

# 1MBI2400VS-170E

**IGBT Modules**

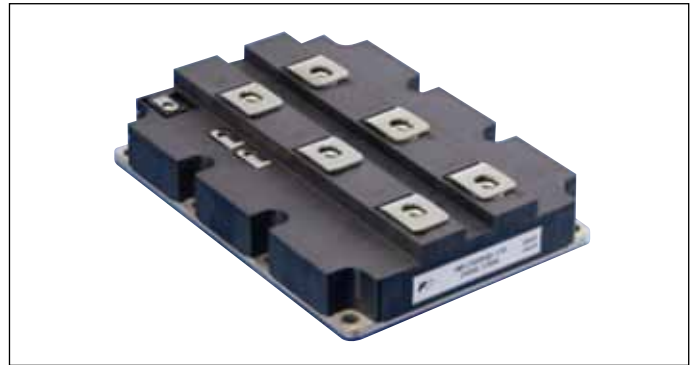
## IGBT MODULE (V series) 1700V / 2400A / 1 in one package

### ■ 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	3600	A
			Tc=100°C	2400	
	$I_{cp}$	1ms	4800		
	$-I_c$		2400		
	$-I_c$ pulse	1ms	4800		
Collector power dissipation	$P_c$	1 device	16120	W	
Junction temperature	$T_j$		175	°C	
Operating junction temperature (under switching conditions)	$T_{jop}$		150		
Storage temperature	$T_{stg}$		-40 ~ +125		
Isolation voltage	Between terminal and copper base (*1) $V_{iso}$	AC : 1min.	4000	VAC	
Screw torque (*2)	Mounting	M6	5.75	Nm	
	Main Terminals	M8	10		
	Sense Terminals	M4	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 Tj= 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	$I_{GES}$	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	4800	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V, I_c = 2400mA$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (main terminal)	$V_{GE} = 15V$ $I_c = 2400A$	$T_j = 25^\circ C$	-	2.21	2.49	V
			$T_j = 125^\circ C$	-	2.61	-	
			$T_j = 150^\circ C$	-	2.66	-	
	$V_{CE(sat)}$ (chip)		$T_j = 25^\circ C$	-	2.00	2.25	
			$T_j = 125^\circ C$	-	2.40	-	
			$T_j = 150^\circ C$	-	2.45	-	
Internal gate resistance	Int Rg		-	0.73	-	$\Omega$	
Input capacitance	$C_{ies}$	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	-	238	-	nF	
Turn-on	$t_{on}$	$V_{CC} = 900V, I_c = 2400A$	-	2.09	-	$\mu s$	
	$t_r$	$L_m = 46nH, V_{GE} = \pm 15V, T_j = 125^\circ C$	-	0.63	-		
Turn-off	$t_{off}$	$R_{gon} = 0.68 \Omega$	-	2.22	-		
	$t_f$	$R_{goff} = 0.39 \Omega$	-	0.43	-		
Forward on voltage	$V_F$ (main terminal)	$V_{GE} = 0V$ $I_F = 2400A$	$T_j = 25^\circ C$	-	1.87	2.22	V
			$T_j = 125^\circ C$	-	2.03	-	
			$T_j = 150^\circ C$	-	2.00	-	
	$V_F$ (chip)		$T_j = 25^\circ C$	-	1.66	1.98	
			$T_j = 125^\circ C$	-	1.82	-	
			$T_j = 150^\circ C$	-	1.79	-	
Reverse recovery	$t_{rr}$	$I_F = 2400A, T_j = 125^\circ C$	-	0.60	-	$\mu s$	
Lead resistance, terminal-chip	R lead		-	0.089	-	m $\Omega$	

