

PS21963-4E/-4AE/-4CE/-4EW

TRANSFER-MOLD TYPE
INSULATED TYPE

PS21963-4E



INTEGRATED POWER FUNCTIONS

600V/8A low-loss CSTBT™ inverter bridge for three phase DC-to-AC power conversion

INTEGRATED DRIVE, PROTECTION AND SYSTEM CONTROL FUNCTIONS

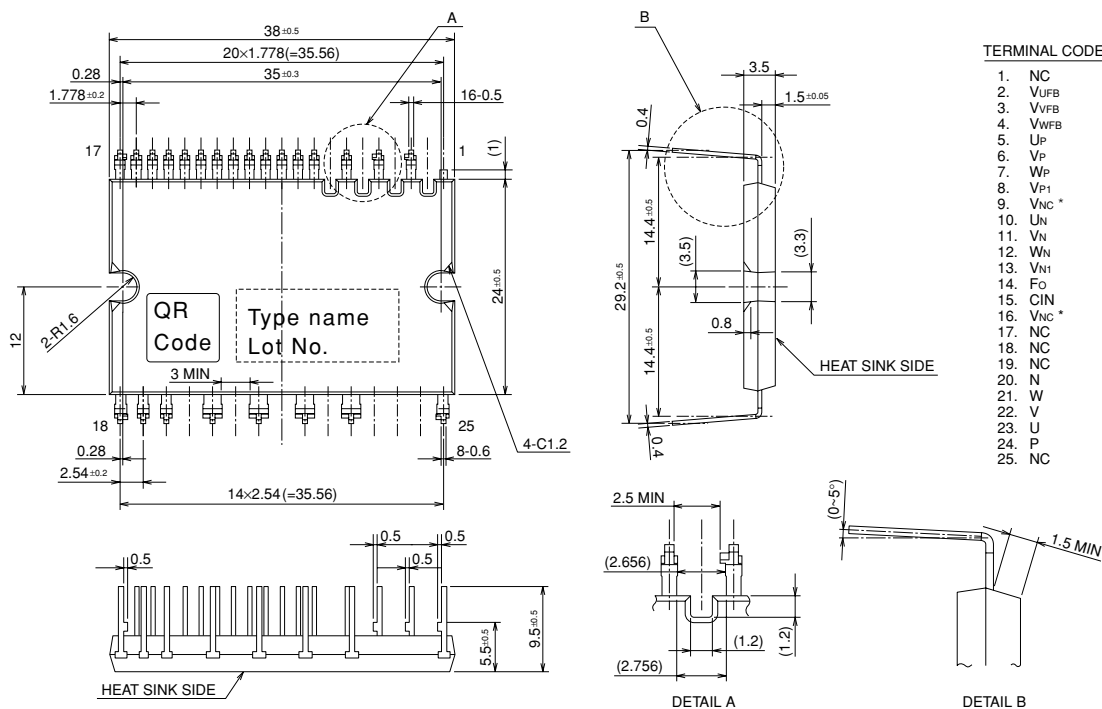
- For upper-leg IGBTs : Drive circuit, High voltage high-speed level shifting, Control supply under-voltage (UV) protection.
- For lower-leg IGBTs : Drive circuit, Control supply under-voltage protection (UV), Short circuit protection (SC).
- Fault signaling : Corresponding to an SC fault (Lower-leg IGBT) or a UV fault (Lower-side supply).
- Input interface : 3V, 5V line (High Active).
- UL Approved : Yellow Card No. E80276

APPLICATION

AC100V~200V three-phase inverter drive for small power motor control.

Fig. 1 PACKAGE OUTLINES (PS21963-4E)

