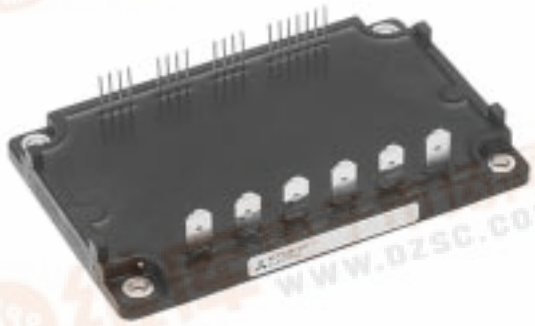
MITSUBISHI INTELLIGENT POWER MODULES

PM75CTK060

FLAT-BASE TYPE
INSULATED PACKAGE

PM75CTK060



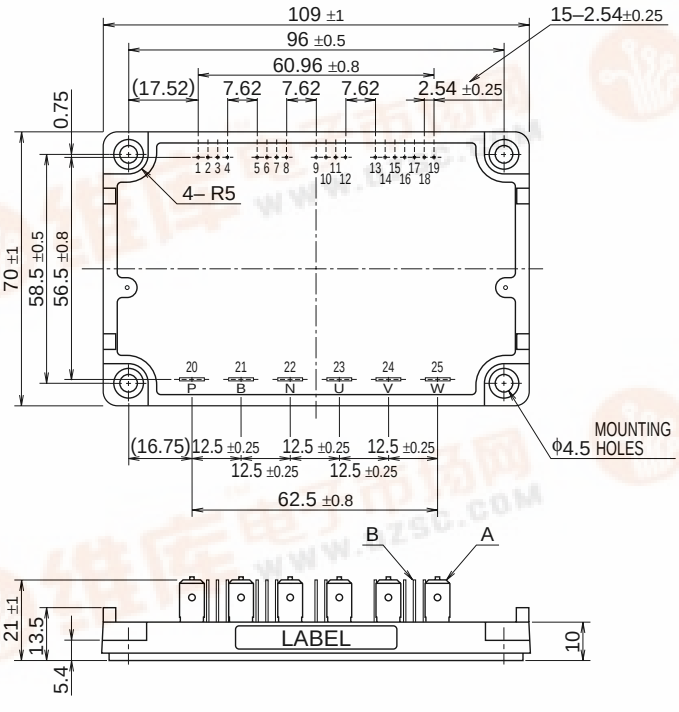
- 600V, 75A Current-sense 6kHz IGBT type inverter
- Built in IGBT gate drive circuit
- Built in Faule OC, SC, OT & UV protection Fault output
- 5.5/7.5kW class inverter application

APPLICATION

Air conditioner, mortor control

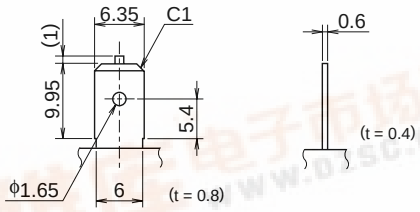
OUTLINE DRAWING

Dimensions in mm



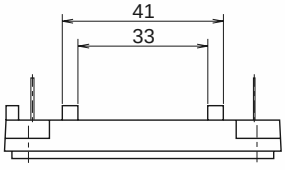
A · B: TERMINAL NAME

1. V_{UPC}	10. NC	19. F_O
2. NC	11. W_P	20. P
3. U_P	12. V_{WP1}	21. NC
4. V_{UP1}	13. V_{NC}	22. N
5. V_{VPC}	14. V_{N1}	23. U
6. NC	15. NC	24. V
7. V_P	16. U_N	25. W
8. V_{VP1}	17. V_N	
9. V_{WPC}	18. W_N	