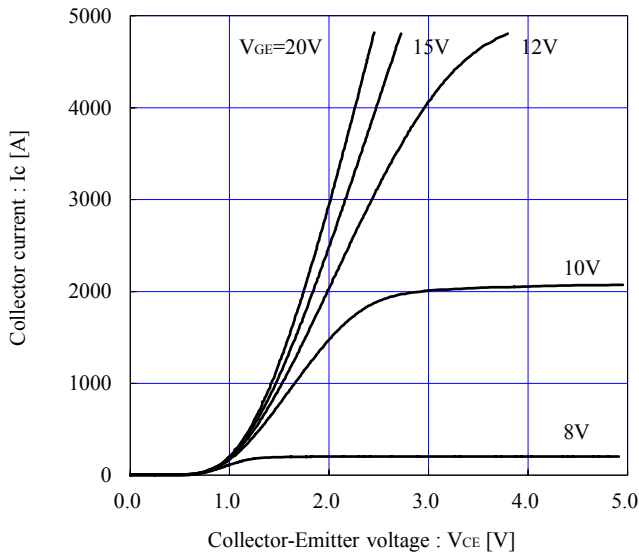
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance	$R_{th(j-c)}$	IGBT	-	-	0.0093	$^\circ C/W$
		FWD	-	-	0.0125	
Contact thermal resistance (*3)	$R_{th(c-f)}$	with Thermal Compound	-	0.005	-	

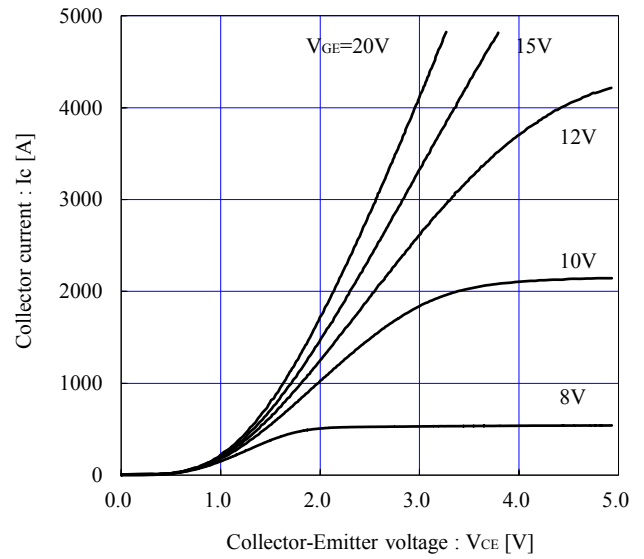
Note \*3: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

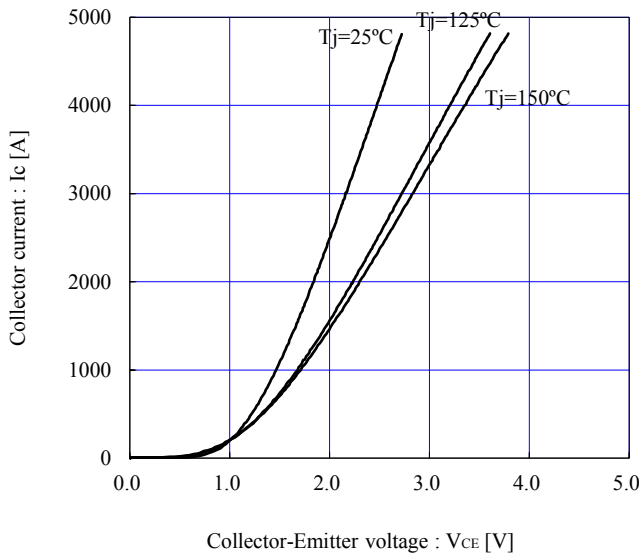
Collector current vs. Collector-Emmitter voltage (typ.)  
T<sub>j</sub>=25°C, chip



