

1MBI3600VD-170E

IGBT Modules

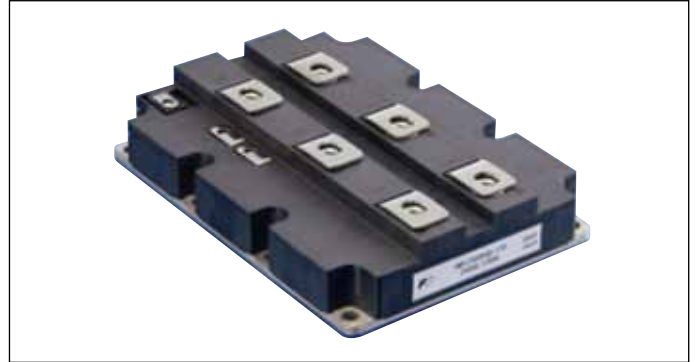
IGBT MODULE (V series) 1700V / 3600A / 1 in one package

■ 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	4800	A
			Tc=100°C	3600	
	I_{cp}	1ms	7200		
	$-I_c$		3600		
	$-I_c$ pulse	1ms	7200		
Collector power dissipation	P_c	1 device	22380	W	
Junction temperature	T_j		175	°C	
Operating junction temperature (under switching conditions)	T_{jop}		150		
Storage temperature	T_{stg}		-40 ~ +150		
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	$V_{GE(th)}$	$V_{CE} = 20V, I_c = 3600mA$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (main terminal)	$V_{GE} = 15V$ $I_c = 3600A$	$T_j = 25^\circ C$	-	2.32	2.61	V
			$T_j = 125^\circ C$	-	2.72	-	
			$T_j = 150^\circ C$	-	2.77	-	
	$V_{CE(sat)}$ (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		-	0.63	-	Ω	
Input capacitance	C_{ies}	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	-	326	-	nF	
Turn-on	t_{on}	$V_{CC} = 900V, I_c = 3600A$ $L_m = 46nH, V_{GE} = \pm 15V, T_j = 125^\circ C$	-	2.27	-	μs	
	t_r		-	0.75	-		
Turn-off	t_{off}	$R_{gon} = 0.5 \Omega$ $R_{goff} = 0.5 \Omega$	-	2.67	-		
	t_f		-	0.31	-		
Forward on voltage	V_F (main terminal)	$V_{GE} = 0V$ $I_F = 3600A$	$T_j = 25^\circ C$	-	2.12	2.52	V
			$T_j = 125^\circ C$	-	2.32	-	
			$T_j = 150^\circ C$	-	2.30	-	
	V_F (chip)		$T_j = 25^\circ C$	-	1.80	2.15	
			$T_j = 125^\circ C$	-	2.00	-	
			$T_j = 150^\circ C$	-	1.98	-	
Reverse recovery	t_{rr}	$I_F = 3600A, T_j = 125^\circ C$	-	0.61	-	μs	
Lead resistance, terminal-chip	R lead		-	0.089	-	m Ω	

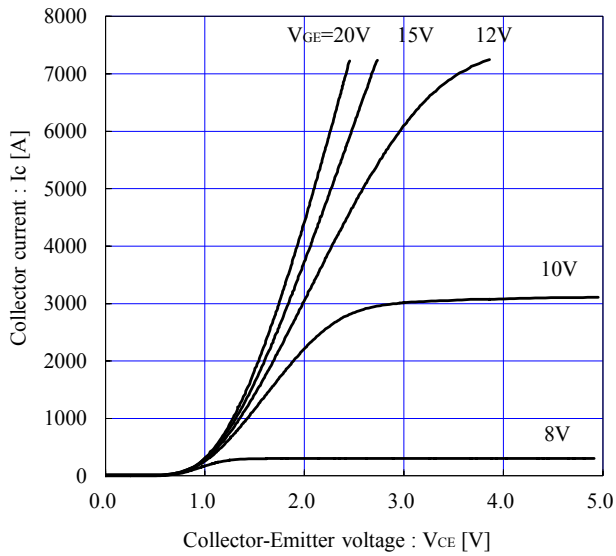
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance	$R_{th(j-c)}$	IGBT	-	-	0.0067	$^\circ C/W$
		FWD	-	-	0.011	
Contact thermal resistance (*3)	$R_{th(c-f)}$	with Thermal Compound	-	0.004	-	

