

1MBI2400VD-120P

IGBT Modules

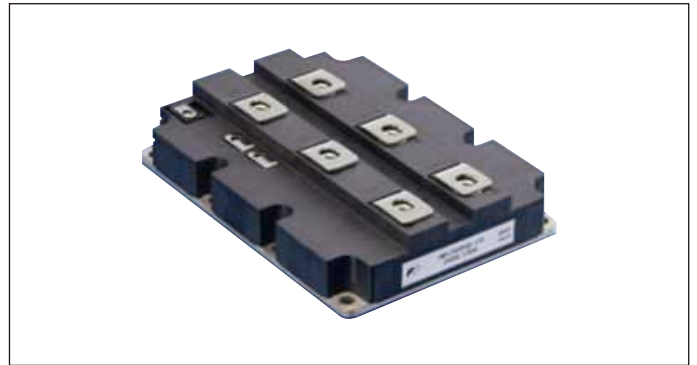
IGBT MODULE (V series) 2400V / 1200A / 1 in one package

■ 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 T_c=25°C unless otherwise specified)

Items	Symbols	Conditions	Maximum ratings	Units
Collector-Emitter voltage	V _{CES}		1200	V
Gate-Emitter voltage	V _{GES}		±20	V
Collector current	I _c	Continuous	T _c =25°C 3600	A
	I _{cp}	1ms	T _c =100°C 2400	
	-I _c		2400	
	-I _{c pulse}	1ms	4800	
Collector power dissipation	P _c	1 device	15780	W
Junction temperature	T _j		175	°C
Operating junction temperature (under switching conditions)	T _{jop}		150	
Storage temperature	T _{stg}		-40 ~ +150	
Isolation voltage	V _{iso}	AC : 1min.	4000	VAC
Screw torque *2	Mounting	M6	5.75	Nm
	Main Terminals	M8	10	
	Sense Terminals	M4	2.5	

(*1) All terminals should be connected together when isolation test will be done.

(*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 $T_j = 25^\circ\text{C}$ unless otherwise specified)

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero gate voltage collector current	I_{CES}	$V_{GE} = 0\text{V}, V_{CE} = 1200\text{V}$	-	-	1.0	mA	
Gate-Emitter leakage current	I_{GES}	$V_{CE} = 0\text{V}, V_{GE} = \pm 20\text{V}$	-	-	4800	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20\text{V}, I_c = 2400\text{mA}$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (main terminal)	$V_{GE} = 15\text{V}$ $I_c = 2400\text{A}$	$T_j = 25^\circ\text{C}$	-	1.91	2.19	V
			$T_j = 125^\circ\text{C}$	-	2.21	-	
			$T_j = 150^\circ\text{C}$	-	2.31	-	
	$V_{CE(sat)}$ (chip)		$T_j = 25^\circ\text{C}$	-	1.70	1.95	
			$T_j = 125^\circ\text{C}$	-	2.00	-	
			$T_j = 150^\circ\text{C}$	-	2.10	-	
Internal gate resistance	Int Rg		-	0.73	-	Ω	
Input capacitance	C_{ies}	$V_{CE} = 10\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$	-	211	-	nF	
Turn-on	t_{on}	$V_{CC} = 600\text{V}, I_c = 2400\text{A}$ $L_m = 46\text{nH}, V_{GE} = \pm 15\text{V}, T_j = 125^\circ\text{C}$	-	2.38	-	μs	
	t_r		-	0.98	-		
Turn-off	t_{off}	$R_{gon} = 1.8\ \Omega$	-	1.64	-	μs	
	t_f	$R_{goff} = 0.22\ \Omega$	-	0.21	-		
Forward on voltage	V_F (main terminal)	$V_{GE} = 0\text{V}$ $I_F = 2400\text{A}$	$T_j = 25^\circ\text{C}$	-	1.91	2.19	V
			$T_j = 125^\circ\text{C}$	-	2.06	-	
			$T_j = 150^\circ\text{C}$	-	2.01	-	
	V_F (chip)		$T_j = 25^\circ\text{C}$	-	1.70	1.95	
			$T_j = 125^\circ\text{C}$	-	1.85	-	
			$T_j = 150^\circ\text{C}$	-	1.80	-	
Reverse recovery time	t_{rr}	$I_F = 2400\text{A}, T_j = 125^\circ\text{C}$	-	0.44	-	μs	
Lead resistance, terminal-chip	R lead		-	0.089	-	m Ω	