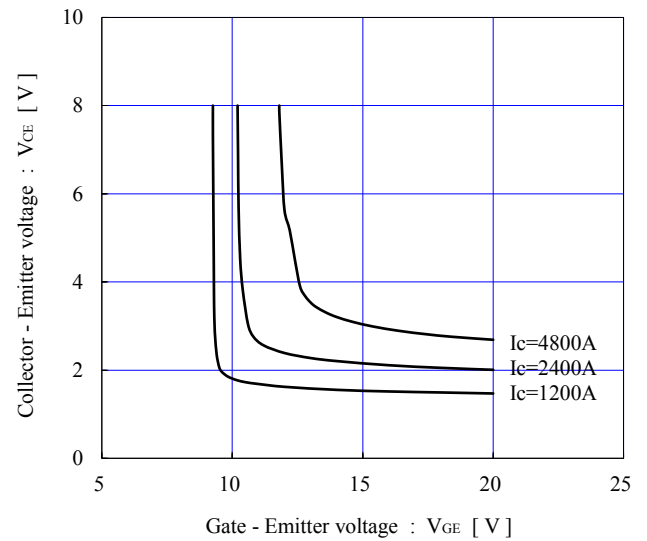
Collector current vs. Collector-Emmitter voltage (typ.)  
T<sub>j</sub>= 150°C, chip



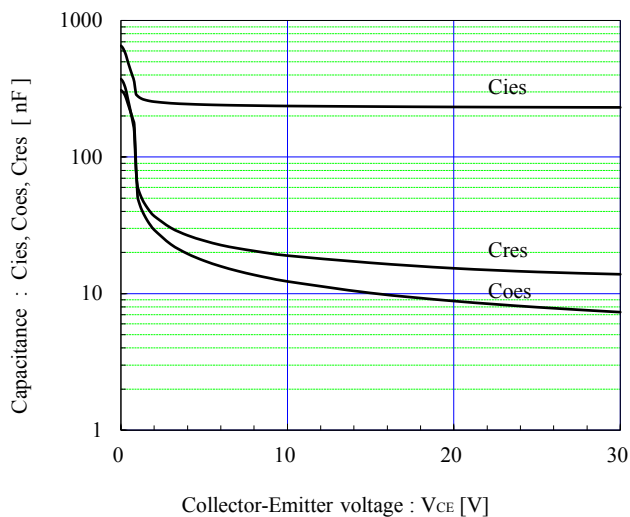
Collector current vs. Collector-Emmitter voltage (typ.)  
V<sub>GE</sub>=+15V, chip



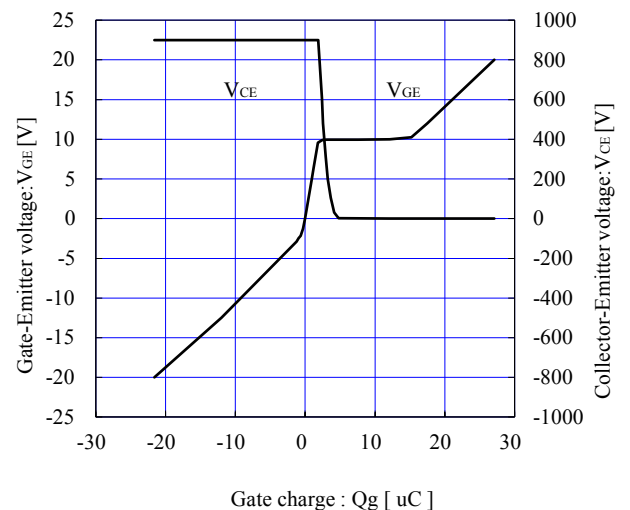
Collector-Emmitter voltage vs. Gate-Emmitter voltage (typ.)  
T<sub>j</sub>=25°C, chip



Capacitance vs. Collector-Emmitter voltage (typ.)  
V<sub>GE</sub>=0V, f= 1MHz, T<sub>j</sub>= 25°C