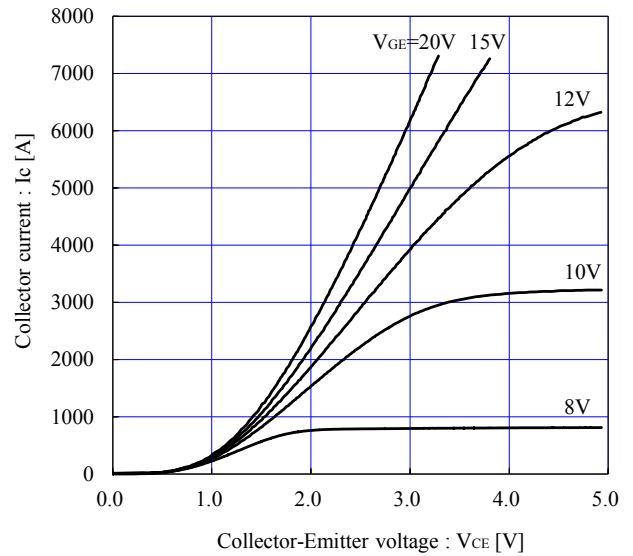
Note *3: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

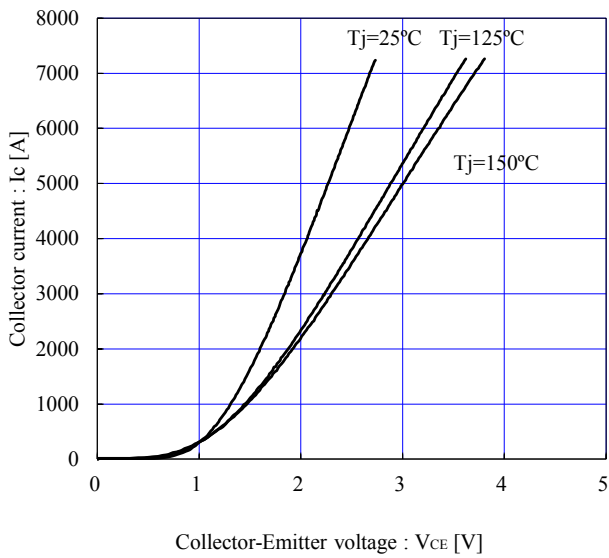
Collector current vs. Collector-Emittter voltage (typ.)
Tj=25°C, chip



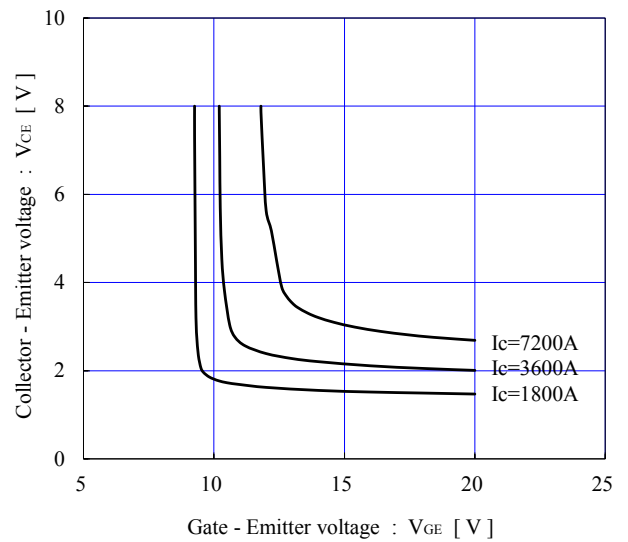
Collector current vs. Collector-Emittter voltage (typ.)
Tj= 150°C, chip



