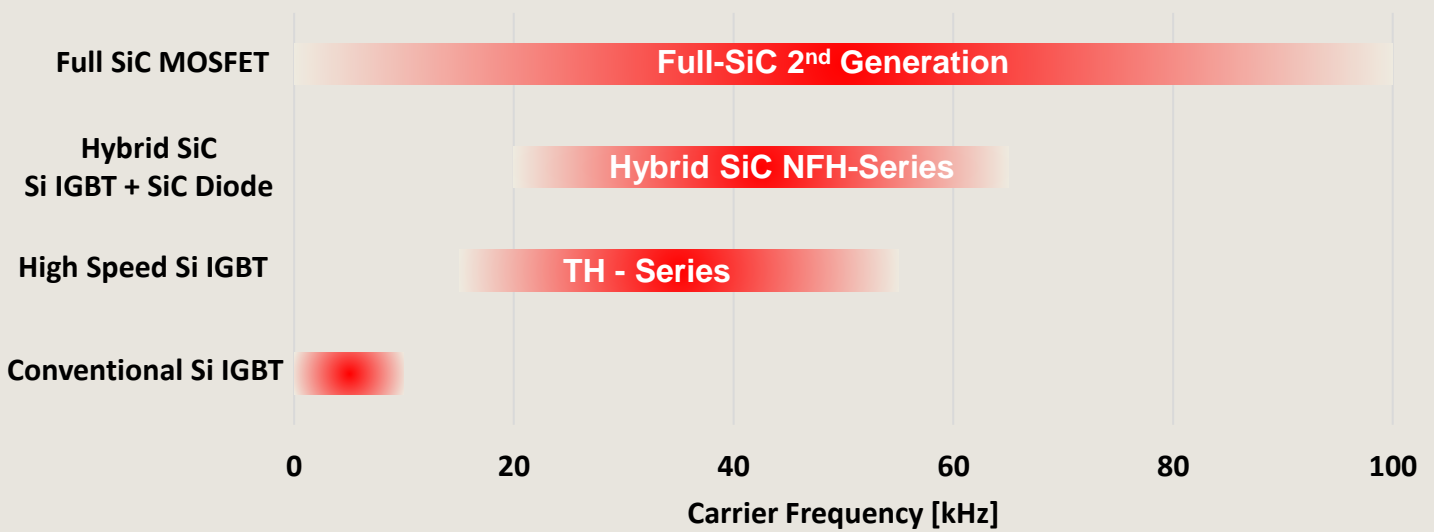


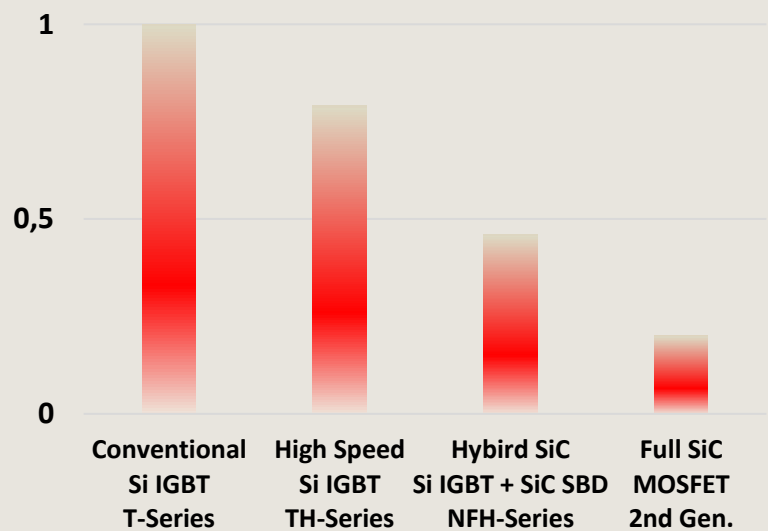
## Power Modules for High Frequency Applications

Applications like battery chargers, welding, medical, or industrial power supplies operating at higher switching frequency in the range of several tens of kHz require power modules with optimized fast switching semiconductors and package layouts. Mitsubishi Electric is offering various products based on Si IGBT and SiC Technologies.