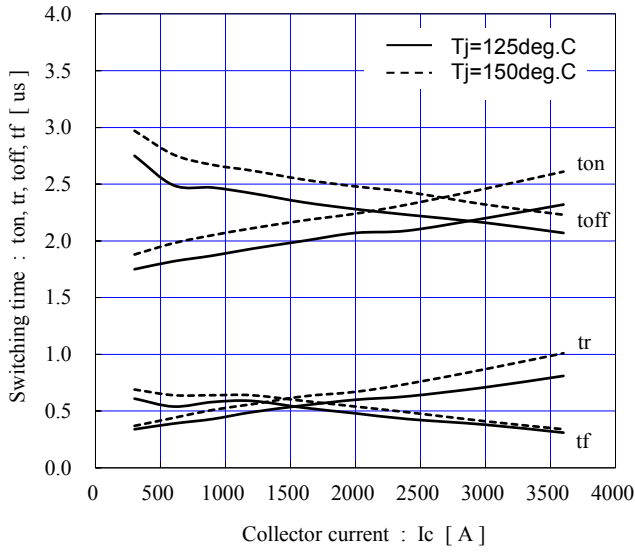


Dynamic Gate charge (typ.)  
T<sub>j</sub>= 25°C



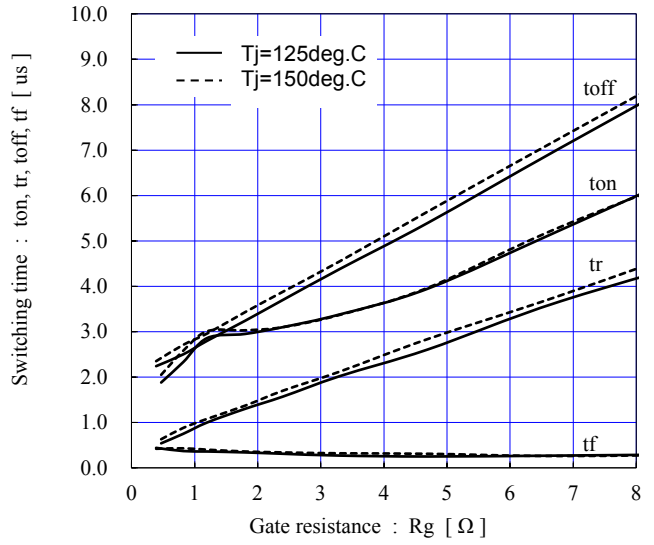
Switching time vs. Collector current (typ.)

$V_{cc}=900V, V_{GE}=\pm 15V, R_{gon}=0.68\Omega, R_{goff}=0.39\Omega$



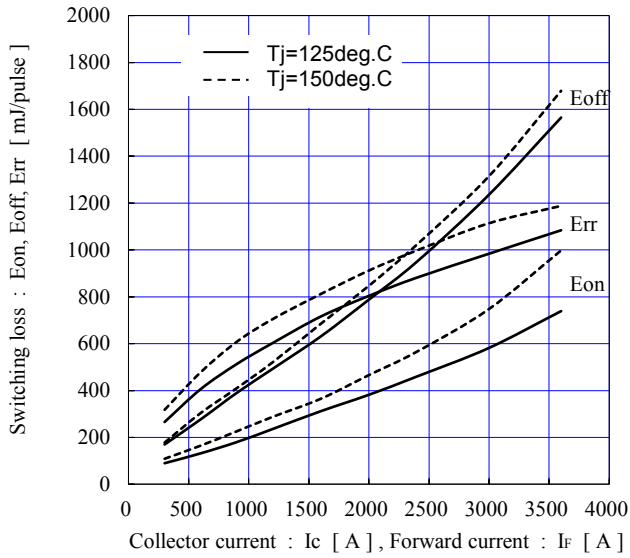
Switching time vs. Gate resistance (typ.)

$V_{cc}=900V, I_c=2400A, V_{GE}=\pm 15V$



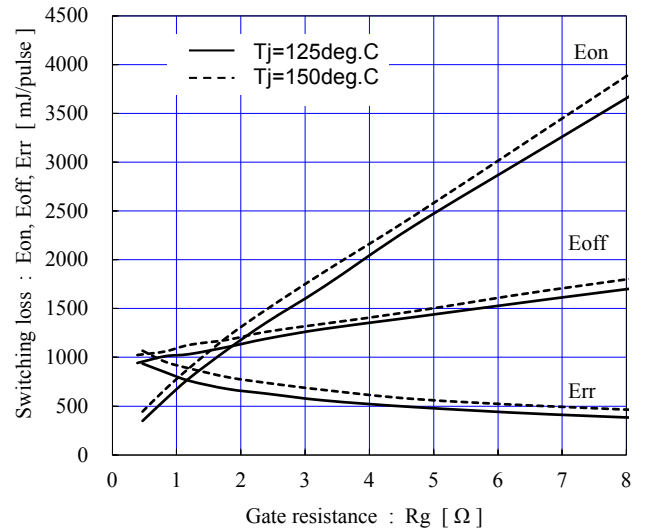
Switching loss vs. Collector current (typ.)

