



芯长铭科技

MPVM03N60 Intelligent Power Module

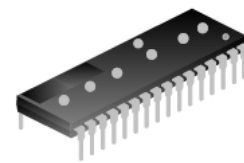
Features

- Integrated 6 fast recovery power MOSFETs (600V/3A)
- Integrated high voltage gate drive circuit (HVIC)
- Compatible with 3.3V & 5V input signal, effective at high level
- Insulation class 1500Vrms / min
- Integrated bootstrap functionality
- High reliability and thermal stability, good parameter consistency
- Built in negative temperature coefficient thermistor for temperature detection

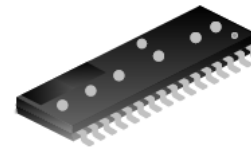
Product Name	Marking	Package Type
MPVM03N60TAN	MPVM03N60TAN	DIP-23H
MPVM03N60TDN	MPVM03N60TDN	SOP-23H

Applications

- Frequency conversion fans
- Cooker hood
- Air conditioning compressor
- Dish washer
- Air cleaner

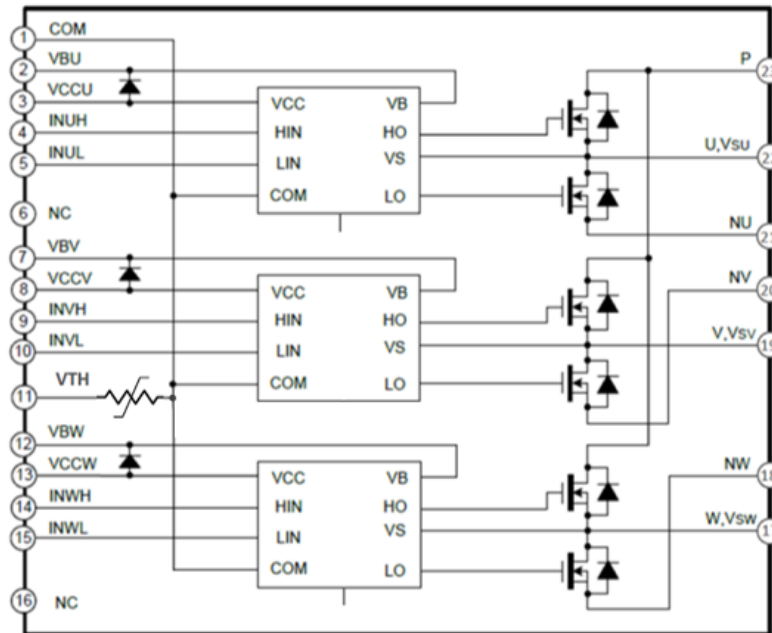


DIP-23H



SOP-23H

Internal Electrical Schematic



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
DC link supply voltage of P-N	V_{PN}	600	V
Single MOSFET output current, $T_C=25^\circ\text{C}$	I_{D25}	3.0	A
Single MOSFET output current, $T_C=80^\circ\text{C}$	I_{D80}	2.5	
Single MOSFET peak output current $T_C=25^\circ\text{C}$, pulse width $<100\mu\text{s}$	I_{DP}	5	A
Power dissipation per MOSFET, $T_C=25^\circ\text{C}$	P_D	13.9	W
Module supply voltage	V_{CC}	25	V
High side floating supply voltage (V_B reference to V_S)	V_{BS}	20	V
Input voltage	V_{IN}	-0.3~ $V_{CC}+0.3$	V
Operating junction temperature	T_J	-55 to 150	°C
Operating case temperature, $T_J \leq 150^\circ\text{C}$	T_C	-55 to 150	
Storage temperature range	T_{STG}	-55 to 150	°C
Single MOSFET thermal resistance, junction-case	$R_{\theta JC}$	9	°C/W
Isolation test voltage (1min, RMS, $f = 60\text{Hz}$)	V_{ISO}	1500	Vrms
Bootstrap diode forward current, $T_C=25^\circ\text{C}$	I_F	0.1	A
Bootstrap diode peak forward current, $T_C=25^\circ\text{C}$, pulse width =1ms	I_{FP}	0.3	A

