



晶丰明源半导体

BPP1N5004D

500V Intelligent Power Module

Description

The BPP1N5004D is a high voltage 1-Phase IPM (Intelligent Power Module). It integrates HVIC and high-performance MOSFET for BLDC and PMSM motors. Separate Open-Source Pins from Low-Side MOSFETs are for Current-Sensing.

The input works with Schmitt-trigger and the logic voltage level is compatible with 3.3V/5V/15V signal. UVLO and dead time are also provided.

Features

- Built-in high-performance 500V/4A MOSFET
- Robust at negative transient voltage
- Gate drive supply range from 10V to 20V
- 3.3V, 5V and 15V input logic compatible
- UVLO for both high side and low side
- Built-in dead time to avoid cross-conduction
- Available in DIP8 package

Typical Application

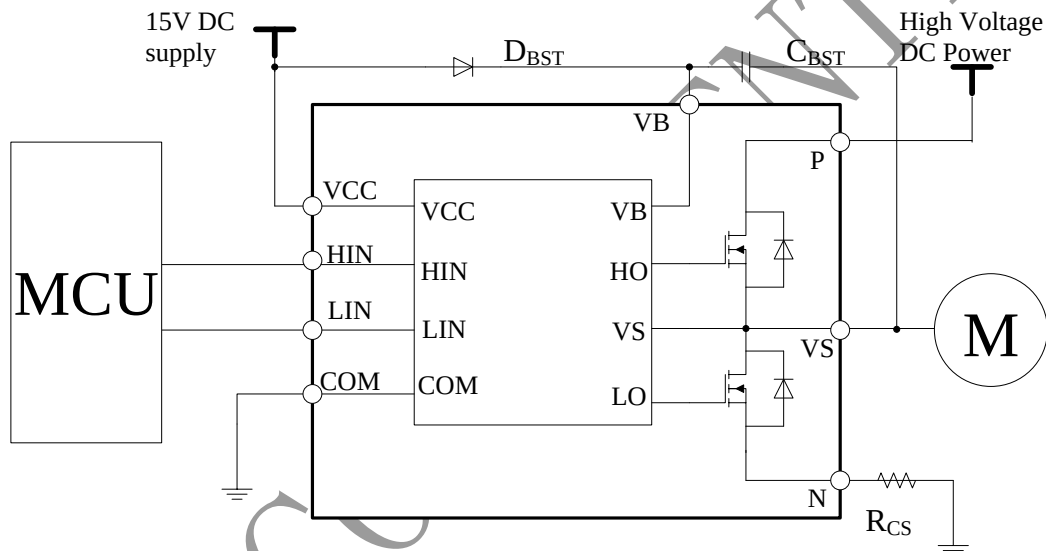


Figure 1. Typical application circuit for BPP1N5004D



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Ordering Information

Part Number	Package	Operation Temperature	Package Method	Marking
BPP1N5004D	DIP 8	-40 °C to 105 °C	Tube 50pcs/tube	BPP1N5004D XXXXXXAX C1ETWWY

Pin Configuration and Marking Information

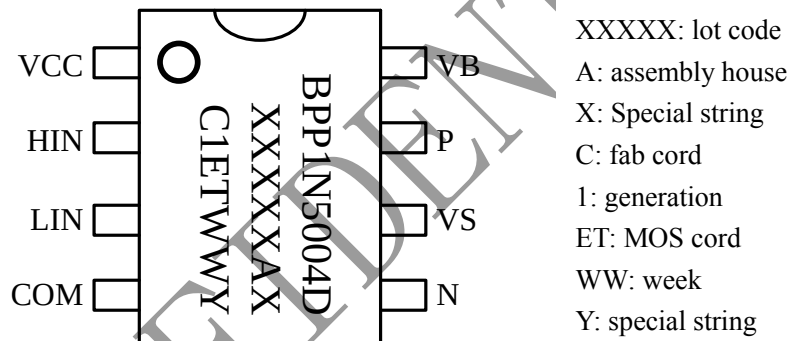


Figure 2. Pin configuration

Pin Definition

Pin No.	Name	Description
1	VCC	Logic and low side MOSFET driving supply
2	HIN	Logic input for high side
3	LIN	Logic input for low side
4	COM	Logic common ground
5	N	Negative reference and low side MOSFET return
6	VS	Output and high side MOSFET return
7	P	Positive high voltage DC Power supply
8	VB	High side MOSFET driving supply



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Absolute Maximum Ratings (note 1) (Unless otherwise specified, $T_A=25\text{ }^{\circ}\text{C}$)