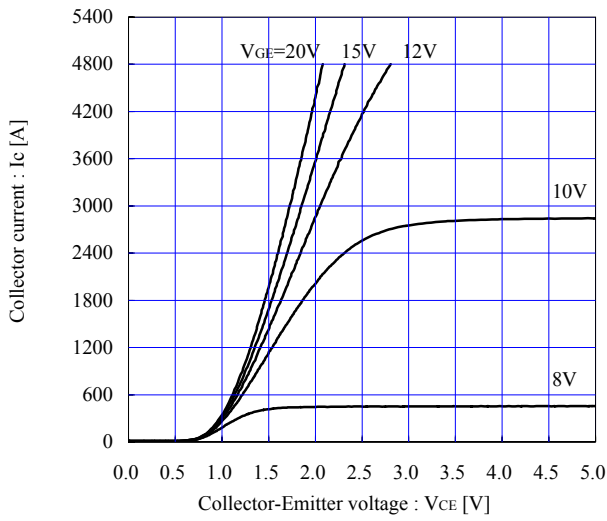
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance	$R_{th(j-c)}$	IGBT	-	-	0.0095	$^\circ\text{C/W}$
		FWD	-	-	0.0153	
Contact Thermal resistance	$R_{th(c-f)}$	with Thermal Compound(*)	-	0.004	-	

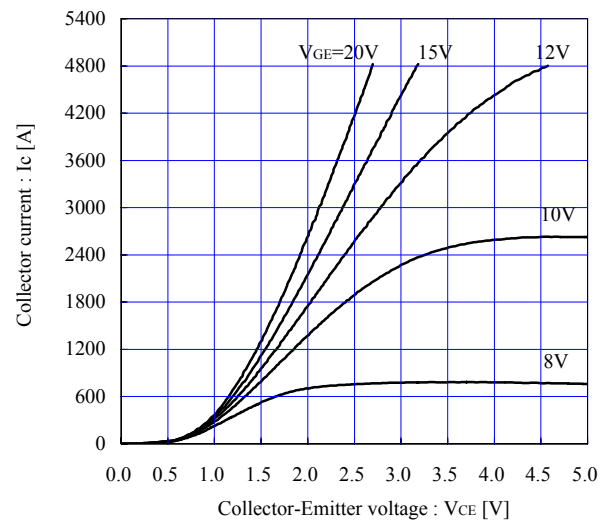
* This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

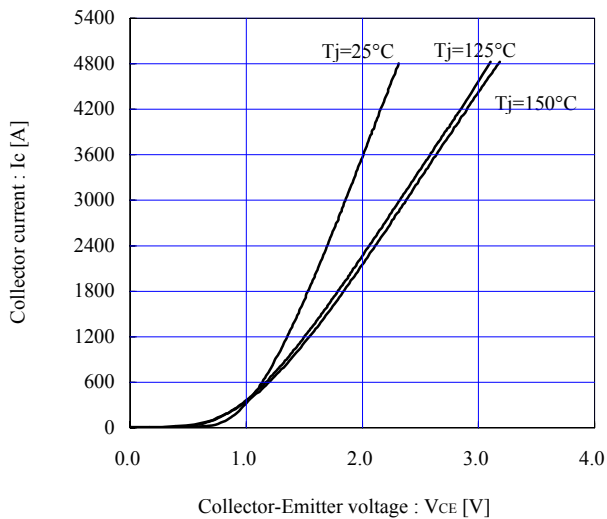
Collector current vs. Collector-Emmitter voltage (typ.)
T_j=25°C, chip



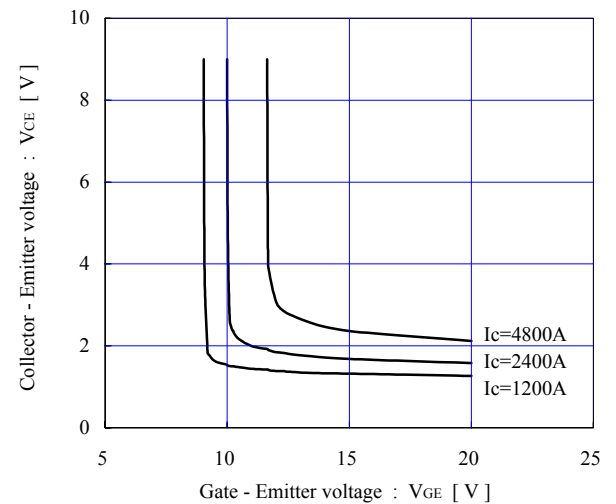
Collector current vs. Collector-Emmitter voltage (typ.)
T_j= 150°C, chip



