DESCRIPTION

The PT5617 is a high speed power MOSFET and IGBT driver with three independent high and low side referenced output channels for 3-phase gate driver. Built-in deadtime protection and Shoot-through protection that prevent half-bridge breakdown. The UVLO circuits prevent malfunction when VCC and VBS are lower than the specified threshold voltage. 600V high-voltage process and common-mode noise canceling technique provide stable operation of high-side drivers under high-dv/dt noise circumstances.

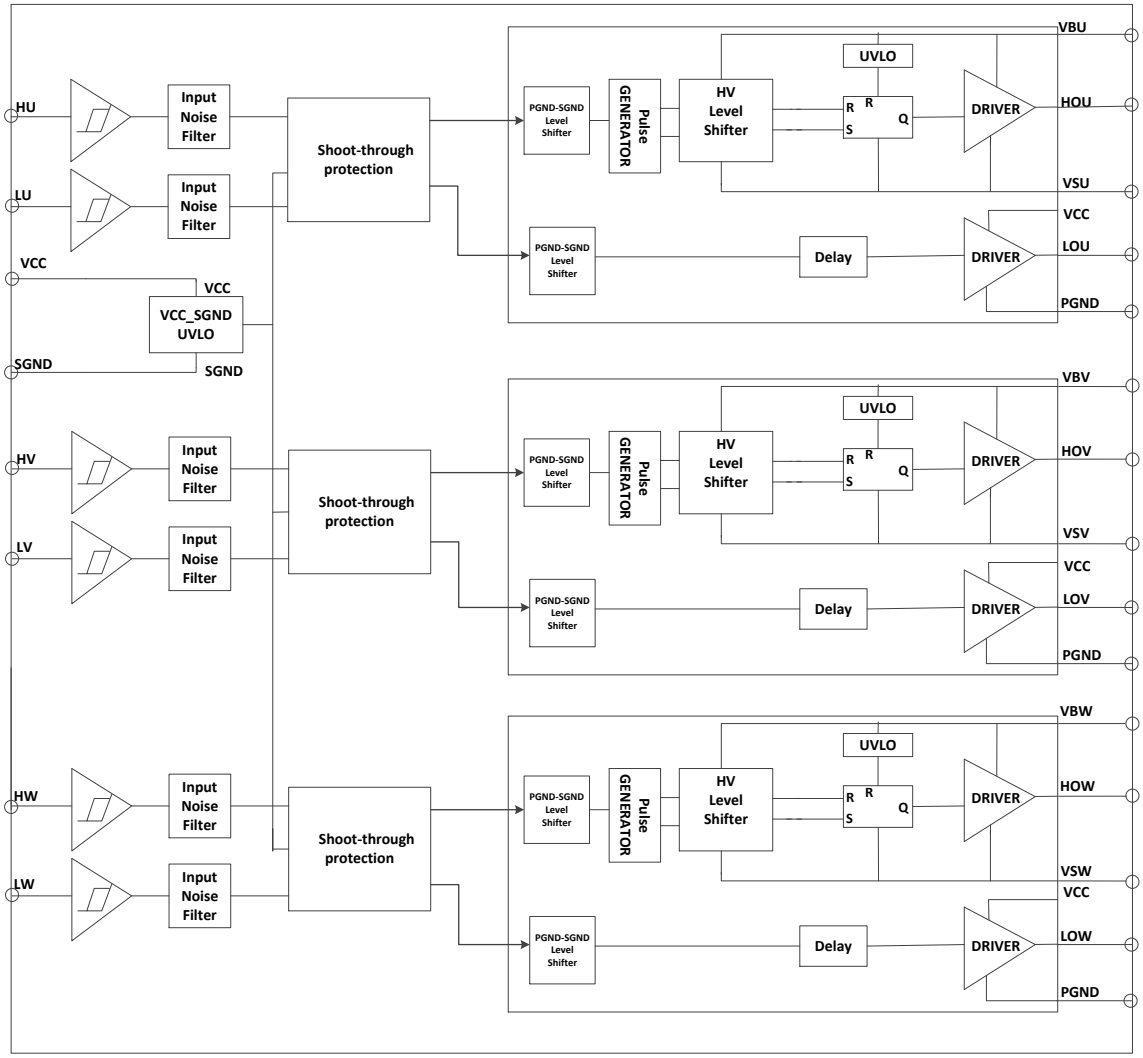
FEATURES

- Integrated 600V half-bridge high side driver
- Driver up to 3-phase half-bridge gates
- Built-in deadtime control
- Shoot-through protection
- Under voltage lockout for VCC and VBS
- 3.3V, 5V,15V input logic Compatible
- Built-in input filter
- -40℃ to 125℃ operating range
- Common-Mode dv/dt Noise Canceling Circuit