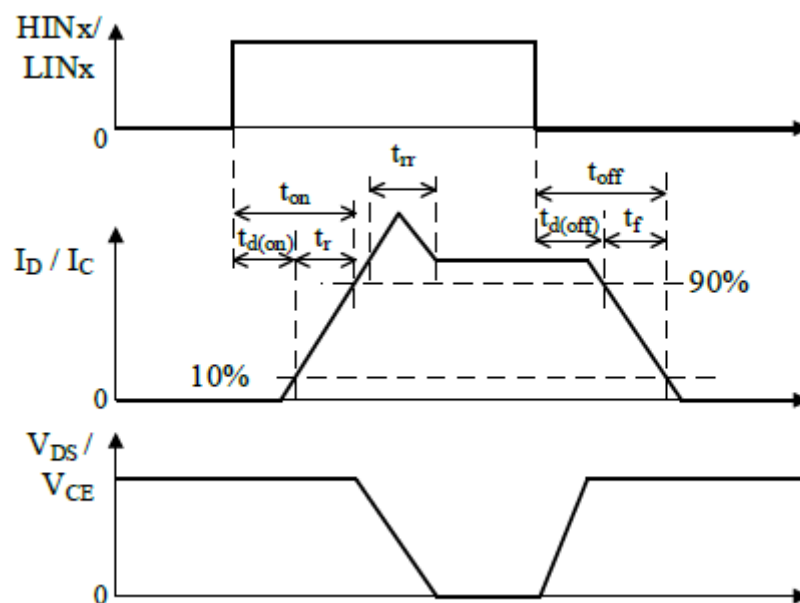
Recommended Operation Conditions

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DC link supply voltage of P-N	V_{PN}	-	300-	400	V
Low side supply voltage	V_{CC}	13.5	15	16.5	V
High side floating supply voltage	V_{BS}	13.5	15	16.5	V
Logic "1" input voltage (LIN, HIN)	$V_{IN(ON)}$	2.5	-	-	V
Logic "0" input voltage (LIN, HIN)	$V_{IN(OFF)}$	-	-	0.8	V
External deadtime between HIN and LIN	T_{dead}	-	540	-	ns
PWM switching frequency, $T_J \leq 150^\circ\text{C}$	f_{PWM}	-	16	-	KHz

Electrical Characteristics (unless otherwise noted, $T_j=25^\circ\text{C}$, $V_{CC}=V_{BS}=15\text{V}$)

Inverter Section

Parameter	Symbol	Condition	Value			Unit
			Min.	Typ.	Max.	
Drain-Source blocking voltage	B_{VDSS}	$V_{IN}=0\text{V}$, $I_D=250\mu\text{A}$	600	-	-	V
Drain-Source leakage current	I_{DSS}	$V_{DS}=600\text{V}$, $V_{GS}=0\text{V}$	-	-	1	μA
Drain-Source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{V}$, $I_D=1.5\text{A}$	-	2.8	3.4	Ω
Diode forward voltage	V_{SD}	$V_{SG}=0\text{V}$, $I_S=1.5\text{A}$	-	-	1.4	V
Switching time	t_{ON}	$V_{PN}=300\text{V}$, $V_{CC}=V_{BS}=15\text{V}$ $I_D=0.5\text{A}$, $V_{IN}=0\text{V}\sim 5\text{V}$, Inductive load		820		ns
	t_{OFF}			500		ns
	t_{rr}			75		ns
	E_{ON}			75		μJ
	E_{OFF}			8		μJ



Switching Time Definition

Control Section

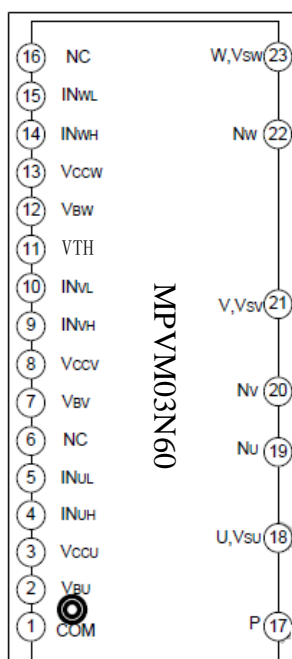
Parameter	Symbol	Condition	Value			Unit
			Min.	Typ.	Max.	
Quiescent VCC supply current	I_{QCC}	$V_{BIAS} (V_{CC}, V_{BS})$ $=15\text{V}$ $T_A = 25^\circ\text{C}$	-	160	-	μA
Quiescent VB supply current	I_{QBS}		-	70	120	

Low side undervoltage protection	UV _{CCR}	Reset level		8	8.9	9.8	V
High side undervoltage protection	UV _{BSR}	Reset level		8	8.9	9.8	V
Logic "1" input voltage (LIN, HIN)	V _{IH}	Logic high level	Between input and COM	2.5	-	-	V
Logic "0" input voltage (LIN, HIN)	V _{IL}	Logic low level		-	-	0.8	V
Input bias current for LIN, HIN	I _{IH}	VIN=5V	Between input and COM	-	6	15	μA
	I _{IL}	VIN=0V		-	-	1	