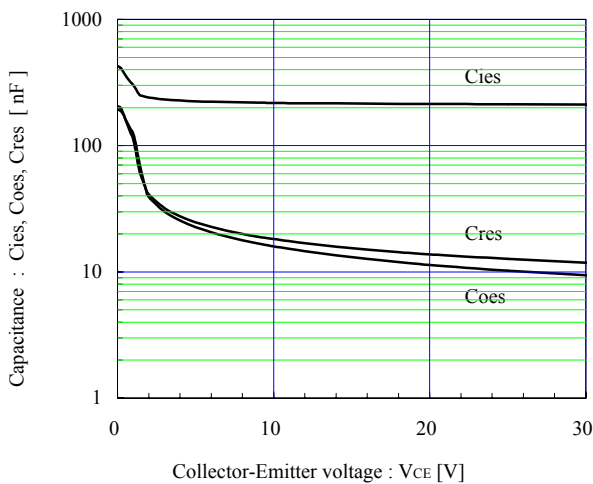
Collector-Emmitter voltage vs. Gate-Emmitter voltage (typ.)
V_{GE}=+15V, chip



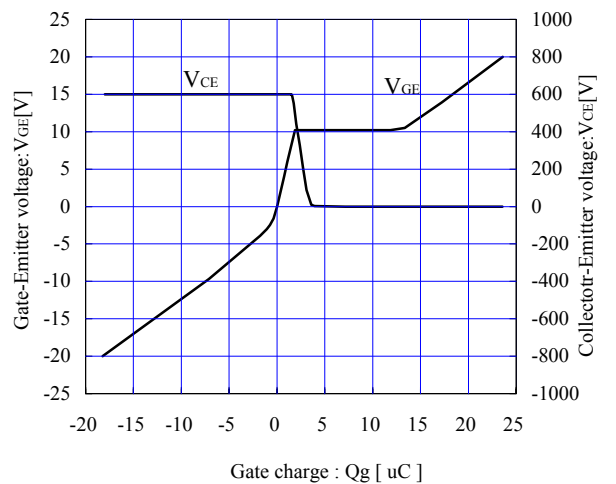
Collector-Emmitter voltage vs. Gate-Emmitter voltage (typ.)
T_j=25°C, chip



Capacitance vs. Collector-Emmitter voltage (typ.)
V_{GE}=0V, f= 1MHz, T_j= 25°C

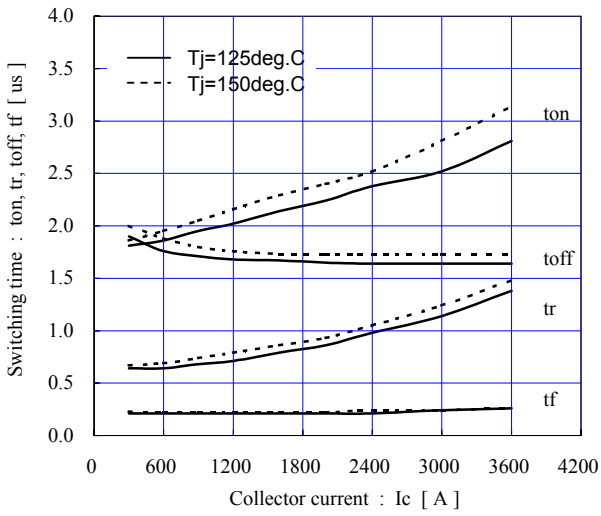


Dynamic Gate charge (typ.)
T_j= 25°C



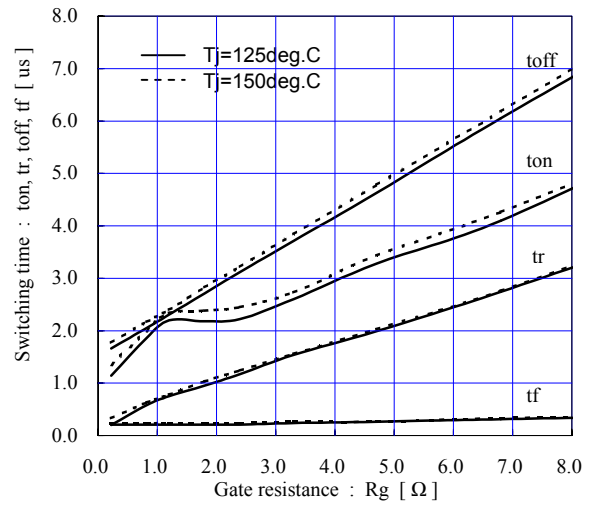
Switching time vs. Collector current (typ.)