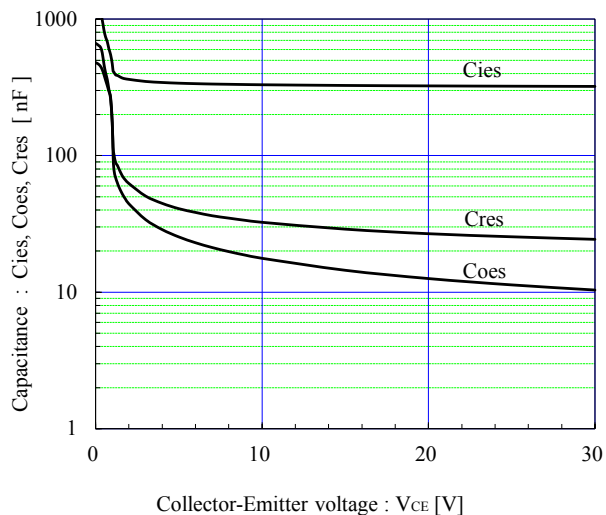
Collector current vs. Collector-Emittter voltage (typ.)
VGE=+15V, chip



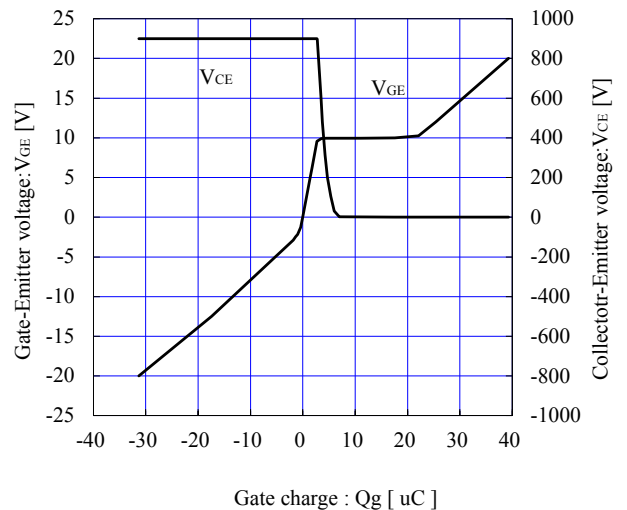
Collector-Emittter voltage vs. Gate-Emittter voltage (typ.)
Tj=25°C, chip