Dimensions in mm



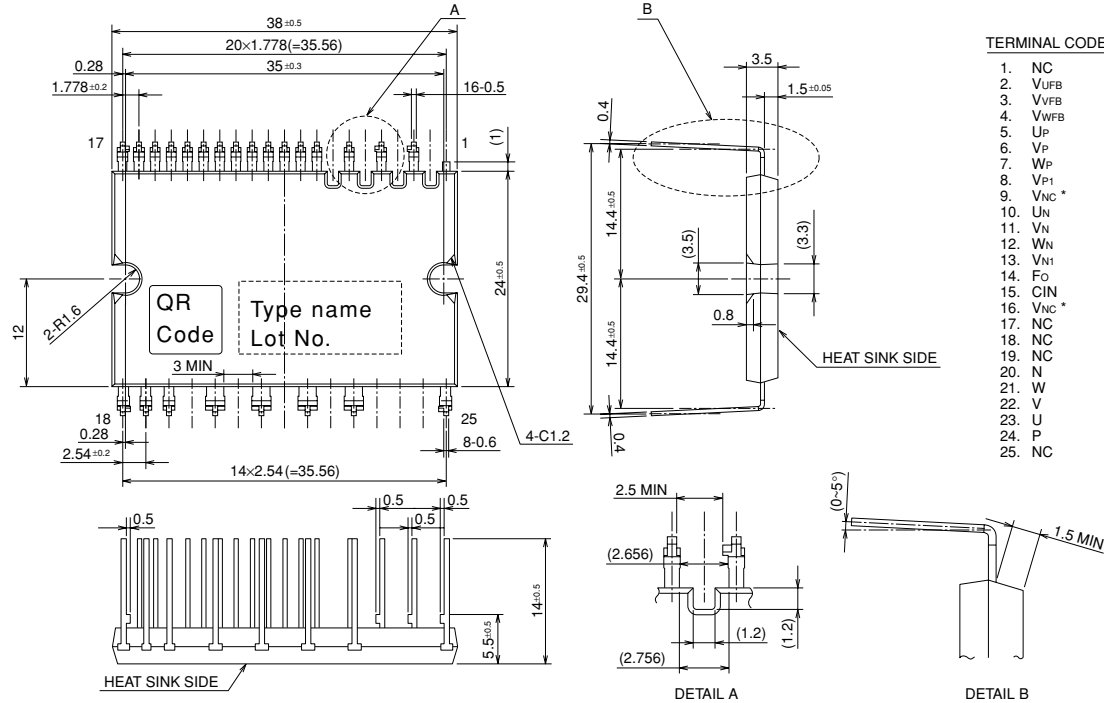
*) Two VNC terminals (9 & 16 pin) are connected inside DIP-IPM, please connect either one to the 15V power supply GND outside and leave another one open.

PS21963-4E/-4AE/-4CE/-4EW

TRANSFER-MOLD TYPE
INSULATED TYPE

Fig. 2 LONG TERMINAL TYPE PACKAGE OUTLINES (PS21963-4AE)