$V_{CC}=600V, V_{GE}=\pm 15V, R_{gon}=1.8\Omega, R_{goff}=0.22\Omega$



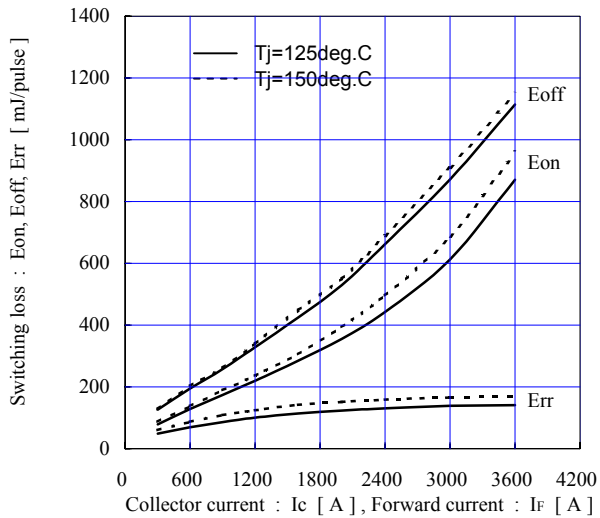
Switching time vs. Gate resistance (typ.)

$V_{CC}=600V, I_c=2400A, V_{GE}=\pm 15V$



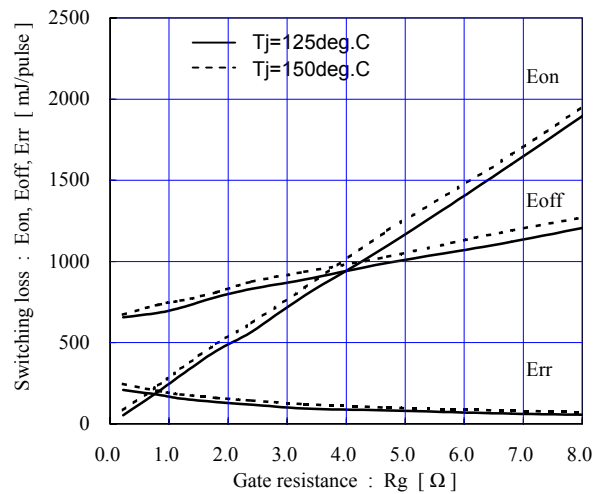
Switching loss vs. Collector current (typ.)

$V_{CC}=600V, V_{GE}=\pm 15V, R_{gon}=1.8\Omega, R_{goff}=0.22\Omega$



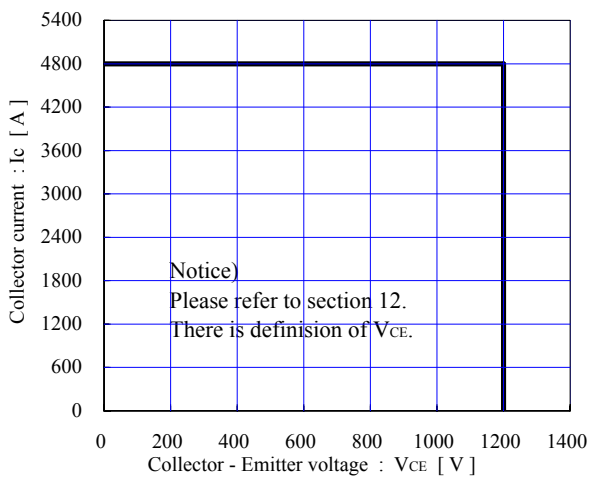
Switching loss vs. Gate resistance (typ.)