Bootstrap diode section

Parameter	Symbol	condition	Value			Unit
			Min.	Typ.	Max.	
Forward voltage	V _F	I _F =10mA@ T _j =25°C	-	3.0	3.5	V
		I _F =10mA@ T _j =125°C	-	-	3.0	
Reverse recovery time	t _{rr}	I _F =0.1A, V _R =30V, di _F /dt=-200A/μs	-	-	45	ns

Pin Assignment



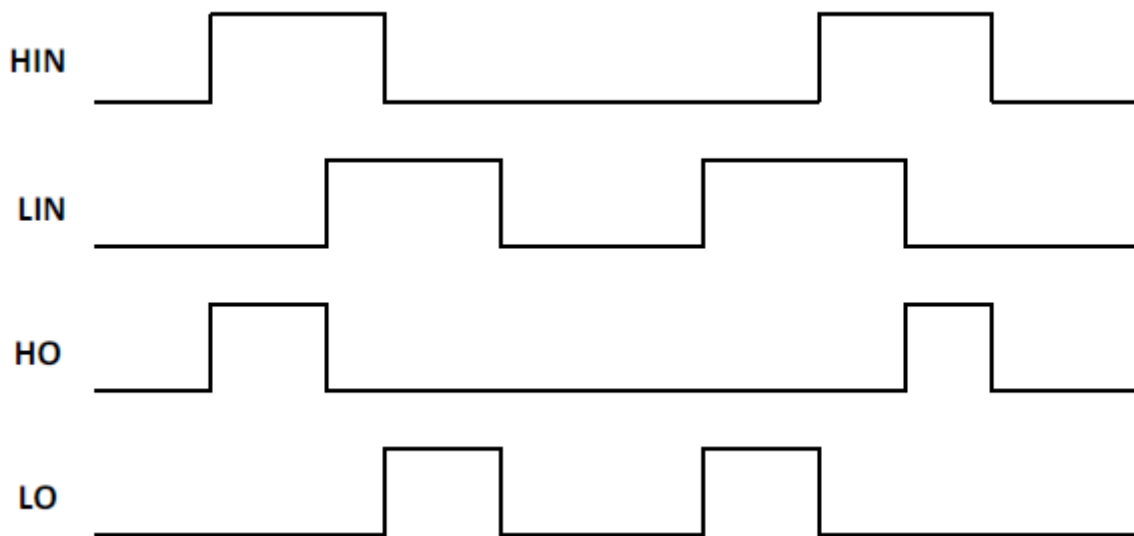
Pin Description

Pin Number	Pin name	I/O	Pin Description
1	COM	I/O	Module common ground
2	V _{BU}	I/O	U-phase high side floating IC supply voltage
3	V _{CCU}	I/O	U-phase low side driver supply voltage
4	I _{NUH}	I	U-phase high side gate driver input
5	I _{NUL}	I	U-phase low side gate driver input
6	NC	I/O	No Connection
7	V _{BV}	I/O	V-phase high side floating IC supply voltage
8	V _{CCV}	I/O	V-phase low side driver supply voltage
9	I _{NVH}	I	V-phase high side gate driver input
10	I _{NVL}	I	V-phase low side gate driver input
11	V _{TH}	O	Negative temperature coefficient thermistor
12	V _{BW}	I/O	W-phase high side floating IC supply voltage
13	V _{CCW}	I/O	W-phase low side driver supply voltage
14	I _{NWH}	I	W-phase high side gate driver input
15	I _{NWL}	I	W-phase low side gate driver input
16	NC	I/O	No Connection
17	P	I/O	Positive bus input voltage
18	U, V _{SU}	O	Motor U-phase output and U-phase high side drive bias voltage ground
19	NU	I/O	U-phase low side source
20	NV	I/O	V-phase low side source
21	V, V _{SV}	O	Motor V-phase output and V-phase high side drive bias voltage ground
22	NW	I/O	W-phase low side source
23	W, V _{SW}	O	Motor W-phase output and W-phase high side drive bias voltage ground