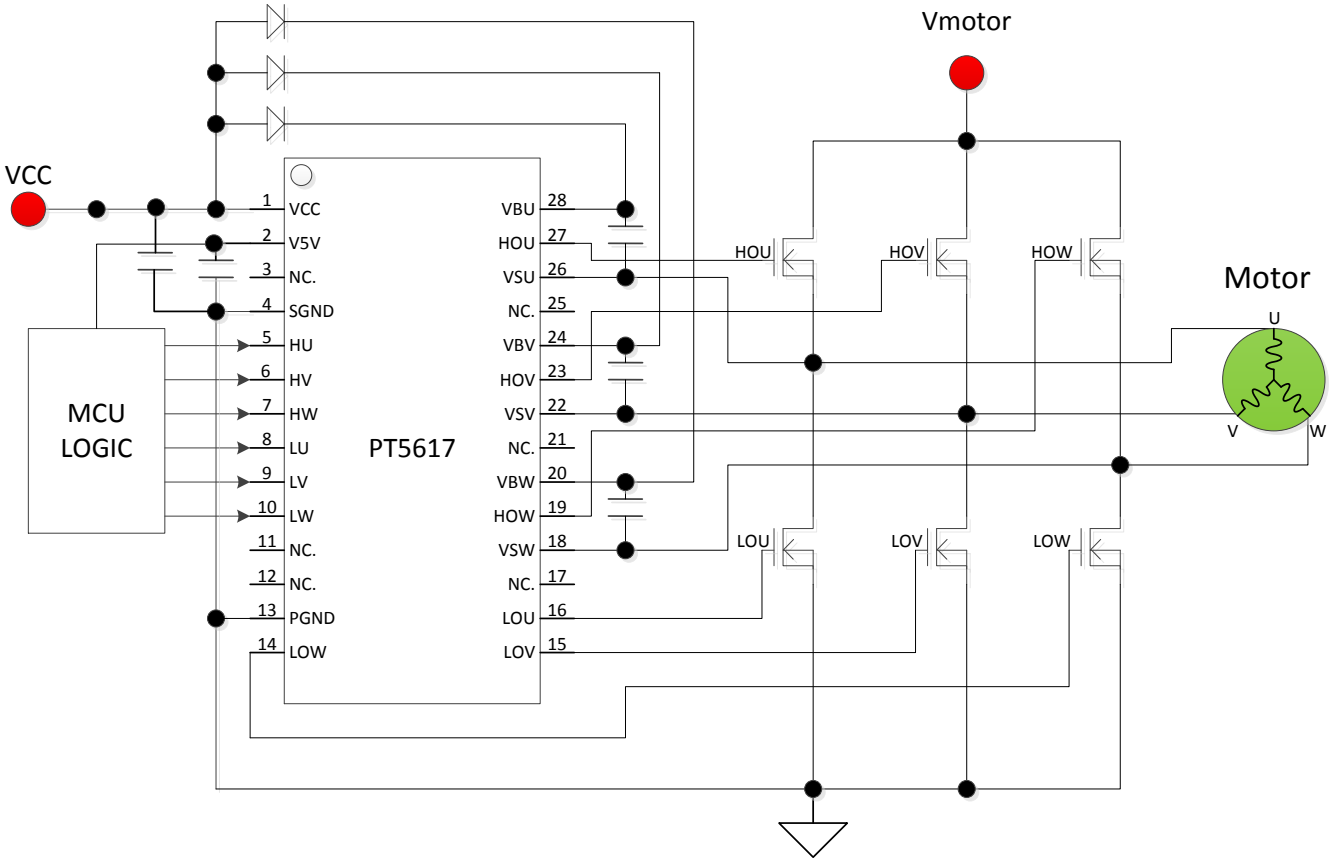
APPLICATION

- 3-phase Motor Inverter Driver
- Air Condition
- Washing Machines

BLOCK DIAGRAM



TYPICAL APPLICATION CIRCUIT

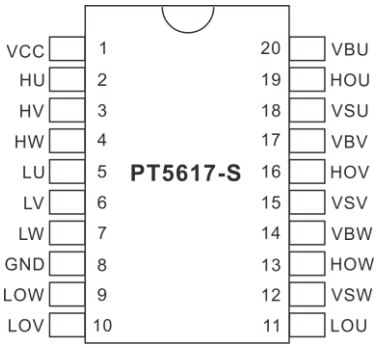


ORDER INFORMATION

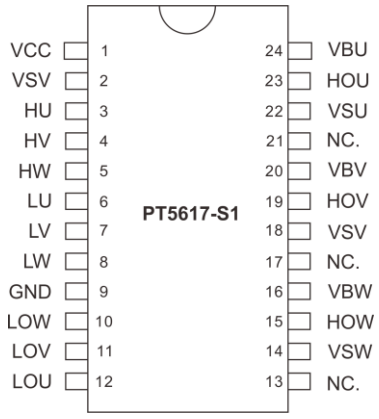
Valid Part Number	Package Type	Top Code
PT5617-S	20-PIN, SOP, 300mil	PT5617-S
PT5617-S1	24-PIN, SOP, 300mil	PT5617-S1
PT5617-S2	28-PIN, SOP, 300mil	PT5617-S2

PIN CONFIGURATION

20-PIN



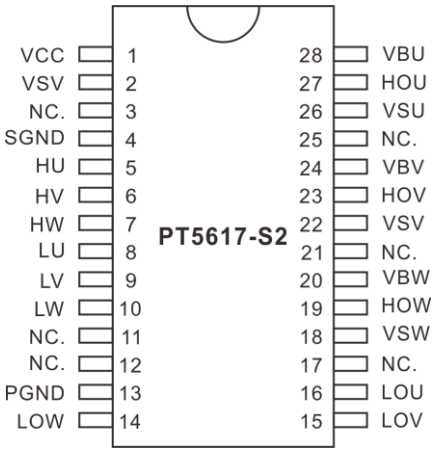
24-PIN



PIN DESCRIPTION

Pin Name	Description	Pin No.	
		SOP20	SOP24
VCC	Logic and low-side gate drivers power supply voltage	1	1
V5V	5V LDO output		2
HU	Logic input for high-side gate U-phase driver	2	3
HV	Logic input for high-side gate V-phase driver	3	4
HW	Logic input for high-side gate W-phase driver	4	5
LU	Logic input for low-side gate U-phase driver	5	6
LV	Logic input for low-side gate V-phase driver	6	7
LW	Logic input for low-side gate W-phase driver	7	8
GND	Logic ground and low-side gate drivers ground	8	9
LOW	Low-side gate driver W-phase output	9	10
LOV	Low-side gate driver V-phase output	10	11
LOU	Low-side gate driver U-phase output	11	12
NC.	Not Connected		13
VSW	High-side driver W-phase floating supply offset voltage	12	14
HOW	High-side driver W-phase gate driver output	13	15
VBW	High-side driver W-phase floating supply	14	16
NC.	Not Connected		17
VSV	High-side driver V-phase floating supply offset voltage	15	18
HOV	High-side driver V-phase gate driver output	16	19
VBV	High-side driver V-phase floating supply	17	20
NC.	Not Connected		21
VSU	High-side driver U-phase floating supply offset voltage	18	22
HOU	High-side driver U-phase gate driver output	19	23
VBU	High-side driver U-phase floating supply	20	24

