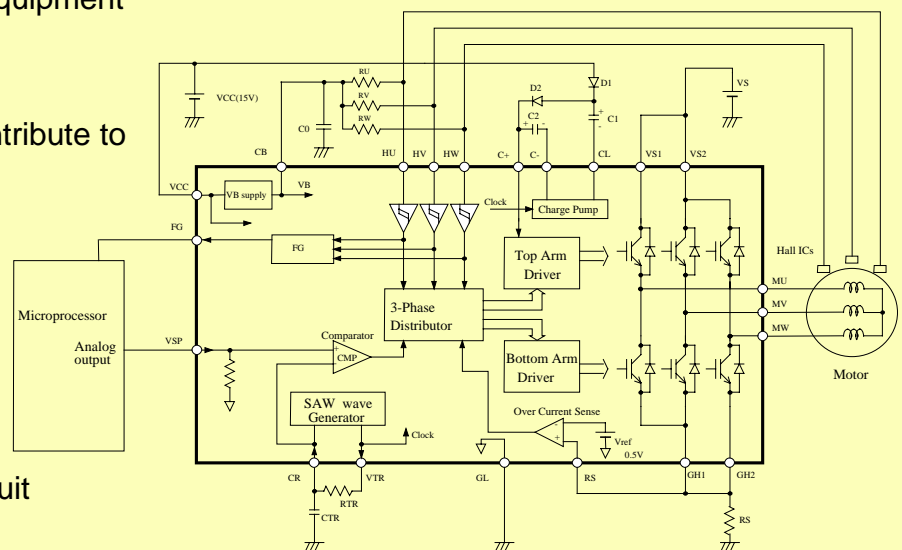
User Merit

- High efficiency and compact which contribute to energy saving

Functions and Features

- Integrated charge pump circuit
- Integrated Free Wheel diodes
- Integrated FG circuit
- Integrated rotating direction monitor circuit
- Integrated over current protection circuit
- 20kHz PWM frequency
- Speed control by 1bit Vsp analog signal

Example of System configuration



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Introduction of ECN3021

ECN3021 is a single chip three-phase bridge inverter IC which has 6 IGBTs in the circuit. It is suitable for controlling 3-phase DC brushless motors to which converted AC200V to 230V power supply is applied up to 45W

Main Application

- Outdoor or indoor fan of air conditioner
- Small pump

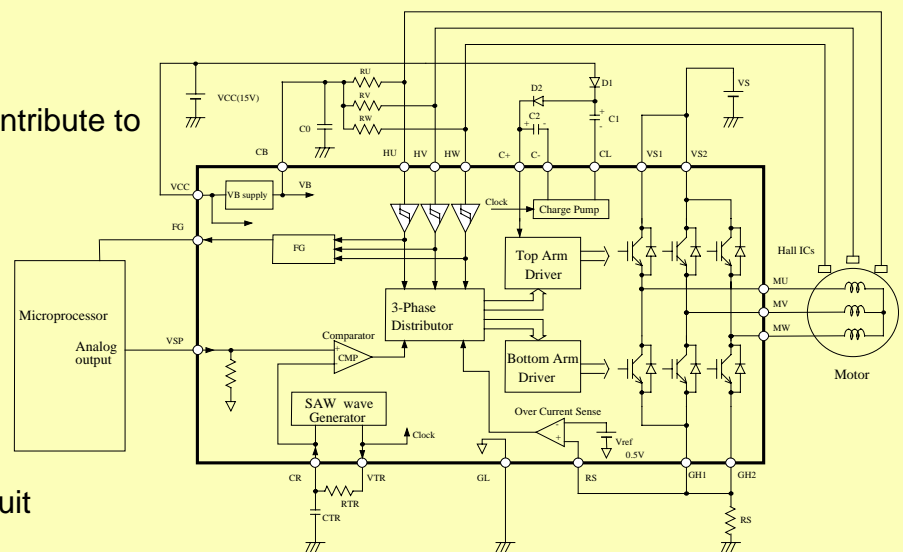
User Merit

- High efficiency and compact which contribute to energy saving

Functions and Features

- Integrated charge pump circuit
- Integrated Free Wheel diodes
- Integrated FG circuit
- Integrated rotating direction monitor circuit
- Integrated over current protection circuit
- 20kHz PWM frequency
- Speed control by 1bit Vsp analog signal

Example of System configuration



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Introduction of ECN3022

ECN3022 is a single chip three-phase bridge inverter IC which has 6 IGBTs in the circuit. It is suitable for controlling 3-phase DC brushless motors to which converted AC200V to 230V power supply is applied up to 70W. ECN3022 is lower loss version of ECN3021.