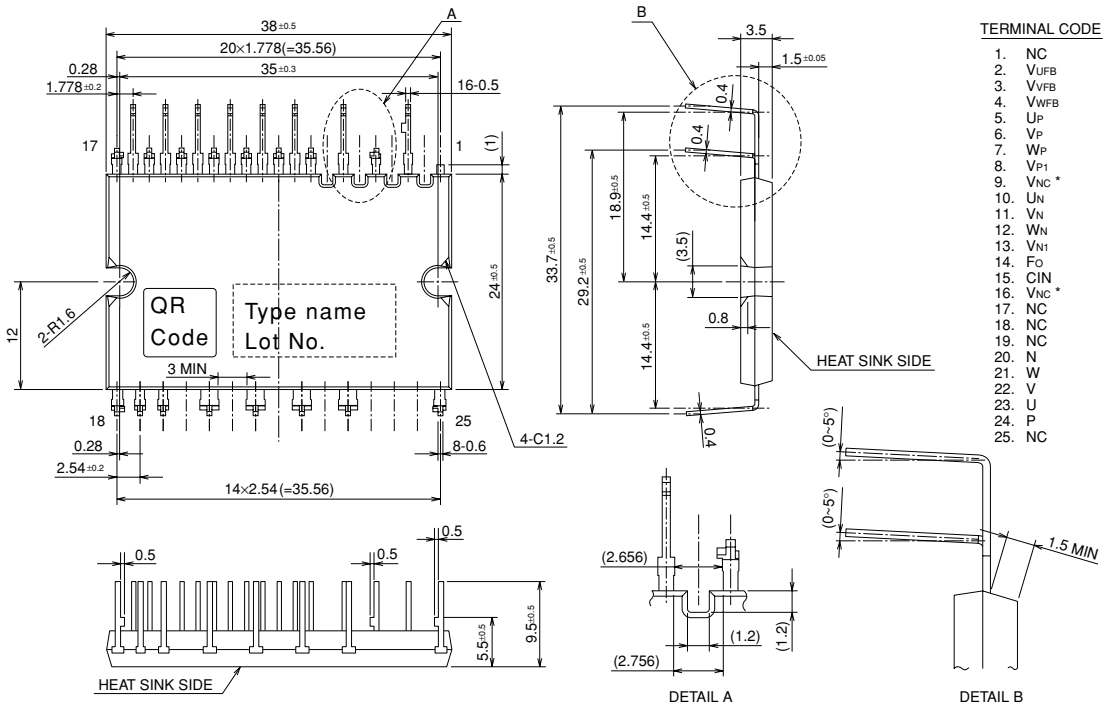
Dimensions in mm



*) Two VNC terminals (9 & 16 pin) are connected inside DIP-IPM, please connect either one to the 15V power supply GND outside and leave another one open.

Fig. 3 ZIGZAG TERMINAL TYPE PACKAGE OUTLINES (PS21963-4CE)

Dimensions in mm



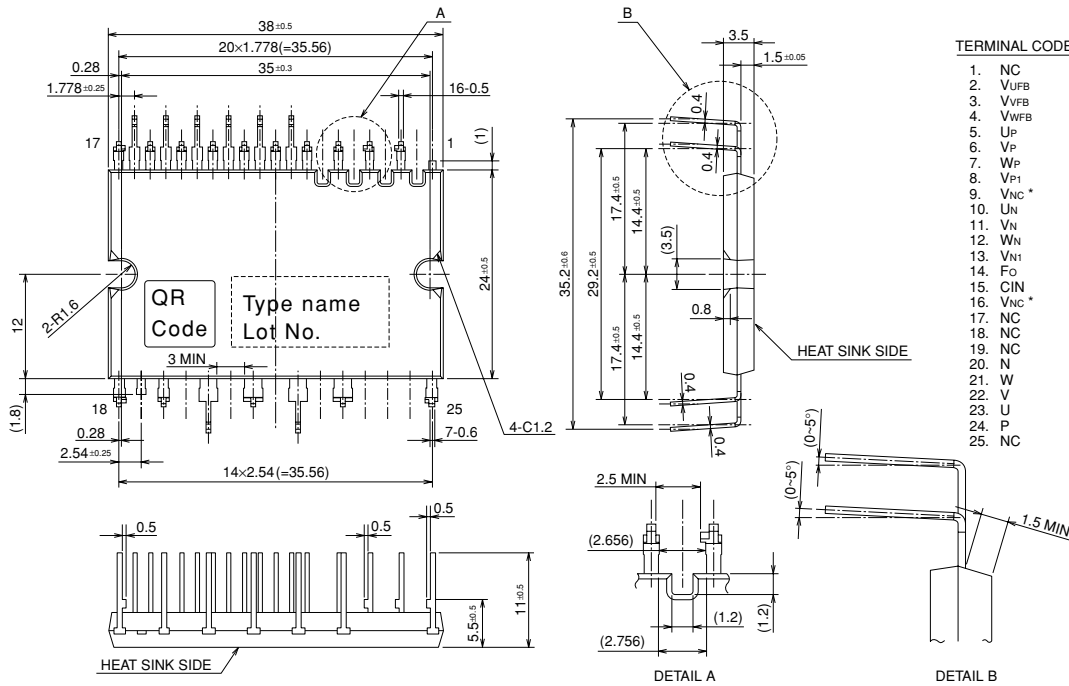
*) Two VNC terminals (9 & 16 pin) are connected inside DIP-IPM, please connect either one to the 15V power supply GND outside and leave another one open.

