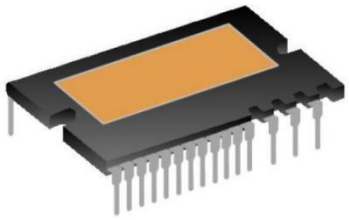
JJMICROELECTRONICS

650V 10A Intelligent Power Module

JM10Z07DL1

Features:

- 650V 10A Three-Phase IGBT inverter with control ICs inside
- Integrated OC SC protection & temperature output
- Very low thermal resistance
- High efficiency due to very low losses
- Integrated bootstrap diodes
- High reliability & strong SC withstand ability



DIP25

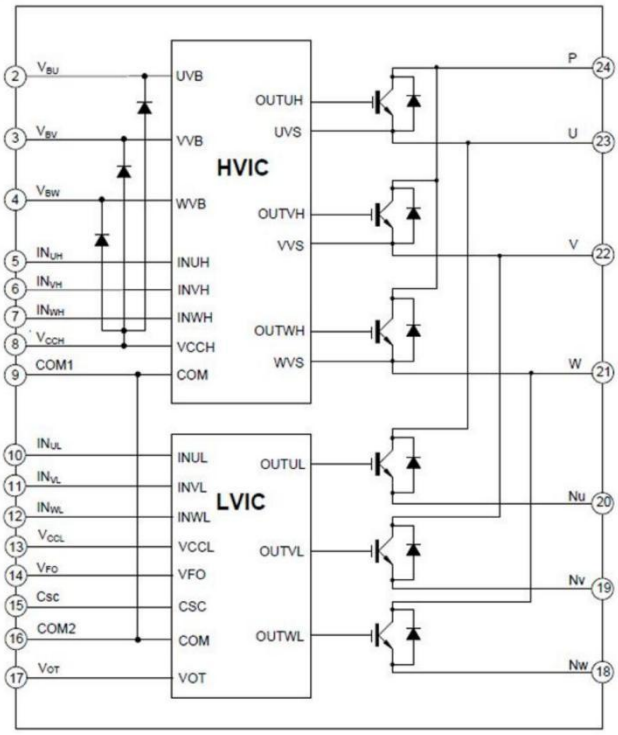
Applications:

- Home appliances
- Motor drives
- General inverter

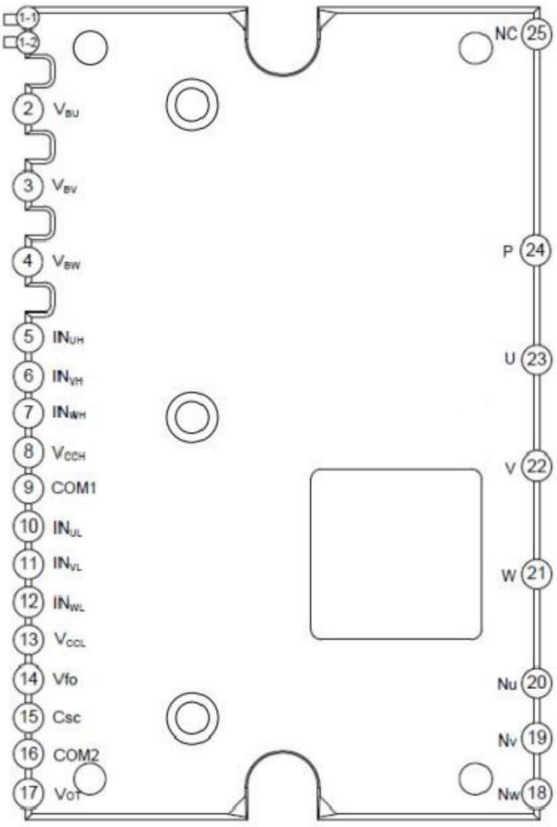
Package parameters

Type	Marking	Package	Packaging Method
JM10Z07DL1	JM10Z07DL1	DIP25	Tube

Internal Electrical Schematic



Pin Configuration



Pin Description

Pin	Name	Descriptions
1-1	NC	No Connection
1-2	NC	No Connection
2	V_{BU}	U-phase high side floating IC supply voltage
3	V_{BV}	V-phase high side floating IC supply voltage
4	V_{BW}	W-phase high side floating IC supply voltage
5	IN_{UH}	U-phase high side gate driver input
6	IN_{VH}	V-phase high side gate driver input
7	IN_{WH}	W-phase high side gate driver input
8	V_{CCH}	High side gate drive supply voltage
9	COM1	Module common ground
10	INUL	U-phase low side gate driver input
11	INVL	V-phase low side gate driver input
12	INWL	W-phase low side gate driver input
13	V_{CCL}	Low side gate drive supply voltage
14	V_{FO}	Fault Output
15	C_{SC}	External capacitor for short-circuit current detection input and low-pass filtering
16	COM2	Module common ground
17	V_{OT}	Temperature output terminal
18	N_W	W-phase DC negative terminal
19	N_V	V-phase DC negative terminal
20	N_U	U-phase DC negative terminal
21	W	Output for W Phase
22	V	Output for V Phase
23	U	Output for U Phase
24	P	Positive DC−Link Input
25	NC	No Connection

Absolute Maximum Ratings (T_{vj} =25℃, unless otherwise noted)

Symbol	Parameter	Values	Unit
Inverter Part			
V_{PN}	Supply voltage	450	V
$V_{PN(surge)}$	Supply voltage (surge)	500	V
V_{CES}	Collector − Emitter voltage	600	V
I_C	Each IGBT collector current, T_C = 25℃, T_{vj}≤ 150℃	10	A
I_{CP}	Each IGBT collector current (Peak) ,T_C= 25℃, T_{vj}≤ 150℃	20	A
P_D	Power dissipation per 1 chip , T_C=25℃	45	W
Control Part			
V_{CC}	Control supply voltage	20	V
V_{BS}	High−Side control bias voltage	20	V
V_{IN}	Input signal voltage	-0.3~V_{CC}+0.3	V
V_{FO}	Fault output supply voltage	-0.3~V_{CC}+0.3	V
T_{vj}	Operating junction temperature	-40 to 150	℃
T_{STG}	Storage temperature range	-40 to 150	℃
R_{thjc}-IGBT	Single IGBT thermal resistance,junction-case	3.0	℃/W
R_{thjc}-FRD	Single FRD thermal resistance,junction-case	3.6	℃/W
VISO	Isolation test voltage (1min, RMS, f = 60Hz)	1500	Vrms

Absolute Maximum Ratings (T_{vj} =25°C, unless otherwise noted)

Symbol	Parameter	Values			Unit
		Min.	Typ.	Max.	
V_{PN}	Supply voltage	-	300	400	V
V_{CC}	Control supply voltage	13.2	-	20	V
V_{BS}	High side control voltage	13.0	-	20	V
V_{HO}	High side driver output voltage	V_{SS}	-	V_{BS}	V
V_{LO}	Low side driver output voltage	V_{SS}	-	V_{CC}	V

Electrical Characteristics (T_{vj} = 25℃, unless otherwise note)

Inverter Part

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
V_{CEsat}	Collector − Emitter saturation voltage	V_{CC}=V_{BS}=15V V_{IN}=5V, I_C= 10A	-	1.8	-	V
V_F	FRD forward voltage	V_{IN}=0V, I_F= 10A	-	1.4	-	V
t_{on}	High side switching & recovery time	V_{PN} = 300V V_{CC} = V_{BS} = 15V I_C = 10A, V_{IN} = 0V to 5V Inductive load	-	553	-	ns
t_r			-	19	-	ns
t_{off}			-	423	-	ns
t_f			-	73	-	ns
t_{rr}			-	101	-	ns
t_{on}	Low side switching & recovery time		-	650	-	ns
t_r			-	56	-	ns
t_{off}			-	533	-	ns
t_f			-	55	-	ns
t_{rr}			-	140	-	ns
I_{CES}	Collector−Emitter leakage current	V_{CE}=600V	-	-	10	uA