Main Application

- Outdoor or indoor fan of air conditioner
- Small pump

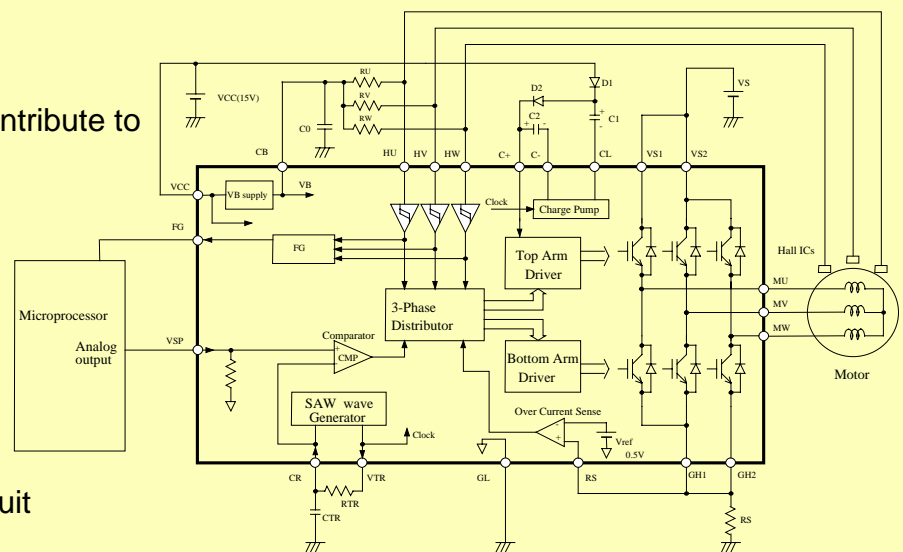
User Merit

- High efficiency and compact which contribute to energy saving

Functions and Features

- Integrated charge pump circuit
- Integrated Free Wheel diodes
- Integrated FG circuit
- Integrated rotating direction monitor circuit
- Integrated over current protection circuit
- 20kHz PWM frequency
- Speed control by 1bit Vsp analog signal

Example of System configuration



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Introduction of ECN3030/31

ECN3030/31 is a single chip three-phase bridge driver IC which drives 6 IGBTs or MOSFETs for the output device. It is suitable for controlling 3-phase DC brushless motors to which converted AC100V to 115V power supply is applied.

Main Application

- Jet bus water control
- Small pump
- Electrical-powered bicycle

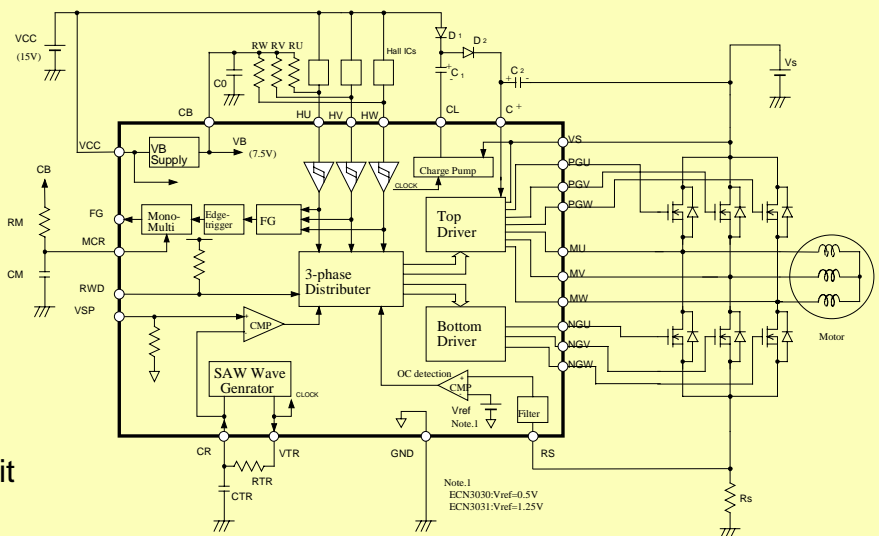
User Merit

- High efficiency and compact which contribute to energy saving

Functions and Features

- Integrated charge pump circuit
- Integrated 3-phase distribution circuit
- Integrated FG circuit
- Integrated rotating direction monitor circuit
- Integrated over current protection circuit
- 20kHz PWM frequency
- Speed control by 1bit Vsp analog signal

Example of System configuration



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Introduction of ECN3035/36

ECN3035/36 is a single chip three-phase bridge driver IC which drives 6 IGBTs or MOSFETs for the output device. It is suitable for controlling 3-phase DC brushless motors to which converted AC200V to 230V power supply is applied.

Main Application

- Consumer products such as washing machine
- Small pump
- Jet bus water control

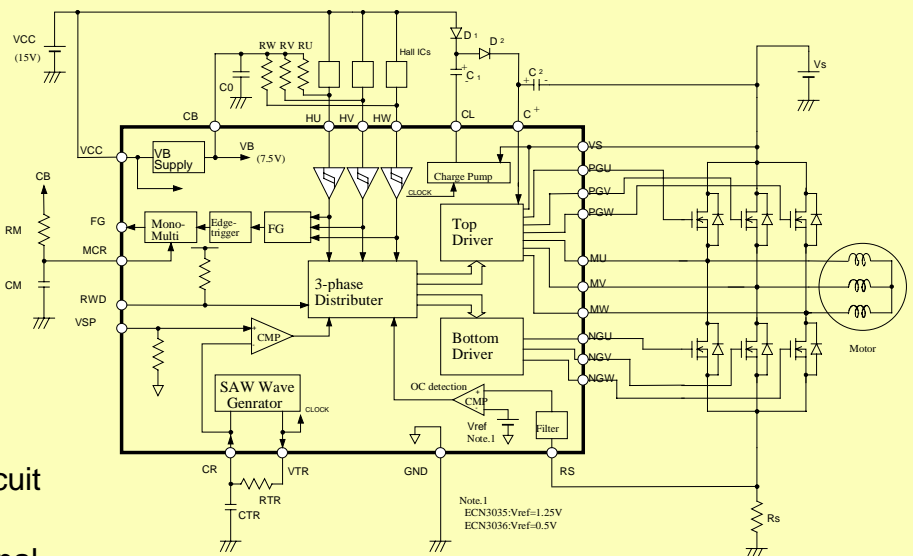
User Merit

- High efficiency and compact which contribute to energy saving

Functions and Features

- Integrated charge pump circuit
- Integrated 3-phase distribution circuit
- Integrated FG circuit
- Integrated rotating direction monitor circuit
- Integrated over current protection circuit
- 20kHz PWM frequency
- Speed control by 1bit Vsp analog signal

Example of System configuration



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Introduction of ECN3051/53

ECN3051/53 is a single chip three-phase bridge driver IC which drives 6 IGBTs or MOSFETs for the output device. It is suitable for controlling 3-phase DC brushless motors or induction motor to which converted AC200V to 230V power supply is applied.