$V_{CC}=600V, I_c=2400A, V_{GE}=\pm 15V$

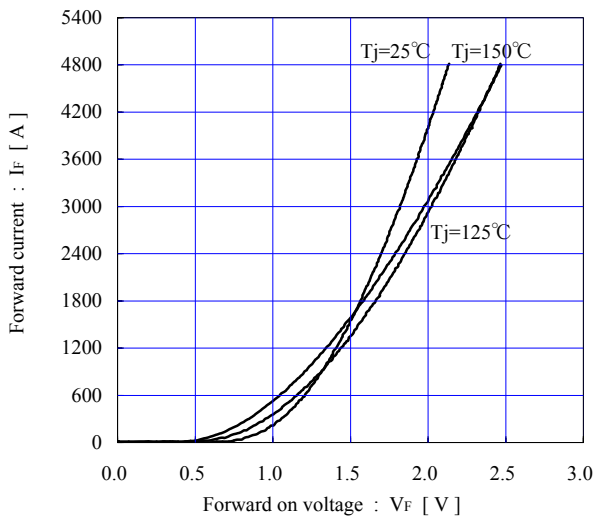


Reverse bias safe operating area (max.)

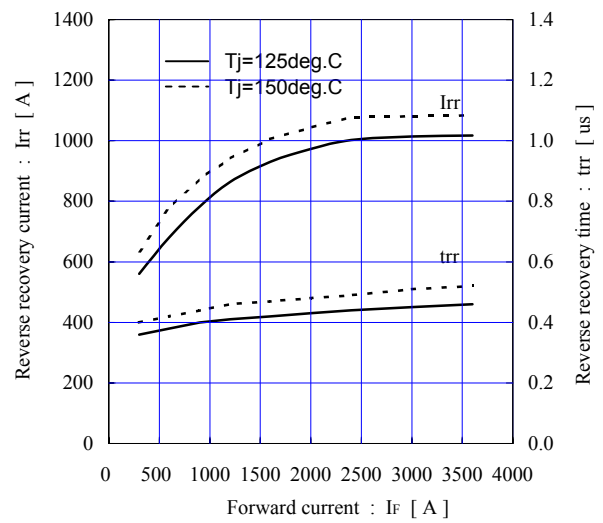
$\pm V_{GE}=15V, T_j=150\text{C}$



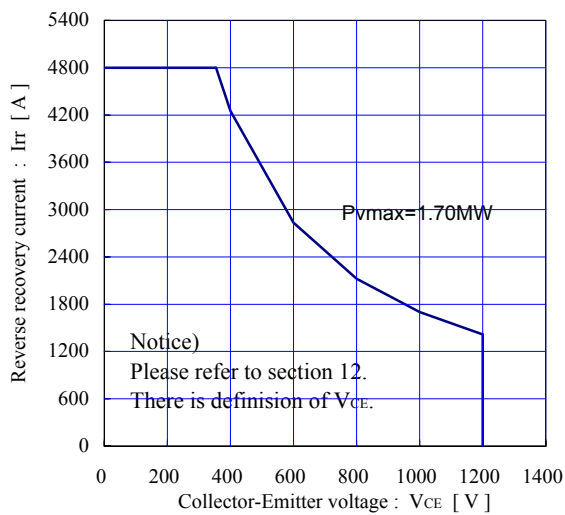
Forward current vs. Forward on voltage (typ.)
chip



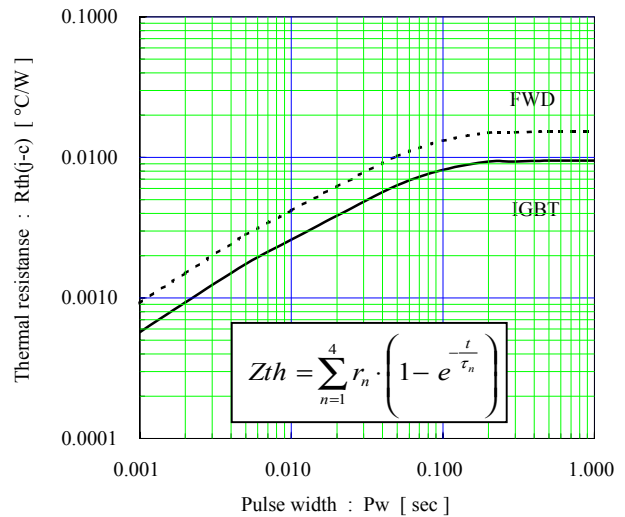
Reverse recovery characteristics (typ.)
Vcc=600V, VGE=±15V, Rgon=1.8Ω