PS21963-4E/-4AE/-4CE/-4EW

TRANSFER-MOLD TYPE
INSULATED TYPE

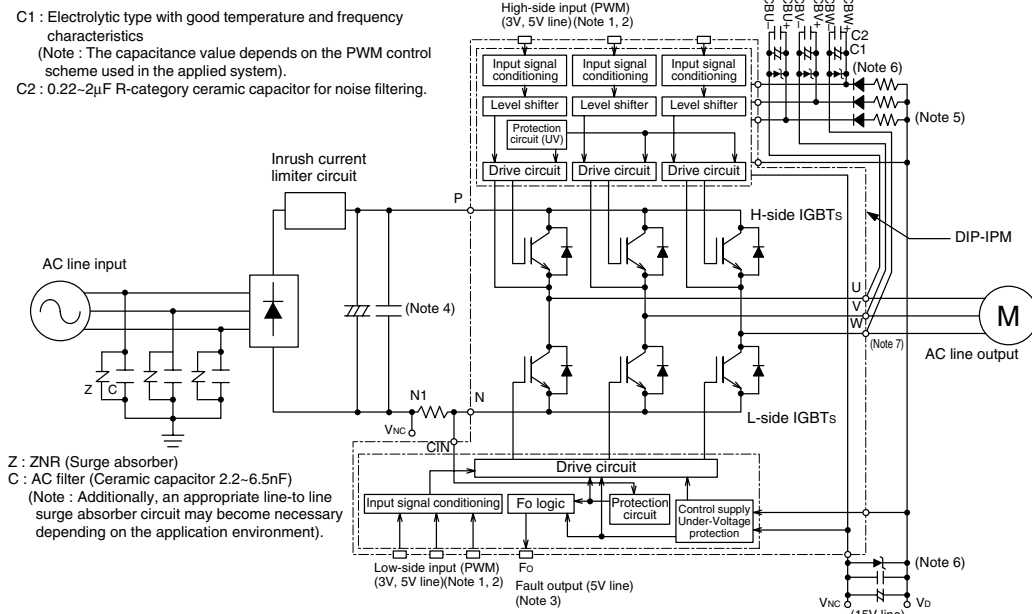
Fig. 4 BOTH SIDES ZIGZAG TERMINAL TYPE PACKAGE OUTLINES (PS21963-4EW)

Dimensions in mm



*) Two V_{NC} terminals (9 & 16 pin) are connected inside DIP-IPM, please connect either one to the 15V power supply GND outside and leave another one open.

Fig. 5 INTERNAL FUNCTIONS BLOCK DIAGRAM (TYPICAL APPLICATION EXAMPLE)



- Note1:** Input logic is high-active. There is a 3.3kΩ (min) pull-down resistor built-in each input circuit. When using an external CR filter, please make it satisfy the input threshold voltage.
- 2:** By virtue of integrating an application specific type HVIC inside the module, direct coupling to MCU terminals without any opto-coupler or transformer isolation is possible. (see also Fig. 11)
- 3:** This output is open drain type. The signal line should be pulled up to the positive side of the 5V power supply with approximately 10kΩ resistor. (see also Fig. 11)
- 4:** The wiring between the power DC link capacitor and the P, N1 terminals should be as short as possible to protect the DIP-IPM against catastrophic high surge voltages. For extra precaution, a small film type snubber capacitor (0.1-0.22μF, high voltage type) is recommended to be mounted close to these P & N1 DC power input pins.
- 5:** High voltage (600V or more) and fast recovery type (less than 100ns) diodes should be used in the bootstrap circuit.
- 6:** It is recommended to insert a Zener diode (24V/1W) between each pair of control supply terminals to prevent surge destruction.
- 7:** Bootstrap negative electrodes should be connected to U, V, W terminals directly and separated from the main output wires.

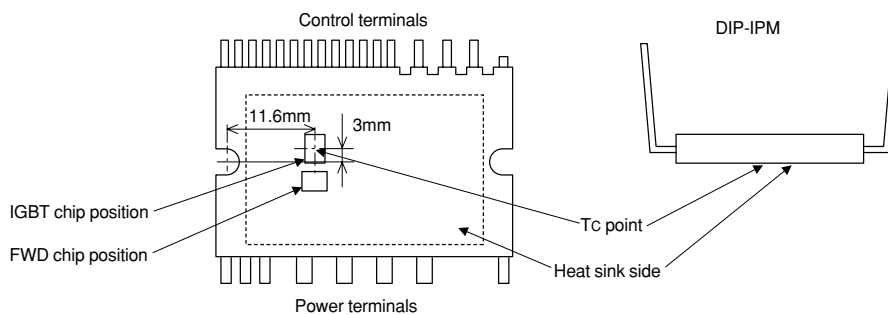
PS21963-4E/-4AE/-4CE/-4EW

TRANSFER-MOLD TYPE
INSULATED TYPE

TOTAL SYSTEM

Symbol	Parameter	Condition	Ratings	Unit
V _{CC(Prot)}	Self protection supply voltage limit (short circuit protection capability)	V _D = 13.5~16.5V, Inverter part T _j = 125°C, non-repetitive, less than 2μs	400	V
T _C	Module case operation temperature	(Note 2)	-20~+100	°C
T _{stg}	Storage temperature		-40~+125	°C
V _{iso}	Isolation voltage	60Hz, Sinusoidal, 1 minute, Between pins and heat-sink plate	1500	V _{rms}

