

1MBI1600VR-170E

IGBT Modules

IGBT MODULE (V series) 1700V / 1600A / 1 in one package

■ Features

- High speed switching
- Voltage drive
- Low Inductance module structure

■ Applications

- Inverter for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply
- Industrial machines, such as Welding machines



■ Maximum Ratings and Characteristics

● Absolute Maximum Ratings (at Tc=25°C unless otherwise specified)

Items	Symbols	Conditions	Maximum ratings	Units
Collector-Emitter voltage	V_{CES}		1700	V
Gate-Emitter voltage	V_{GES}		±20	V
Collector current	I_c	Continuous	Tc=25°C 2400	A
	I_{cp}	1ms	Tc=100°C 1600	
	$-I_c$		3200	
	$-I_{cp}$	1ms	1600	
Collector power dissipation	P_c	1 device	3200	W
Junction temperature	T_j		10710	°C
Operating junction temperature (under switching conditions)	T_{jop}		175	
Storage temperature	T_{slg}		150	
Isolation voltage	Between terminal and copper base (*1) V_{iso}	AC : 1min.	-40 ~ +125	VAC
Screw torque (*2)	Mounting	M6	4000	Nm
	Main Terminals	M8	5.75	
	Sense Terminals	M4	10	
			2.5	

Note *1: All terminals should be connected together when isolation test will be done.

Note *2: Recommendable Value :

Mounting 4.25~5.75 Nm (M6) , Main Terminals 8~10 Nm (M8) , Sense Terminals 1.7~2.5 Nm (M4)

● Electrical characteristics (at T_j = 25°C unless otherwise specified)

Items	Symbols	Conditions		Characteristics			Units
				min.	typ.	max.	
Zero gate voltage collector current	I _{CES}	V _{GE} = 0V, V _{CE} = 1700V		-	-	1.0	mA
Gate-Emitter leakage current	I _{GES}	V _{CE} = 0V, V _{GE} =±20V		-	-	3200	nA
Gate-Emitter threshold voltage	V _{GE(th)}	V _{CE} = 20V, I _c = 1600mA		6.0	6.5	7.0	V
Collector-Emitter saturation voltage	V _{CE(sat)} (main terminal)	V _{GE} =15V I _c = 1600A	T _J =25°C	-	2.21	2.49	V
			T _J =125°C	-	2.61	-	
			T _J =150°C	-	2.66	-	
	V _{CE(sat)} (chip)		T _J =25°C	-	2.00	2.25	
			T _J =125°C	-	2.40	-	
			T _J =150°C	-	2.45	-	
Internal gate resistance	Int R _g			-	1.09	-	Ω
Input capacitance	C _{ies}	V _{CE} =10V, V _{GE} =0V, f=1MHz		-	158	-	nF
Turn-on	t _{on}	V _{CC} = 900V, I _c =1600A L _m = 56nH, V _{GE} =±15V, T _J =125°C		-	1.83	-	μs
	t _r			-	0.56	-	
Turn-off	t _{off}	R _{gon} = 0.6 Ω R _{goff} = 0.6 Ω		-	2.17	-	
	t _f			-	0.40	-	
Forward on voltage	V _F (main terminal)	V _{GE} =0V I _F = 1600A	T _J =25°C	-	1.87	2.22	V
			T _J =125°C	-	2.03	-	
			T _J =150°C	-	2.00	-	
	V _F (chip)		T _J =25°C	-	1.66	1.98	
			T _J =125°C	-	1.82	-	
			T _J =150°C	-	1.79	-	
Reverse recovery	t _{rr}	I _F = 1600A, T _J =125°C		-	0.48	-	μs
Lead resistance, terminal-chip	R lead			-	0.134	-	mΩ