Inverter Part

Symbol	Parameter	Conditions	Ratings	Unit
V_{DS}	Drain-Source Voltage of Each MOSFET		500	V
I_D	Each MOSFET Current, Continuous	$T_C=25^{\circ}\text{C}$	1.6	A
I_{DM}	Each MOSFET Pulse Current, Peak	Less than 100us	4.2	A
P_D	Maximum Power Dissipation		1.56	W

Control Part

Symbol	Parameter	Conditions	Ratings	Unit
V_{CC}	Control Supply Voltage	Applied between VCC and COM	20	V
V_{BS}	High-side Bias Voltage	Applied between VB and VS	20	V
V_{IN}	Input Signal Voltage	Applied between VIN and COM	-0.3 ~ VCC+0.3	V

Thermal Resistance

Symbol	Parameter	Conditions	Ratings	Unit
$R_{th(j-c)}$	Junction to Case Thermal resistance	For Each MOSFET	80	$^{\circ}\text{C/W}$

Total System

Symbol	Parameter	Conditions	Ratings	Unit
T_J	Operating Junction Temperature		-40~150	$^{\circ}\text{C/}$
T_{STG}	Storage Temperature		-40~125	$^{\circ}\text{C/}$
V_{ISO}	Isolation Voltage	60Hz, Sinusoidal, AC 1 minute, between pins and heat-sink plate	1500	V

Note 1: Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. Under “recommended operating conditions” the device operation is assured, but some particular parameter may not be achieved. The electrical characteristics table defines the operation range of the device, the electrical characteristics is assured on DC and AC voltage by test program. For the parameters without minimum and maximum value in the EC table, the typical value defines the operation range, the accuracy is not guaranteed by spec.



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Recommended Operation Conditions

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V _{PN}	Supply Voltage	Applied between P and N	-	300	400	V
V _{CC}	Control Supply Voltage	Applied between VCC and COM	13.5	15.0	16.5	V
V _{BS}	High-Side Bias Voltage	Applied between VB and VS	13.5	15.0	16.5	V
V _{IN(ON)}	Input ON Threshold Voltage	Applied between VIN and COM	3.0	-	VCC	V
V _{IN(OFF)}	Input OFF Threshold Voltage	Applied between VIN and COM	0	-	0.4	V
T _{DEAD}	Blanking Time for Preventing Arm-Short	VCC = VBS = 13.5 ~ 16.5 V, TJ <150°C	1.0	-	-	us
F _{PWM}	PWM Switching Frequency	TJ <150°C	-	15	-	KHz



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Electrical Characteristics (Unless otherwise specified, $T_A=25\text{ }^{\circ}\text{C}$)

Inverter Part

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain – Source Breakdown Voltage	$V_{IN} = 0\text{ V}$, $I_D = 1\text{ mA}$	500	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{IN} = 0\text{ V}$, $V_{DS} = 500\text{ V}$	-	-	1	mA
V_{SD}	Drain - Source Diode Forward Voltage	$V_{CC} = V_{BS} = 15\text{ V}$, $V_{IN} = 0\text{ V}$, $I_D = 0.5\text{ A}$	-	0.8	-	V
$R_{DS(ON)}$	Drain-Source Turn-On Resistance	$V_{CC} = V_{BS} = 15\text{ V}$, $V_{IN} = 5\text{ V}$, $I_D = 0.5\text{ A}$	-	2.8	3.3	ohm
T_{ON}	Switching Times	$V_{PN} = 300\text{ V}$, $V_{CC} = V_{BS} = 15\text{ V}$, $I_D = 0.5\text{ A}$ $V_{IN} = 0/5\text{ V}$, Inductive Load $L = 3\text{ mH}$ High-Side and Low-Side MOSFET Switching	-	750	-	ns
T_{OFF}			-	300	-	ns
T_{rr}			-	75	-	ns
E_{ON}			-	15	-	uJ
E_{OFF}			-	2	-	uJ
R_{BSOA}	Reverse Bias Safe Operating Area	$V_{PN} = 400\text{ V}$, $V_{CC} = V_{BS} = 15\text{ V}$, $I_D = I_{DP}$, $V_{DS} = BV_{DSS}$, $T_J = 150^{\circ}\text{C}$ High- Side and Low-Side MOSFET Switching	Full Square			

Control Part

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_{QCC}	Quiescent VCC Supply Current	$V_{CC} = 15\text{ V}$, $V_{IN} = 0\text{ V}$	-	180	-	uA
I_{QB}	Quiescent VBS Supply Current	$V_{BS} = 15\text{ V}$, $V_{IN} = 0\text{ V}$	-	50	-	uA
V_{CC_ON}	VCC and VBS under voltage rising threshold		7.8	8.9	9.8	V
V_{BS_ON}						
V_{CC_UVLO}	VCC and VBS under voltage falling threshold		7.2	8.1	8.8	V
V_{BS_UVLO}						
V_{CC_HYS}	VCC and VBS under voltage hysteresis voltage		0.5	0.8	1.2	V
V_{BS_HYS}						
V_{IH}	ON Threshold Voltage	Logic High Level	2.8	-	-	V
V_{IL}	OFF Threshold Voltage	Logic Low Level	-	-	0.45	V