Control Part

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
I_{QCC}	Quiescent V_{CC} supply current	V_{CC}= 15V ,V_{IN}=0V	-	-	1.3	mA
I_{QBS}	Quiescent V_{BS} supply current	V_{BS}= 15V, V_{IN}=0V	-	-	300	uA
V_{FOH}	Fault output voltage	V_{SC}=0V V_{FO} Circuit: 10kΩ to 5V	4.9	-	-	V
V_{FOL}		V_{SC}= 1V, I_{FO}= 1mA	-	-	0.95	V
t_{FO}	Fault output pulse width	Fault duration	40	-	200	us
$V_{SC(ref)}$	Short-circuit trip level	V_{CC}= 15V	0.455	0.48	0.505	V
OT_t	Over temperature protection trip	LVIC temperature	100	120	140	℃
OT_{rh}	Over temperature protection hysteresis	LVIC temperature Hysteresis	-	10	-	℃
V_{OT}	Temperature output	LVIC temperature=25℃	1.06	1.2	1.39	V
		LVIC temperature=90℃	2.63	2.77	2.91	V
UV_{CCt}	Low side undervoltage protection	Trip level	9.0	10.0	11.0	V
UV_{CCr}		Reset level	10.0	11.0	12.0	V
UV_{BSt}	High side undervoltage protection	Trip level	9.0	10.0	11.0	V
UV_{BSr}		Reset level	10.0	11.0	12.0	V
V_{IH}	On threshold voltage	Applied among inputs and COM	-	-	2.5	V
V_{IL}	Off threshold voltage		0.8	-	-	V