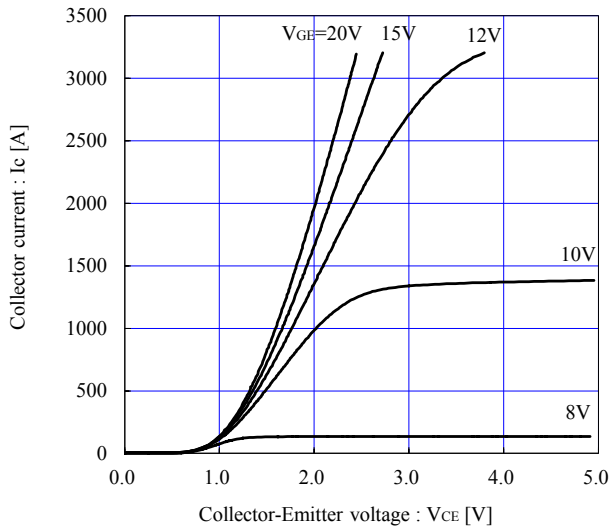
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R _{th(j-c)}	IGBT	-	-	0.014	°C/W
		FWD	-	-	0.019	
Contact thermal resistance (*3)	R _{th(c-f)}	with Thermal Compound	-	0.0077	-	

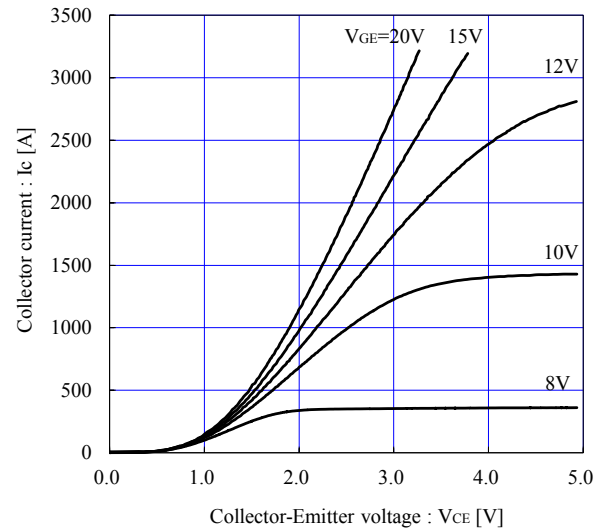
Note *3: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

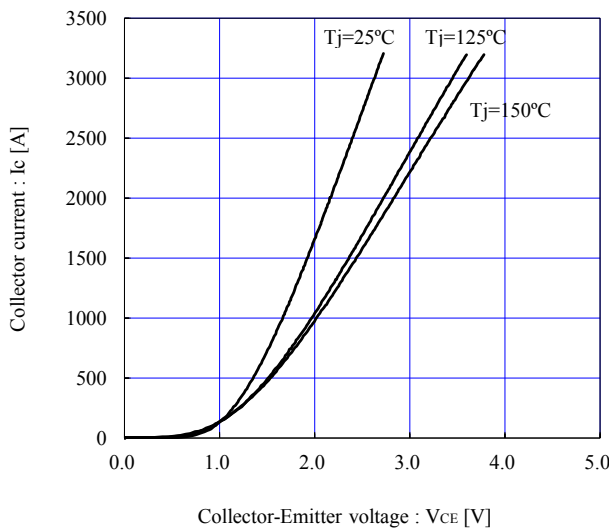
Collector current vs. Collector-Emmitter voltage (typ.)

 $T_j = 25^\circ\text{C}$, chip

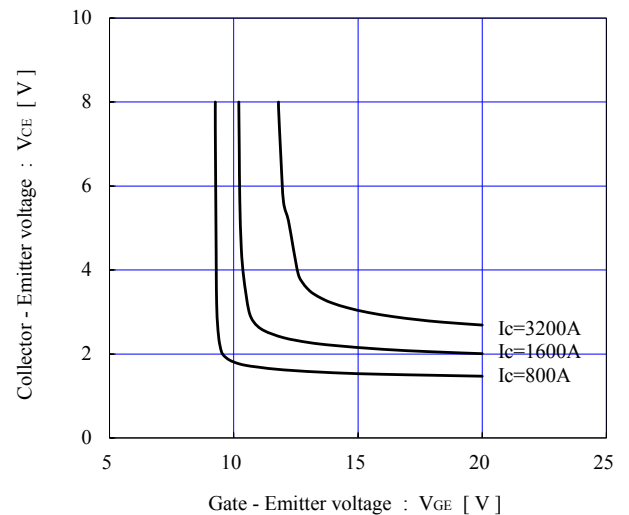
Collector current vs. Collector-Emmitter voltage (typ.)

