

Description

DPQB04HB50MF is a 4A,500V half-bridge Intelligent Power Module(IPM) designed for high-efficiency appliance motor drives. This module integrates 1 high voltage gate driver and 2 fast recovery MOSFETs in ESOP-9 package.

Features

- High voltage gate driver
- Built-in 4A,500V fast recovery MOSFET
- Signal high level valid,compatible with 3.3V and 5V MCU
- Built-in bootstrap diode with current limiting resistor
- UVLO for both high side and low side
- Built-in dead time to avoid cross-conduction
- Internal integrated temperature detection output

Key Parameters

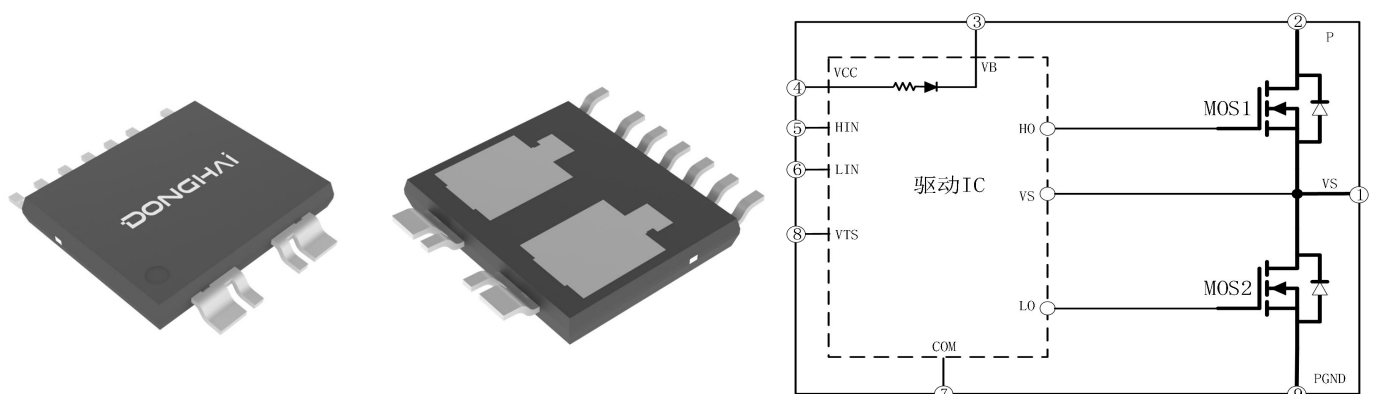
Topology	Half-bridge
Driver	HV Gate Driver
MOSFET	500V/4A/1.8Ω
P _D	32.9W

