PM55051B-50 Datasheet

500V/5A Single-Phase Half-Bridge Power Module

Version：Rev.1.0

Release Date：2025-05-16

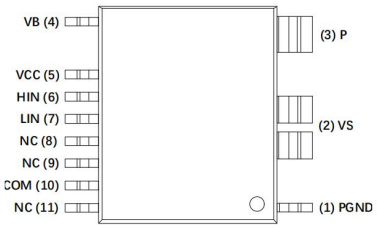
MetaWells Co., Ltd.

www.MetaWells.com

GENERAL DESCRIPTION

PM55051B-50 is a 500V/5A single-phase half-bridge power module. Internally integrated high voltage gate driver IC And two fast recovery features POWER MOSFET , It is suitable for mains-powered high-voltage motor applications and uses SOP -11 packaging.

PIN CONFIGURATION



FEATURES

- **Built-in high voltage gate driver IC**
- **Built-in fast recovery 500V/5A MOSFET**
- **$R_{DS(ON)}$ = 1.5Ω**
- **Compatible with 3.3V and 5V Logic level input**
- **Integrated high-side and low-side undervoltage lockout protection**
- **Integrated dead-band protection against shoot-through**
- **Dielectric strength 1500V/ Min**

APPLICATIONS

- **High pressure standing fan**
- **High pressure ceiling fans**
- **High pressure water pump**
- **High-speed air duct**

ORDERING INFORMATION

Order number	Marking ID	Package	Description
PM55051B-50	PM55051B 50PYMDNN	SOP11	Halogen Free RoHS compliant in T&R, 1500 pcs/Reel

MARKING INFORMATION

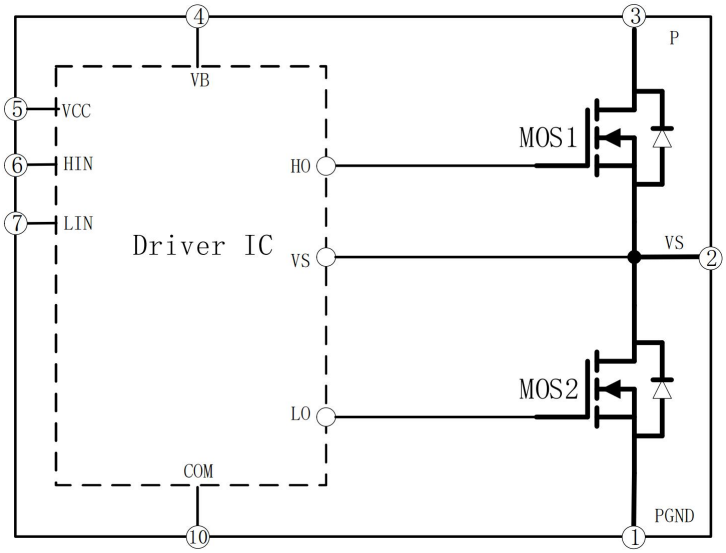
Marking	Package	Definition
PM55051B 50PYMDNN	SOP11	Product code:PM55051B Voltage/Package code:50P Y:Year code M:Month code D:Day code NN:Serial Number

FUNCTIONAL PIN DESCRIPTION

TERMINAL		I/O(1)	DESCRIPTION
NUMBER	NAME		
1	PGND	G	**Low-side MOSFET Source/Power Ground**. Connect to the power ground plane with low impedance.
2	VS	O	**Phase Voltage Output**. Connect to the switching node between high-side and low-side MOSFET.
3	P	I	**DC Bus Positive Input**. Provide the positive DC supply for the power stage.
4	VB	I	**High-side Gate Drive Supply Input**. Bootstrap supply for driving the high-side MOSFET.
5	VCC	I	**Low-side Gate Drive & High-side Logic Supply Input**. Power supply for gate drivers and control logic.
6	HIN	I	**High-side Gate Drive Input Signal**. PWM control signal for the high-side MOSFET.
7	LIN	I	**Low-side Gate Drive Input Signal**. PWM control signal for the low-side MOSFET.
8	NC	-	**No Connection**. Reserved for future use. Do not connect.
9	NC	-	**No Connection**. Reserved for future use. Do not connect.
10	COM	G	**Logic Signal Reference Ground**. Ground reference for control signals.
11	NC	-	**No Connection**. Reserved for future use. Do not connect.