 $T_j = 150^\circ\text{C}$, chip

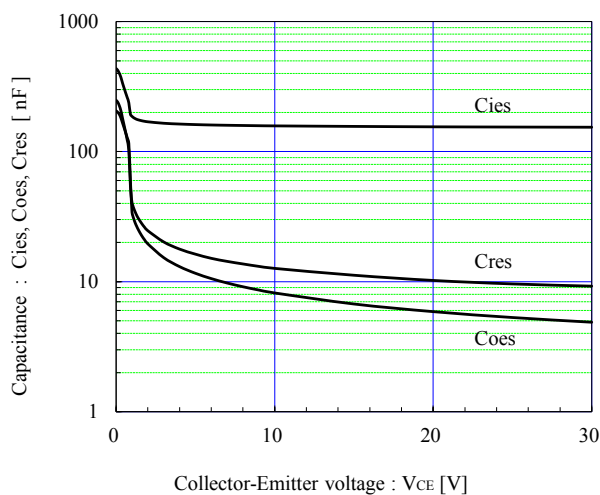
Collector current vs. Collector-Emmitter voltage (typ.)

 $V_{GE} = +15\text{V}$, chip

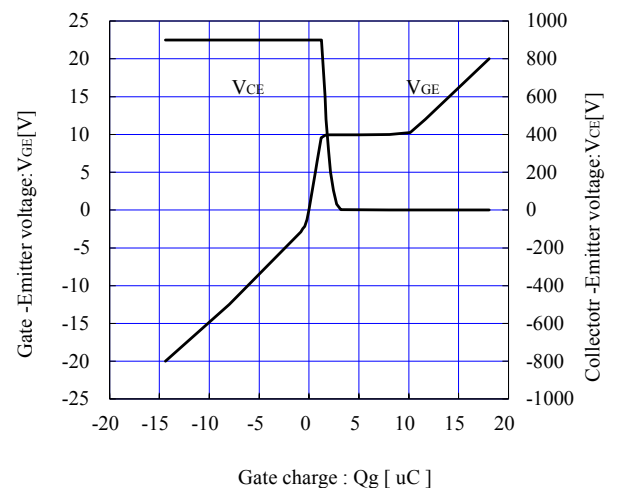
Collector-Emmitter voltage vs. Gate-Emmitter voltage (typ.)

 $T_j = 25^\circ\text{C}$, chip

Capacitance vs. Collector-Emmitter voltage (typ.)

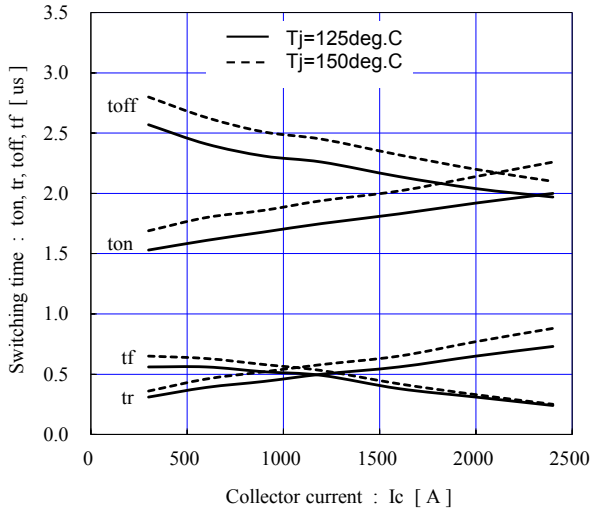
 $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$, $T_j = 25^\circ\text{C}$ 

Dynamic Gate charge (typ.)

 $T_j = 25^\circ\text{C}$ 

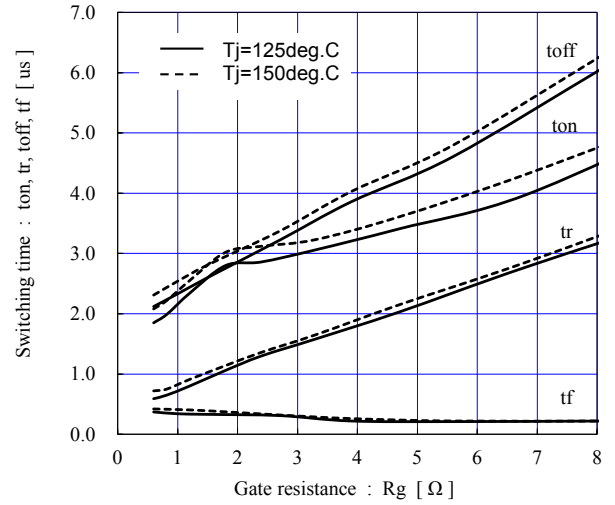
Switching time vs. Collector current (typ.)