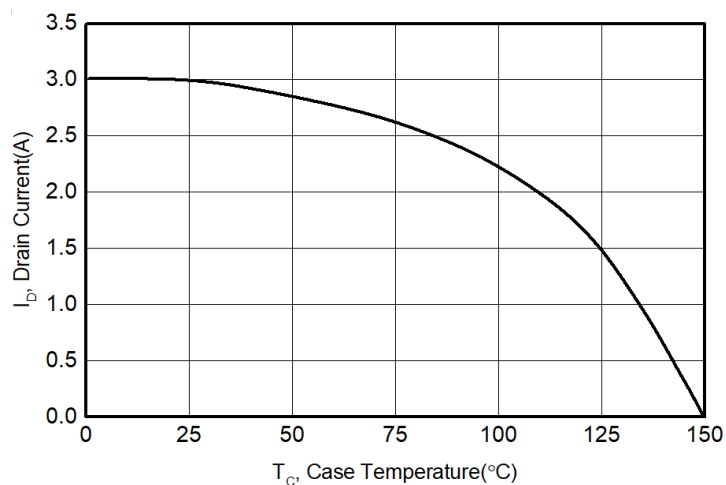
Function description

Input-output table

INH	INL	OUTPUT	REMARK
0	0	Z	The high and low sides of the bridge arm are closed
0	1	0	The low side of the bridge arm is opened
1	0	VDC	The high side of the bridge arm is opened
1	1	Forbid	Bridge arm punch through
Open	Open	Z	The high and low sides of the bridge arm are closed



Control sequence diagram

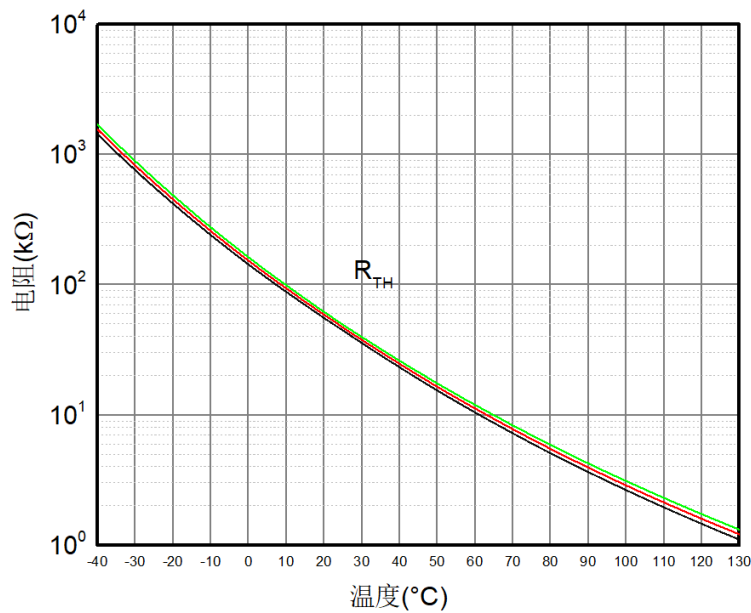


I_D Drain Current vs. Case Temperature

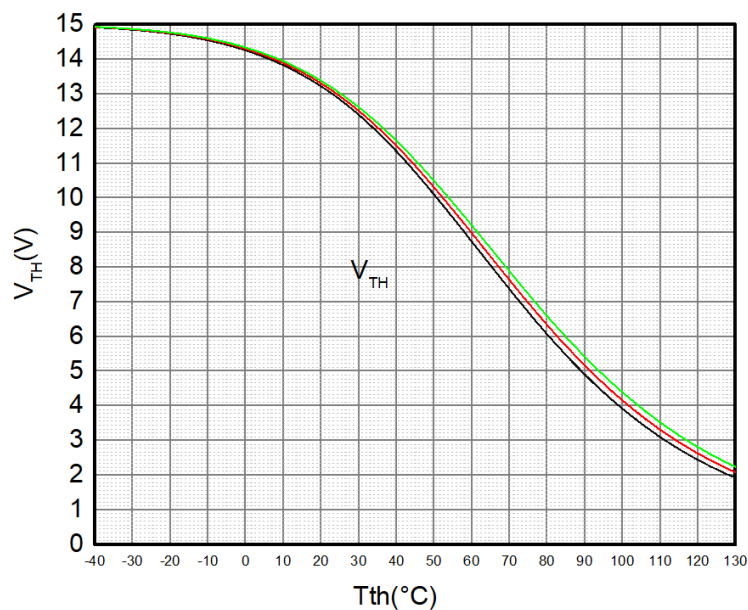
NTC 电阻

Parameter	Symbol	condition	Value			Unit
			Min.	Typ.	Max.	
Thermistor	R _{TH}	T _{TH} =25°C	44.65	47.00	49.35	kΩ
		T _{TH} =125°C	2.65	2.87	3.10	

Note: T_{TH} is the temperature of thermistor itself. In the application circuit, the Vth pin passes through 7.5KΩ is pulled up to VCC; The figure below shows the resistance characteristics of NTC and the output voltage and temperature curve of Vth pin. NTC tolerance ±5%. If you need to test the Tc, please carry out the experiment according to the practical application.