$V_{cc}=900V, V_{GE}=\pm 15V, R_{gon}=0.68\Omega, R_{goff}=0.39\Omega$



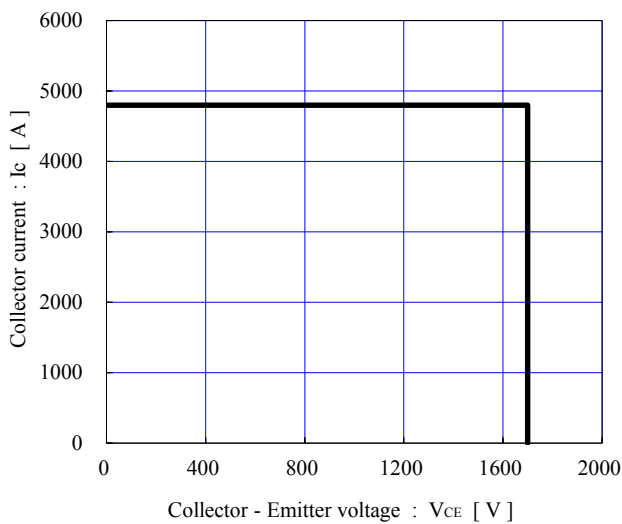
Switching loss vs. Gate resistance (typ.)

$V_{cc}=900V, I_c=2400A, V_{GE}=\pm 15V$

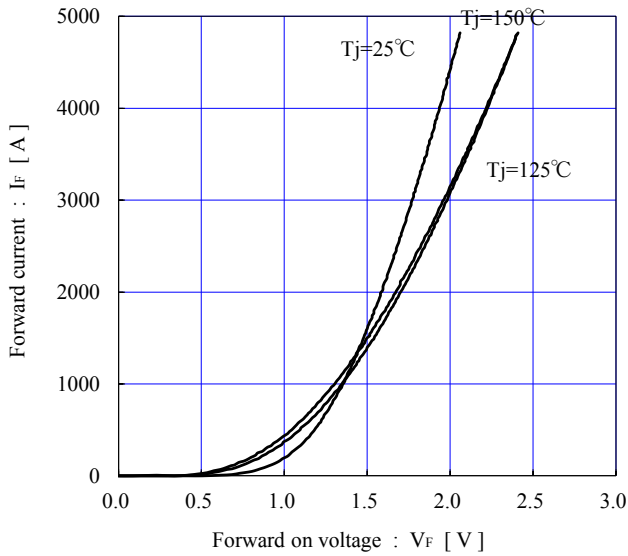


Reverse bias safe operating area (max.)

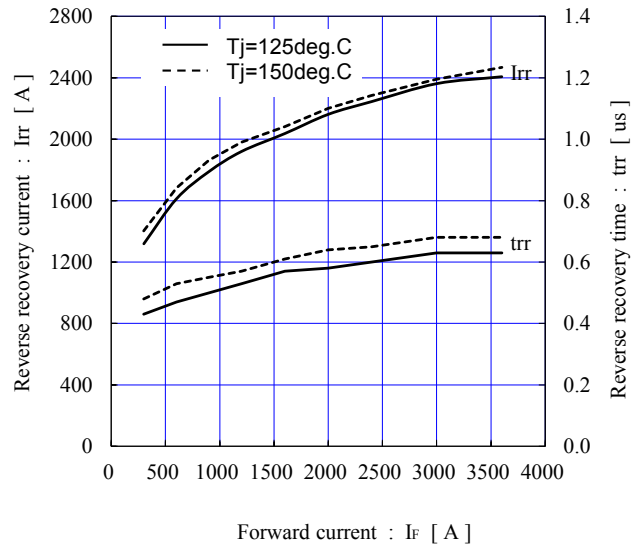
$\pm V_{GE}=15V, T_j = 150^\circ C$  / chip