$V_{cc}=900V$, $V_{GE}=\pm 15V$, $R_{gon}=0.6\Omega$, $R_{goff}=0.6\Omega$



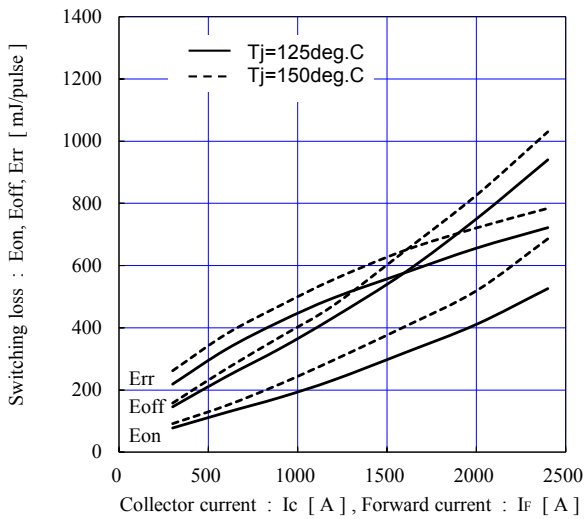
Switching time vs. Gate resistance (typ.)

$V_{cc}=900V$, $I_c=1600A$, $V_{GE}=\pm 15V$



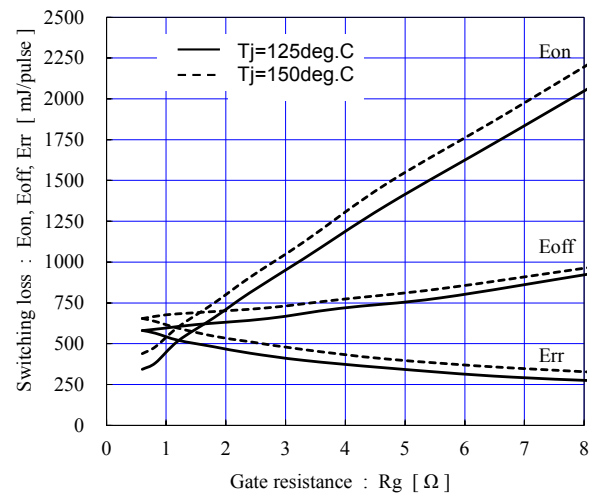
Switching loss vs. Collector current (typ.)

$V_{cc}=900V$, $V_{GE}=\pm 15V$, $R_{gon}=0.6\Omega$, $R_{goff}=0.6\Omega$



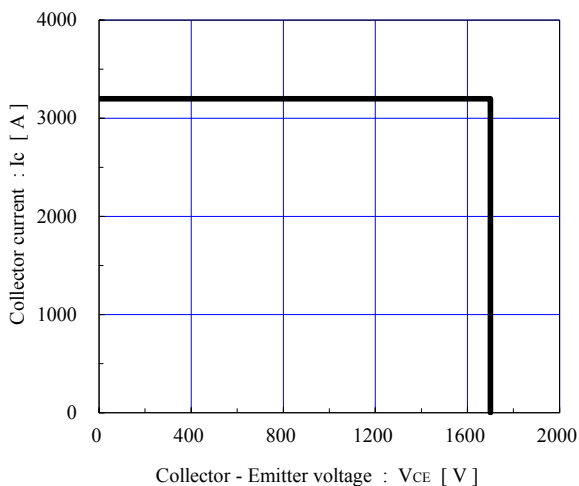
Switching loss vs. Gate resistance (typ.)