A : DETAIL

B : DETAIL



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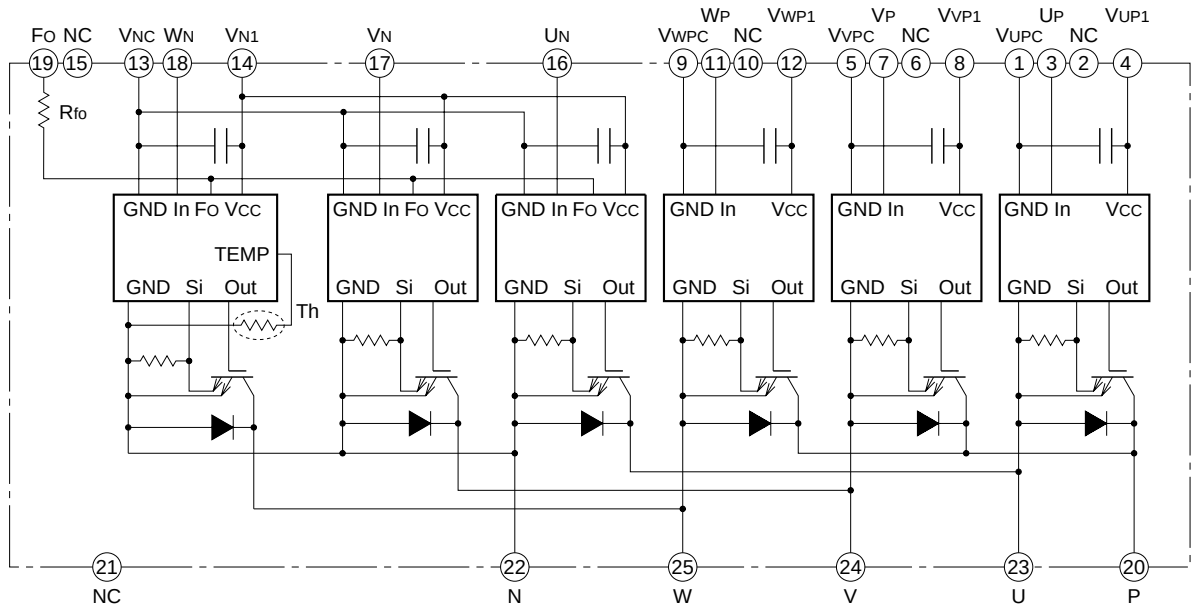
EQUIVALENT CIRCUIT DIAGRAM



MAXIMUM RATINGS (Tj = 25°C, unless otherwise noted)

INVERTER PART

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-emitter voltage	V_D = 15V, I_{CIN} = 10mA	600	V
±I_C	Collector current	T_C = 25°C	75	A
±I_{CP}	Collector current (peak)	T_C = 25°C	150	A
P_C	Collector dissipation	T_C = 25°C	134	W
T_j	Junction temperature		–20 ~ +150	°C

CONTROL PART

Symbol	Parameter	Conditions	Ratings	Unit
V_D	Supply voltage	Applied between : V_{UP1}-V_{UPC}, V_{VP1}-V_{VPC} V_{WP1}-V_{WPC}, V_{N1}-V_{NC}	20	V
I_{CIN}	Input current	Applied between : U_P-V_{UPC}, V_P-V_{VPC}, W_P-V_{WPC}, U_N · V_N · W_N-V_{NC}	20	mA
V_{FO}	Fault output supply voltage	Applied between : F_O-V_{NC}	20	V
I_{FO}	Fault output current	Sink current of F_O terminal	20	mA

MITSUBISHI ELECTRIC

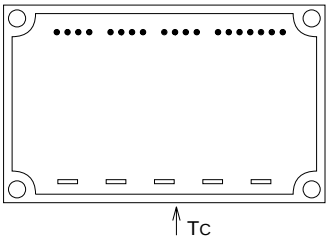
PM75CTK060

FLAT-BASE TYPE
INSULATED PACKAGE

TOTAL SYSTEM

Symbol	Parameter	Conditions	Ratings	Unit
$V_{CC(PROT)}$	Supply voltage protected by OC & SC	V_D = 13.5 ~ 16.5V, Inverter part, T_j = 125°C start	400	V
V_{CC}	Supply voltage	Applied between : P-N, operating time	450	V
$V_{CC(surge)}$	Supply voltage (surge)	Applied between : P-N, surge and non-operating time	500	V
T_C	Module case operating temperature	(Note 1)	–20 ~ +100	°C
T_{stg}	Storage temperature		–40 ~ +125	°C
V_{iso}	Isolation voltage	60Hz, sinusoidal, AC · 1 min	2500	V_{rms}

Note 1 : T_C measuring point is as shown below.



ELECTRICAL CHARACTERISTICS (T_j = 25°C, unless otherwise noted)

INVERTER PART

Symbol	Parameter	Test conditions		Limits Min.	Limits Typ.	Limits Max.	Unit
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_D = 15V, I_{CIN} = 10mA	I_C = 75A, T_j = 25°C	—	1.8	2.7	V
			I_C = 75A, T_j = 125°C	—	1.85	2.78	
V_{EC}	FWDi forward voltage	–I_C = 75A, V_D = 15V, I_{CIN} = 0mA		—	2.2	3.3	V
t_{on}	Switching time	V_D = 15V, I_{CIN} = 0mA↔10mA V_{CC} = 300V, I_C = 75A T_j = 125°C (Per 1 arm) Inductive Load		0.6	1.2	2.4	µs
t_{rr}				—	0.15	0.3	µs
$t_{c(on)}$				—	0.5	1.1	µs
t_{off}				—	2.8	3.6	µs
$t_{c(off)}$				—	0.6	1.2	µs
I_{CES}	Collector-emitter cutoff current	V_{CE} = V_{CES}, I_{CIN} = 0mA	T_j = 25°C	—	—	1	mA
			T_j = 125°C	—	—	10	

