SPE02M50T-A

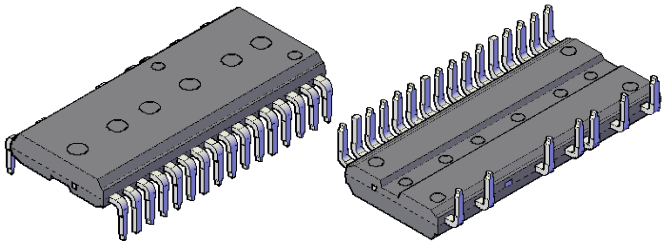


Figure 1

Applications

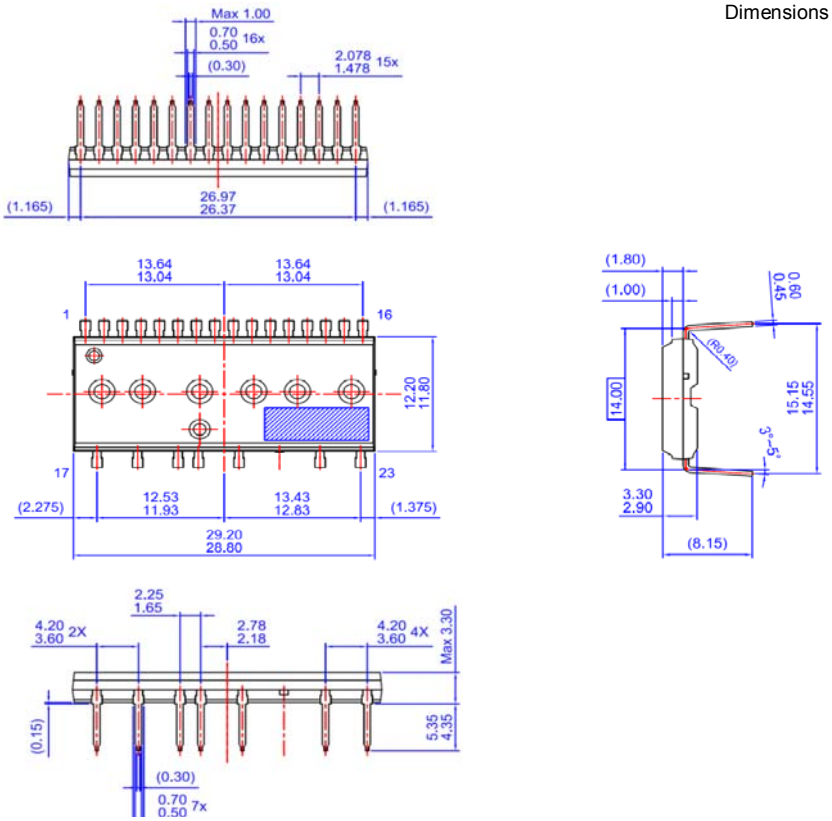
500V/2A low-loss MOSFET inverter driver for Small Power AC Motor Drives

Features

- 500V Rds(on)=3.5ohm（Max）MOSFET 3-Phase inverter with Gate Drivers and protection
- Separate Open-Source Pins from Low-Side MOSFETs for Three-Phase Current-Sensing
- Gate drive supply range from 10v to 20v
- Active-High interface, works with 3.3v/5v logic input, Schmitt-trigger input
- HVIC Temperature-Sensing Built-In for temperature Monitoring
- HVIC for Gate Driving and Under-voltage Protection
- Built-In Bootstrap Diodes simplify PCB layout
- Isolation Rating:1500Vrms/min