Main Application

- General purpose inverter
- Industrial Motor
- Refrigerator, washing machine

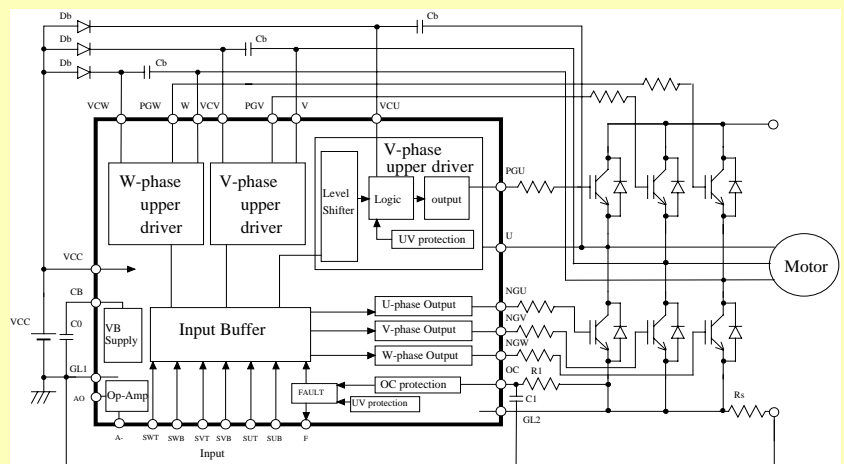
User Merit

- High efficiency and compact which contribute to energy saving

Functions and Features

- Functionally compatible with IR2130
- Lower arm over current protection
- Under voltage protection
- Fault output function
- It can be controlled by PWM with 6 inputs from an external microprocessor
- 6 logic inputs are compatible with 5V CMOS and LSTTL outputs

Example of System configuration



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Introduction of ECN3063

ECN3063 is a single chip three-phase bridge inverter IC which has 6 IGBTs in the circuit. It is suitable for controlling 3-phase DC brushless motors to which converted AC200V to 230V power supply is applied up to 45W.

Main Application

- Outdoor fan of air conditioner
- Small pump

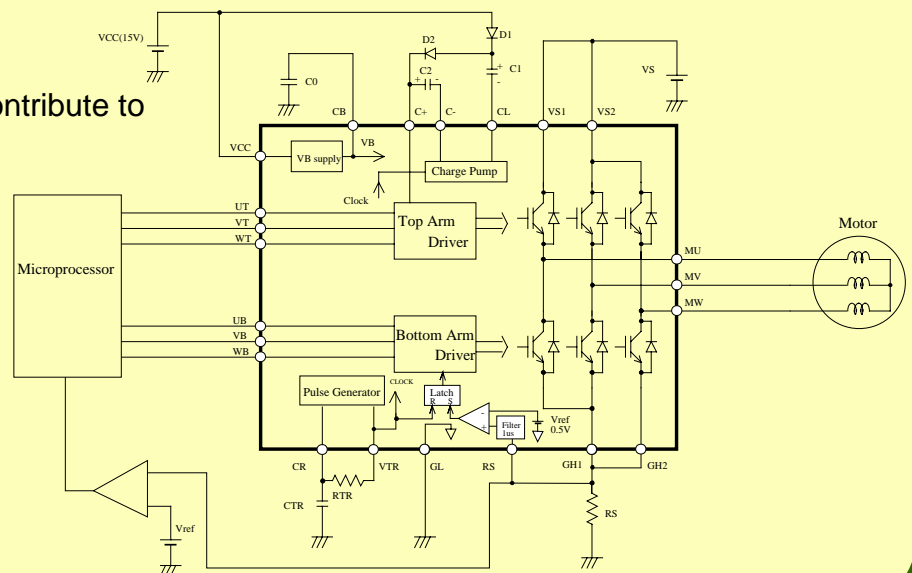
User Merit

- High efficiency and compact which contribute to energy saving

Functions and Features

- Integrated charge pump circuit
- Integrated Free Wheel diodes
- Integrated over current protection circuit
- 20kHz PWM frequency

Example of System configuration



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Introduction of ECN3064

ECN3064 is a single chip three-phase bridge inverter IC which has 6 IGBTs in the circuit. It is suitable for controlling 3-phase DC brushless motors to which converted AC200V to 230V power supply is applied up to 70W. ECN3064 is lower loss version of ECN3063.