Note 2: T_C measurement point



THERMAL RESISTANCE

Symbol	Parameter	Condition	Limits			Unit
			Min.	Typ.	Max.	
R _{th(j-c)Q}	Junction to case thermal resistance (Note 3)	Inverter IGBT part (per 1/6 module)	—	—	4.1	°C/W
R _{th(j-c)F}		Inverter FWD part (per 1/6 module)	—	—	5.4	°C/W

Note 3: Grease with good thermal conductivity should be applied evenly with about +100μm~+200μm on the contacting surface of DIP-IPM and heat-sink.

The contacting thermal resistance between DIP-IPM case and heat sink (R_{th(c-f)}) is determined by the thickness and the thermal conductivity of the applied grease. For reference, R_{th(c-f)} (per 1/6 module) is about 0.3°C/W when the grease thickness is 20μm and the thermal conductivity is 1.0W/m·k.

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

INVERTER PART

Symbol	Parameter	Condition		Limits			Unit
				Min.	Typ.	Max.	
V _{CE(sat)}	Collector-emitter saturation voltage	V _D = V _{DB} = 15V V _{IN} = 5V	I _C = 8A, T _j = 25°C I _C = 8A, T _j = 125°C	—	1.70 1.80	2.20 2.30	V
V _{EC}	FWD forward voltage	T _j = 25°C, -I _C = 8A, V _{IN} = 0V		—	1.90	2.35	V
t _{on}	Switching times	V _{CC} = 300V, V _D = V _{DB} = 15V		0.60	1.10	1.70	μs
t _{rr}		I _C = 8A, T _j = 125°C, V _{IN} = 0 ↔ 5V		—	0.30	—	μs
t _{c(on)}		Inductive load (upper-lower arm)		—	0.40	0.60	μs
t _{off}				—	1.40	2.00	μs
t _{c(off)}				—	0.40	0.75	μs
I _{CES}	Collector-emitter cut-off current	V _{CE} = V _{CES}	T _j = 25°C T _j = 125°C	—	—	1 10	mA

PS21963-4E/-4AE/-4CE/-4EW

TRANSFER-MOLD TYPE

INSULATED TYPE

CONTROL (PROTECTION) PART

Symbol	Parameter	Condition	Limits			Unit
			Min.	Typ.	Max.	
ID	Circuit current	$V_D = V_{DB} = 15V$ $V_{IN} = 5V$	Total of V_{P1-VNC} , V_{N1-VNC}		2.80	mA
			V_{UFB-U} , V_{VFB-V} , V_{WFB-W}		0.55	mA
		$V_D = V_{DB} = 15V$ $V_{IN} = 0V$	Total of V_{P1-VNC} , V_{N1-VNC}		2.80	mA
			V_{UFB-U} , V_{VFB-V} , V_{WFB-W}		0.55	mA
VFOH	Fault output voltage	$V_{SC} = 0V$, Fo terminal pull-up to 5V by 10k Ω	4.9	—	—	V
VFOL		$V_{SC} = 1V$, IFO = 1mA	—	—	0.95	V
VSC(ref)	Short circuit trip level	$T_j = 25^\circ C$, $V_D = 15V$ (Note 4)	0.43	0.48	0.53	V
IIN	Input current	$V_{IN} = 5V$	0.70	1.00	1.50	mA
UVDBt	Control supply under-voltage protection	$T_j \leq 125^\circ C$	Trip level		10.0	V
UVDBr			Reset level		10.5	V
UVDt			Trip level		10.3	V
UVDr			Reset level		10.8	V
tFO	Fault output pulse width	(Note 5)	20	—	—	μs
Vth(on)	ON threshold voltage	Applied between UP, VP, WP, UN, VN, WN-VNC	—	2.1	2.6	V
Vth(off)	OFF threshold voltage		0.8	1.3	—	V
Vth(hys)	ON/OFF threshold hysteresis voltage		0.35	0.65	—	V

Note 4 : Short circuit protection is functioning only for the lower-arms. Please select the external shunt resistance such that the SC trip-level is less than 1.7 times of the current rating.