28-PIN



PIN DESCRIPTION

Pin Name	Description	Pin No.
VCC	Logic and low-side gate drivers power supply voltage	1
V5V	5V LDO output	2
NC.	Not Connected	3
SGND	Logic ground	4
HU	Logic input for high-side gate U-phase driver	5
HV	Logic input for high-side gate V-phase driver	6
HW	Logic input for high-side gate W-phase driver	7
LU	Logic input for low-side gate U-phase driver	8
LV	Logic input for low-side gate V-phase driver	9
LW	Logic input for low-side gate W-phase driver	10
NC.	Not Connected	11
NC.	Not Connected	12
PGND	Low-side gate drivers ground	13
LOW	Low-side gate driver W-phase output	14
LOV	Low-side gate driver V-phase output	15
LOU	Low-side gate driver U-phase output	16
NC.	Not Connected	17
VSW	High-side driver W-phase floating supply offset voltage	18
HOW	High-side driver W-phase gate driver output	19
VBW	High-side driver W-phase floating supply	20
NC.	Not Connected	21
VSV	High-side driver V-phase floating supply offset voltage	22
HOV	High-side driver V-phase gate driver output	23
VBV	High-side driver V-phase floating supply	24
NC.	Not Connected	25
VSU	High-side driver U-phase floating supply offset voltage	26
HOU	High-side driver U-phase gate driver output	27
VBU	High-side driver U-phase floating supply	28

FUNCTION DESCRIPTION

LOW SIDE POWER SUPPLY (VCC, GND（SGND, PGND）)

VCC is the low side supply and it provides power to both input logic and low side output power stage. In PT5617-S2, input logic is referenced to SGND as well as the under-voltage detection circuit. Output power stage is referenced to PGND. PGND ground is floating respect to SGND ground with a recommended range of operation of +/-5V, which guarantees enough margin of gate to source voltage, V_{GS}, to driver power devices such as power MOSFET.
The built-in under-voltage lockout circuit enables the device to operate at sufficient power on when a typical VCC supply voltage higher than V_{CCUV+} =9.5 is present, shown as FIG1. The IC shuts down all the gate drivers outputs, when the VCC supply voltage is below V_{CCUV-} =8.8 V, shown as FIG1. This prevents the external power devices from extremely low gate voltage levels during on-state and therefore from excessive power dissipation.

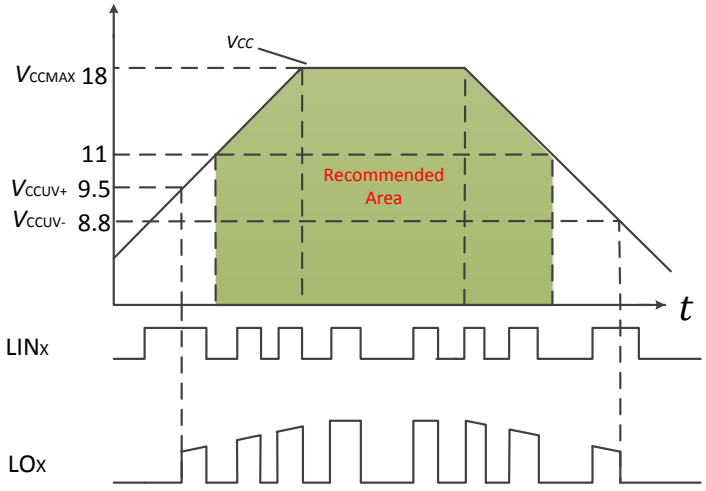


FIG.1 VCC supply UVLO operating area

HIGH SIDE POWER SUPPLY (VBU-VSU, VBV-VSV, VBW-VSW)

VB to VS is the high side supply voltage. The totally high side circuitry can float with respect to SGND following the external high side power device emitter/source voltage. Due to the internally low power consumption, the whole high side circuitry can be supplied by bootstrap topology connected to VCC, and it can be powered with small bootstrap capacitors. The device operating area as a function of the supply voltage is given in Figure2.

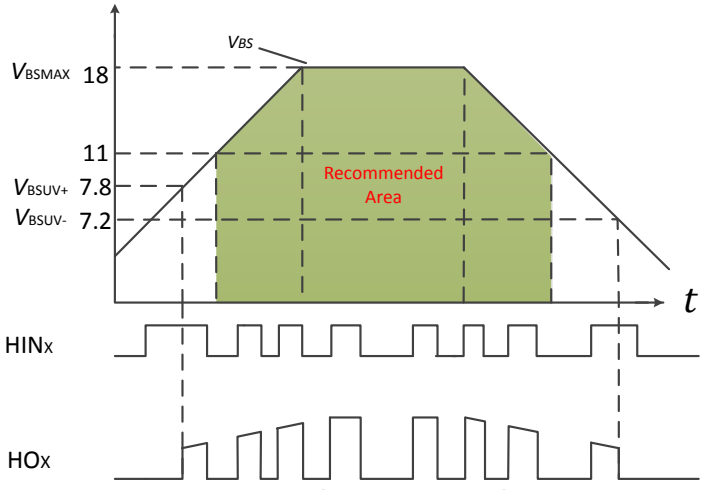


FIG.2 VBS supply UVLO operating area

LOW SIDE AND HIGH CONTROL INPUT LOGIC (HU, V, W / LU, V, W)