CONTROL PART

Symbol	Parameter	Test conditions		Limits Min.	Limits Typ.	Limits Max.	Unit
I_D	Circuit current	V_D = 15V, I_{CIN} = 0mA	V_{N1}-V_{NC}	—	40	55	mA
			V_{XP1}-V_{XPC}	—	13	18	
$I_{th(ON)}$	Input on threshold current	Applied between : U_P-V_{UPC}, V_P-V_{VPC}, W_P-V_{WPC}		1	3	5	mA
$I_{th(OFF)}$	Input off threshold current	U_N · V_N · W_N-V_{NC}		1	3	5	mA
OC	Over current trip level	–20°C ≤ T_j ≤ 125°C, V_D = 15V		115	161	—	A
SC	Short circuit trip level	–20°C ≤ T_j ≤ 125°C, V_D = 15V		—	241	—	A
$t_{off(OC)}$	Over current delay time	V_D = 15V		—	10	—	µs
OT	Over temperature protection	Base-plate Temperature detection, V_D = 15V	Trip level	100	110	120	°C
OT_r			Reset level	—	90	—	°C
UV	Supply circuit under voltage protection	–20°C ≤ T_j ≤ 125°C	Trip level	11.5	12.0	12.5	V
UV_r			Reset level	—	12.5	—	V
$I_{FO(H)}$	Fault output current (Note 2)	V_D = 15V, V_{FO} = 15V		—	—	0.01	mA
$I_{FO(L)}$				—	10	15	mA
t_{FO}	Minimum fault output pulse width (Note 2)	V_D = 15V		1.0	1.8	—	ms

Note 2 : Fault output is given only when the internal OC, SC, OT & UV protection.
Fault output of OC, SC protection operate by lower arm.
Fault output of OC, SC protection given pulse.
Fault output of OT, UV protection given pulse while over level. (OT is only N side)

THERMAL RESISTANCES

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Tye.	Max.	
$R_{th(j-c)Q}$	Junction to case thermal resistances	Inverter IGBT part, per 1/6 module	—	—	0.93	°C / W
$R_{th(j-c)F}$		Inverter FWDi part, per 1/6 module	—	—	0.91	°C / W
$R_{th(c-f)}$	Contact thermal resistance	Case to fin, thermal grease applied, per 1 module	—	—	0.036	°C / W

MECHANICAL RATINGS AND CHARACTERISTICS

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Tye.	Max.	
—	Mounting torque	Mounting screw : M4	0.98	1.18	1.47	N·m
			10	12	15	kg·cm
—	Weight		—	150	—	g

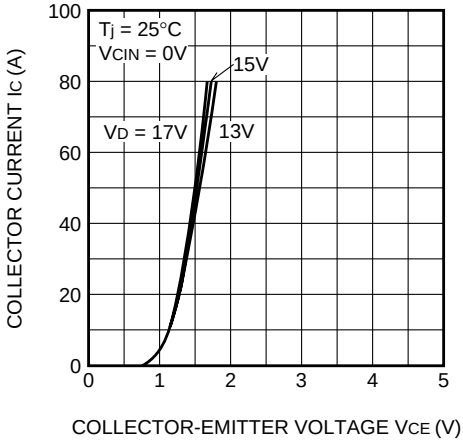
RECOMMENDED CONDITIONS FOR USE

Symbol	Parameter	Test conditions	Ratings	Unit
V_{CC}	Supply voltage	Applied between : P-N	≤ 400	V
V_D		Applied between : V_{UP1}-V_{UPC}, V_{VP1}-V_{VPC} V_{WP1}-V_{WPC}, V_{N1}-V_{NC} (Note 3)	15 ± 1.5	V
$I_{CIN(ON)}$	Input on current	Applied between : U_P, V_P, W_P, U_N, V_N, W_N	≥ 5	mA
$I_{CIN(OFF)}$	Input off current		≤ 1	mA
f_{PWM}	PWM input frequency	Using application circuit Opto-coupler's input signal	≤ 8	kHz
t_{dead}	Arm shoot-through blocking time	Using application circuit Opto-coupler's input signal	≥ 3	µs

