

# 6MBI50UA-120

## IGBT Module U-Series 1200V / 50A 6 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)

Item	Symbol	Conditions	Rating	Unit	
Collector-Emitter voltage	V <sub>CEs</sub>		1200	V	
Gate-Emitter voltage	V <sub>GES</sub>		±20	V	
Collector current	I <sub>c</sub>	Continuous	T <sub>c</sub> =25°C	75	A
			T <sub>c</sub> =80°C	50	
	I <sub>cp</sub>	1ms	T <sub>c</sub> =25°C	150	
			T <sub>c</sub> =80°C	100	
	-I <sub>c</sub>			50	
	-I <sub>c</sub> pulse			100	
Collector Power Dissipation	P <sub>c</sub>	1 device	275	W	
Junction temperature	T <sub>j</sub>		+150	°C	
Storage temperature	T <sub>stg</sub>		-40 to +125		
Isolation voltage	between terminal and copper base *1	V <sub>iso</sub>	AC:1min.	2500	VAC
	between thermistor and others *2				
Screw Torque	Mounting *3	-	3.5	N·m	

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

\*2: Two thermistor terminals should be connected together, each other terminals should be connected together and shorted to base plate when isolation test will be done.

\*3: Recommendable value: 2.5 to 3.5 N·m(M5)

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

Item	Symbols	Conditions	Characteristics			Unit	
			Min.	Typ.	Max.		
Zero gate voltage collector current	I <sub>CEs</sub>	V <sub>GE</sub> =0V, V <sub>CE</sub> =1200V	-	-	1.0	mA	
Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V	-	-	200	nA	
Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> =20V, I <sub>c</sub> =50mA	4.5	6.5	8.5	V	
Collector-Emitter saturation voltage	V <sub>CE(sat)</sub> (terminal)	V <sub>GE</sub> =15V, I <sub>c</sub> =50A	T <sub>j</sub> =25°C	-	2.00	2.35	V
			T <sub>j</sub> =125°C	-	2.25	-	
	V <sub>CE(sat)</sub> (chip)		T <sub>j</sub> =25°C	-	1.75	2.10	
			T <sub>j</sub> =125°C	-	2.00	-	
Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> =10V, V <sub>GE</sub> =0V, f=1MHz	-	6	-	nF	
Turn-on time	t <sub>on</sub>	V <sub>CC</sub> =600V	-	0.36	1.20	μs	
	t <sub>r</sub>	I <sub>c</sub> =50A	-	0.21	0.60		
	t <sub>r(i)</sub>	V <sub>GE</sub> =±15V	-	0.03	-		
Turn-off time	t <sub>off</sub>	R <sub>G</sub> =22 Ω	-	0.37	1.00	μs	
	t <sub>f</sub>		-	0.07	0.30		
Forward on voltage	V <sub>F</sub> (terminal)	V <sub>GE</sub> =0V I <sub>F</sub> =50A	T <sub>j</sub> =25°C	-	1.85	2.15	V
			T <sub>j</sub> =125°C	-	1.95	-	
	V <sub>F</sub> (chip)		T <sub>j</sub> =25°C	-	1.60	1.90	
			T <sub>j</sub> =125°C	-	1.70	-	
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> =50A	-	-	0.35	μs	
Lead resistance, terminal-chip*4	R lead		-	4.1	-	mΩ	
Resistance	R	T=25°C	-	5000	-	Ω	
		T=100°C	465	495	520		
B value	B	T=25/50°C	3305	3375	3450	K	

\*4: Biggest internal terminal resistance among arm.

#### ● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Unit
			Min.	Typ.	Max.	
Thermal resistance	R <sub>th(j-c)</sub>	IGBT	-	-	0.45	°C/W
	R <sub>th(j-c)</sub>	FWD	-	-	0.73	°C/W
Contact Thermal resistance	R <sub>th(c-f)</sub> *5	With thermal compound	-	0.05	-	°C/W