The Schmitt trigger threshold of each input is designed enough low such to guarantee LSTTL and CMOS compatibility down to 3.3 V controller outputs. Input Schmitt trigger and advanced noise filter provide beneficial noise rejection to short input pulses. An internal pull-down resistor of about 200kΩ (positive logic) pre-biases each input during VCC supply start-up state. It is anyway recommended for proper work of the driver not to provide input pulse-width lower than 400ns.

SHOOT-THROUGH PREVENTION

The IC is equipped with shoot-through prevention circuitry (also known as cross conduction prevention circuitry). Figure 3 shows how this prevention circuitry prevents both the high- and low-side switches from conducting at the same time. During the inputs controlling high side driver and low side driver are both “high”, the both driver outputs are pulled down “low” to shutdown two power devices in the same bridge.

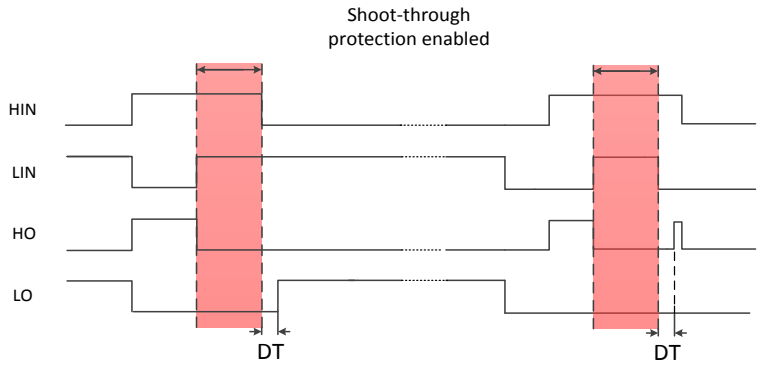


FIG.3 Shoot-through prevention

DEAD TIME

The IC features integrated a fixed dead-time protection circuitry. The dead time feature inserts a time period (a minimum dead time) in which both the high- and low-side power switches are held off; this is done to ensure that the power switch being turned off has fully turned off before the second power switch is turned on. This minimum dead time is automatically inserted whenever the external dead time is shorter than DT; external dead times larger than DT are not modified by the gate driver. Figure 4 illustrates the dead time period and the relationship between the output gate signals.

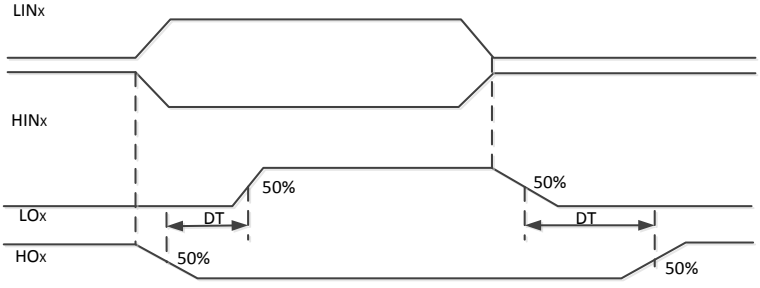


FIG.4 Dead Time

GATE DRIVER (HOU, V, W, LOU, V, W)

Low side and high side driver outputs are specifically designed for pulse operation and dedicated to drive the power devices such as IGBT and MOSFET. Low side outputs (i.e. LOU, V, W) are state triggered by the respective inputs, while high side outputs (i.e. HOU, V, W) are only changed at the edge of the respective inputs. In particular, after releasing from an under voltage condition of the VBS supply, a new turn-on signal (edge) is necessary to activate the respective high side output, while after releasing from a under voltage condition of the VCC supply, the low side outputs can directly switch to the state of their respective inputs and don’t suffer from the trouble as high side driver.

ABSOLUTE MAXIMUM RATINGS

Stresses exceeding the absolute maximum ratings may damage the device or make the function abnormal. All the voltage parameters are absolute voltages referenced to IC SGND unless otherwise stated in the table.