Temperature Output Function Description

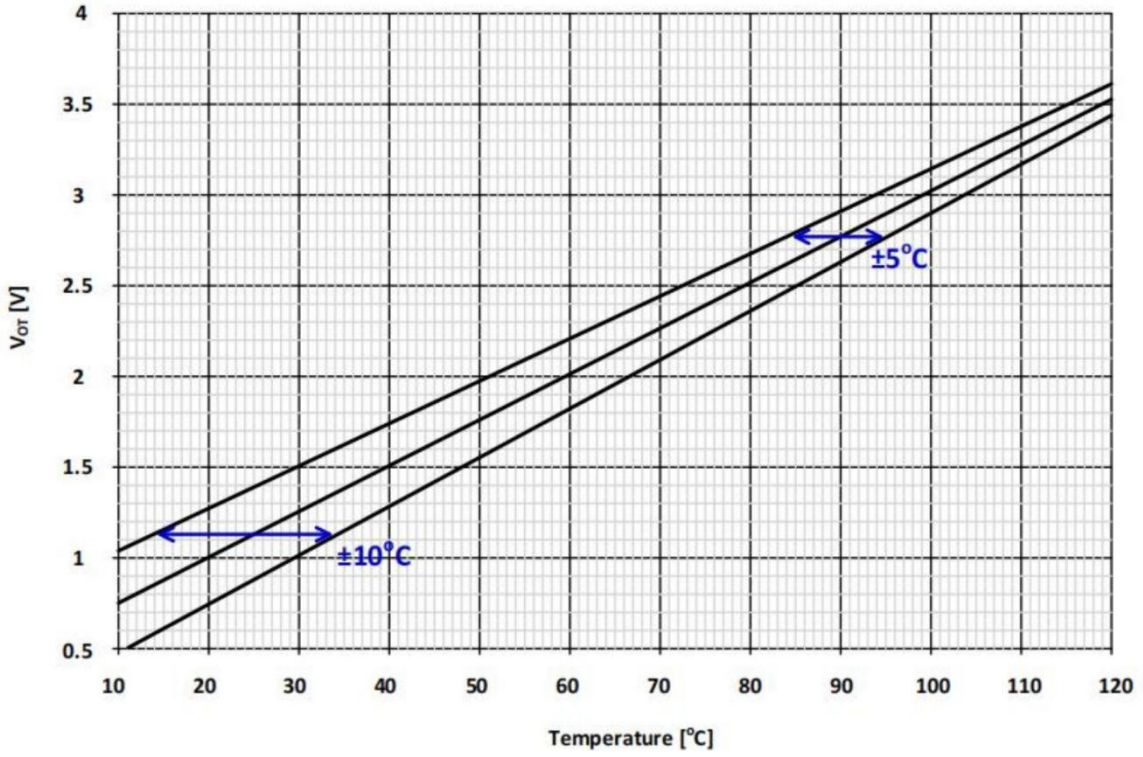


Figure 1. V_{OT} temperature characteristics

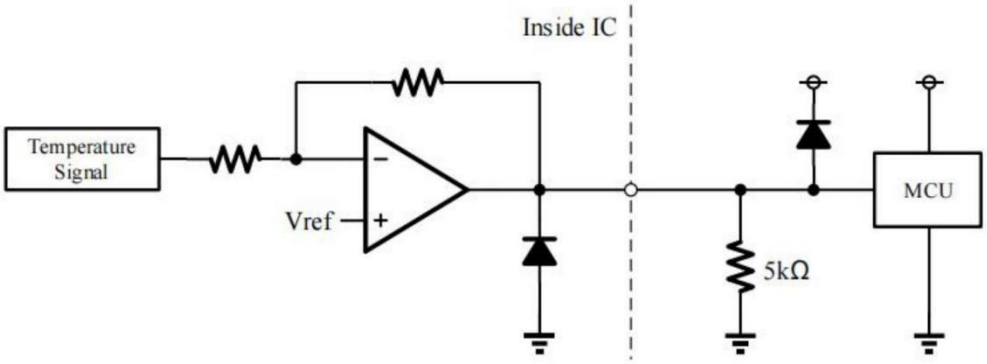


Figure 2. V_{OT} output circuit

(1) Connect 5kΩ to VOT pin if temperature monitoring function is used, and then the internal OTP function is omitted. Leave the VOT pin open (no connect) if internal over-temperature shutdown function is used. However, the VOT is also operated, but with inferior accuracy.

(2) In the case of using VOT with low voltage controller like 3.3V MCU, VOT output might exceed control supply voltage 3.3V when temperature rises excessively. If system use slow voltage controller, it is recommended to insert a clamp diode between control supply of the controller and V_{OT} output for preventing over voltage destruction.

