FUJI ELECTRIC

6MBP 150RA-060

IGBT IPM
600V
6×150A

Intelligent Power Module (R-Series)

■ Maximum Ratings and Characteristics

• Absolute Maximum Ratings (T_c=25°C)

Items		Symbols	Ratings		Units
			Min.	Max.	
DC Bus Voltage		V_{DC}	0	450	V
DC Bus Voltage (surge)		$V_{DC(Surge)}$	0	500	
DC Bus Voltage (short operating)		V_{SC}	200	400	
Collector-Emitter Voltage		V_{CES}	0	600	
Inverter Collector Current	Continuous	I_C		150	A
	1ms	I_{CP}		300	
	Duty=58.8%	$-I_C$		150	
Collector Power Dissipation	One Transistor	P_C		595	W
Voltage of Power Supply for Driver		V_{CC} *1	0	20	V
Input Signal Voltage		V_{IN} *2	0	V_Z	
Input Signal Current		I_{IN}		1	mA
Alarm Signal Voltage		V_{ALM} *3	0	V_{CC}	V
Alarm Signal Current		I_{ALM} *4		15	mA
Junction Temperature		T_j		150	°C
Operating Temperature		T_{OP}	-20	100	
Storage Temperature		T_{stg}	-40	125	
Isolation Voltage	A.C. 1min.	V_{iso}		2500	V
Screw Torque		Mounting *1		3.5	Nm
		Terminals *1		3.5	

Note: *1: Recommendable Value; 2.5 – 3.0 Nm (M5)

■ Outline Drawing

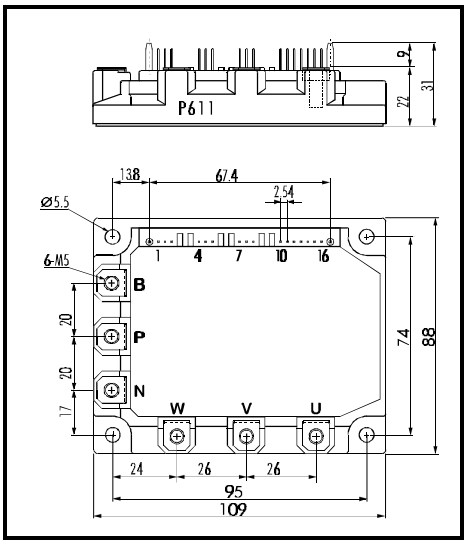


Fig. 1

• Electrical Characteristics of Power Circuit (at T_j=25°C, V_{CC}=15V)

Items		Symbols	Conditions	Min.	Typ.	Max.	Units
INV	Collector Current At Off Signal Input	I_{CES}	V_{CE}=600V, Input Terminal Open			1.0	mA
	Collector-Emitter Saturation Voltage	$V_{CE(Sat)}$	I_C=150A			2.8	V
	Forward Voltage of FWD	V_F	$-I_C$=150A			3.0	V

• Electrical Characteristics of Control Circuit (at T_j=25°C, V_{CC}=15V)

Items	Symbols	Conditions	Min.	Typ.	Max.	Units
Current of P-Line Side Driver (One Unit)	I_{CCP}	f_{SW}=0~15kHz, T_C=-20~100°C	3		18	mA
Current of N-Line Side Driver (Three Units)	I_{CCN}	f_{SW}=0~15kHz, T_C=-20~100°C	10		65	
Input Signal Threshold Voltage	$V_{IN(th)}$	On	1.00	1.35	1.70	V
		Off	1.25	1.60	1.95	
Input Zener Voltage	V_Z	R_{IN}=20kΩ		8.0		
Over Heating Protection Temperature Level	T_{COH}	V_{DC}=0V, I_C=0A, Case Temp.	110		125	°C
Hysteresis	T_{CH}			20		
IGBT Chips Over Heating Protec. Temp. Level	T_{jOH}	Surface of IGBT Chip	150			
Hysteresis	T_{jH}			20		
Inverter Collector Current Protection Level	I_{OC}	T_j=125°C	225			A
Over Current Detecting Time	t_{DOC}	T_j=25°C		10		µs
Alarm Signal Hold Time	t_{ALM}		1.5	2		ms
Limiting Resistor for Alarm	R_{ALM}		1425	1500	1575	Ω
Under Voltage Protection Level	V_{UV}		11.0		12.5	V
Hysteresis	V_H		0.2			