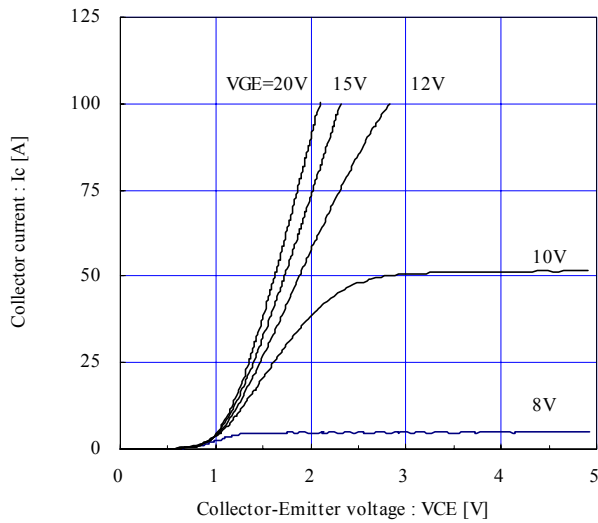
\*5: This is the value which is defined mounting on the additional cooling fin with thermal compound.



■ Characteristics (Representative)

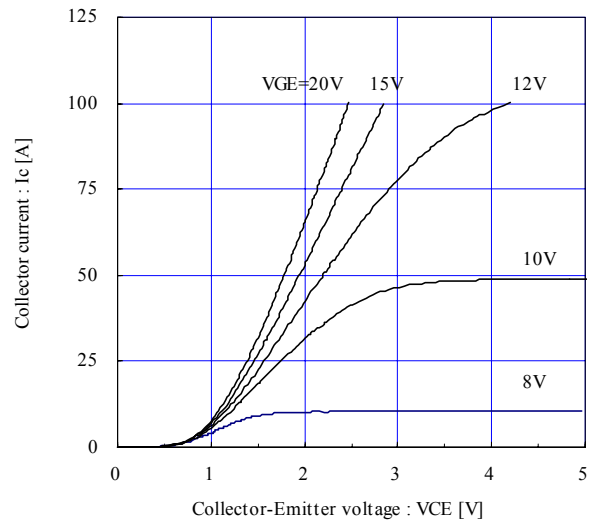
Collector current vs. Collector-Emitter voltage (typ.)

T<sub>j</sub>= 25°C / chip



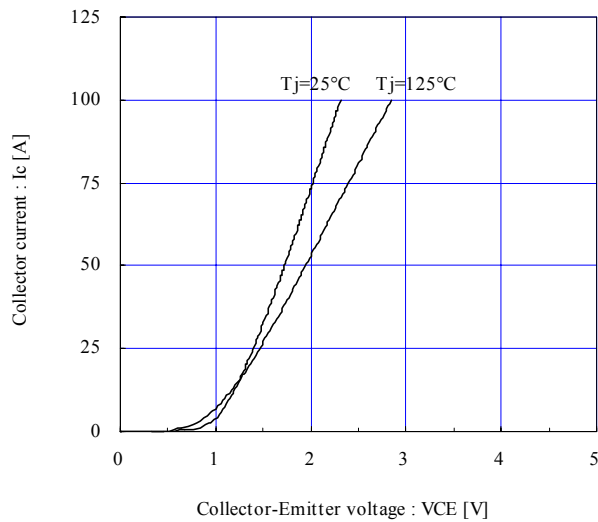
Collector current vs. Collector-Emitter voltage (typ.)

T<sub>j</sub>= 125°C / chip



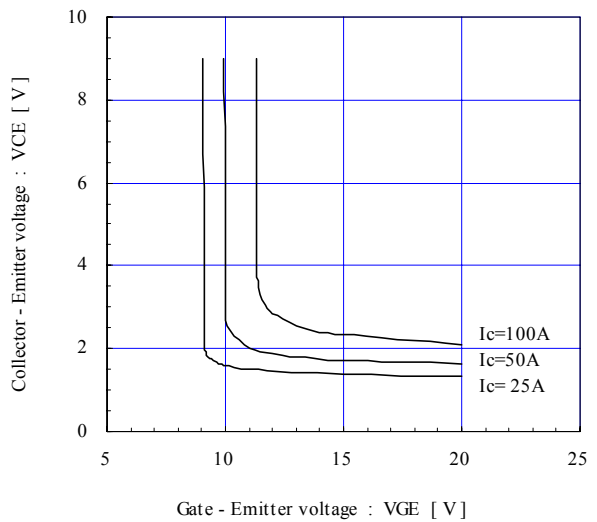
Collector current vs. Collector-Emitter voltage (typ.)