Applications

- Fans
- Pumps



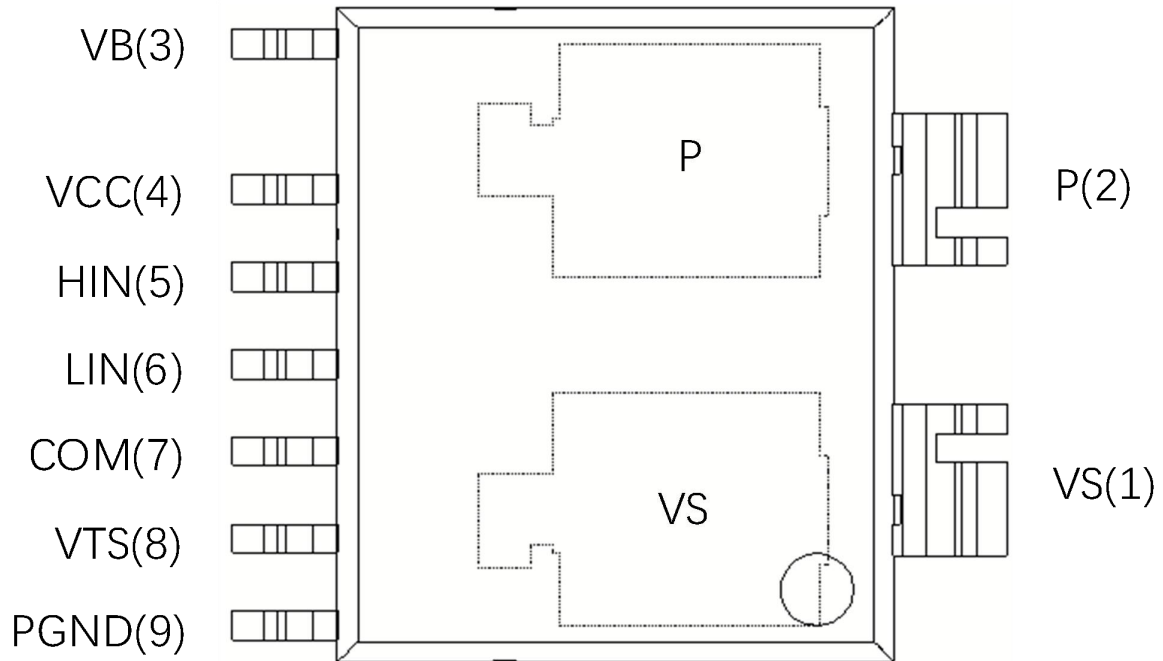
ESOP-9



Marking & Packing Information

Part #	Package	Marking	Tube/Reel	Qty(pcs)
DPQB04HB50MF	ESOP-9	DPQB04HB50MF	Reel	2500/box

Module Pin-Out Description



Pin Number	Pin Name	Description
1	VS	High Side Floating Offset Voltage
2	P	DC Bus Voltage Positive
3	VB	High Side Floating Supply Voltage
4	VCC	Low Side Driving And High Side Logic Power Supply
5	HIN	Logic Input For High Side Gate Driver
6	LIN	Logic Input For Low Side Gate Driver
7	COM	Logic Common Ground
8	VTS	Temperature-Sensing Voltage Output
9	PGND	Source For Low Side MOSFET

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	500	V
Continuous Drain Current $T_C = 25^{\circ}\text{C}$ (Silicon limit) $T_C = 25^{\circ}\text{C}$ (Package limit) $T_C = 80^{\circ}\text{C}$ (Package limit)	I_D	4 3 1.8	A
Pulsed Drain Current ($T_C = 25^{\circ}\text{C}, t_p < 100\mu\text{s}$)	I_{DP}	12	A
Power Dissipation ($T_C = 25^{\circ}\text{C}$, Each MOSFET)	P_D	32.9	W
Low Side Driving And High Side Logic Power Supply	V_{CC}	20	V
High-Side Bias Voltage	V_{BS}	20	V
Input Signal Voltage	V_{IN}	$-0.3 \sim V_{CC} + 0.3$	V
Operating Junction Temperature	T_J	$-40 \sim 150$	$^{\circ}\text{C}$
Operating Case Temperature	T_C	$-40 \sim 125$	$^{\circ}\text{C}$
Storage Temperature	T_{stg}	$-40 \sim 125$	$^{\circ}\text{C}$
Junction to Case Thermal Resistance	θ_{JC}	3.8	$^{\circ}\text{C}/\text{W}$
Bootstrap Diode Reverse Voltage	V_{RRMB}	500	V

Recommended Operating Conditions

Parameter	Symbol	Value			Unit
		min.	typ.	max.	
Supply Voltage	V_{PN}	-	300	400	V
Low Side Driving And High Side Logic Power Supply	V_{CC}	12	15	18	V
High-Side Bias Voltage	V_{BS}	12	15	18	V
Input ON Threshold Voltage	$V_{IN(ON)}$	3	-	V_{CC}	V
Input OFF Threshold Voltage	$V_{IN(OFF)}$	0	-	0.8	V
Blanking Time for Preventing Arm-Short	t_{DEAD}	1	-	-	μs
PWM Switching Frequency	f_{PWM}	-	25	35	kHz

Electrical Characteristic (at $T_j = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