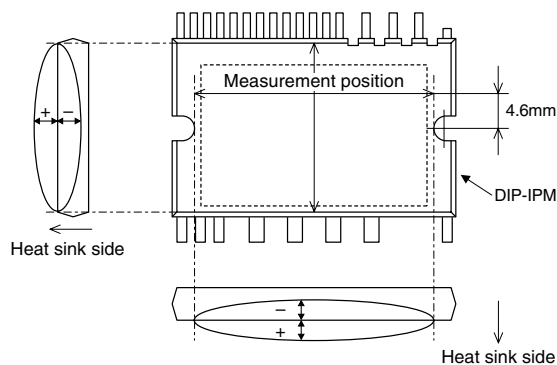
5 : Fault signal is asserted corresponding to a short circuit or lower side control supply under-voltage failure.

MECHANICAL CHARACTERISTICS AND RATINGS

Parameter	Condition	Limits			Unit
		Min.	Typ.	Max.	
Mounting torque	Mounting screw : M3 (Note 6) Recommended : 0.69 N·m	0.59	—	0.78	N·m
Weight		—	10	—	g
Heat-sink flatness	(Note 7)	-50	—	100	μm

Note 6 : Plain washers (ISO 7089~7094) are recommended.

Note 7 : Flatness measurement position



PS21963-4E/-4AE/-4CE/-4EW

TRANSFER-MOLD TYPE
INSULATED TYPE

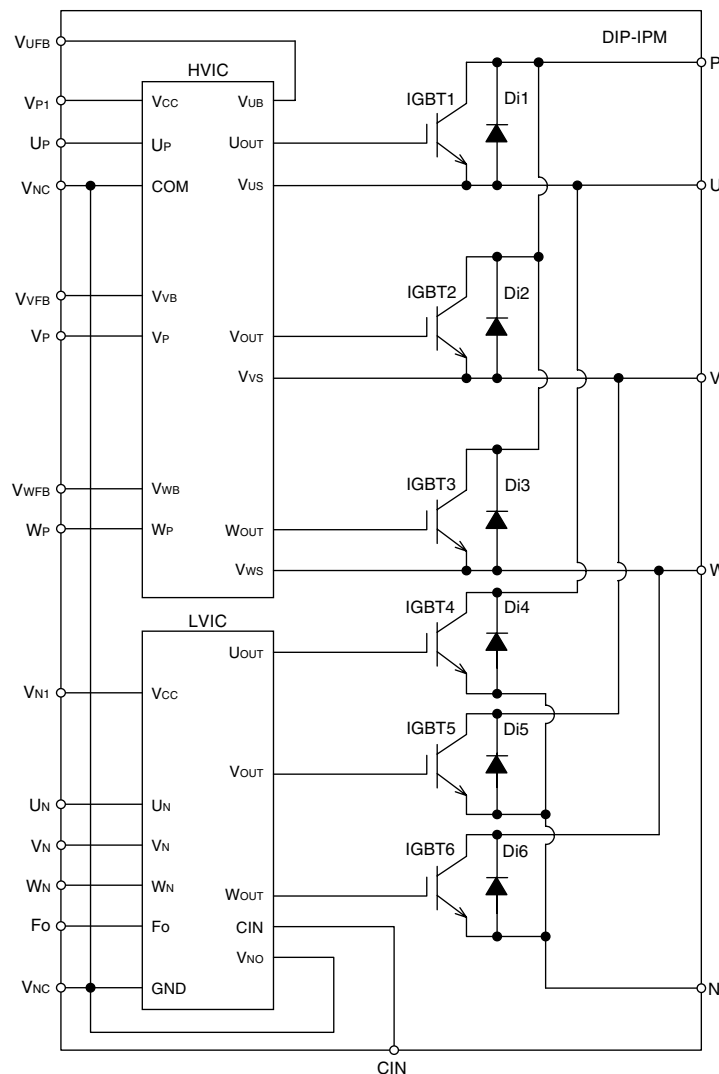
RECOMMENDED OPERATION CONDITIONS

Symbol	Parameter	Condition	Limits			Unit
			Min.	Typ.	Max.	
V _{CC}	Supply voltage	Applied between P-N	0	300	400	V
V _D	Control supply voltage	Applied between V _{P1} -V _{NC} , V _{N1} -V _{NC}	13.5	15.0	16.5	V
V _{DB}	Control supply voltage	Applied between V _{UFB} -U, V _{VFB} -V, V _{WFB} -W	13.0	15.0	18.5	V
ΔV _D , ΔV _{DB}	Control supply variation		-1	—	1	V/μs
t _{dead}	Arm shoot-through blocking time	For each input signal, T _c ≤ 100°C	1.5	—	—	μs
f _{PWM}	PWM input frequency	T _c ≤ 100°C, T _j ≤ 125°C	—	—	20	kHz