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True Table

HIN	LIN	OUTPUT (U/V/W)	Description
0	0	Hi-Z	High side and Low side OFF
0	1	0	Low side ON, High side OFF
1	0	V _P	High side ON, Low side OFF
1	1	Hi-Z	Forbidden input, High side and Low side OFF
Open	Open	Hi-Z	Input internal pull-down resistor 1M ohm

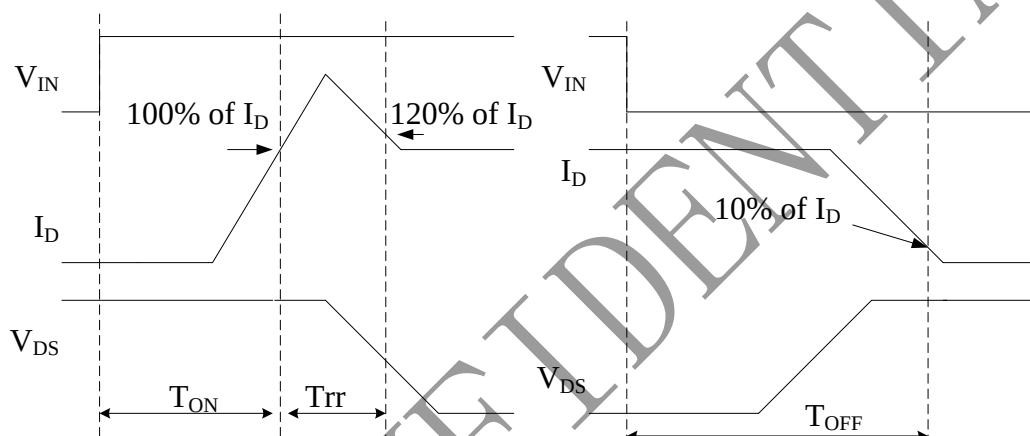
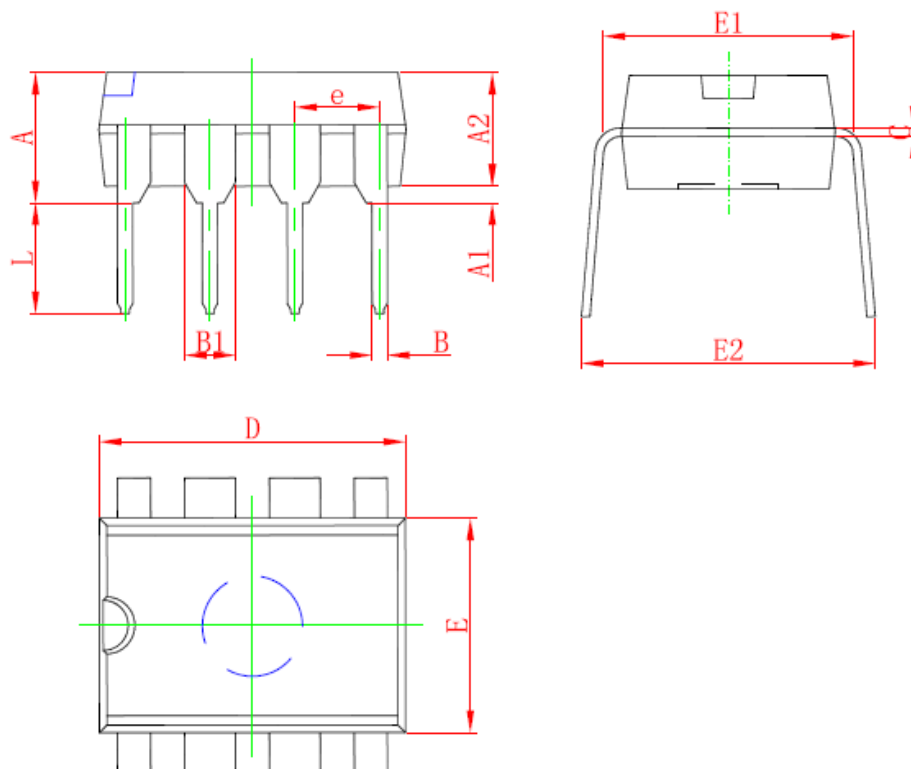


Figure 3. Switching time definition

Physical Dimensions

DIP8 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524 (BSC)		0.060 (BSC)	
C	0.204	0.360	0.008	0.014
D	9.000	9.400	0.354	0.370
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540 (BSC)		0.100 (BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354