Main Application

- Outdoor or fan of air conditioner
- Small pump

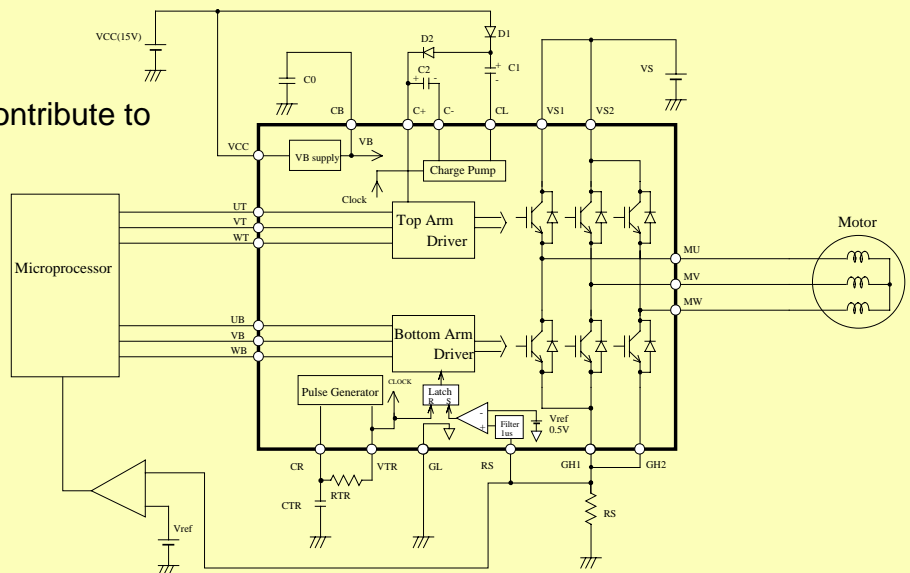
User Merit

- High efficiency and compact which contribute to energy saving

Functions and Features

- Integrated charge pump circuit
- Integrated Free Wheel diodes
- Integrated over current protection circuit
- 20kHz PWM frequency

Example of System configuration



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Introduction of ECN3067

ECN3067 is a single chip three-phase bridge inverter IC which has 6 IGBTs in the circuit. It is suitable for controlling 3-phase DC brushless motors to which converted AC200V to 230V power supply is applied.

Main Application

- Compressor of refrigerator
- Small pump

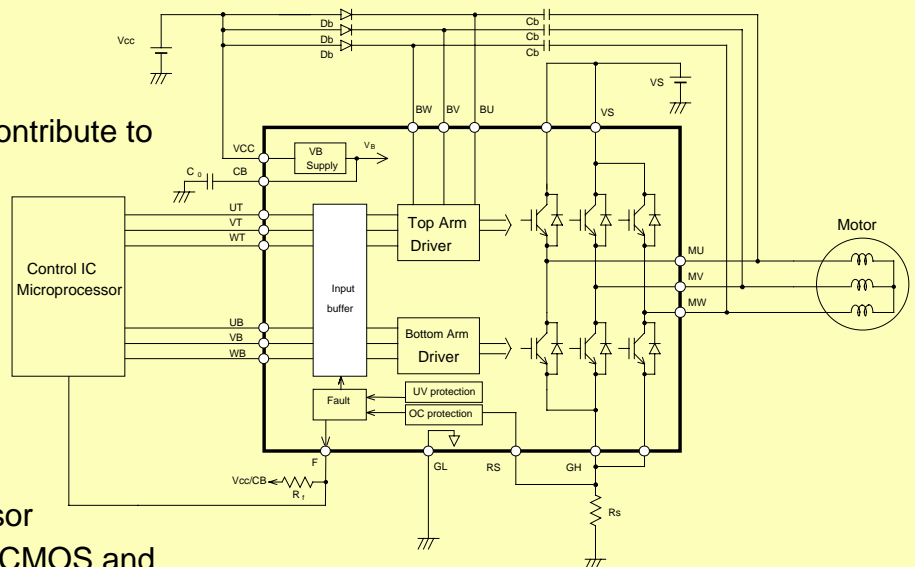
User Merit

- High efficiency and compact which contribute to energy saving

Functions and Features

- Under voltage protection circuit
- Integrated Free Wheel diodes
- Integrated over current protection circuit
- It can be controlled by PWM with 6 inputs from an external microprocessor
- 6 logic inputs are compatible with 5V CMOS and LSTTL outputs