VGE=15V / chip



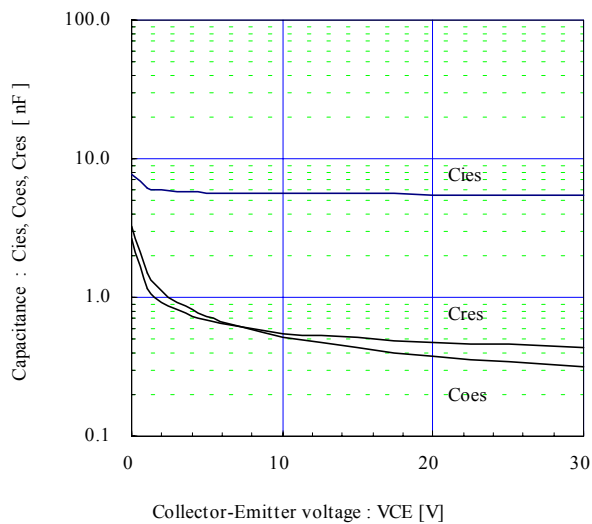
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)

T<sub>j</sub>=25°C / chip



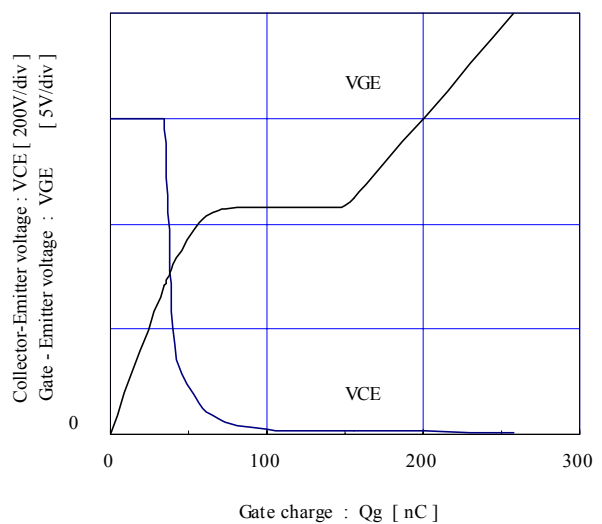
Capacitance vs. Collector-Emitter voltage (typ.)

VGE=0V, f= 1MHz, T<sub>j</sub>= 25°C

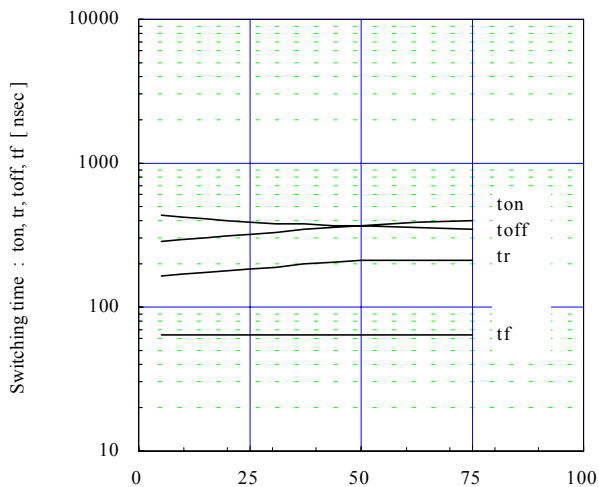


Dynamic Gate charge (typ.)

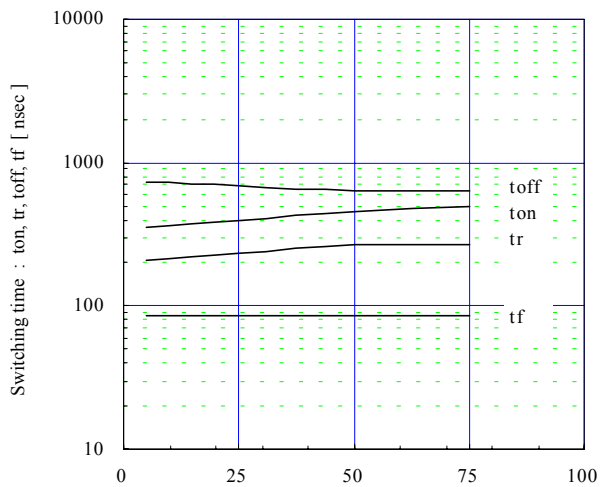
V<sub>cc</sub>=600V, Ic=50A, T<sub>j</sub>= 25°C