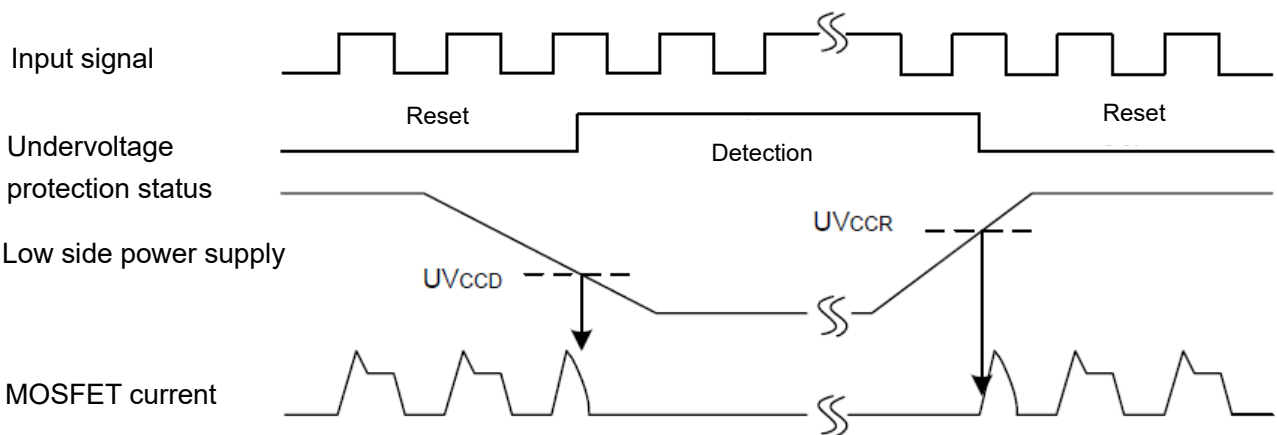
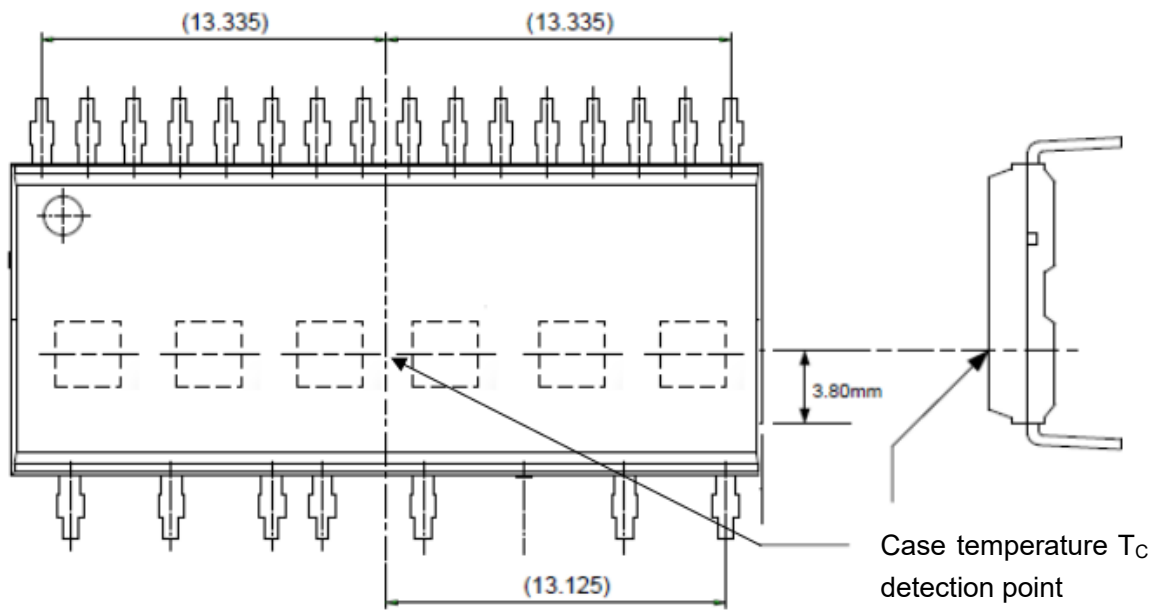