Power Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Drain-Source Breakdown Voltage ⁽¹⁾	BV_{DSS}	500	-	-	V	$V_{IN}=0V, I_D=250\mu A$
Zero Gate Voltage Drain Current	I_{DSS}	-	-	250	μA	$V_{IN}=0V, V_{DS}=500V$
Drain-Source on-state Resistance	$R_{DS(on)}$	-	1.8	2.2	Ω	$V_{CC}=V_{BS}=15V$ $V_{IN}=5V, I_D=2A$
Diode Forward Voltage	V_{SD}	-	-	1.5	V	$V_{CC}=V_{BS}=15V$ $V_{IN}=0V, I_{SD}=4A$
Switching Times ⁽²⁾	t_{ON}	-	860	-	ns	$V_{PN}=300V$ $V_{CC}=V_{BS}=15V$ $V_{IN}=0\sim 5V, I_D=2A$
	t_{OFF}	-	543	-	ns	
	t_{rr}	-	100	-	ns	
	E_{ON}	-	95	-	μJ	
	E_{OFF}	-	16	-	μJ	

Control Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Quiescent VCC Supply Current	I_{QCC}	-	-	300	μA	$V_{CC}=V_{BS}=15V$ $V_{LIN}=5V$
Quiescent VBS Supply Current	I_{QBS}	-	-	100	μA	$V_{CC}=V_{BS}=15V$ $V_{HIN}=5V$
High-side Control Supply under-voltage Protection	UV_{BSD}	6	6.5	7	V	Trip Level
	UV_{BSR}	6.5	7	7.5	V	Reset Level
Low-side Control Supply under-voltage Protection	UV_{CCD}	7.5	8.2	9	V	Trip Level
	UV_{CCR}	8	9.1	9.8	V	Reset Level
ON Threshold Voltage	V_{IH}	-	-	2.5	V	Logic High Level
OFF Threshold Voltage	V_{IL}	0.8	-	-	V	Logic Low Level
ON Input Bias Current	I_{IH}	-	-	20	μA	$V_{CC}=15V, V_{IH}=5V$
Off Input Bias Current	I_{IL}	-	-	1	μA	$V_{CC}=15V, V_{IH}=0V$
Temperature-Sensing Output	V_{TS}	0.6	0.79	0.98	V	$V_{CC}=15V, T=25^{\circ}\text{C}$

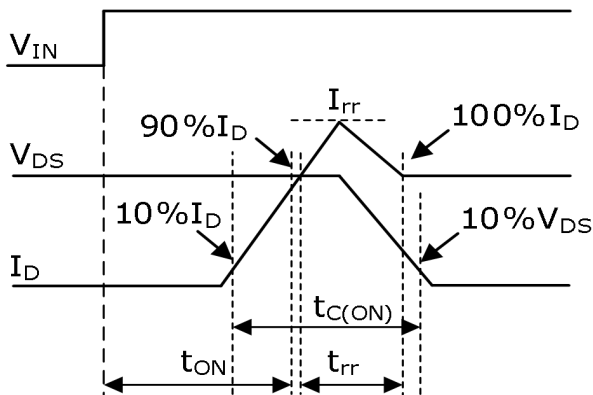
Bootstrap Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Bootstrap Diode Forward Voltage	V_F	-	1.5	-	V	$I_F=10\text{mA}, T_C=25^\circ\text{C}$
Built-in Limiting Resistance	R_{BS}	-	50	-	Ω	

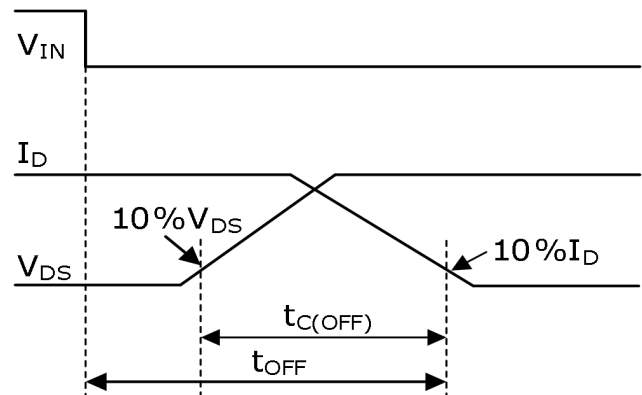
Note:

1、BVDSS is the absolute maximum rated voltage between drain and source of each MOSFET. Thinking of the effects of stray inductance, VPN should be less than this value to ensure that VDS doesn't exceed BVDSS in any case.