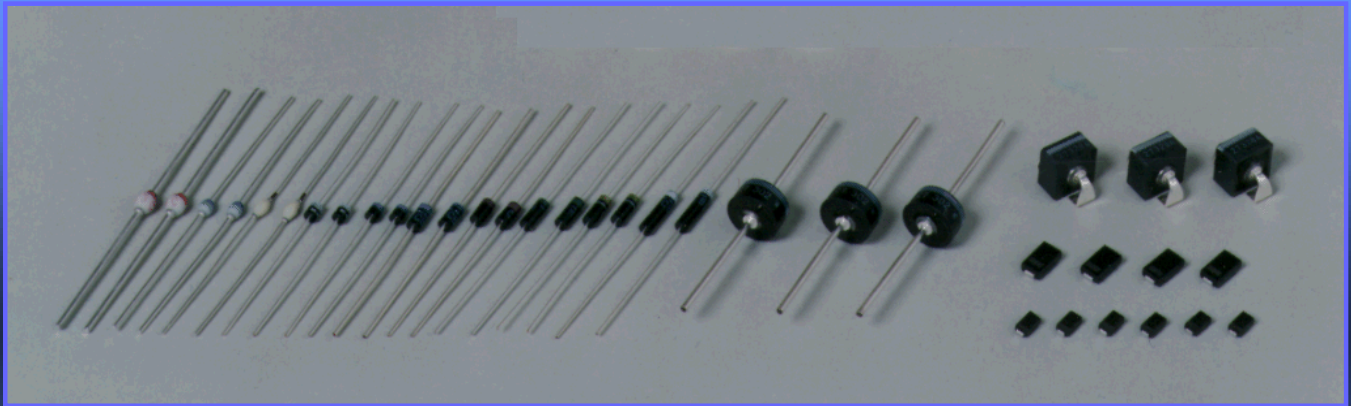
Example of System configuration



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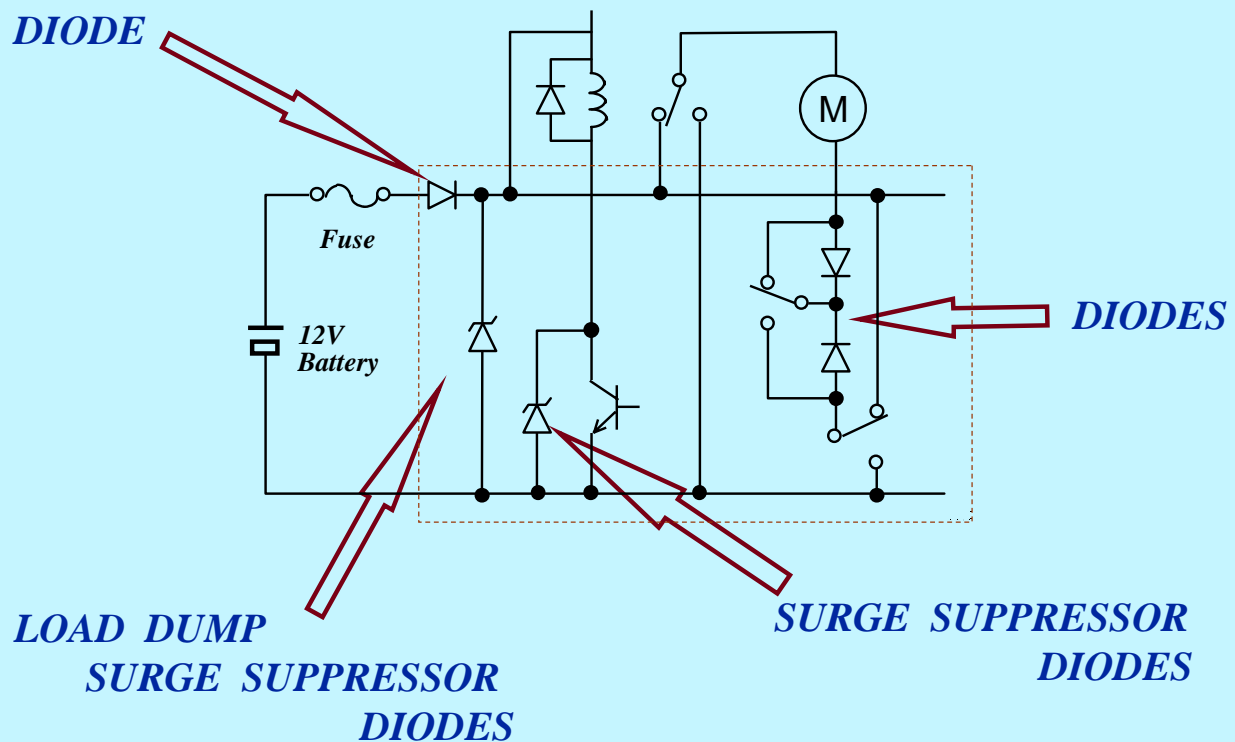
Surge Suppressor Diodes



Hitachi Ltd.

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Basic Application Circuit



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Features

- 1 *Various Kind of Package*
- 2 *High Reverse Power (PRSM:600~3,000W)*
- 3 *Excellent High Capability for Surge Suppression*
- 4 *Available for Inserter Machine*

Axial Lead Forming and Taping
Radial Lead Forming and Taping
Embossed Taping

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Line up

Package	P(W)	Type	Vz class
<i><u>Resin molded : Surge suppresser</u></i>			
Lead type	600	DAM1SA	10~51V
	600	DAM1A	10~51V
	1800	DAM3A	10~51V
	1800	DAM3B	10~51V
	3000	ZSA5A	27V
SMD	600	DAM1MA	10~82V
	1800	DAM3MA	10~82V
	3000	ZSA5MA	27V
	3000	ZSH5MA	27V
	3000	ZSH5MB	27V
<i><u>Glass molded : Zener</u></i>			
Lead type	1.0	AW01	6~33V
	2.5	AU01	7~33V
<i><u>Glass molded : Avalanche</u></i>			
Lead type	1500	V17	170~700V
	3000	U17	270~700V

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Structure of Axial Lead Type Resin Diode