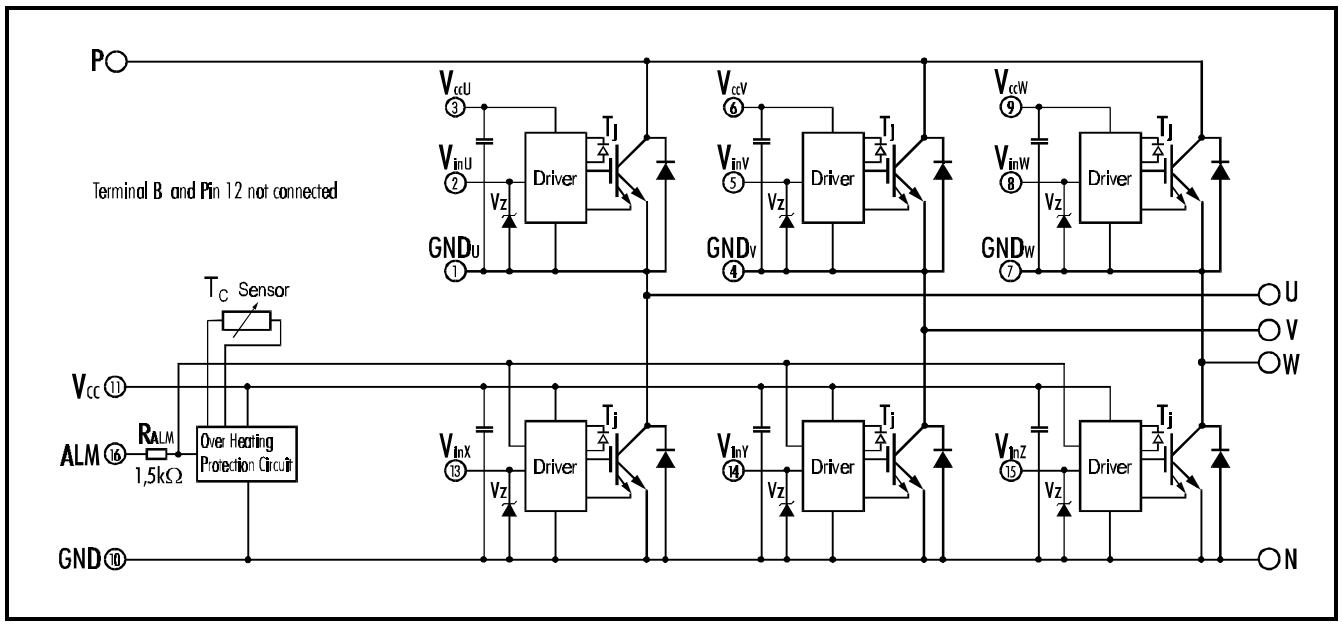
• Dynamic Characteristics (at T_C=T_j=125°C, V_{CC}=15V)

Items	Symbols	Conditions	Min.	Typ.	Max.	Units
Switching Time	t_{ON}	I_C=150A, V_{DC}=300V	0.3			µs
	t_{OFF}				3.6	
	t_{RR}	I_F=150A, V_{DC}=300V			0.4	

• Thermal Characteristics

Items	Symbols	Conditions	Min.	Typ.	Max.	Units
Thermal Resistance	$R_{th(j-c)}$	Inverter IGBT			0.21	°C/W
	$R_{th(j-c)}$	Diode			0.47	
	$R_{th(c-f)}$	With Thermal Compound		0.05		