Short-Circuit Protection Function Description

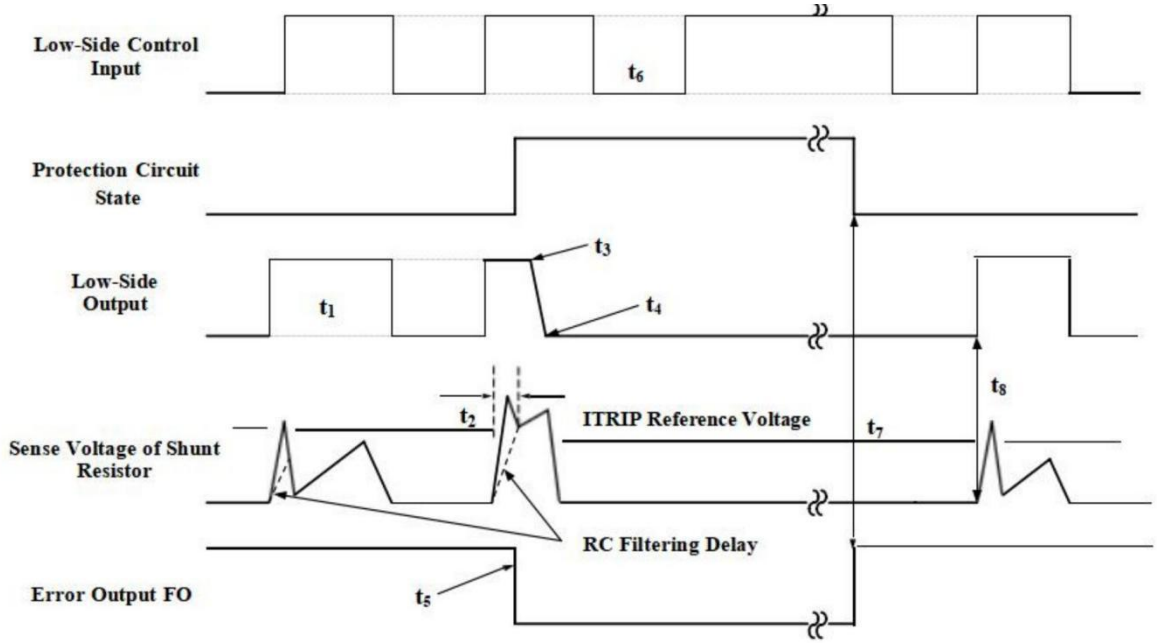


Figure 2. Short-circuit protection

t1 : Normal operation, Low-Side output.

t2 : Short circuit current detection (I_{TRIP} trigger).

(It is recommended to set RC time constant 1.5-2.0us so that IGBT shunt down within 2.0us when I_{TRIP} be triggered.) t3 : All low-side outputs are hard interrupted.

t4 : All low-side outputs turn off.

t5 : FO outputs for t_{FO}=40us (min).

t6 : Input is low, outputs turn off.

t7 : FO rise to high, but outputs don't turn on until input signal change low to high.

t8 : Normal operation, outputs on.

Low-side Under-Voltage Protection Description

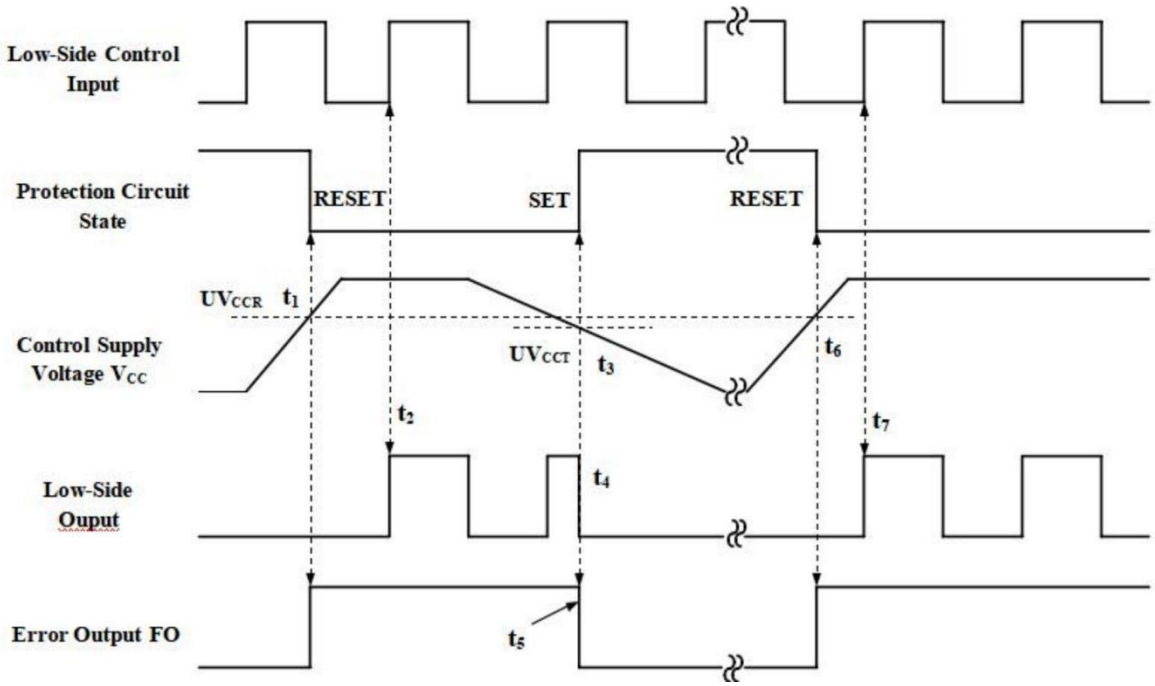


Figure 3. Under-voltage protection(low side)