(1) I – Input; O – Output; P – Power; G – Ground

INTERNAL LOGIC BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

T_C =25°C(unless otherwise noted) (1)

PARAMETER	Symbol	MAX	Unit
Drain-Source Voltage	V_{DS}	500	V
Drain Current (T_c=25°C, Chip Limit)	I_D	5	A
Drain Current (T_c=25°C, Package Limit)		2.4	A
Drain Current (T_c=80°C, Package Limit)		1.8	A
Pulsed Current (T_c=25°C, Pulse<100μs)	I_{DP}	9.6	A
Power Dissipation (T_c=25°C per chip)	P_D	17.1	W
Low-side Drive & High-side Logic Supply Voltage	V_{CC}	20	V
High-side Drive Supply Voltage	V_{BS}	20	V
Input Signal Voltage	V_{IN}	-0.3~V_{CC}+ 0.3	V
Operating Junction Temperature	T_j	-40~150	°C
Operating Case Temperature	T_C	-40~125	°C
Storage Temperature	T_{stg}	-40~125	°C
Junction-to-Case Thermal Resistance	θ_{JC}	7.3	°C/W
Isolation Voltage (60Hz sine wave, 1min test)	V_{ISO}	1500	V

(1) Stresses beyond those listed under ***absolute maximum ratings*** may cause permanent damage to the device. These are stress ratings only,and functional operation of the device at these or any other conditions beyond those indicated under ***recommended operating conditions*** is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

T_C =25°C(unless otherwise noted)

PARAMETER		MIN	TYP	MAX	UNIT
V_{PN}	DC bus voltage	-	300	400	V
V_{CC}	Low-side driver & high-side logic supply input voltage	12	15	18	V
V_{BS}	High-side driver supply input voltage	12	15	18	V
V_{IN}(ON)	Input signal turn-on voltage threshold	3	-	VCC	V
V_{IN}(OFF)	Input signal turn-off voltage threshold	0	-	0.8	V
t_{DEAD}	Dead time	1	-	-	μs
f_{PWM}	Switching frequency	-	25	35	kHz

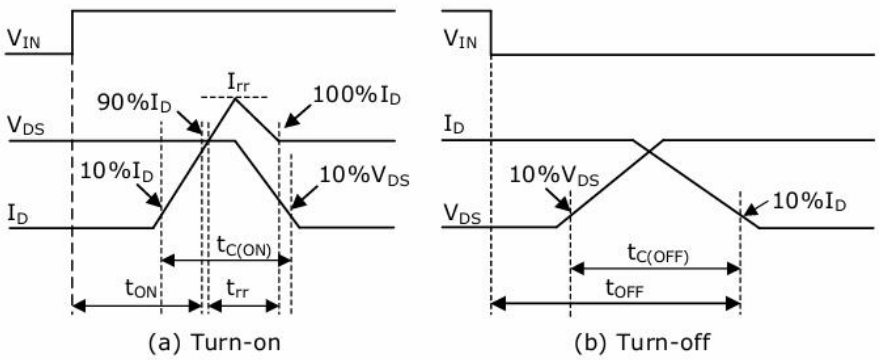
ELECTRICAL CHARACTERISTICS

V_{CC}=12V,T_C =25°C(unless otherwise noted)

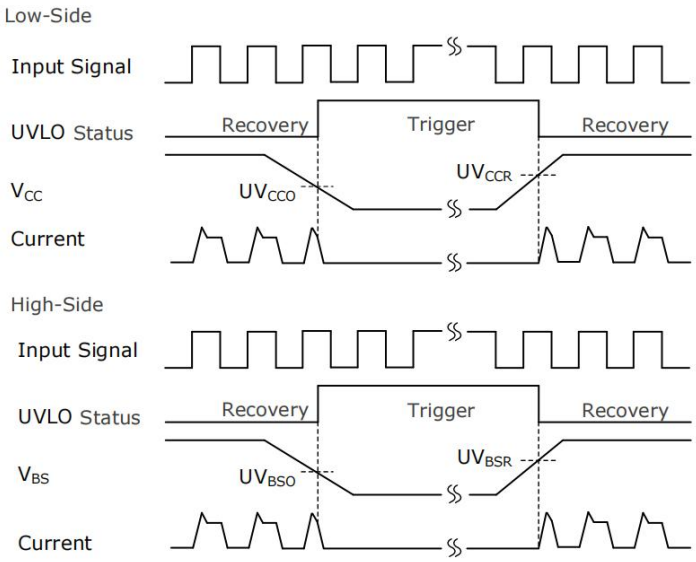
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
POWER SECTION						
BV_{DSS}	Drain-source breakdown voltage(1)	V_{IN}=0V,I_D=250uA	500	-	-	V
I_{DSS}	Drain leakage current	V_{DS}=500V,V_{IN} =0V	-	-	250	μA
$R_{DS(ON)}$	On-state resistance	V_{CC} =V_{BS} =15V,V_{IN} =5V,I_D =2.5A	-	1.5	1.8	Ω
V_{SD}	Body diode forward voltage	V_{CC}=V_{BS} =15V,V_{IN}=0V,I_{SD} =5A	-	-	1.5	V
t_{ON}	Switching time(2)	V_{PN}=300V, V_{CC} =V_{BS} =15V, I_D=2.5A, V_{IN}=0~5V	-	370	-	ns
t_{OFF}			-	330	-	ns
t_{rr}			-	99	-	ns
E_{ON}			-	124	-	μJ
E_{OFF}			-	16	-	μJ
CONTROL SECTION						
I_{QCC}	VCC supply current	V_{CC} =V_{BS}=15V,V_{LIN} =5V	-	-	200	μA
I_{QBS}	VBS supply current	V_{CC} =V_{BS} =15V V_{HIN}=5V	-	-	150	μA
UV_{BSD}	High-side UVLO	Trigger level	6	6.5	7	V
UV_{BSR}		Release level	6.5	7	7.5	V
UV_{CCD}	Low-side UVLO	Trigger level	7.2	8.0	8.8	V
UV_{CCR}		Release level	8.0	8.8	9.8	V
V_{IH}	Input high threshold voltage	Logic high level	-	-	2.5	V
V_{IL}	Input low threshold voltage	Logic low level	0.8	-	-	V
I_{IH}	Input high bias current	V_{CC} =15V,V_{IH} =5V	-	-	15	μA
I_{IL}	Input low bias current	V_{CC} =15V,V_{IH} =0V	-	-	1	μA