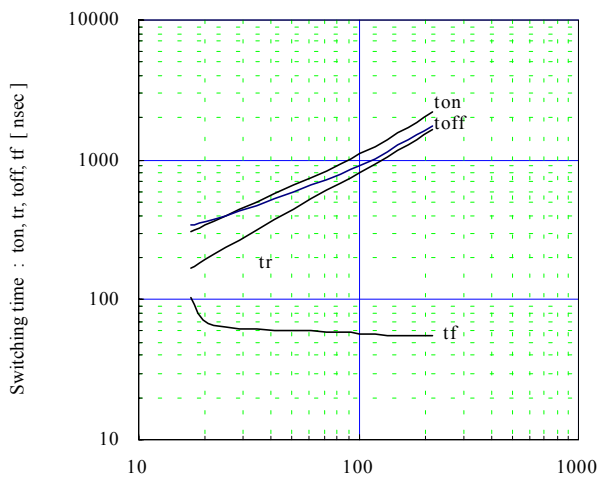
Switching time vs. Collector current (typ.)  
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=22\Omega, T_j=25^\circ C$



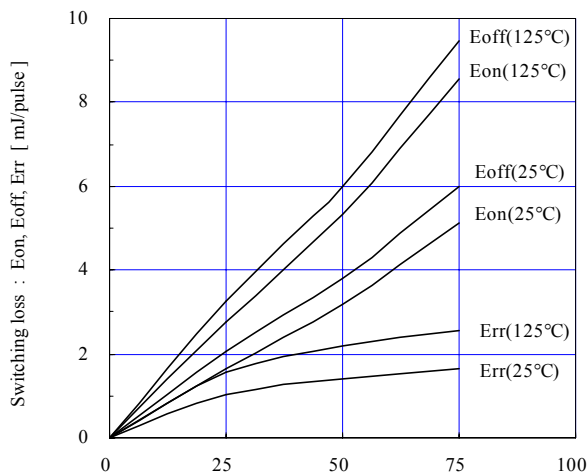
Switching time vs. Collector current (typ.)  
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=22\Omega, T_j=125^\circ C$



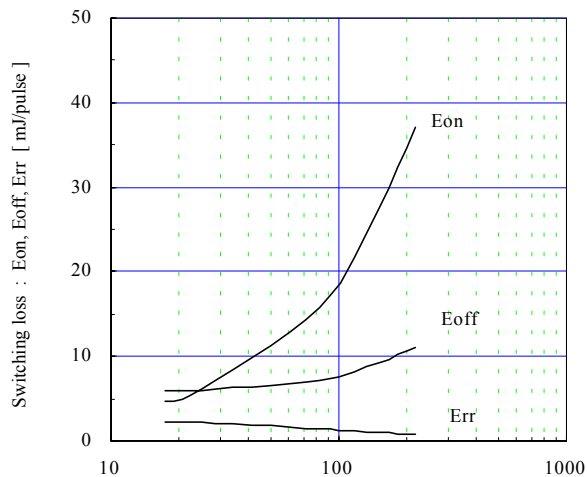
Switching time vs. Gate resistance (typ.)  
 $V_{cc}=600V, I_c=50A, V_{GE}=\pm 15V, T_j=25^\circ C$



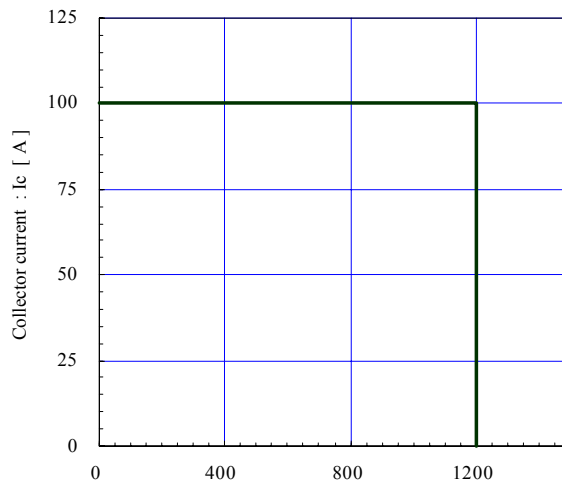
Switching loss vs. Collector current (typ.)  
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=22\Omega$