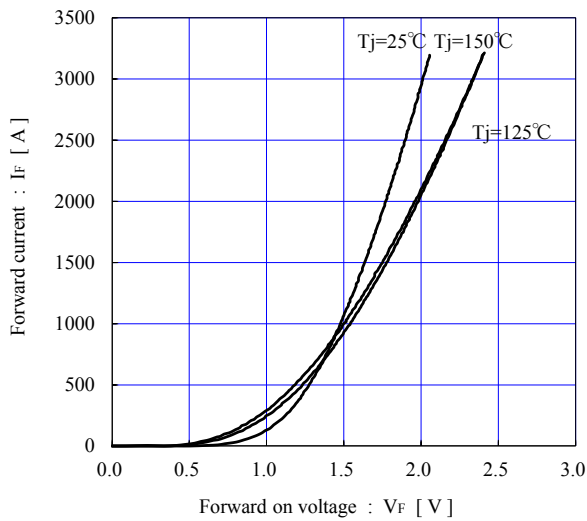
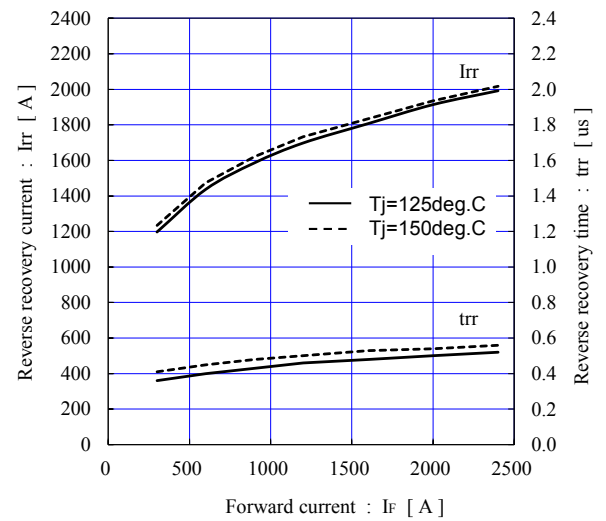
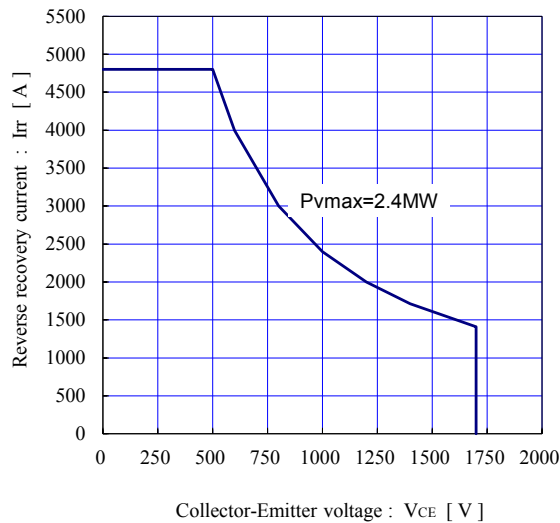
$V_{cc}=900V$, $I_c=1600A$, $V_{GE}=\pm 15V$



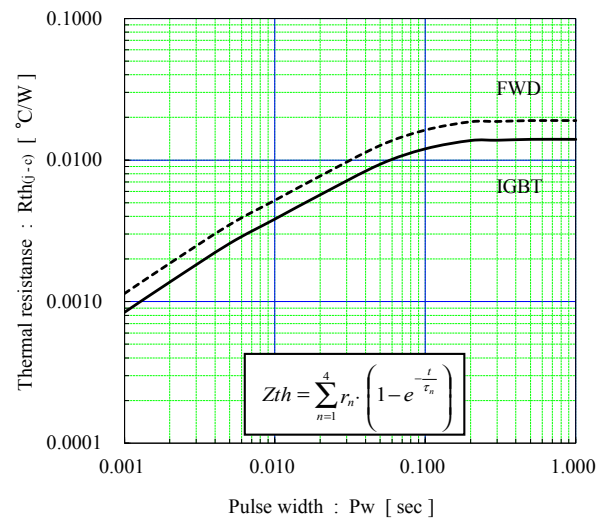
Reverse bias safe operating area (max.)