### Technology Frequency Map



### Power Loss Ratio @ $f_c=30\text{kHz}$



Industrial



Medical

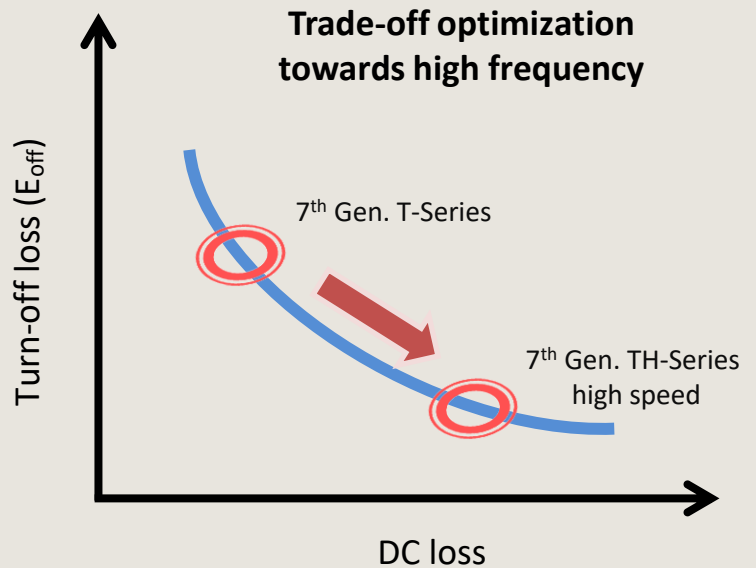


Charging

## 7th Gen. high speed TH-Series IGBT Modules




### Features

- ❑ Latest 7<sup>th</sup> Gen. CSTBT™ IGBT and RFC-Diode technologies
- ❑ Half bridge Configuration
- ❑ Compatible pkg 48mm, 62mm and 80mm
- ❑ Low power loss at high switching frequency operation (fc: 20~60kHz)
- ❑ Optimized for trade-off of IGBT and Diode
- ❑ Low thermal resistance and high-power density by AlN ceramic substrate
- ❑ Low inductive package with 4kV insulation
- ❑ High temperature operation with  $T_{vjmax} = 175^{\circ}\text{C}$  junction temperature at overload events



The TH-Series IGBT is equipped with the latest 7<sup>th</sup> Generation CSTBT™ IGBT and RFC-Diode technology. The chip characteristics has been optimized for the needs of high frequency operation. For instance, comparing the 200A high speed TH-Series with 200A normal speed T-Series device, the turn-off switching energy ( $E_{off}$ ) has been reduced by 56%. As result, a highly efficient operation at high frequency has been achieved.

### Line-up TH-Series 2-in-1 High Speed IGBT Modules

Package	$V_{CES}$ [V]	$I_C$ [A]		
		200	400	600
 48 x 94 mm <sup>2</sup>	1200V	CM200DY-24TH		
 62 x 108 mm <sup>2</sup>		CM400DY-24TH		
 80 x 110 mm <sup>2</sup>		CM400DU-24TH	CM600DU-24TH	