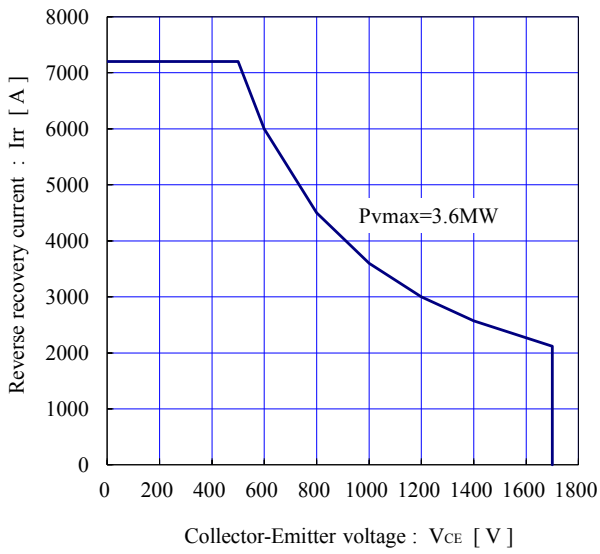
Forward current vs. Forward on voltage (typ.)  
chip



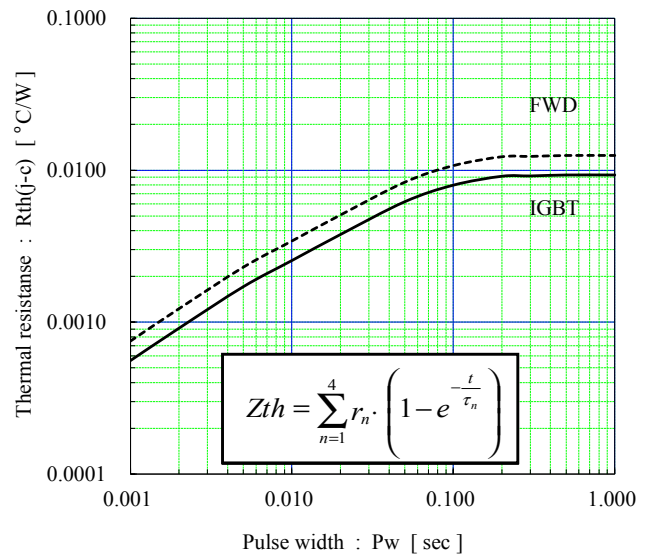
Reverse recovery characteristics (typ.)  
V<sub>cc</sub>=900V, V<sub>GE</sub>=±15V, R<sub>gon</sub>=0.68Ω