■ Equivalent Circuit

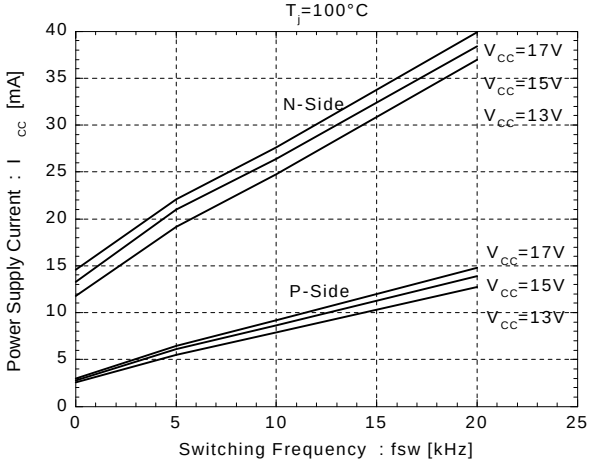


Drivers include following functions

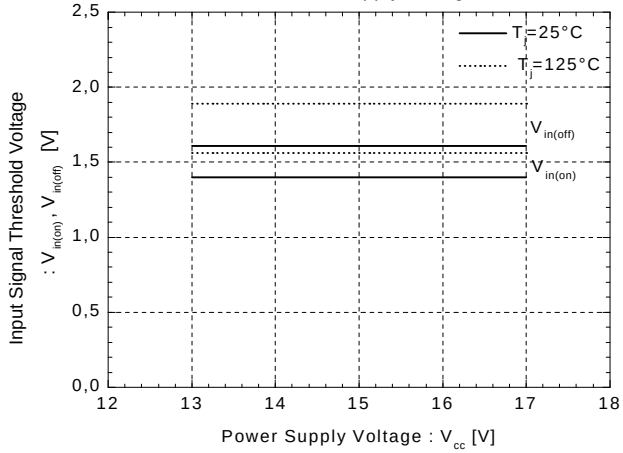
- Short circuit protection circuit
- Amplifier for driver
- Undervoltage protection circuit
- Overcurrent protection circuit
- IGBT Chip overheating protection

■ Control Circuit

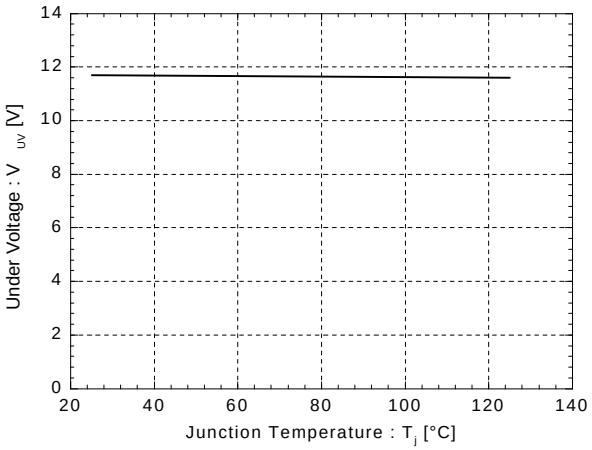
Power Supply Current vs. Switching Frequency



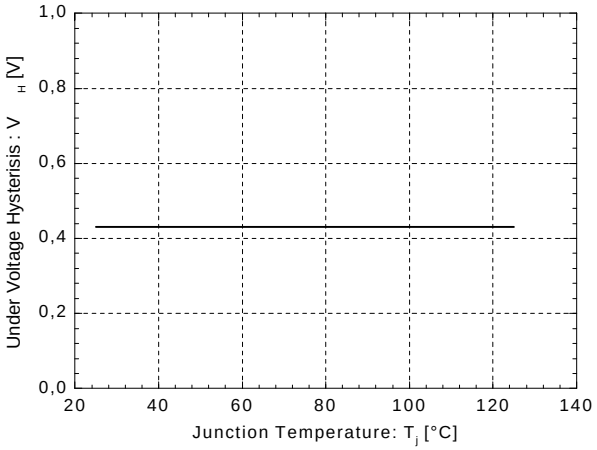
Input Signal Threshold Voltage vs. Power Supply Voltage