2、 T_{on}, T_{off} include delay time of internal driver IC. The values were mresured under laboratory test conditions. Due to printed circuit board and wiring, they may vary depending on the field application. And the definition of switching times can refer to the following figure.

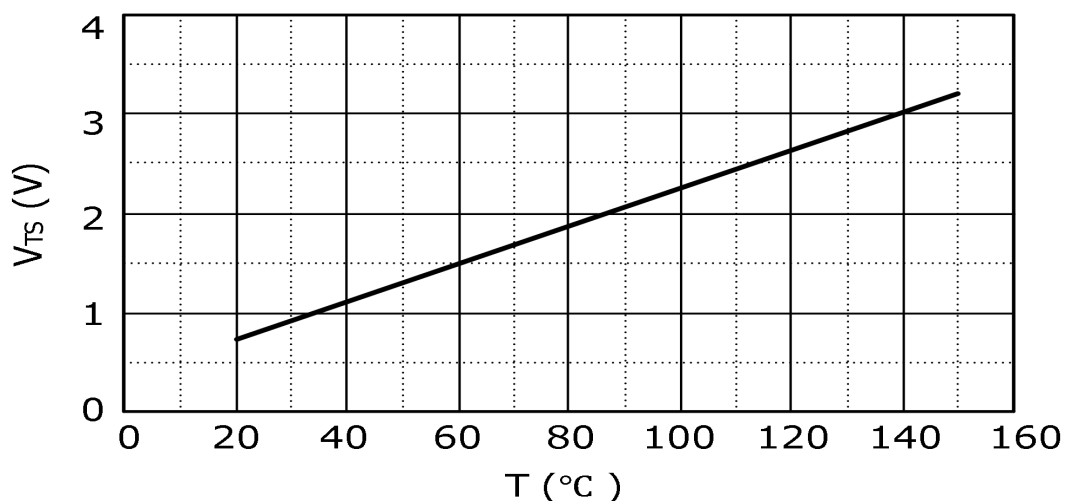


(a) Turn-on



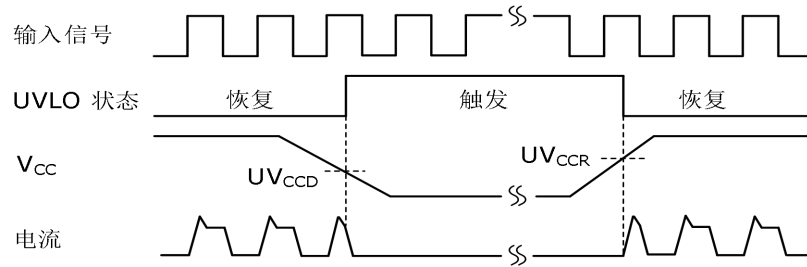
(b) Turn-off

Temperature-Sensing Output

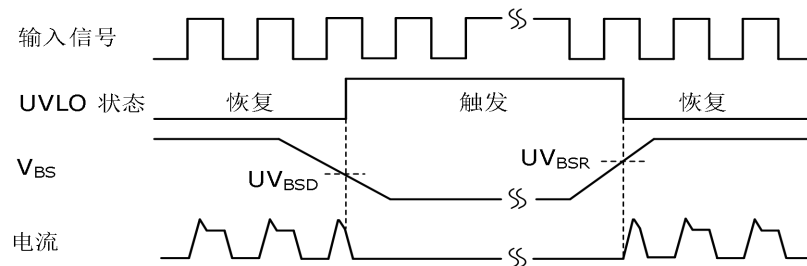