Industrial



Medical



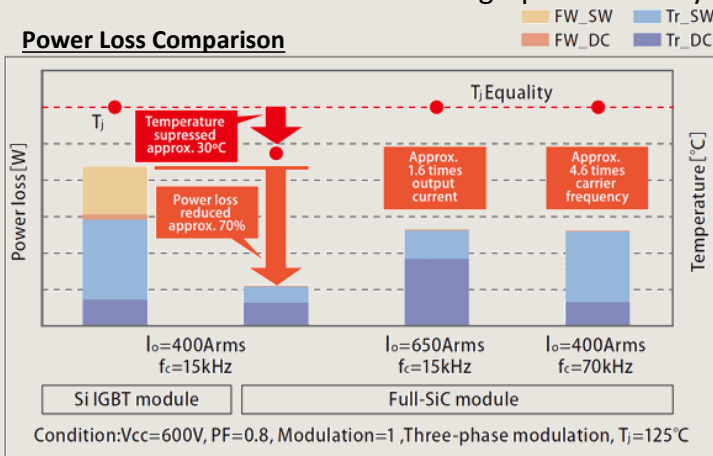
Charging

## 2<sup>nd</sup> Gen. Full SiC MOSFET Modules

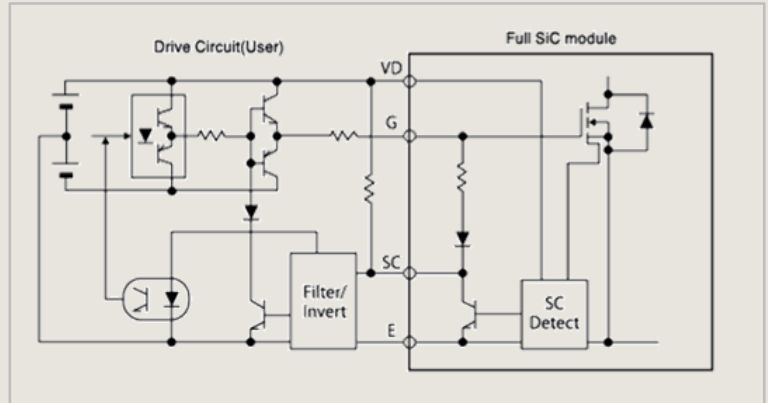
### Features

- ❑ Low inductance packages adopted to deliver full SiC performance
- ❑ Safe operation also in short circuit condition by RTC (Real Time current Control)
- ❑ Low power loss by 2<sup>nd</sup> Generation SiC
- ❑ Wide range of switching frequency operation ( $f_c$ : 0~100 kHz)
- ❑ Low thermal resistance and high-power density by AlN ceramic substrate








### Power Loss Comparison



### RTC SC-Protection Diagram



### Line-up 2<sup>nd</sup> Gen. Full SiC MOSFET Modules

Package	Model	$V_{DSX}$ [V]	$I_D$ [A]	Circuit	SC protection
 121.7 x 92.3 mm <sup>2</sup>	FMF600DXE-24BN	1200	600	2-in-1	-
	FMF600DXE-34BN	1700			
 121.7 x 92.3 mm <sup>2</sup>	FMF400BX-24B	1200V	400	4-in-1	-
	FMF800DX-24B		800	2-in-1	sense source for external protection
 62 x 108 mm <sup>2</sup>	FMF400DY-24B	1200V	400	2-in-1	-
 122 x 79.6 mm <sup>2</sup>	FMF300BXZ-24B	1200V	300	4-in-1	RTC
	FMF400BXZ-24B		400		
 122 x 79.6 mm <sup>2</sup>	FMF600DXZ-24B	1700	600	2-in-1	RTC
	FMF800DXZ-24B		800		
	FMF300DXZ-34B		300		
 122 x 79.6 mm <sup>2</sup>	FMF300E3XZ-34B	1700	300	Chopper	RTC
 122 x 152 mm <sup>2</sup>	FMF1200DXZ-24B	1200	1200	2-in-1	RTC



Industrial



Medical

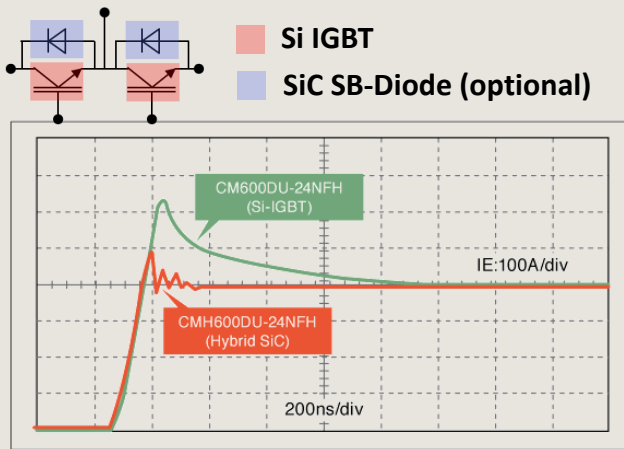


Charging




## NFH-Series High speed IGBT with optional SiC Diode

### Features

- ❑ High Speed IGBT combined with SiC SB-Diode for recovery loss elimination
- ❑ Comprehensive Line-up 1200V , 100A ~ 600A half bridge configuration
- ❑ Low power loss at high switching frequency operation ( $f_c$ : 20~60 kHz)
- ❑ Optimized for trade-off of IGBT and Diode
- ❑ Low thermal resistance and high power density by AlN ceramic substrate



### Line-up 2-in-1 NFH-series High Speed Hybrid Modules

Package	$V_{CES}$ [V]	$I_c$ [A]					
		100	150	200	300	400	600
	1200	CMH100DY-24NFH	CMH150DY-24NFH				
				CMH200DU-24NFH	CMH300DU-24NFH		
						CMH400DU-24NFH	CMH600DU-24NFH

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Industrial



Medical



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