I _O	Allowable r.m.s. current	V _{CC} = 300V, V _D = V _{DB} = 15V, P.F = 0.8, sinusoidal PWM, T _j ≤ 125°C, T _c ≤ 100°C (Note 8)	f _{PWM} = 5kHz	—	4.0	Arms
			f _{PWM} = 15kHz	—	2.5	
P _{WIN(on)}	Allowable minimum input pulse width	(Note 9)	0.5	—	—	μs
P _{WIN(off)}			0.5	—	—	
V _{NC}	V _{NC} variation	Between V _{NC} -N (including surge)	-5.0	—	5.0	V

Note 8 : The allowable r.m.s. current value depends on the actual application conditions.

9 : IPM might not make response if the input signal pulse width is less than the recommended minimum value.

Fig. 7 THE DIP-IPM INTERNAL CIRCUIT



PS21963-4E/-4AE/-4CE/-4EW

TRANSFER-MOLD TYPE
INSULATED TYPE

Fig. 8 TIMING CHART OF THE DIP-IPM PROTECTIVE FUNCTIONS

[A] Short-Circuit Protection (Lower-side only with the external shunt resistor and CR filter)

- a1. Normal operation : IGBT ON and carrying current.
- a2. Short circuit detection (SC trigger).
- a3. IGBT gate hard interruption.
- a4. IGBT turns OFF.
- a5. Fo outputs ($t_{FO(min)} = 20\mu s$).
- a6. Input "L" : IGBT OFF.
- a7. Input "H" : IGBT ON.
- a8. IGBT OFF in spite of input "H".



[B] Under-Voltage Protection (Lower-side, UV_D)