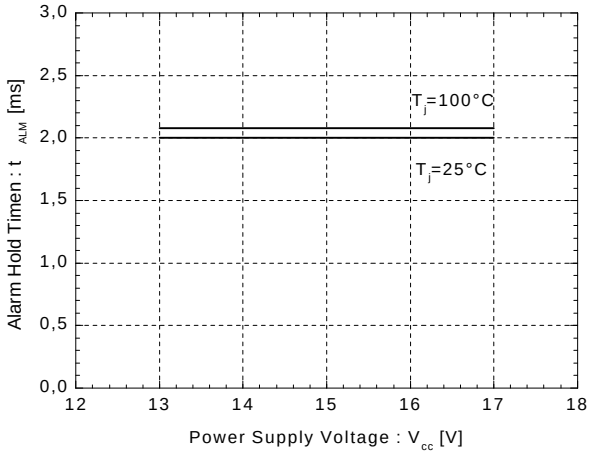
Under Voltage vs. Junction Temperature



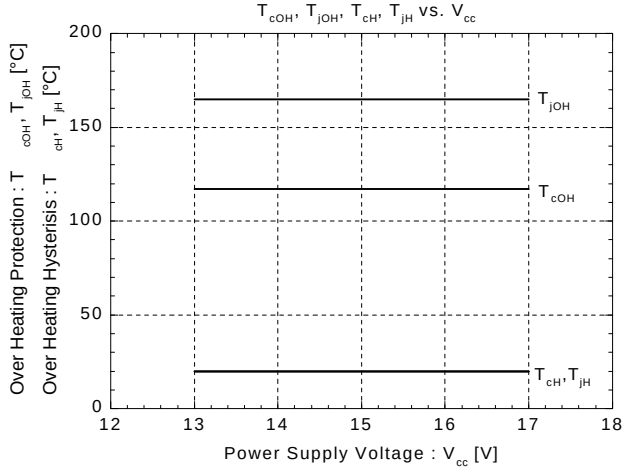
Under Voltage Hysterisis vs. Junction Temperature



Alarm Hold Time vs. Power Supply Voltage



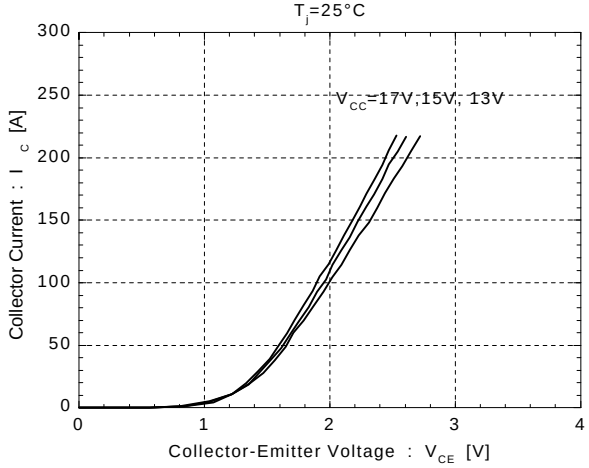
Over Heating Characteristics



■ Inverter

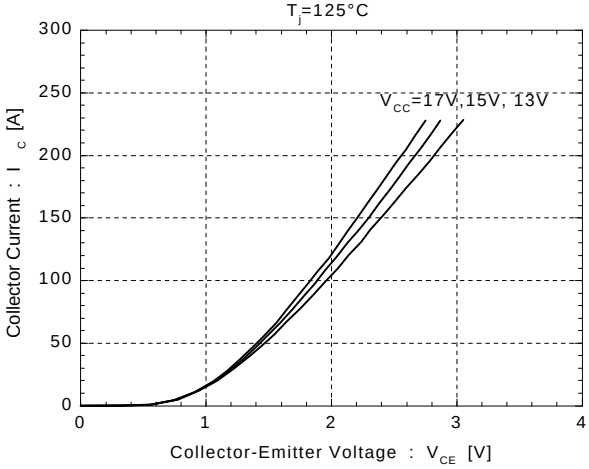
Collector Current vs. Collector-Emitter Voltage