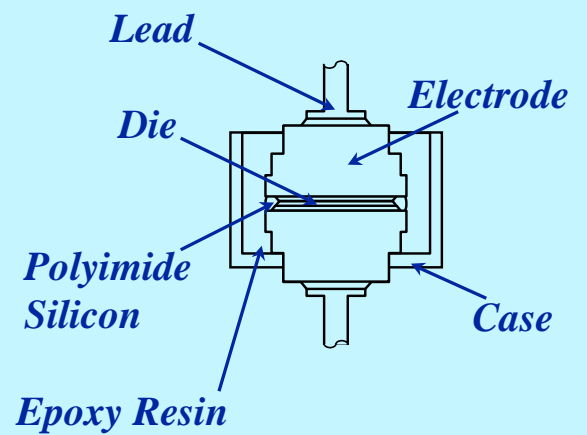
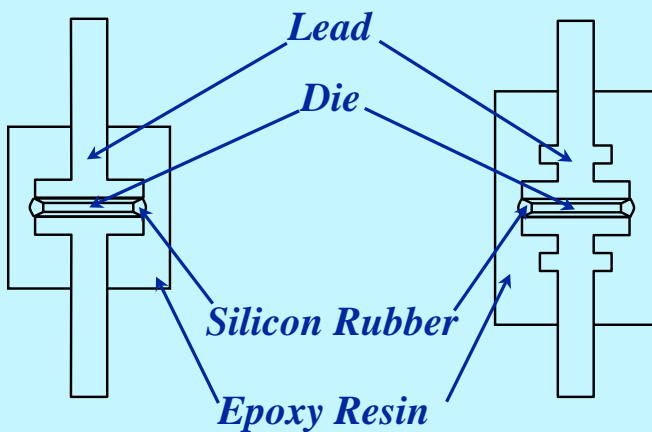
DAM1SA

DAM1A

DAM3A

DAM3B

ZSA5A27



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Structure of Surface Mount Diode

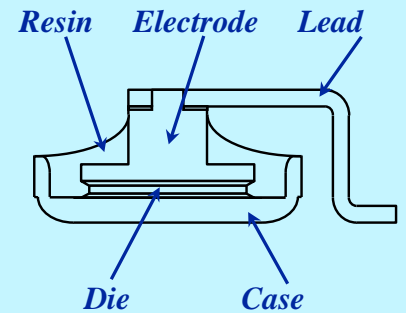
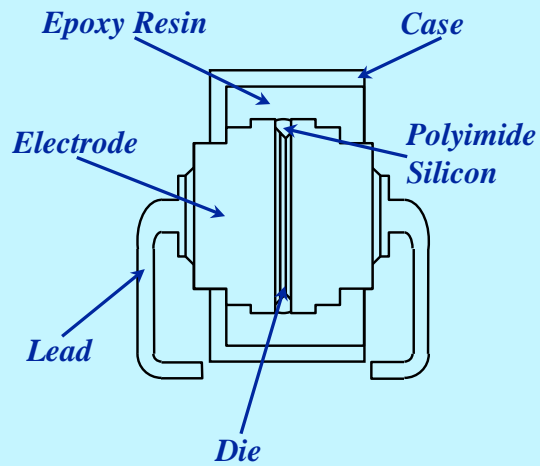
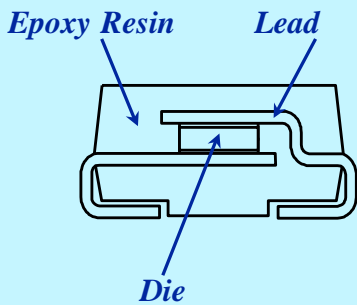
DAM1MA