Parameter	Symbol	Min.	Max.	Units
High-side floating supply voltage	$V_{B.U.V.W}$	-0.3	600	V
High-side offset voltage	$V_{S.U.V.W}$	$V_{B.U.V.W}$ -18	$V_{B.U.V.W}$ +0.3	
High-side gate driver output voltage	$V_{HO.U.V.W}$	$V_{S.U.V.W}$-0.3	$V_{S.U.V.W}$ +0.3	
Low-side gate driver output voltage	$V_{LO.U.V.W}$	PGND-0.3	V_{CC}+0.3	
Logic input voltage	$V_{H.U.V.W}$ $V_{L.U.V.W}$	-0.3	20	
Low-side supply voltage	V_{CC}	-0.3	20	
Logic gate driver return	PGND	V_{CC}-18	V_{CC}+0.3	
Allowable Offset Voltage Slew Rate	dV/dt		40	V/ns
Junction temperature	T_J	-40	+125	°C
Storage temperature	T_S	-50	+150	

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min.	Typ.	Max.	Units
Low-side supply voltage	V_{CC}	11	-	18	V
High-side Floating Supply Offset Voltage(note1)	$V_{S.U.V.W}$	V_B-18	-	V_B-11	
High-side Floating Supply Voltage	$V_{B.U.V.W}$	-8	-	600	
High-side gate driver output voltage	$V_{HO.U.V.W}$	V_S	-	V_B	
Low-side gate driver output voltage	$V_{LO.U.V.W}$	PGND	-	V_{CC}	
Logic gate driver return	PGND	-3		3	
Logic input voltage	$V_{H.U.V.W}$ $V_{L.U.V.W}$	0	-	5	
IC operating Junction temperature	T_J	-40	-	+125	°C

Note1: For VBS=12V, normal Logic operation for VS of –8 V to 600 V. The parameter is only guaranteed by design.

STATIC ELECTRICAL CHARACTERISTICS

（VCC-SGND）=(VB-VS)=12V. T_{AMB}=25℃ unless otherwise specified. The V_{IN}, V_{TH} and I_{IN} Parameters are reference to SGND and are applicable to all six channels. The V_O and I_o parameters are referenced to respective V_S and PGND and are applicable to the respective output leads. The V_{CCUV} parameters are referenced to SGND. The V_{BSUV} parameters are referenced to V_S.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Low Side Power Supply Characteristics						
VCC quiescent current in UVLO mode	I_{QVCC}	$V_{H.U.V.W}$ =$V_{L.U.V.W}$=0 or 5V,	200	350	500	μA
VCC operating Vcc supply current	I_{VCCOP}	$f_{L.U.V.W}$=20k, $f_{H.U.V.W}$=20k,	-	1200	-	
VCC supply under-voltage positive going threshold	V_{CCUV+}		8.0	9.5	11.0	V
VCC supply under-voltage negative going threshold	V_{CCUV-}		7.3	8.8	10.3	
V_{CC} supply under-voltage lockout hysteresis	V_{CCHYS}		-	0.7	-	
High Side Floating Power Supply Characteristics						
High side VBS supply under-voltage positive going threshold	V_{BSUV+}		6.8	7.8	8.8	V
High side VBS supply under-voltage negative going threshold	V_{BSUV-}		6.2	7.2	8.2	
High side VBS supply under-voltage lockout hysteresis	$V_{BSUVHYS}$		-	0.6	-	
High side VBS quiescent current in UVLO mode	I_{QBS}	V_{BS}=12V	35	54	75	μA
Offset supply leakage current	I_{LK}	V_B=V_S=600V V_{CC}=0V	-	-	1	
Gate Driver Output Section						
High Side Output High Short-Circuit Pulse Current	I_{HO+}	V_{HO}=V_S=0	-	160	-	mA
High Side Output Low Short-Circuit Pulse Current	I_{HO-}	V_{HO}=V_B=12V	-	340	-	
Low Side Output High Short-Circuit Pulse Current	I_{LO+}	V_{LO}=PGND=0	-	160	-	
Low Side Output Low Short-Circuit Pulse Current	I_{LO-}	V_{LO}=V_{CC}=12V	-	340	-	
Allowable Negative Vs Pin Voltage for HU.V.W Signal Propagation to HOU.V.W	V_{SN}	V_{BS}=12V	-	-10	-8	V
Logic Input Section						
Logic"1" Input voltage HU.V.W and LU.V.W	V_{IH}		2.8	-	-	V
Logic"0" Input voltage HU.V.W and LU.V.W	V_{IL}		-	-	0.8	
Input positive going threshold	$V_{IN,TH+}$		-	2.0	-	
Input negative going threshold	$V_{IN,TH-}$		-	1.5	-	
Logic "1" Input bias current	I_{IN+}	V_{IN}=5V	-	25	-	uA
Logic "0" Input bias current	I_{IN-}	V_{IN}=0	-	0	-	
LDO Characteristic （Only for PT5617-S1 and PT5617-S2）						
Output Voltage	V_{LDO}	VCC=12V	4.5	5	5.5	V
Output Current	I_{LDO}		-	20	30	mA