T_j=25°C



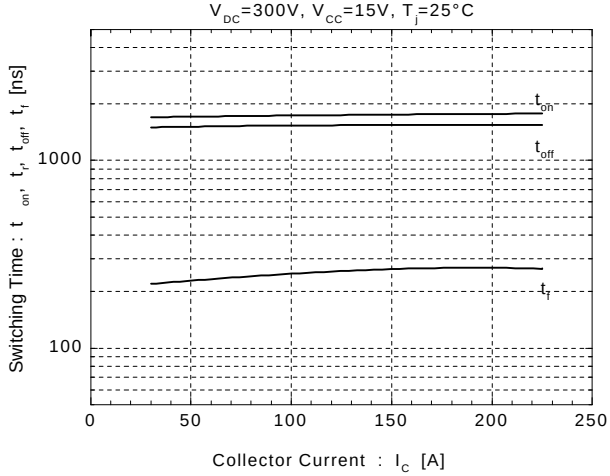
Collector Current vs. Collector-Emitter Voltage

T_j=125°C



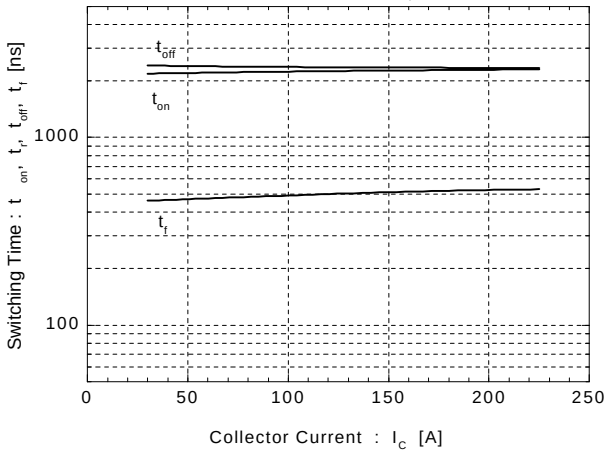
Switching Time vs. Collector Current

V_{DC}=300V, V_{CC}=15V, T_j=25°C

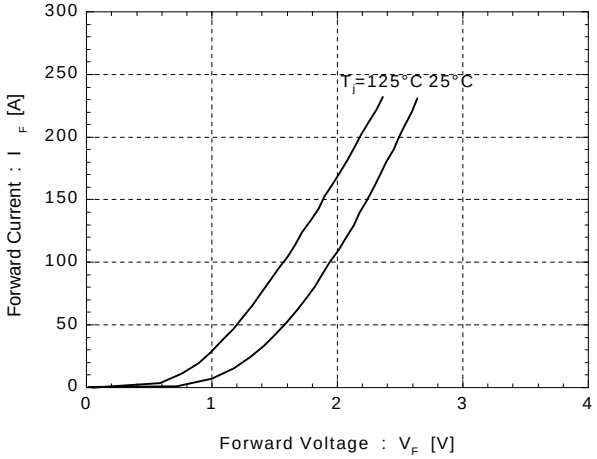


Switching Time vs. Collector Current

V_{DC}=300V, V_{CC}=15V, T_j=125°C

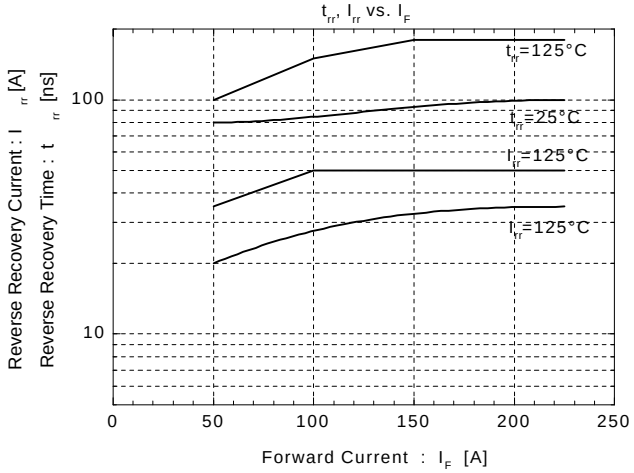


Forward Voltage vs. Forward Current