(1) BV_{DSS} is the absolute maximum drain-to-source voltage rating for each internal MOSFET in the IPM. Considering stray inductance effects, V_{PN} should be sufficiently lower than this value to ensure V_{DS} never exceeds BV_{DSS} under any condition.

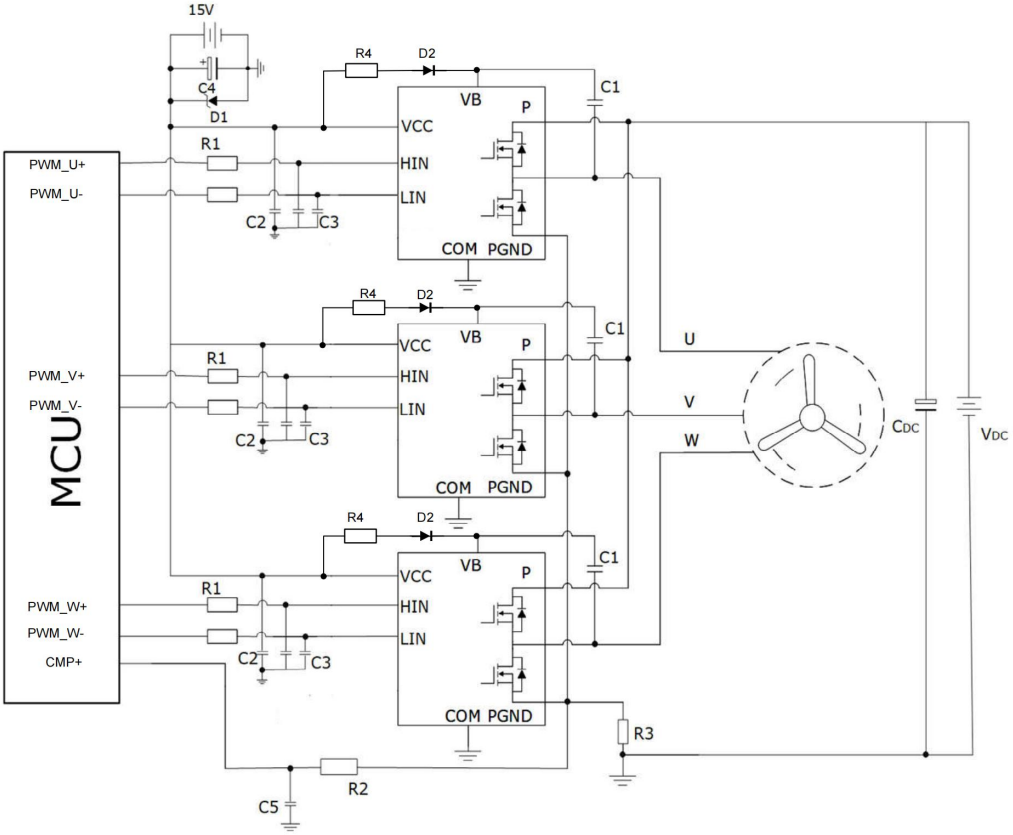
(2) t_{ON} and t_{OFF} include the propagation delay of the internal driver IC. Listed values are measured under laboratory conditions and may vary in actual applications due to PCB layout and wiring effects. Refer to the following diagram for switching time definitions.