Capacitance vs. Collector-Emittter voltage (typ.)
VGE=0V, f= 1MHz, Tj= 25°C

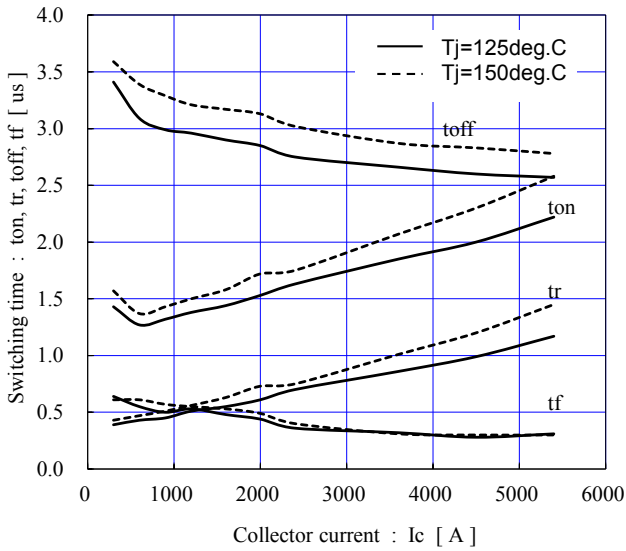


Dynamic Gate charge (typ.)
Tj= 25°C



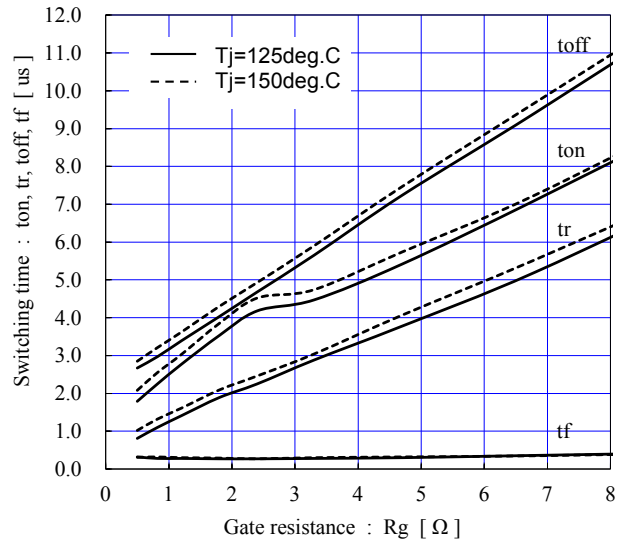
Switching time vs. Collector current (typ.)

$V_{cc}=900V, V_{GE}=\pm 15V, R_{gon}=0.5\Omega, R_{goff}=0.5\Omega$



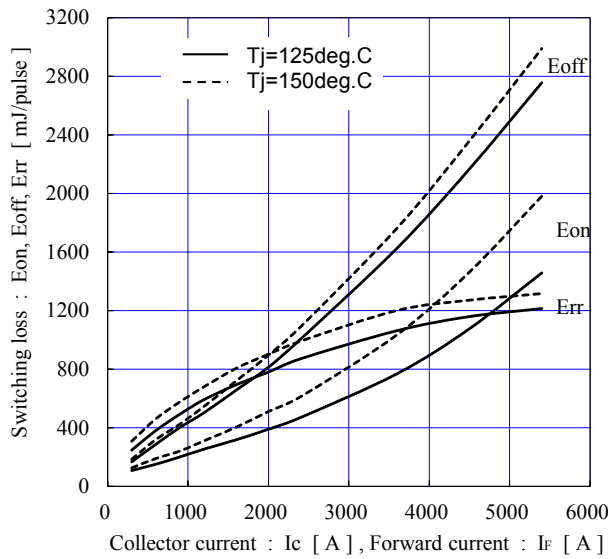
Switching time vs. Gate resistance (typ.)

$V_{cc}=900V, I_c=3600A, V_{GE}=\pm 15V$



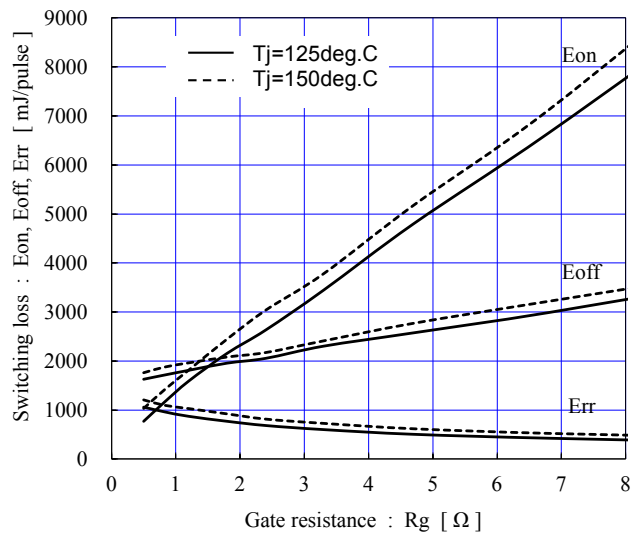
Switching loss vs. Collector current (typ.)