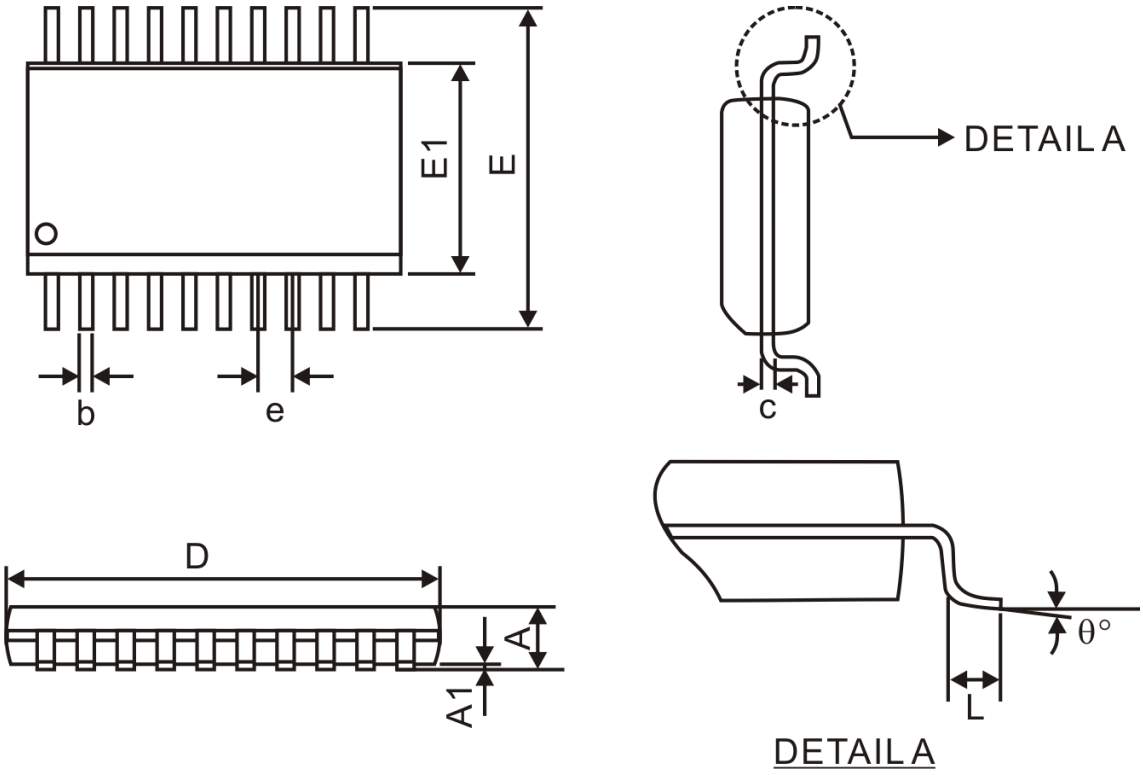
DYNAMIC ELECTRICAL CHARACTERISTICS

（VCC-SGND）=(VB-VS)=12V ,Vs.u.v.w=SGND=PGND, and Cload=1nF unless otherwise specified, T_{AMB}=25℃.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Turn-On propagation delay	t_{ON}	$V_{H.U.V.W}$ or $V_{L.U.V.W}$=5V, $V_{S.U.V.W}$=0	300	510	700	ns
Turn-Off Propagation delay	t_{OFF}	$V_{H.U.V.W}$ or $V_{L.U.V.W}$=0, $V_{S.U.V.W}$=0	300	570	700	
Turn-On Rise time	t_R	$V_{H.U.V.W}$ or $V_{L.U.V.W}$=5V, $V_{S.U.V.W}$=0	-	90	-	
Turn-Off Fall time	t_F	$V_{H.U.V.W}$ or $V_{L.U.V.W}$=0, $V_{S.U.V.W}$=0	-	40	-	