Detailed Package Outline Drawings

Dimensions in mm



Pin Configuration and Internal Block Diagram

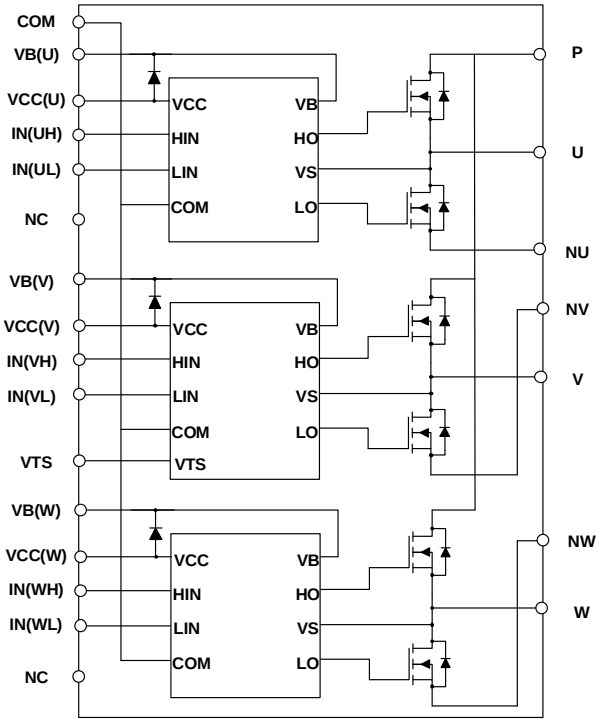


Figure 2. Bottom view

Pin Descriptions

Pin number	Pin name	Pin Description
1	COM	IC Common Supply Ground
2	VB(U)	Bias Voltage for U-Phase High-Side MOSFET Driving
3	VCC(U)	Bias Voltage for U-Phase IC and Low-Side MOSFET Driving
4	IN(UH)	Signal Input for U-Phase High-Side
5	IN(UL)	Signal Input for U-Phase Low-Side
6	NC	No Connection
7	VB(V)	Bias Voltage for V-Phase High Side MOSFET Driving
8	VCC(V)	Bias Voltage for V-Phase IC and Low Side MOSFET Driving
9	IN(VH)	Signal Input for V-Phase High-Side
10	IN(VL)	Signal Input for V-Phase Low-Side
11	VTS	Output for HVIC Temperature Sensing
12	VB(W)	Bias Voltage for W-Phase High-Side MOSFET Driving
13	VCC(W)	Bias Voltage for W-Phase IC and Low-Side MOSFET Driving
14	IN(WH)	Signal Input for W-Phase High-Side
15	IN(WL)	Signal Input for W-Phase Low-Side
16	NC	No Connection
17	P	Positive DC-Link Input
18	U	Output for U-Phase & Bias Voltage Ground for High-Side MOSFET Driving
19	NU	Negative DC-Link Input for U-Phase
20	NV	Negative DC-Link Input for V-Phase
21	V	Output for V-Phase & Bias Voltage Ground for High-Side MOSFET Driving
22	NW	Negative DC-Link Input for W-Phase
23	W	Output for W Phase & Bias Voltage Ground for High-Side MOSFET Driving

Absolute Maximum Ratings (TJ= 25°C, Unless Otherwise Specified)

Inverter Part

Symbol	Parameter	Conditions	Ratings	Unit
VDSS	Drain-Source Voltage of Each MOSFET		500	V
ID	Each MOSFET Current, Continuous	TC = 25°C	2	A
IDM	Each MOSFET Pulse Current, Peak	TC = 25°C, Less than 100us	4.5	A
IDrms	Each MOSFET Current, Rms	TC = 25°C, FPWM <20KHz	1.6	Arms
PD	Maximun Power Dissipation	TC = 25°C For each MOSFET	14.2	W

Control Part

Symbol	Parameter	Conditions	Ratings	Unit
VCC	Control Supply Voltage	Applied between VCC and COM	20	V
VBS	High-side Bias Voltage	Applied between VB and VS	20	V
VIN	Input Signal Voltage	Applied between VIN and COM	-0.3~VCC+0.3	V

Bootstrap Diode Part

Symbol	Parameter	Conditions	Ratings	Unit
VRRMB	Maximum Repetitive Reverse Voltage		500	V
IFB	Forward Current	TC = 25°C	1	A
IFPB	Forward Peak Current, Peak	TC = 25°C,Under 1ms Pulse Width	2.5	A