$V_{cc}=900V, V_{GE}=\pm 15V, R_{gon}=0.5\Omega, R_{goff}=0.5\Omega$



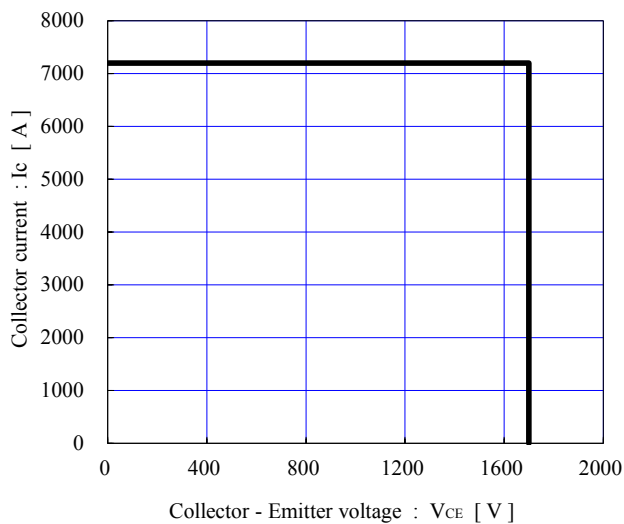
Switching loss vs. Gate resistance (typ.)

$V_{cc}=900V, I_c=3600A, V_{GE}=\pm 15V$

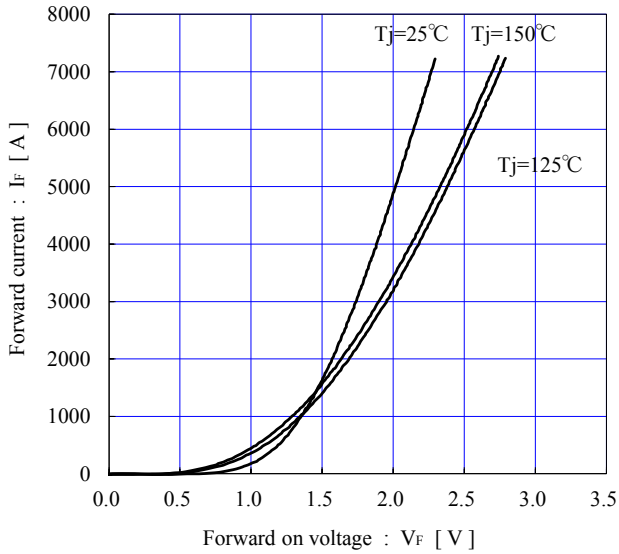


Reverse bias safe operating area (max.)

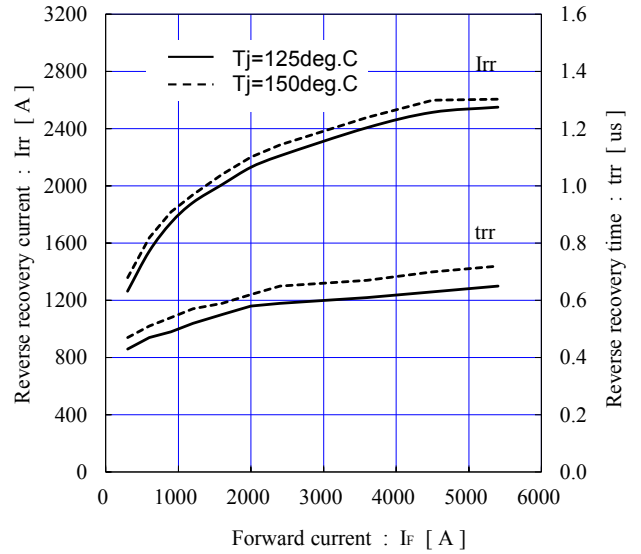
$\pm V_{GE}=15V, T_j = 150^\circ\text{C} / \text{chip}$