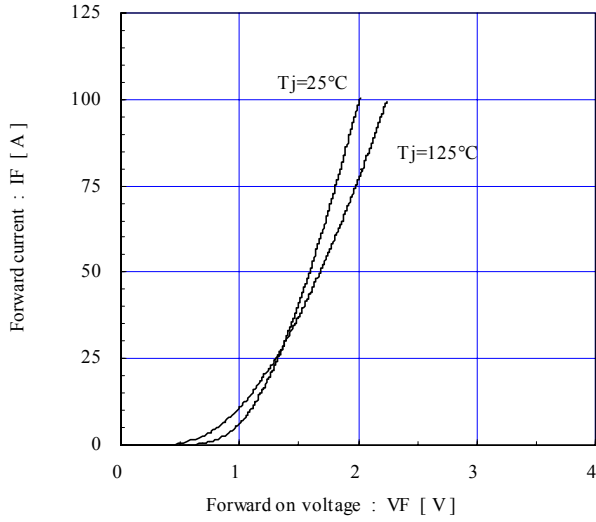
Switching loss vs. Gate resistance (typ.)  
 $V_{cc}=600V, I_c=50A, V_{GE}=\pm 15V, T_j=125^\circ C$



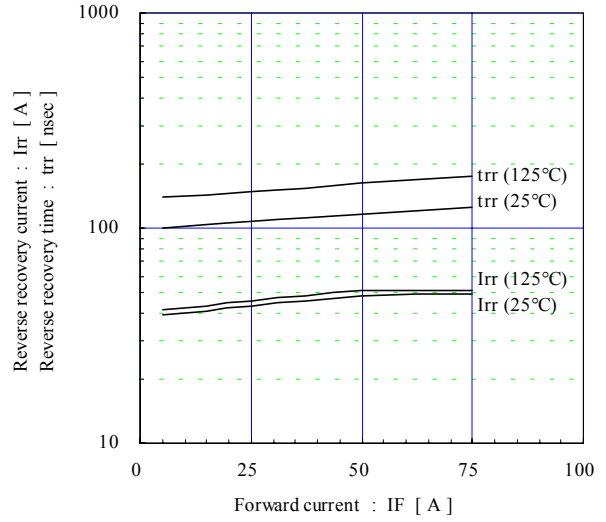
Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE} \le 15V, R_g \ge 22\Omega, T_j \le 125^\circ C$



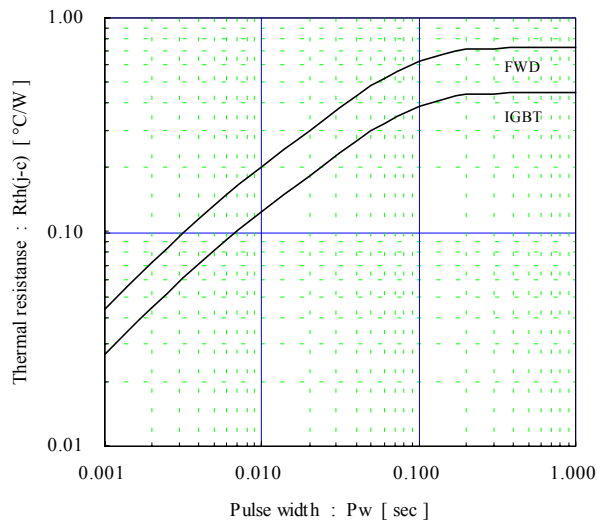
Forward current vs. Forward on voltage (typ.)  
chip



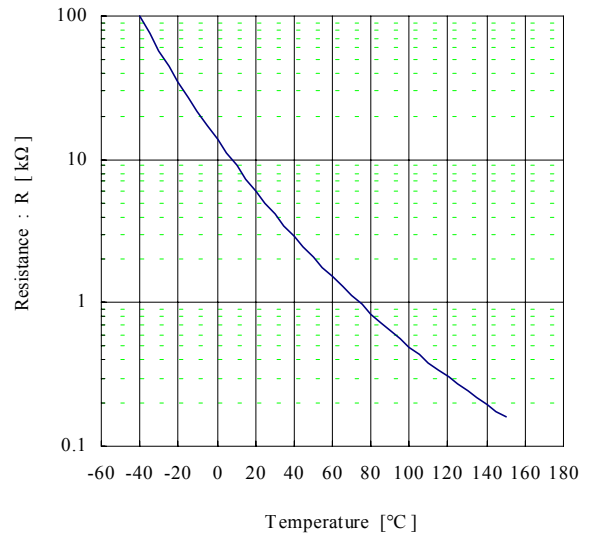
Reverse recovery characteristics (typ.)  
Vcc=600V, VGE=±15V, Rg=22Ω