NTC Resistance characteristics

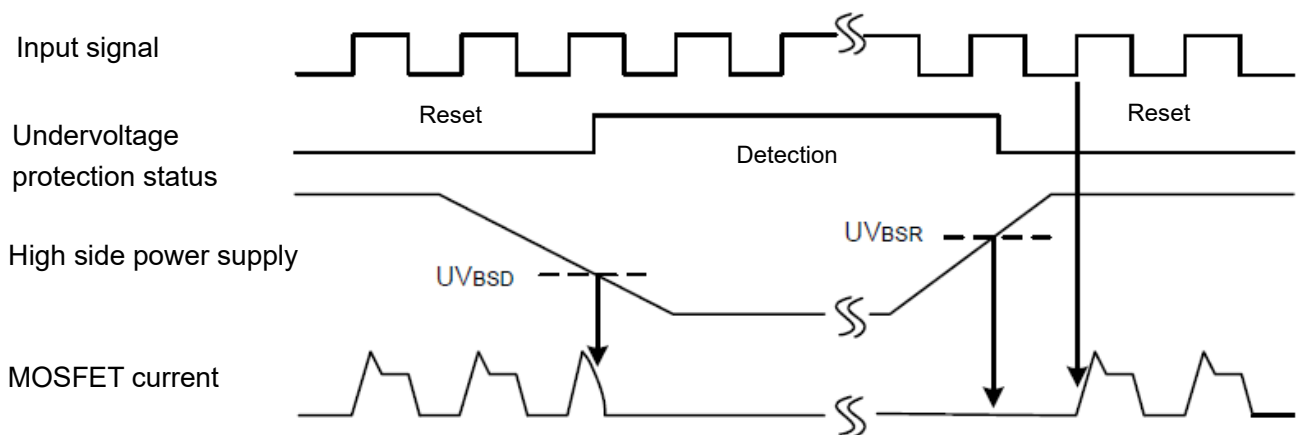


NTC Voltage characteristics

Case temperature T_C detection

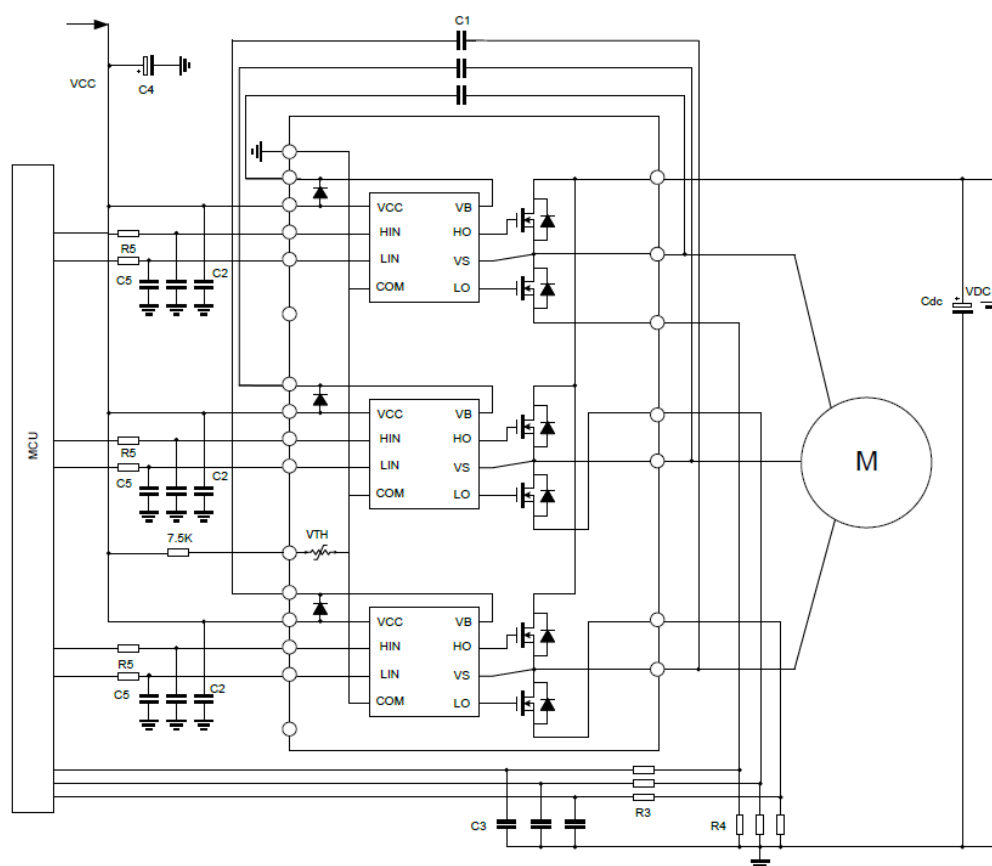


Undervoltage protection (Low side)



Undervoltage protection (High side)