FWD safe operating area (max.)
Tj=150°C

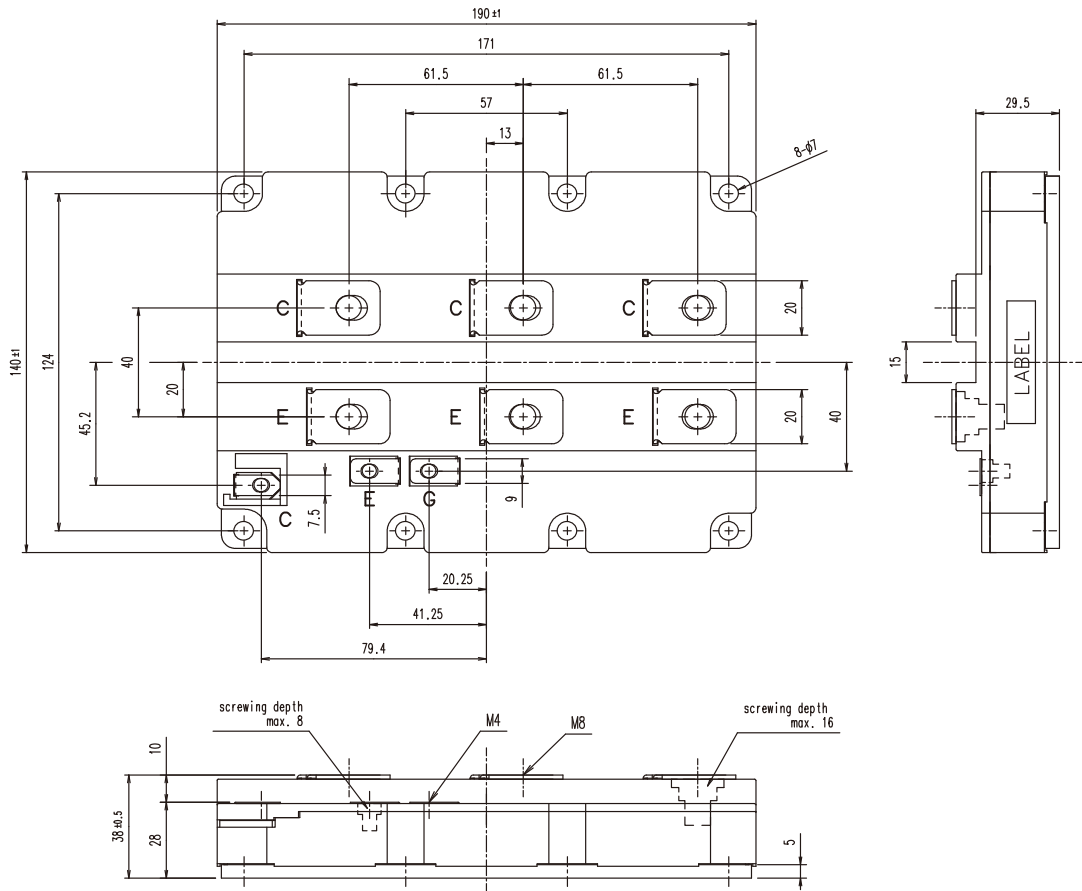


Transient thermal resistance (max.)

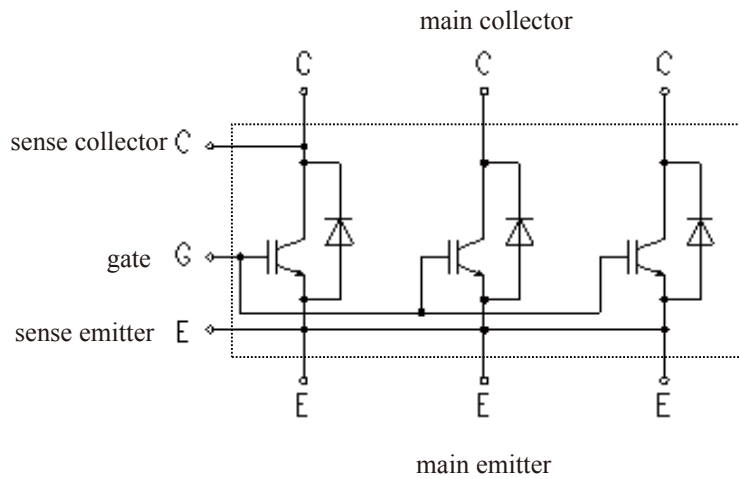


	IGBT	FWD
r1	0.00120	0.00171
r2	0.00356	0.00591
r3	0.00263	0.00423
r4	0.00211	0.00345
τ1	0.0028	0.0024
τ2	0.0395	0.0357
τ3	0.0588	0.0634
τ4	0.0743	0.0737

■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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