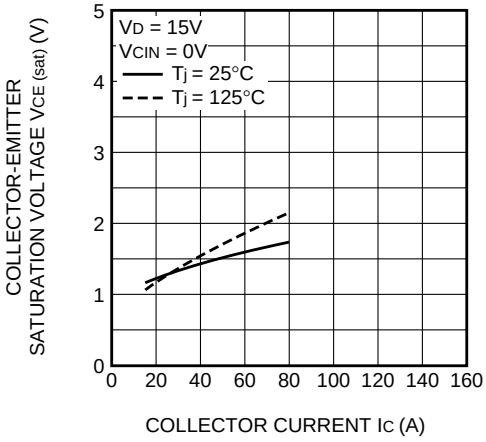
Note 3 : Permissible ripple value : dv/dt ≤ ±5V/µs, Vripple ≤ $2V_{P-P}$

PERFORMANCE CURVES

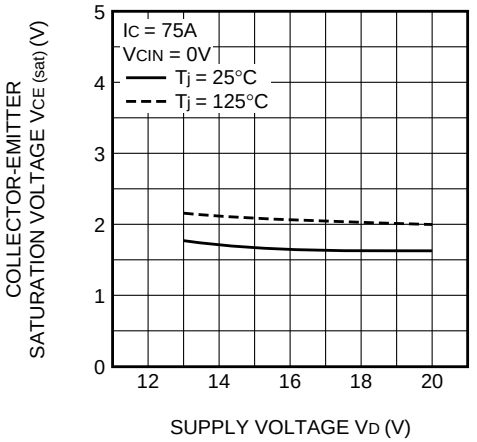
OUTPUT CHARACTERISTICS (TYPICAL)



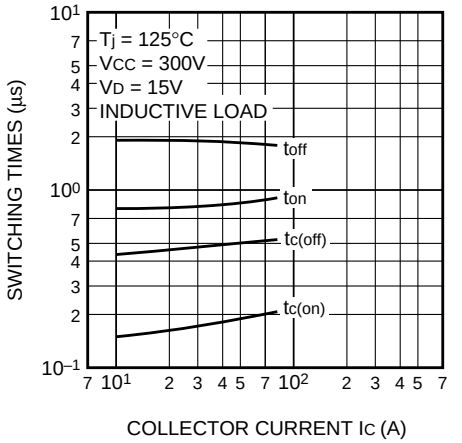
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



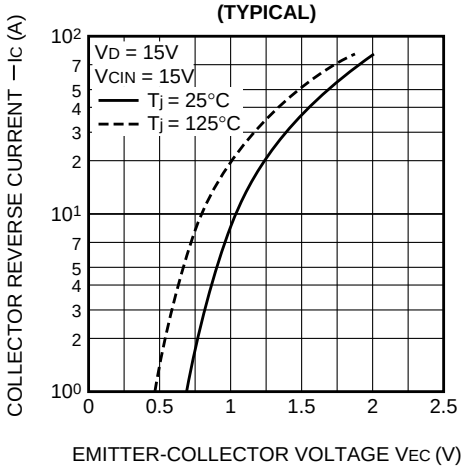
COLLECTOR-EMITTER SATURATION VOLTAGE VS. SUPPLY VOLTAGE (TYPICAL)



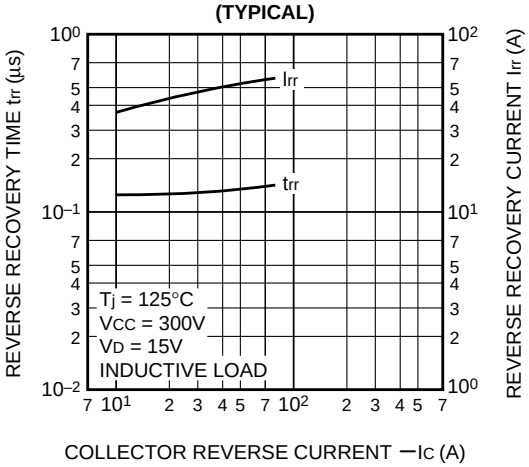
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



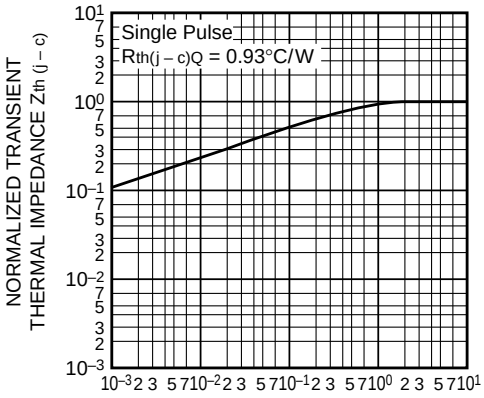
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT per 1 element)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi per 1 element)