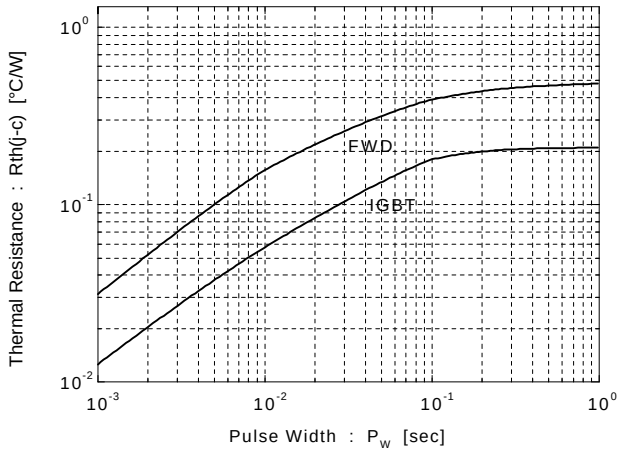


Reverse Recovery Characteristics

t_{rr}, I_{rr} vs. I_F

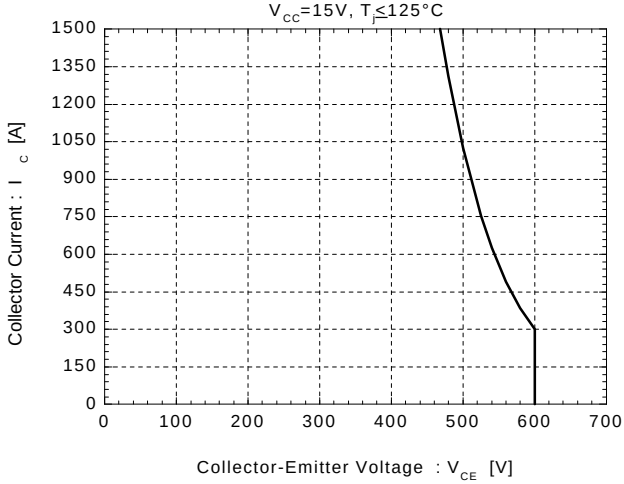


Transient Thermal Resistance



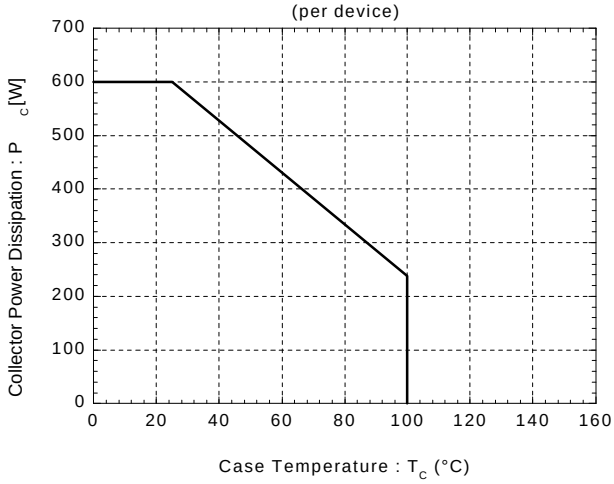
Reverse Biased Safe Operating Area

V_{CC}=15V, $T_j \leq 125°C$



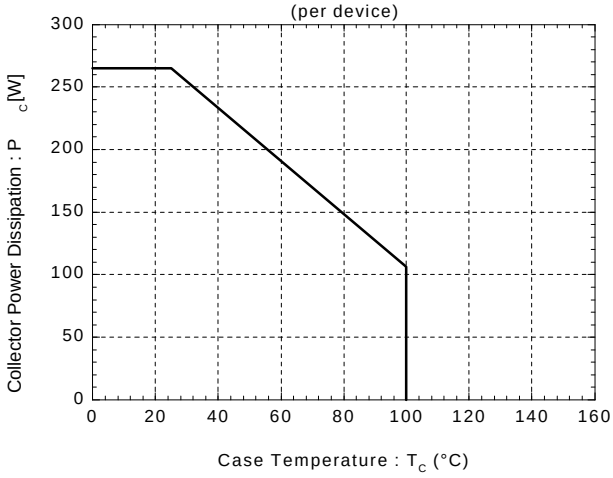
Power Derating For IGBT

(per device)



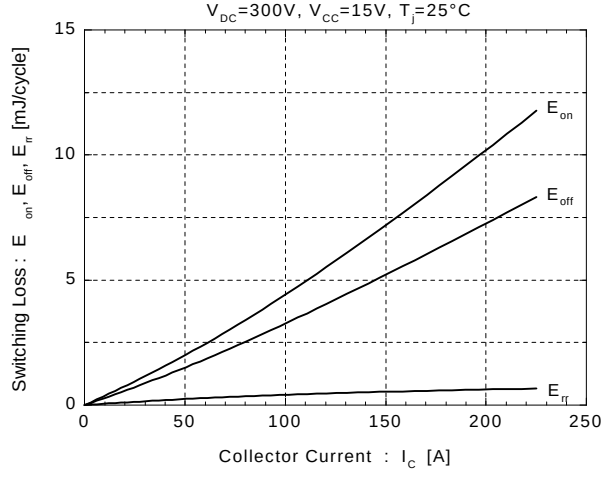
Power Derating For FWD

(per device)