Total System

Symbol	Parameter	Conditions	Ratings	Unit
TJ	Operating Junction Temperature		-40~150	℃
TSTG	Storage Temperature	TC = 25°C	-40~125	℃
VISO	Isolation Voltage	60Hz, Sinusoidal, AC 1 minute, between pins and heat-sink plate	1500	V

Note:

1. To insure safe operation of the IPM, the average junction temperature should be limited to TJ ≤ 150°C (@Tc ≤ 100°C).

Thermal Resistance

Symbol	Parameter	Conditions	Ratings	Unit
Rth(j-c)	Junction to Case Thermal resistance	For Each MOSFET	8.8	°C/W

Electrical Characteristics (TJ= 25°C, Unless Otherwise Specified)

Inverter Part

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
BVDSS	Drain - Source Breakdown Voltage	VIN = 0 V, ID = 1 mA	500	-	-	V
IDSS	Zero Gate Voltage Drain Current	VIN = 0 V, VDS = 500 V	-	-	1	mA
VSD	Drain - Source Diode Forward Voltage	VCC = VBS = 15V, VIN = 0 V, ID = -0.5 A	-	0.8	1.4	V
RDS(on)	Drain-Source Turn-On Resistance	VCC = VBS = 15 V, VIN = 5 V, ID =0.5 A	-	2.6	3.5	ohm
tON	Switching Times	VPN = 300 V, VCC = VBS = 15 V, ID = 0.5 A VIN = 0/5 V, Inductive Load L = 3 mH High- and Low-Side MOSFET Switching	-	800	-	ns
tOFF			-	450	-	ns
trr			-	200	-	ns
EON			-	40	-	uJ
EOFF			-	10	-	uJ
RBSOA	Reverse Bias Safe Operating Area	VPN = 400 V, VCC = VBS = 15 V, ID = IDP, VDS = BVDSS,TJ = 150°C High- and Low-Side MOSFET Switching	Full Square			

Control Part

Symbol	Parameter	Condition		Min.	Typ.	Max.	Units
IQCC	Quiescent VCC Supply Current	VCC = 15V VIN = 5V	Applied between VCC and COM	-	-	500	uA
IQB	Quiescent VBS Supply Current	VDB = 15V VIN = 5V	Applied between VB(U) - U, VB(V) - V, VB(W) - W	-	-	200	uA
UVCCD	Low-Side Under-Voltage Protection	VCC Under-Voltage Protection Detection Level		7.6	8.4	9.2	V
UVCCR		VCC Under-Voltage Protection Reset Level		8.0	8.9	9.8	V
UVBSD	High-Side Under-Voltage Protection	VBS Under-Voltage Protection Detection Level		7.6	8.4	9.2	V
UVBSR		VBS Under-Voltage Protection Reset Level		8.0	8.9	9.8	V
VTS	HVIC Temperature Sensing Voltage Output	VCC = 15 V, THVIC = 25°C		0.6	0.8	1	V
VIH	ON Threshold Voltage	Logic HIGH Level, Applied between VIN and COM		2.7	-	-	V
VIL	OFF Threshold Voltage	Logic Low Level, Applied between VIN and COM		-	-	0.8	V
VF	BSD Forward voltage	IF = 0.1 A, TC = 25°C		-	1.35	1.8	V
trr	Reverse Recovery Time	IF = 0.1 A, TC = 25°C		-	45	-	ns

Recommended Operating Conditions

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
VPN	Supply Voltage	Applied between P and N	-	300	400	V
VCC	Control Supply Voltage	Applied between VCC and COM	13.5	15.0	16.5	V
VBS	High-Side Bias Voltage	Applied between VB and VS	13.5	15.0	16.5	V
VIN(ON)	Input ON Threshold Voltage	Applied between VIN and COM	3.0	-	VCC	V
VIN(OFF)	Input OFF Threshold Voltage		0	-	0.6	V
tdead	Blanking Time for Preventing Arm-Short	VCC = VBS = 13.5 ~ 16.5 V, TJ <150°C	1.0	-	-	us
fPWM	PWM Switching Frequency	TJ <150°C	-	15	-	KHz