$\pm V_{GE}=15V$, $T_j=150^\circ C$ / chip



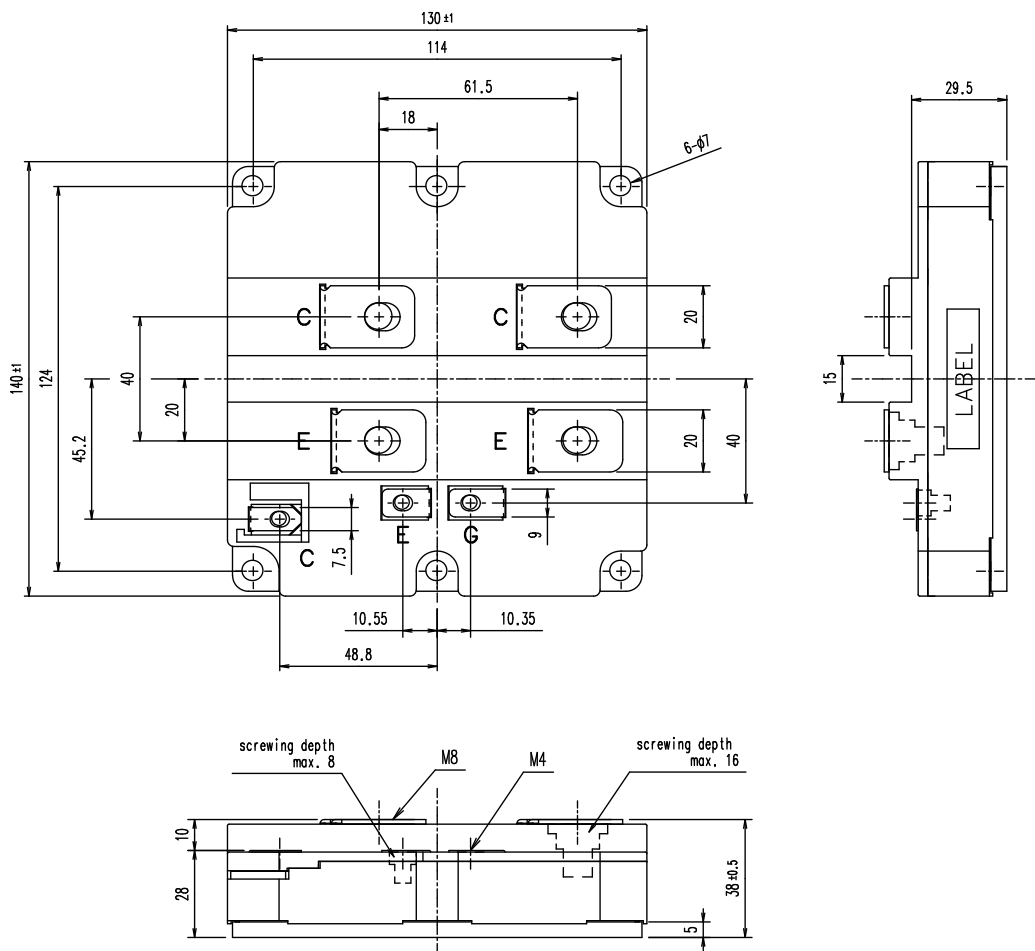
Forward current vs. Forward on voltage (typ.)
chipReverse recovery characteristics (typ.)
 $V_{CC}=900V$, $V_{GE}=\pm 15V$, $R_{gon}=0.6\Omega$ FWD safe operating area (max.)
 $T_J=150^\circ C$ / sence terminals

Transient thermal resistance (max.)

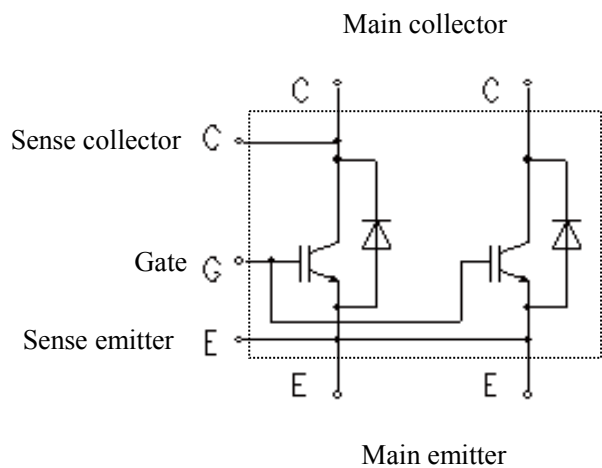


	IGBT	FWD
r1	0.00157	0.00211
r2	0.00541	0.00734
r3	0.00387	0.00525
r4	0.00315	0.00430
τ_1	0.0024	0.0024
τ_2	0.0357	0.0355
τ_3	0.0632	0.0638
τ_4	0.0739	0.0733

Outline Drawings, mm



Equivalent Circuit Schematic



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