DAM3MA

ZSH5MA27

ZSH5MB27

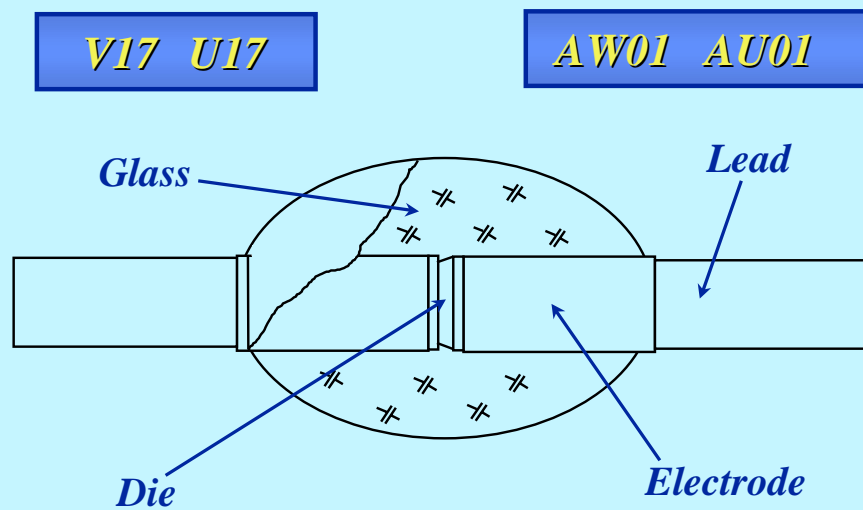
ZSA5MA27



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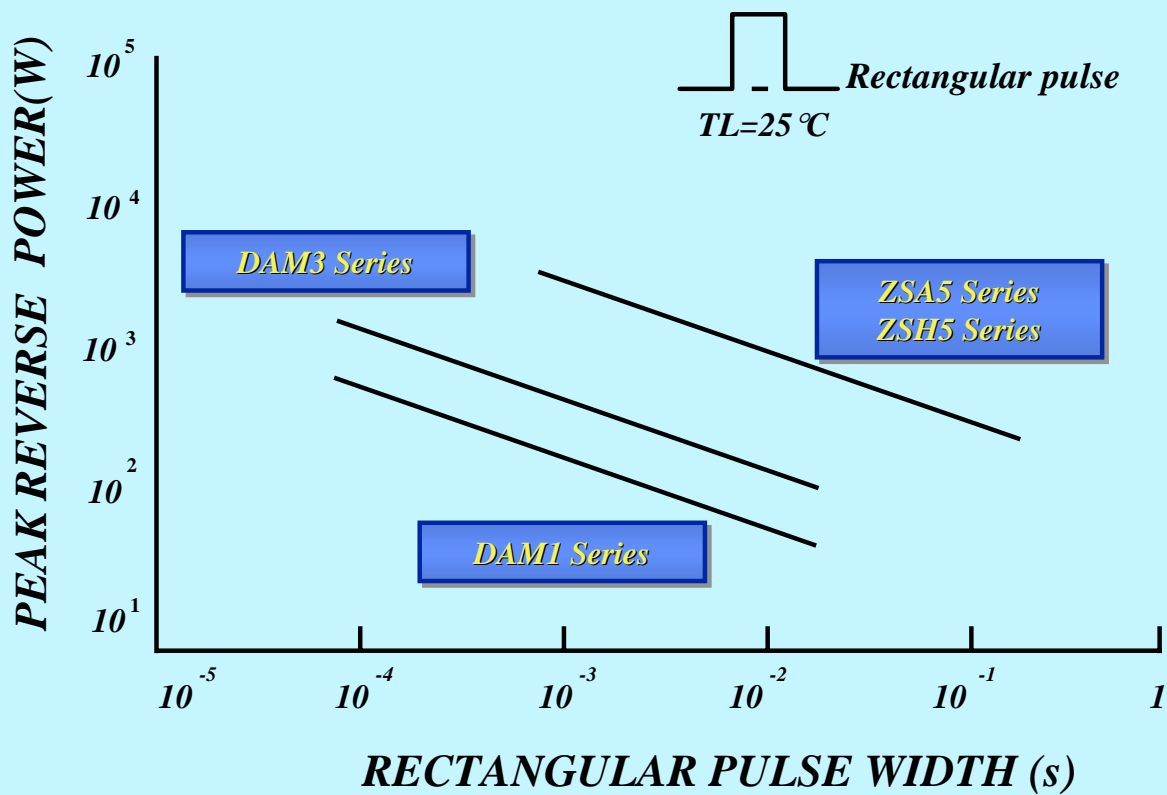
Structure of Axial Lead Type Glass Diode



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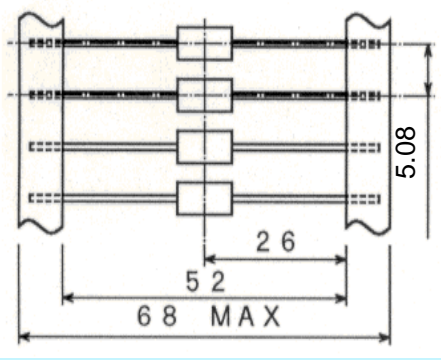
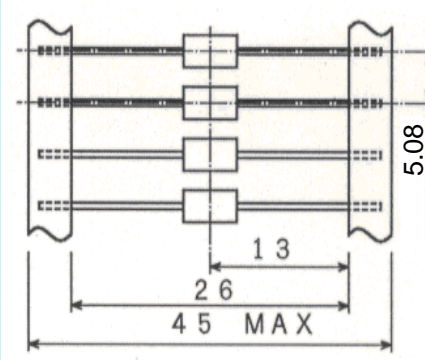
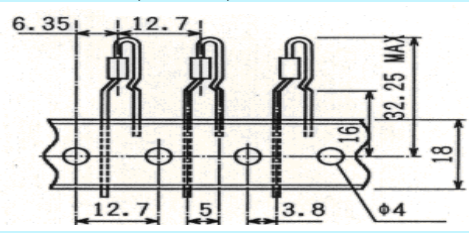
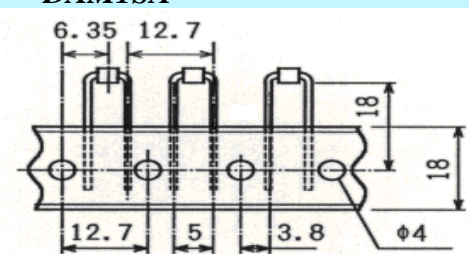
Reverse Power Characteristics



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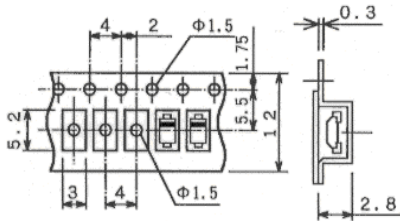
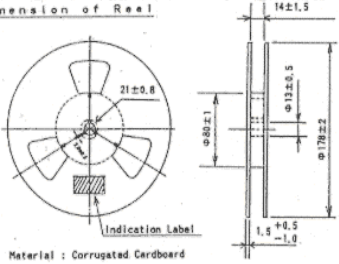
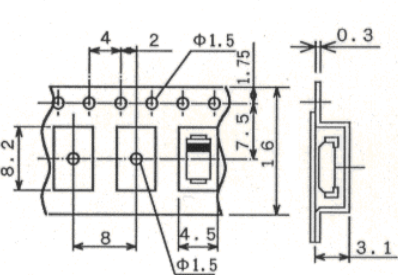
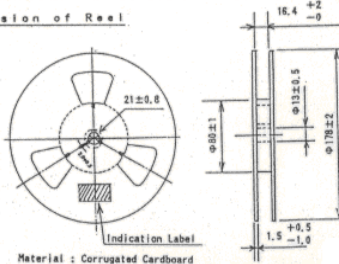
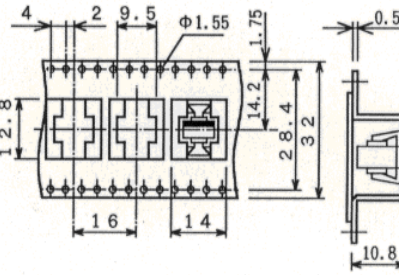
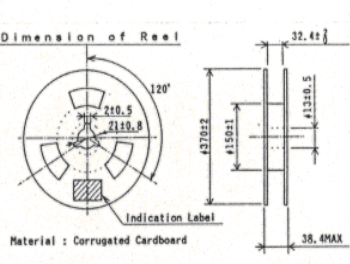
Dimension of Carrier Taping - Axial Lead Type -