FWD safe operating area (max.)  
T<sub>j</sub>=150°C / sence terminals

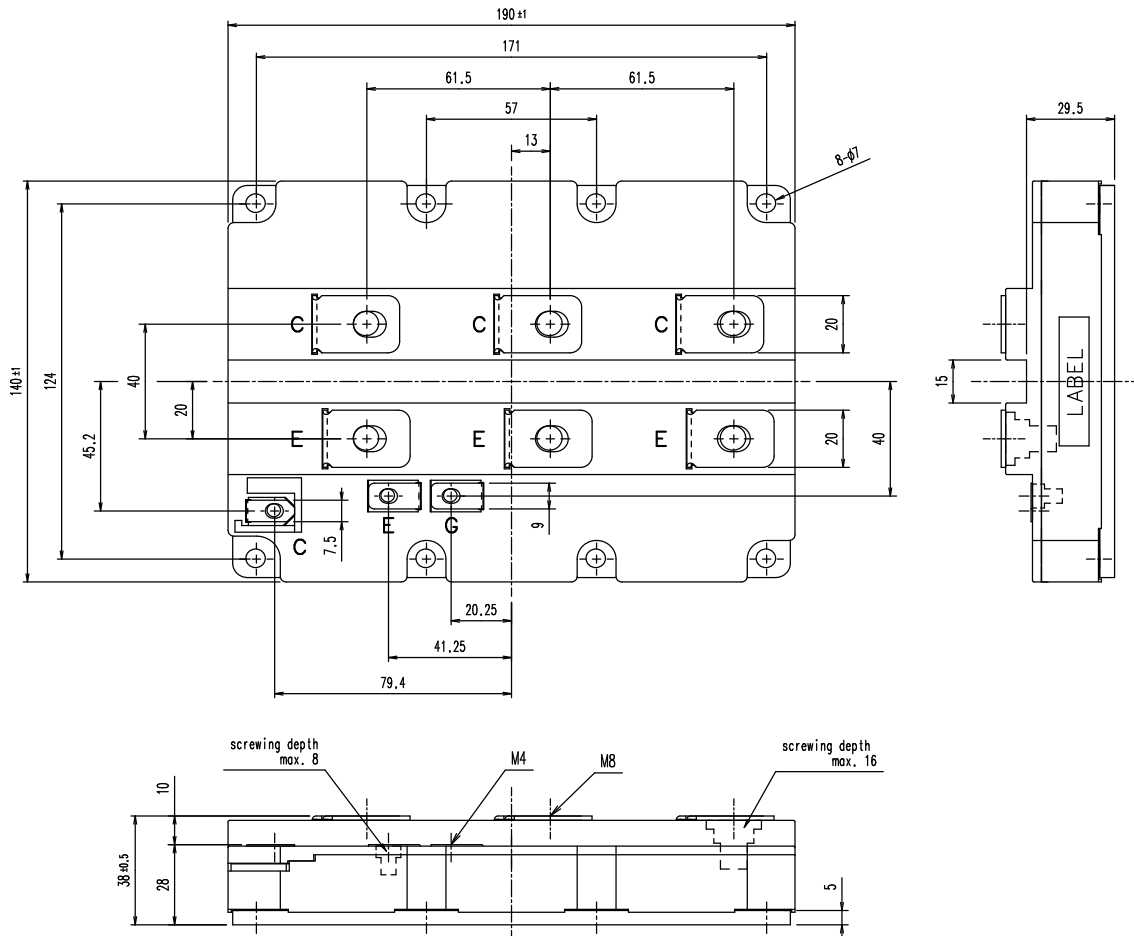


Transient thermal resistance (max.)

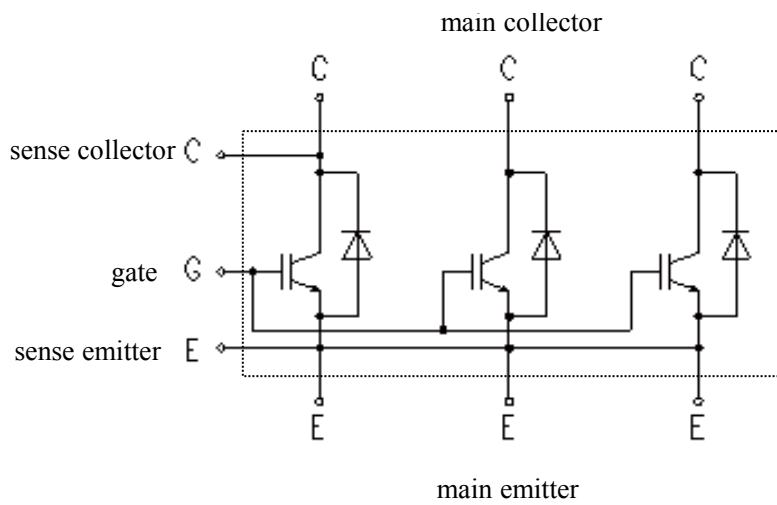


	IGBT	FWD
r1	0.00119	0.00140
r2	0.00347	0.00483
r3	0.00258	0.00346
r4	0.00207	0.00281
τ1	0.0028	0.0024
τ2	0.0400	0.0358
τ3	0.0584	0.0630
τ4	0.0740	0.0740

■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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