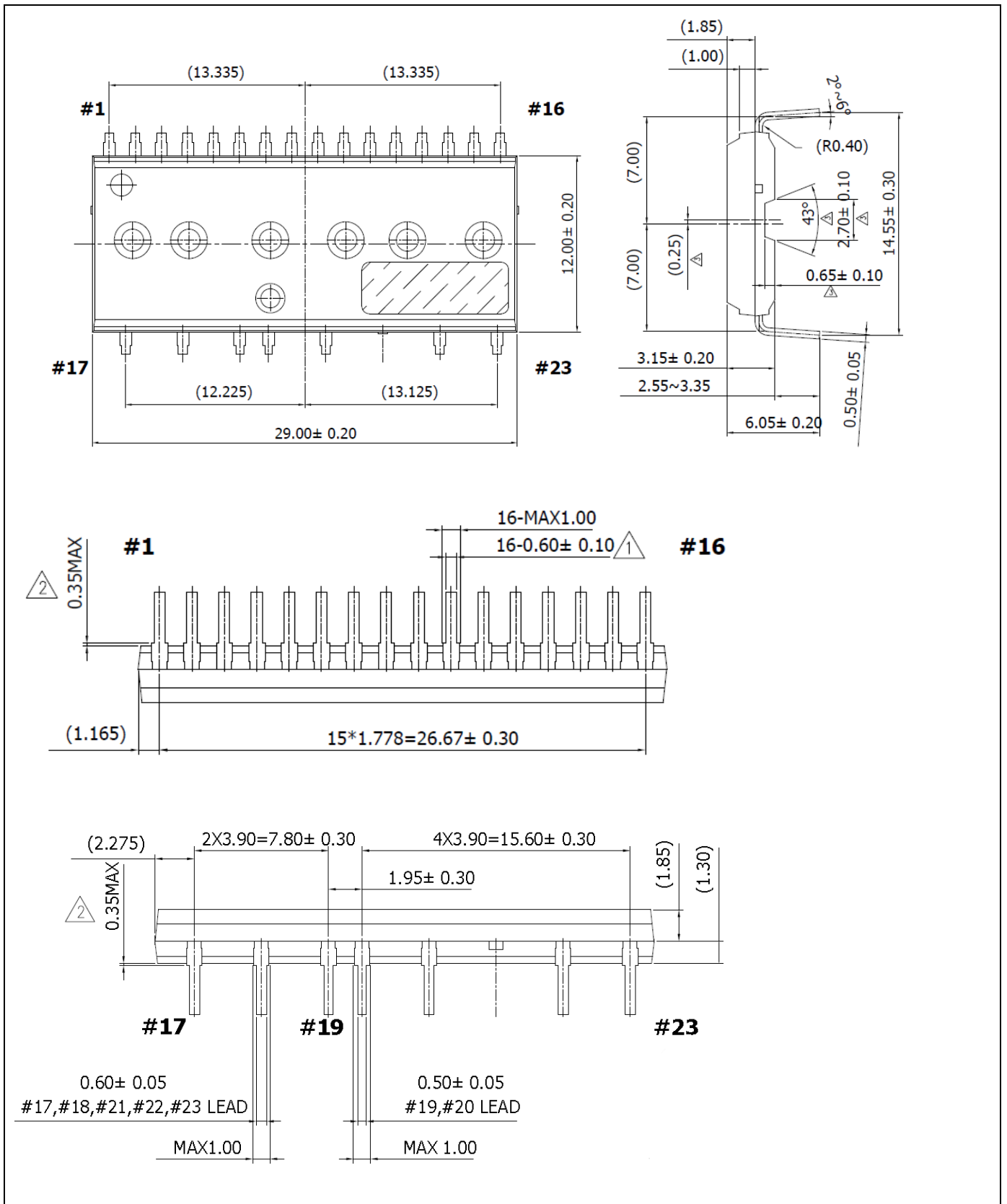
Typical Application Schematic:



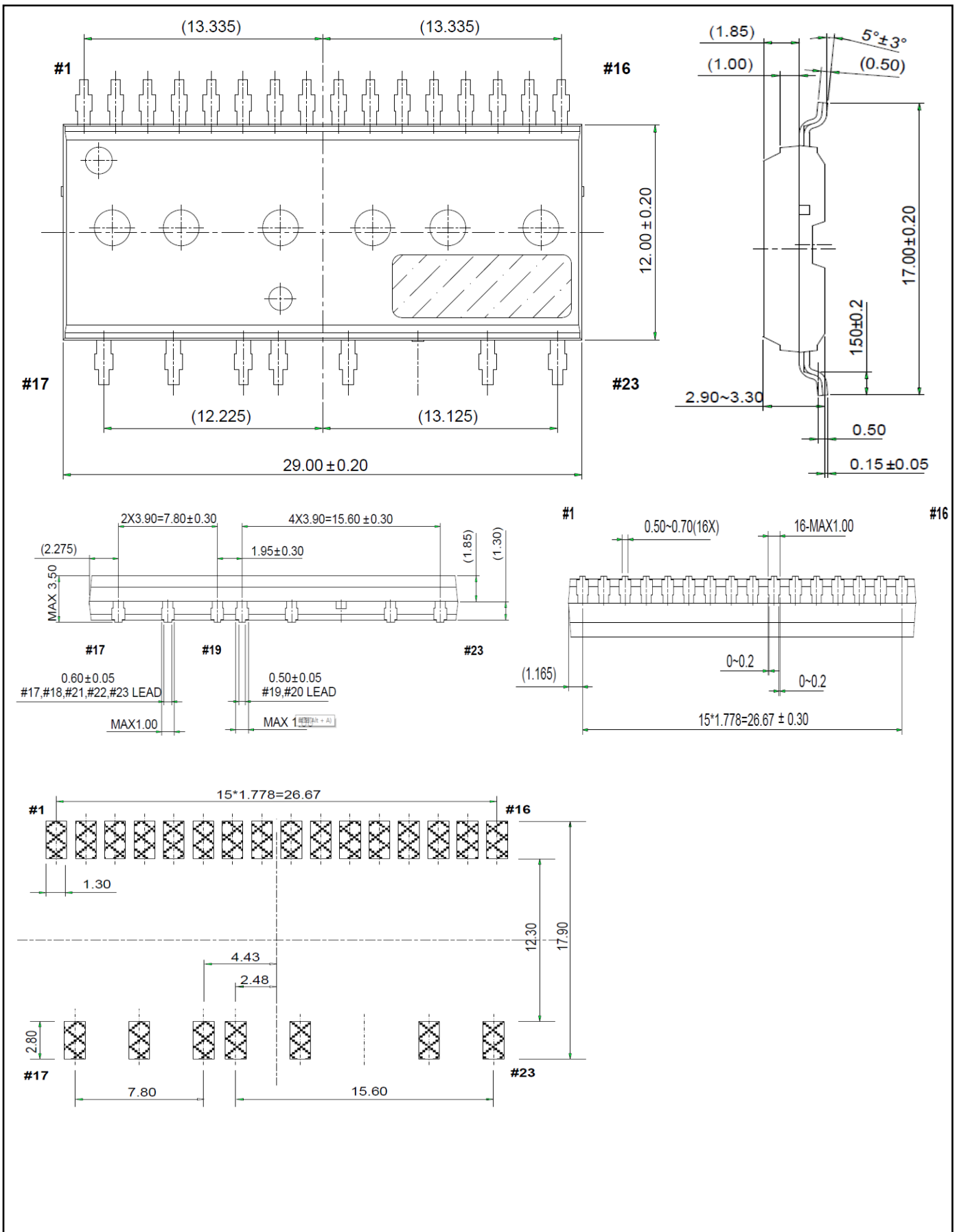
Remark:

- (1) The wiring of each input pin shall be as short as possible, otherwise it may cause mis operation; in addition, RC filter can be used to reduce input signal noise.
- (2) All external capacitors should be located close to IPM.
- (3) In order to prevent surge damage, in addition to filter capacitance between PN, it is recommended to add a high-frequency non inductive smoothing capacitance, and the connection of capacitance should be as short as possible.
- (4) The filter capacitance at the input of VCC power supply is recommended to be at least 7 times of bootstrap capacitance C1.
- (5) The bootstrap capacitor C1 is suggested to adopt a capacitor with high frequency characteristics to absorb high frequency ripple current, and its capacitance value is suggested to be greater than 2.2uf.
- (6) The connection between current limiting resistor R4 and IPM shall be as short as possible to prevent the large surge voltage generated by the connection inductance from damaging IPM.

Package Outline DIP23



Package Outline SOP23



Revision History:

Revision	Date	Subjects (major changes since last revision)
1.0	2021-08	Initial Version

Disclaimer:

Operating conditions may differ from simulation assumptions in several aspects like level of DC-link voltage, applied gate-voltage and gate-resistor, case and junction temperatures as well as the power circuit stray-inductance. Therefore, deviations of parameters and assumptions used for the simulation and the real application may exist.

For these reasons we cannot take any responsibility or liability for the exactness or validity of the form's results. The form cannot replace a detailed reflection of the customers application with all of its operating conditions.

Accurate results depend on huge data, so with the measured data is increasing, we should be updated in real time and send it to the corresponding engineer so that he can know it in real time.