t1 : Control supply voltage V_{CC} exceeds under voltage reset level (UV_{CCR}), but output turns on until next high level signal.

t2 : Normal operation, outputs turn on.

t3 : V_{CC} level drops to under voltage trip level. (UV_{CCT})

t4 : All low side outputs turn off in spite of control input condition.

t5 : FO outputs for t_{FO}=40us (Min), but output is extended during V_{CC} keeps below UV_{CCR}.

t6 : V_{CC} level reaches UV_{CCR}.

t7 : Normal operation, outputs turn on.

Over Temperature Protection Description

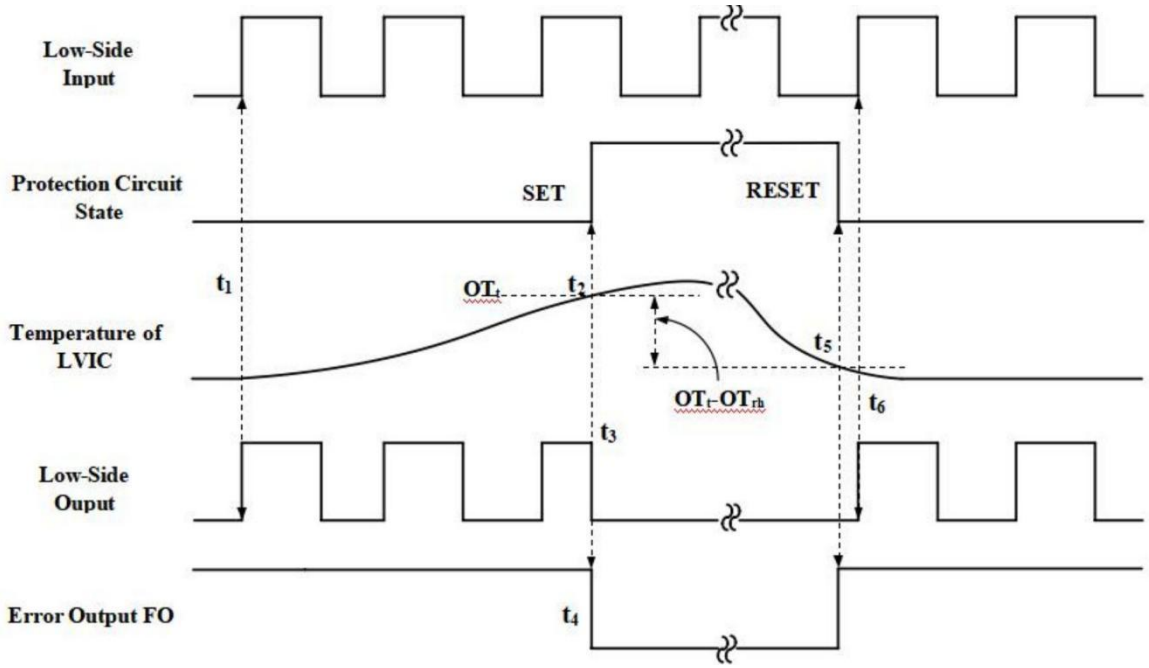


Figure 4. Over temperature protection

t1 : Normal operation, low side outputs turn on.

t2 : LVIC temperature exceeds over temperature trip level (OTt).

t3 : All low side outputs turn off in spite of control input condition.