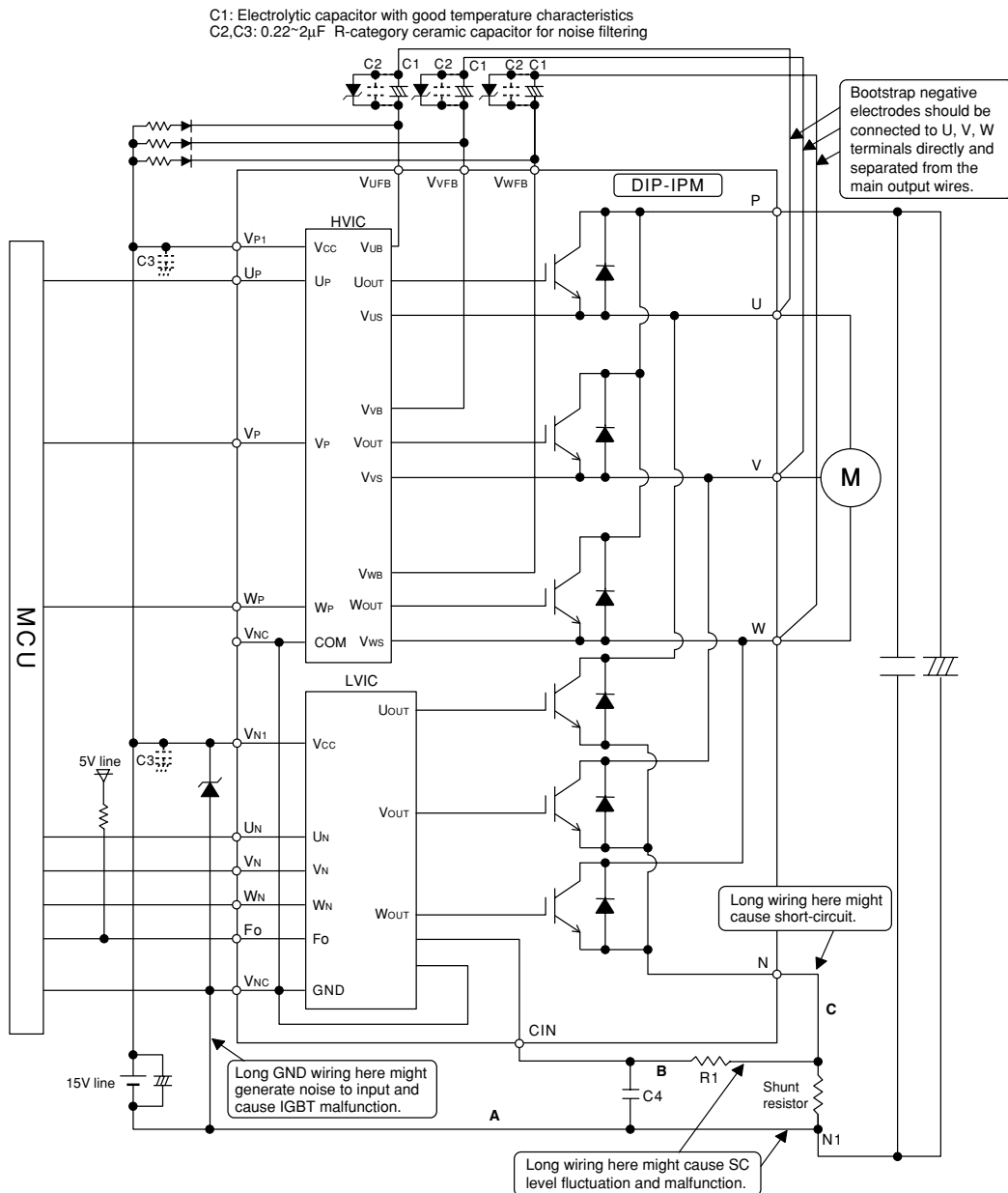
- b1. Control supply voltage rising : After the voltage level reaches UV_{Dr}, the circuits start to operate when next input is applied.
- b2. Normal operation : IGBT ON and carrying current.
- b3. Under voltage trip (UV_{Dt}).
- b4. IGBT OFF in spite of control input condition.
- b5. Fo outputs ($t_{FO} \geq 20\mu s$ and Fo outputs continuously during UV period).
- b6. Under voltage reset (UV_{Dr}).
- b7. Normal operation : IGBT ON and carrying current.



PS21963-4E/-4AE/-4CE/-4EW

TRANSFER-MOLD TYPE
INSULATED TYPE

Fig. 11 AN EXAMPLE OF TYPICAL DIP-IPM APPLICATION CIRCUIT



- Note 1** : Input drive is High-Active type. There is a 3.3kΩ(min.) pull-down resistor integrated in the IC input circuit. To prevent malfunction, the wiring of each input should be as short as possible. When using RC coupling circuit, make sure the input signal level meet the turn-on and turn-off threshold voltage.
- 2** : Thanks to HVIC inside the module, direct coupling to MCU without any opto-coupler or transformer isolation is possible.
- 3** : Fo output is open drain type. It should be pulled up to the positive side of a 5V power supply by a resistor of about 10kΩ.
- 4** : To prevent erroneous protection, the wiring of A, B, C should be as short as possible.
- 5** : The time constant R1C4 of the protection circuit should be selected in the range of 1.5-2μs. SC interrupting time might vary with the wiring pattern. Tight tolerance, temp-compensated type is recommended for R1, C4.
- 6** : All capacitors should be mounted as close to the terminals of the DIP-IPM as possible. (C1: good temperature, frequency characteristic electrolytic type, and C2, C3: good temperature, frequency and DC bias characteristic ceramic type are recommended.)
- 7** : To prevent surge destruction, the wiring between the smoothing capacitor and the P, N1 terminals should be as short as possible. Generally a 0.1-0.22μF snubber between the P-N1 terminals is recommended.
- 8** : Two Vnc terminals (9 & 16 pin) are connected inside DIP-IPM, please connect either one to the 15V power supply GND outside and leave another one open.
- 9** : It is recommended to insert a Zener diode (24V/1W) between each pair of control supply terminals to prevent surge destruction.
- 10** : If control GND is connected to power GND by broad pattern, it may cause malfunction by power GND fluctuation. It is recommended to connect control GND and power GND at only a point.

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А