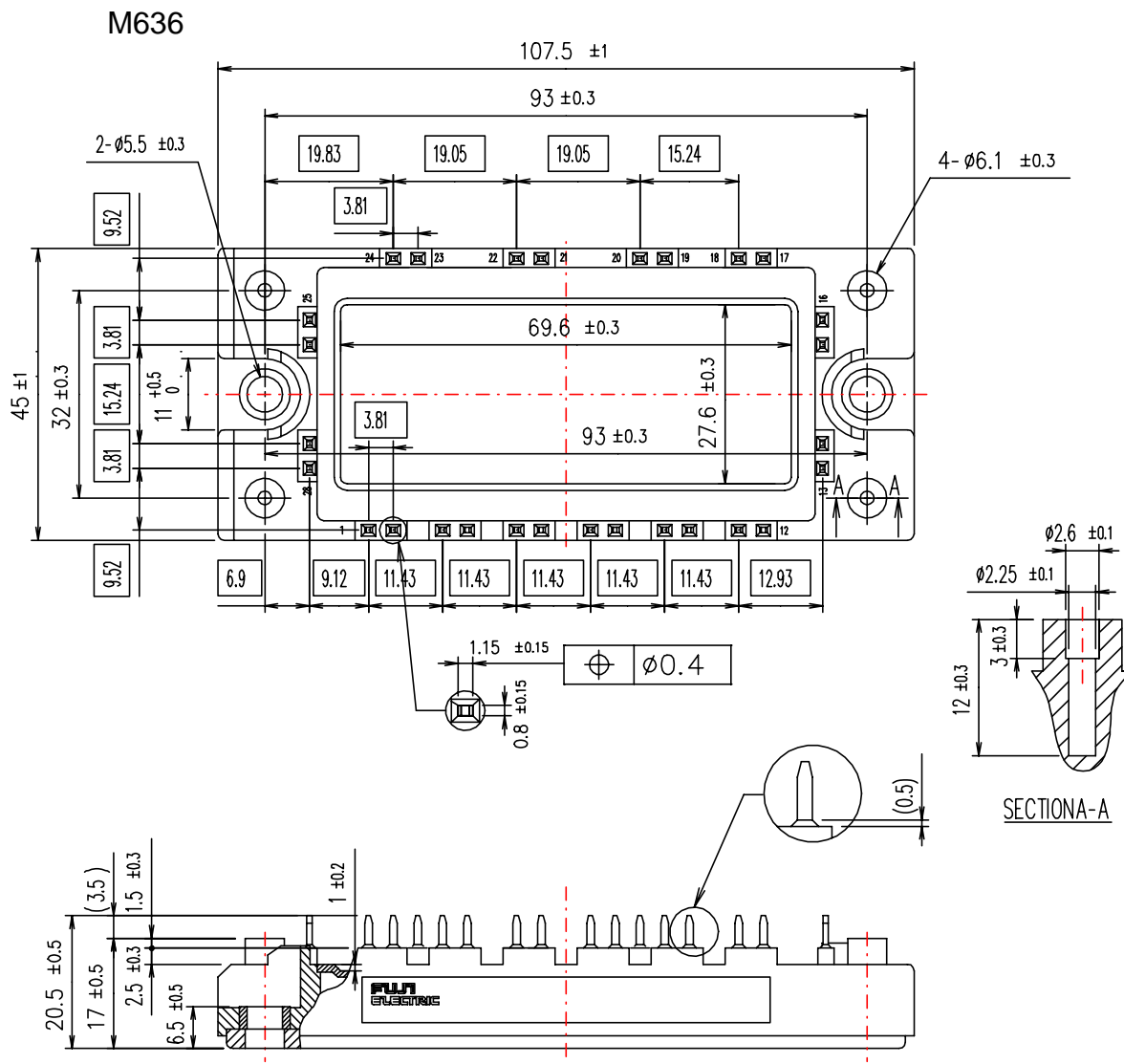
Transient thermal resistance (max.)



Temperature characteristic (typ.)



Outline Drawings, mm



□ shows theoretical dimension.  
 ( ) shows reference dimension.

Equivalent Circuit Schematic