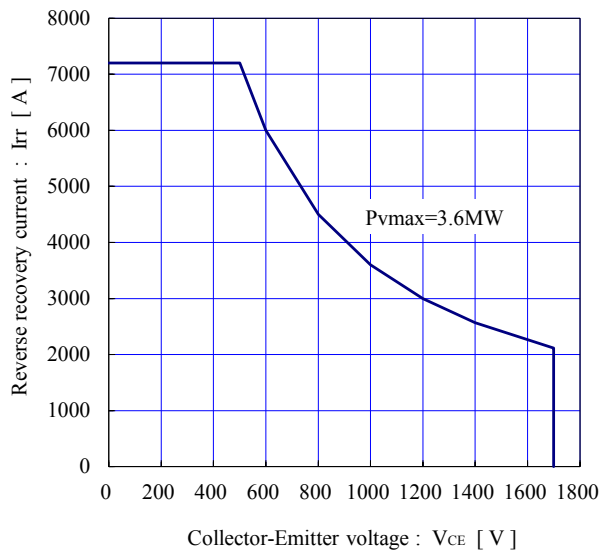
Forward current vs. Forward on voltage (typ.)
chip



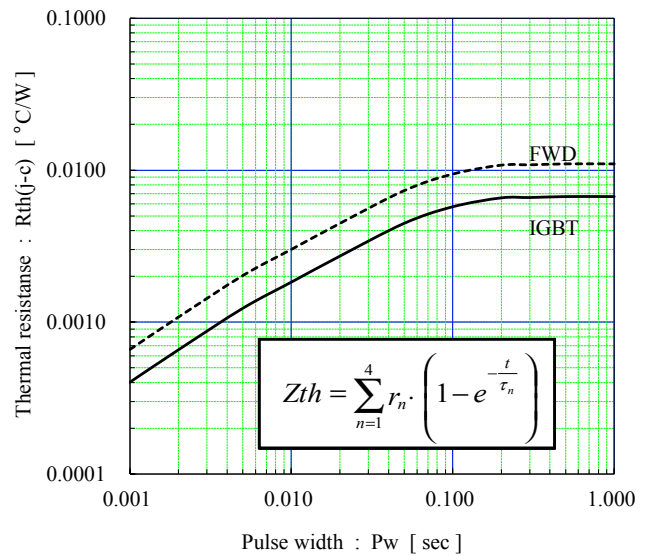
Reverse recovery characteristics (typ.)
V_{CC}=900V, V_{GE}=±15V, R_{gon}=0.5Ω