Undervoltage Lockout Protection Circuit

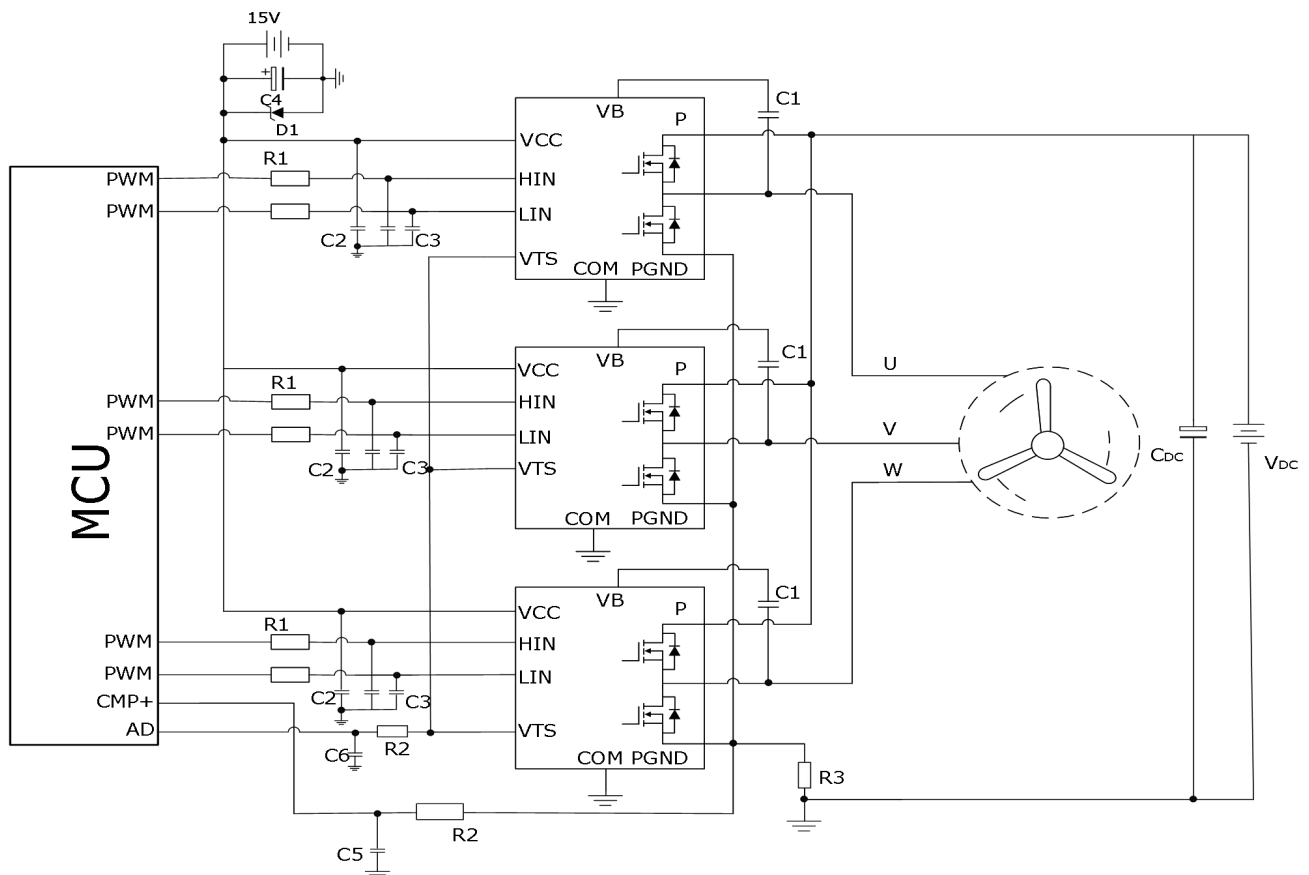
低侧



高侧

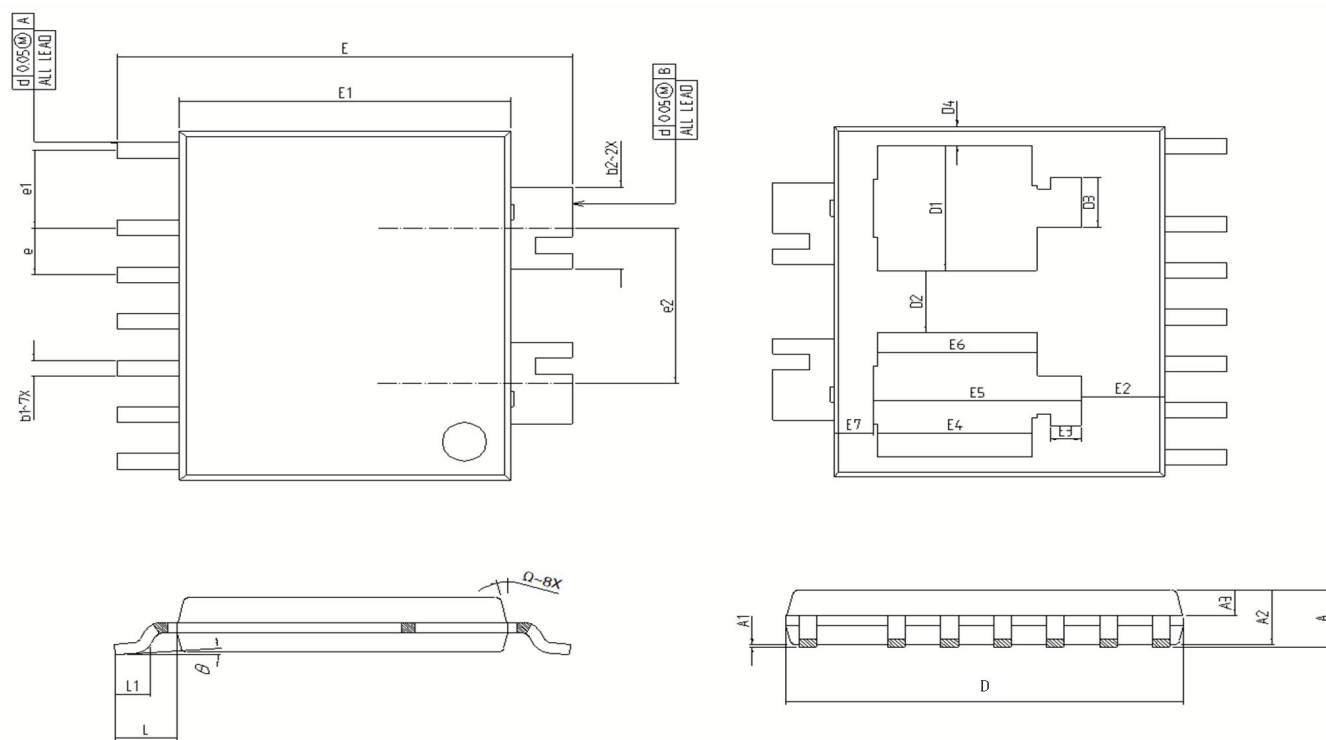


Recommended Application Circuit



Package Outline : ESOP-9

*Dimensions in mm



Symbol	Value			Symbol	Value		
	min.	typ.	max.		min.	typ.	max.
A	-	-	1.52	E2	-	1.9	-
A1	0.02	-	0.12	E3	-	0.7	-
A2	1.35	1.4	1.45	E4	-	3.5	-
A3	0.6	0.65	0.7	E5	-	4.7	-
b1	0.37	-	0.43	E6	-	3.6	-
b2	-	-	2.13	E7	-	0.9	-
D	8.95	9	9.05	e	1.2(BSC)		
D1	-	3.2	-	e1	2.0(BSC)		
D2	-	1.6	-	e2	4.0(BSC)		
D3	-	1.28	-	L	-	1.4	-
D4	-	0.5	-	L1	-	0.8	-
E	10.1	10.3	10.5	Ω	-	13°	-
E1	7.45	7.5	7.55	θ	-	4°	-

Disclaimer

Unless otherwise specified in the datasheet, the product is designed and qualified as a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability, such as aviation, aerospace, life-support devices or systems.

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