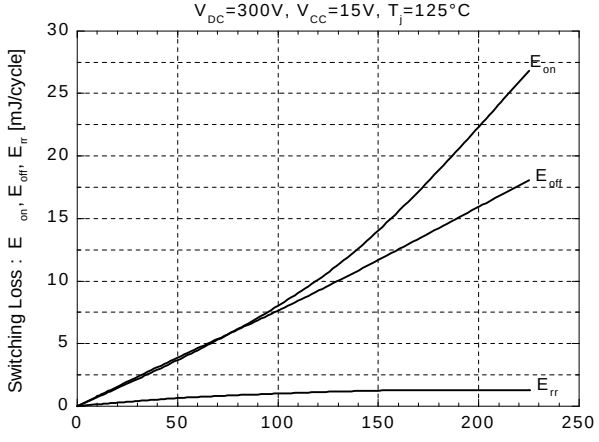
Switching Loss vs. Collector Current

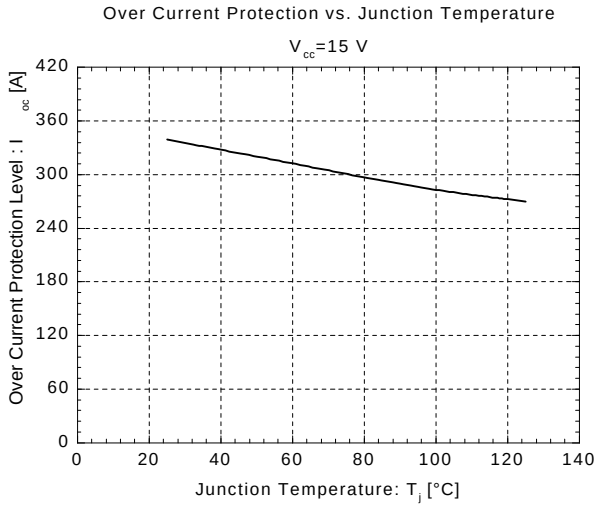
V_{DC}=300V, V_{CC}=15V, T_j=25°C



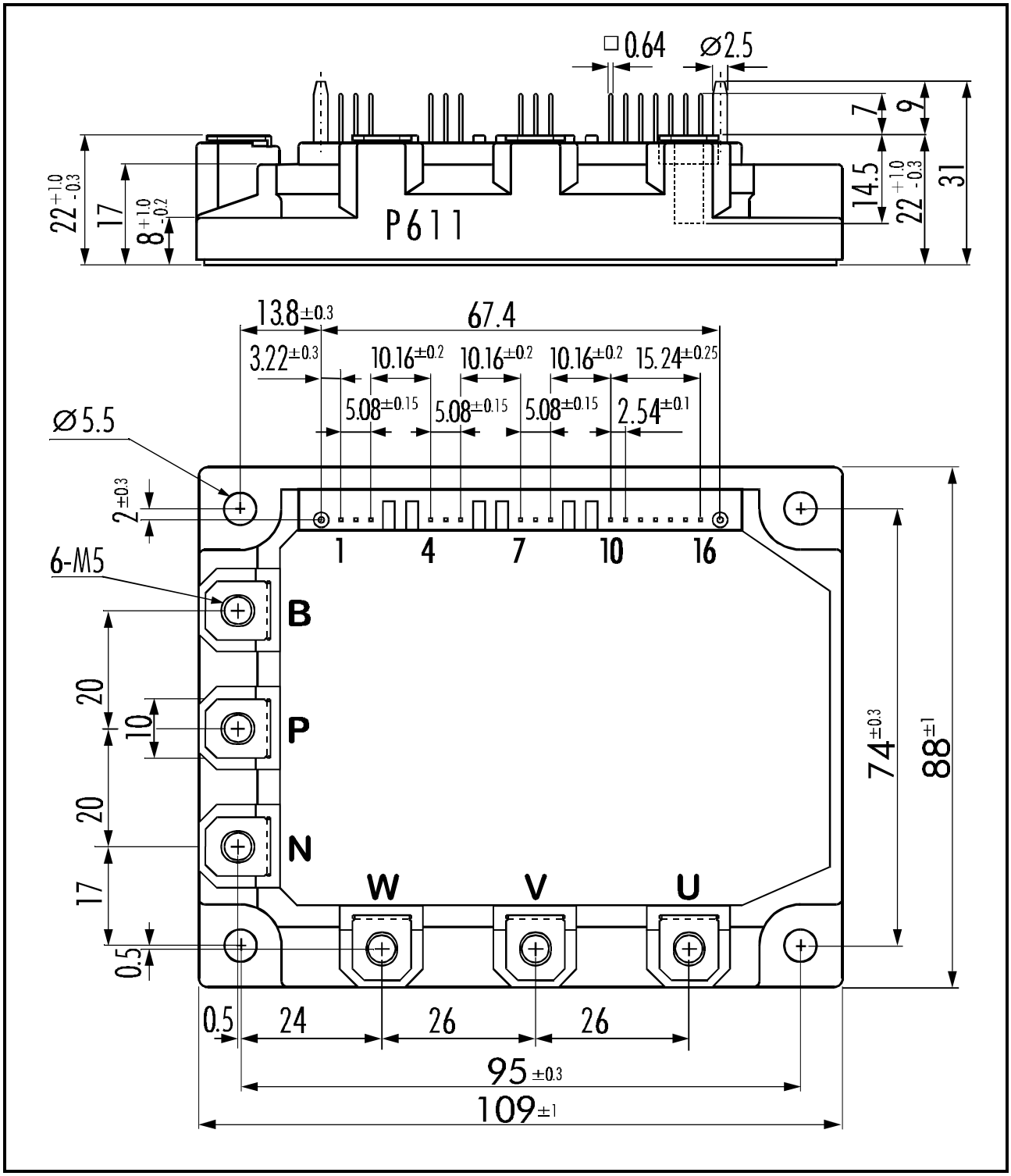
Switching Loss vs. Collector Current

V_{DC}=300V, V_{CC}=15V, T_j=125°C




Over Current Protection vs. Junction Temperature
V cc=15 V
Over Current Protection Level : I oc [A]
420
360
300
240
180
120
60
0
0
20
40
60
80
100
120
140
Junction Temperature: T j [°C]

■ Outline Drawing



Weight: 440g