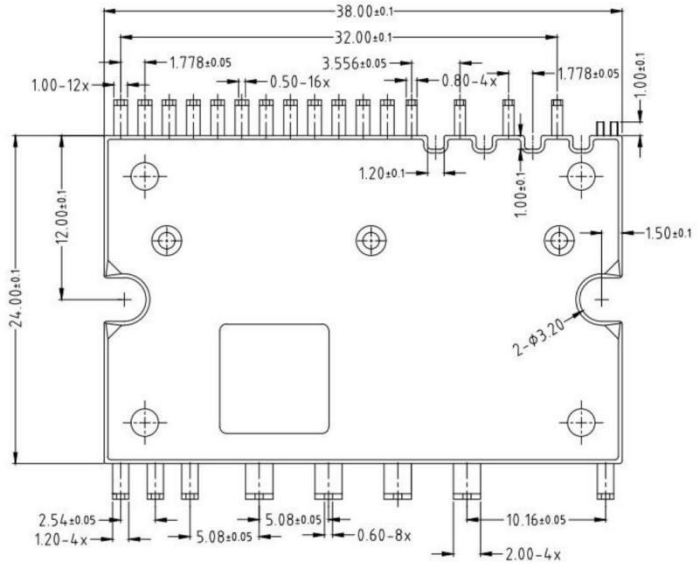
t4 : FO outputs for t_{FO}=40us (Min), but output is extended during LVIC temperature higher than OTt.

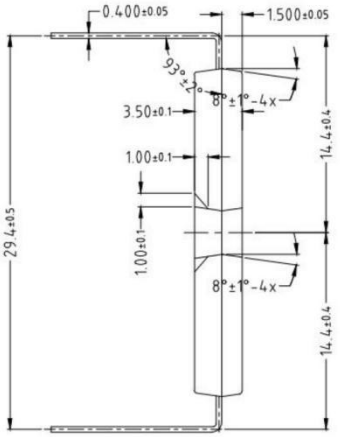
t5 : LVIC temperature drops to over temperature reset level.

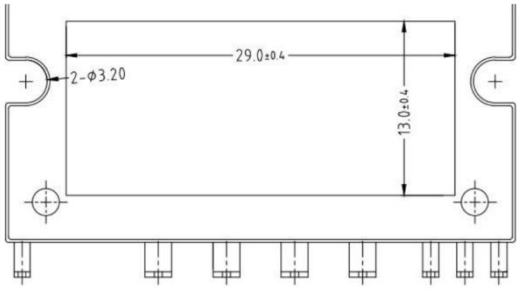
t6 : Normal operation, low side outputs turn on by next high level signal.

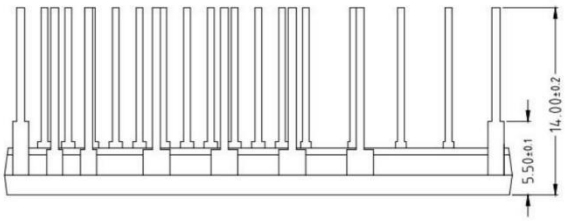
Package dimension

DIP-25









Revision history

Date	Revision	Changes
2025-01-10	Rev 1.0	Release of the preliminary datasheet.

Disclaimer

PLEASE NOTE - Jiangsu JieJie Microelectronics Co., Ltd ("JJM") reserves the right to amend, correct, modify and enhance the product and/or this document at any time without prior notice. If you intend to purchase this product, please obtain the latest information available before placing your order. The sale of JJM products is governed by JJM's prevailing terms and conditions at the time of purchase and purchasers are solely responsible for the selection and use of the products with no liability on JJM's part to supply application assistance or customization. Purchase of JJM products does not grant the purchaser license, express or implied, to JJM's intellectual property. Any warranties provided with JJM products are null and void upon resale unless accompanied by the information set forth herein in its entirety. The JJM name and logo are registered trademarks of Jiangsu JieJie Microelectronics Co., Ltd. This document supersedes all previous versions.