UNDERVOLTAGE LOCKOUT (UVLO) TIMING DIAGRAM

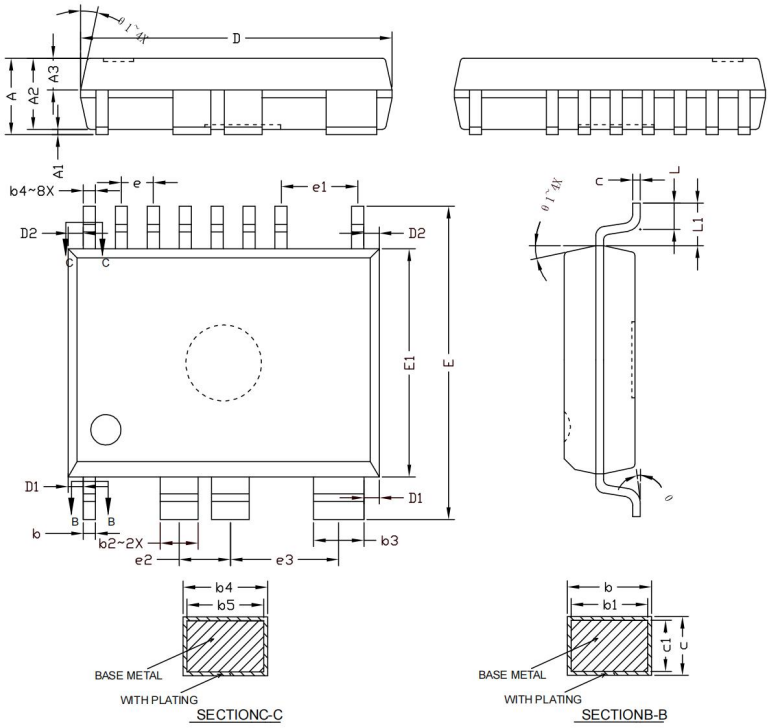


RECOMMENDED APPLICATION CIRCUIT



PACKAGE DIMENSION

SOP-11：mm



Symbol	Millimeters			Symbol	Millimeters		
	MIN	NOM	MAX		MIN	NOM	MAX
A	-	-	2.615	D1	0.502（BSC）		
A1	0.125	-	0.225	D2	0.515（BSC）		
A2	2.29	2.34	2.39	E	10.106	10.306	10.506
A3	0.993	1.043	1.093	E1	7.40	7.50	7.60
b	0.37	-	0.47	e	1.058(BSC)		
b1	0.36	0.4	0.46	e1	2.54(BSC)		
b2	-	-	1.25	e2	1.69(BSC)		
b3	-	-	1.67	e3	3.60(BSC)		
b4	0.35	-	0.45	L	0.75	-	0.97
b5	0.34	0.38	0.44	L1	1.403(REF)		
c	0.25	-	0.29	θ	0°	~	8°
c1	0.24	0.25	0.26	θ1	6°	~	15°
D	10.20	10.30	10.40	-	-	-	-

VERSION HISTORY

Date	Version	Description of Change
2025-5-16	Rev.1.0	Initial Release

Disclaimer

MetaWells Co., Ltd. and all other MetaWells Co., Ltd. trademarks are the exclusive property of MetaWells Co., Ltd.. Any mention of additional trademarks or registered trademarks in this document is made in acknowledgment of their respective owners.

Without the consent of MetaWells Co., Ltd. , any modification to any part or subsection of the company's product specifications and datasheets is strictly prohibited in any form or manner. MetaWells Co., Ltd. reserves the rights to make changes of the content herein the document follow PCN procedure. Please refer to our website for latest document. It is recommended that customers obtain the latest version of relevant information and verify its timeliness and completeness before placing an order. All products are sold in accordance with the terms and conditions provided in the sales contract at the time of order confirmation, which includes warranty scope, intellectual property rights, and liability limitations.

During the sales period, MetaWells Co., Ltd. guarantees that the performance of the products will be in accordance with the company's standard warranty. The company utilizes testing and other quality control techniques to ensure the necessity to maintain this warranty. Except for government-mandated requirements, there is no need for special testing of measurement tables or other instruments.

Customers must acknowledge that our products are not intended or manufactured for use in life support systems or other high-risk activities or environments. The utilization of our products in such applications may lead to severe consequences, including personal injury, loss of life, property damage, or environmental harm. Our products are explicitly not warranted for deployment in high-risk activities, and we shall bear no responsibility towards customers or third parties for such usage.

MetaWells Co., Ltd. commits to providing technical support, assistance, advice, and information, in line with our current capabilities, including guidance related to the design, development, or debugging of purchased boards or other applications. However, we hereby disclaim all warranties concerning technical support, merchantability, or fitness for a particular purpose. We do not guarantee the error-free operation of boards or applications in conjunction with our support services, and we shall not be held liable for any consequences arising from the utilization of our support services.

Website：www.MetaWells.com