FWD safe operating area (max.)
T_j=150°C / sence terminals

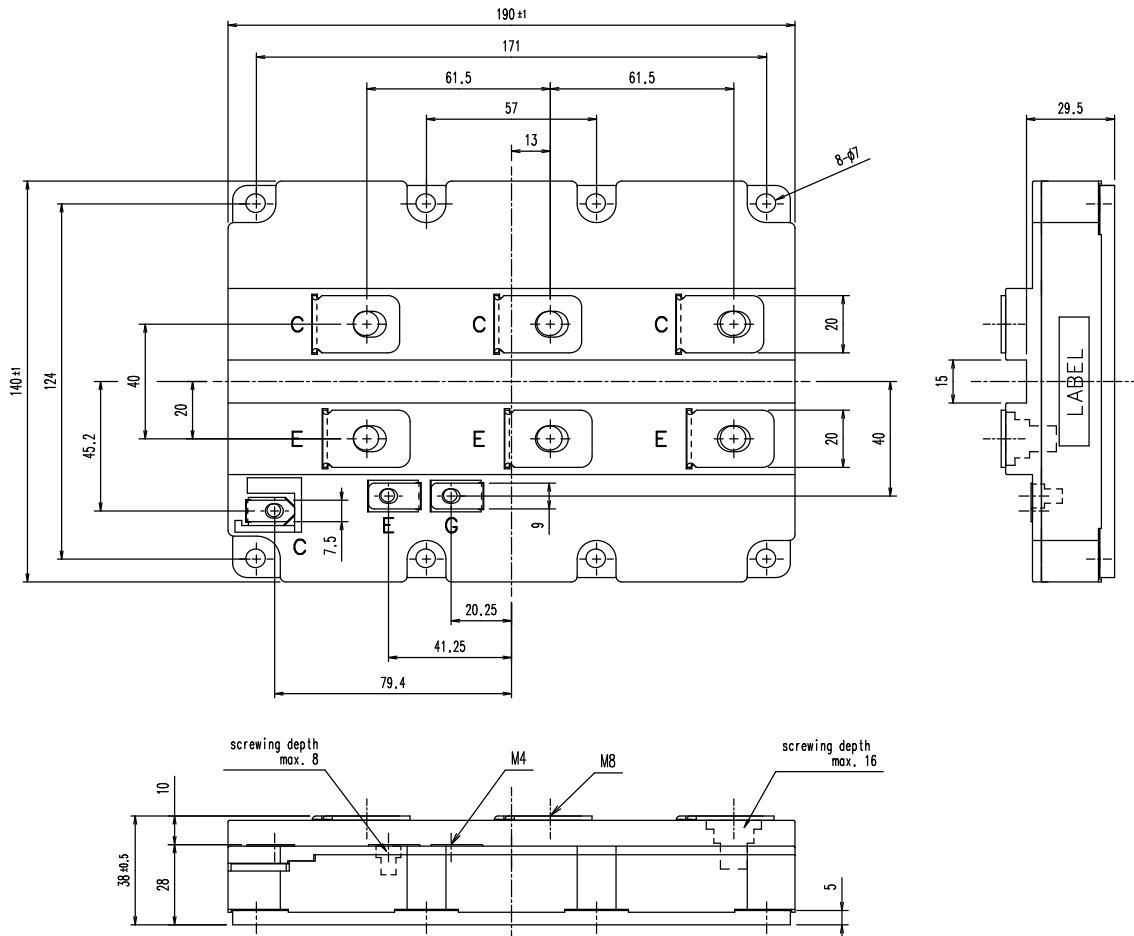


Transient thermal resistance (max.)

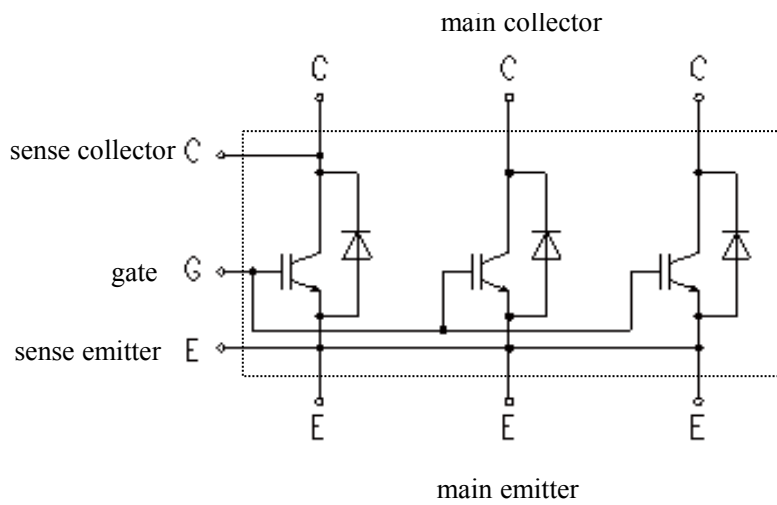


	IGBT	FWD
r1	0.00196	0.00226
r2	0.00192	0.00354
r3	0.00153	0.00286
r4	0.00129	0.00234
τ1	0.0127	0.0069
τ2	0.0402	0.0477
τ3	0.0684	0.0586
τ4	0.0928	0.0765

■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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