<i>Type1</i>	<i>Type2</i>	<i>Type3</i>
<p style="text-align: center;">52mm Taping</p> <p><i>DAMISA,DAM1A,DAM3B</i> <i>AW01,AU01</i> <i>V17,U17</i></p> 	<p style="text-align: center;">26mm Taping</p> <p><i>DAMISA,DAM1A,DAM3B</i> <i>AW01</i> <i>V17</i></p> 	<p style="text-align: center;"><i>DAM1A,AW01,V17</i></p>  <p style="text-align: center;">Type4</p> <p style="text-align: center;"><i>DAMISA</i></p> 

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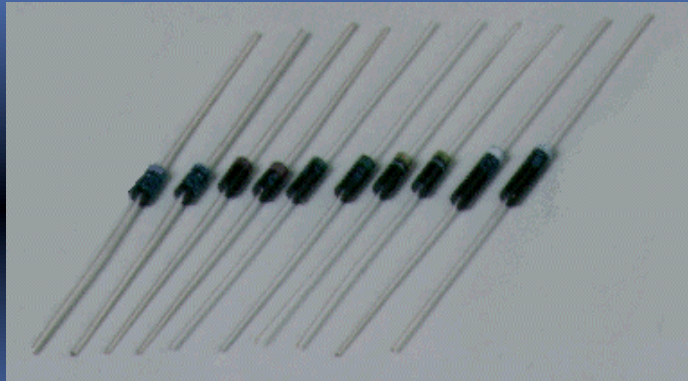
Dimension of Carrier Taping - Surface Mounting Type -

<i>DAM1MA</i>	<i>DAM3MA</i>	<i>ZSA5MA27</i>
 <p style="text-align: center; margin-top: 10px;">Dimension of Reel</p>  <p style="text-align: center; margin-top: 5px;">Material : Corrugated Cardboard</p>	 <p style="text-align: center; margin-top: 10px;">Dimension of Reel</p>  <p style="text-align: center; margin-top: 5px;">Material : Corrugated Cardboard</p>	 <p style="text-align: center; margin-top: 10px;">Dimension of Reel</p>  <p style="text-align: center; margin-top: 5px;">Material : Corrugated Cardboard</p>
<i>1500pcs/reel</i>	<i>800pcs/reel</i>	<i>500pcs/reel</i>

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High Voltage Fast Recovery Diodes



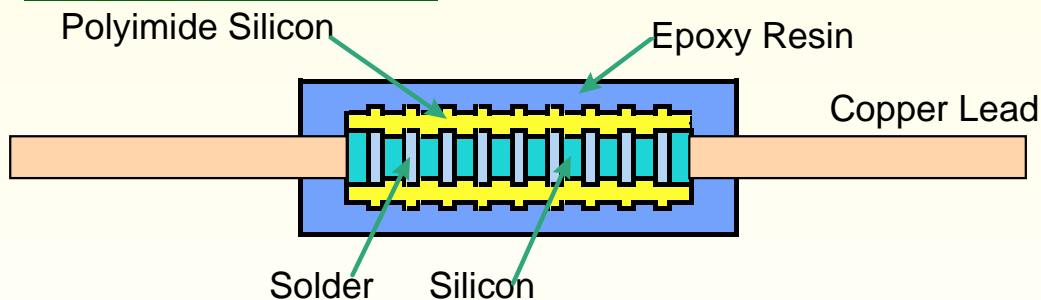
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Features of HITACHI HIGH VOLTAGE DIODE

- For high resolution displays and TV receivers
- Diffused-junction and resin molded construction
- Reverse voltage 2kV to 16kV
- Operating frequency 15.75kHz to 100kHz
- Excellent high temperature output characteristics
(Small leakage current at high temperature
and excellent reverse characteristics)

Structure



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High Voltage Diode

HITACHI HV Diode LINE UP

VRRM f	2kV	3kV	4kV	6kV	8kV	12kV	14kV	16kV
15.75kHz	DHM3K20 DHM3S20	DHM3E30	DHM3P40 DHM3T30	—	DHM3G80	DHM3J120	DHM3C140	DHM3D160
63kHz				DHM3FJ60	DHM3FG80 DHM3FL80			
82kHz					DHM3HA80 DHM3HC80 DHM3HD80	DHM3HB120 DHM3HE120		
100kHz					DHM3UA80 * DHM3UE80 * DHM3UM80	DHM3UB120		

* Sample Available

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High Voltage Diode

Spec. comparison table

Items \ Type	DHM3G80	DHM3FG80	DHM3HA80	DHM3UE80
VRRM	8kV	8kV	8kV	8kV
IF(AV)	3mA	1mA	1mA	1mA
IFSM	0.5A	0.5A	0.5A	0.5A
VFM	25V	28V	32V	23V
IRRM	2uA	2uA	2uA	2uA
trr	100ns	70ns	50ns	40ns
OUTLINE				

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High Voltage Diode