Input Filtering Time	$t_{FLT,IN}$		-	400	-	
Dead Time	DT		150	230	310	
Dead-Time Matching(All Six Channels)	MDT		-	-	100	
Delay Matching(All Six Channels)	MT		-	-	150	
Output Pulse-Width Matching	PM	PW_{IN}=10us, $PM=PW_{OUT}-PW_{IN}$	-	-	100	

PACKAGE INFORMATION

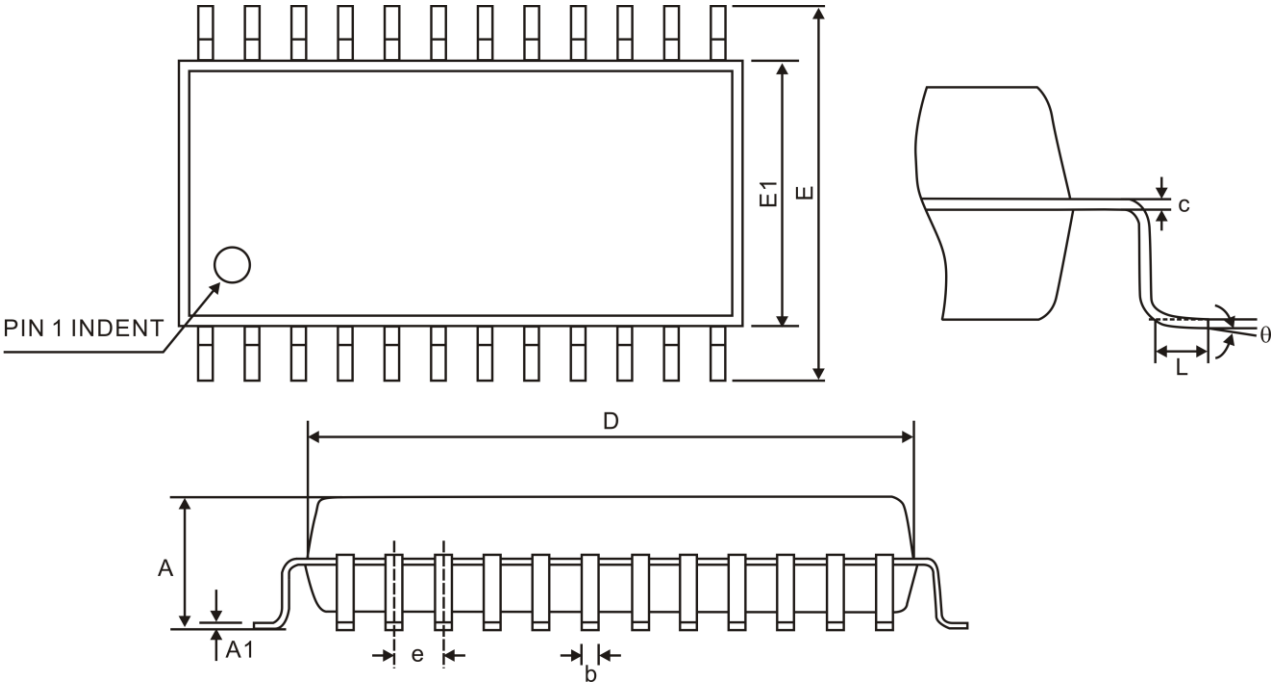
20-PIN, SOP, 300MIL



Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	-	-	2.65
A1	0.10	-	0.30
b	0.31	-	0.51
c	0.20	-	0.33
e	1.27 BSC.		
D	12.80 BSC.		
E	10.30 BSC.		
E1	7.50 BSC.		
L	0.40	-	1.27
θ	0°	-	8°

Notes:
1. Refer to JEDEC MS-013 AC.
2. Unit: mm.

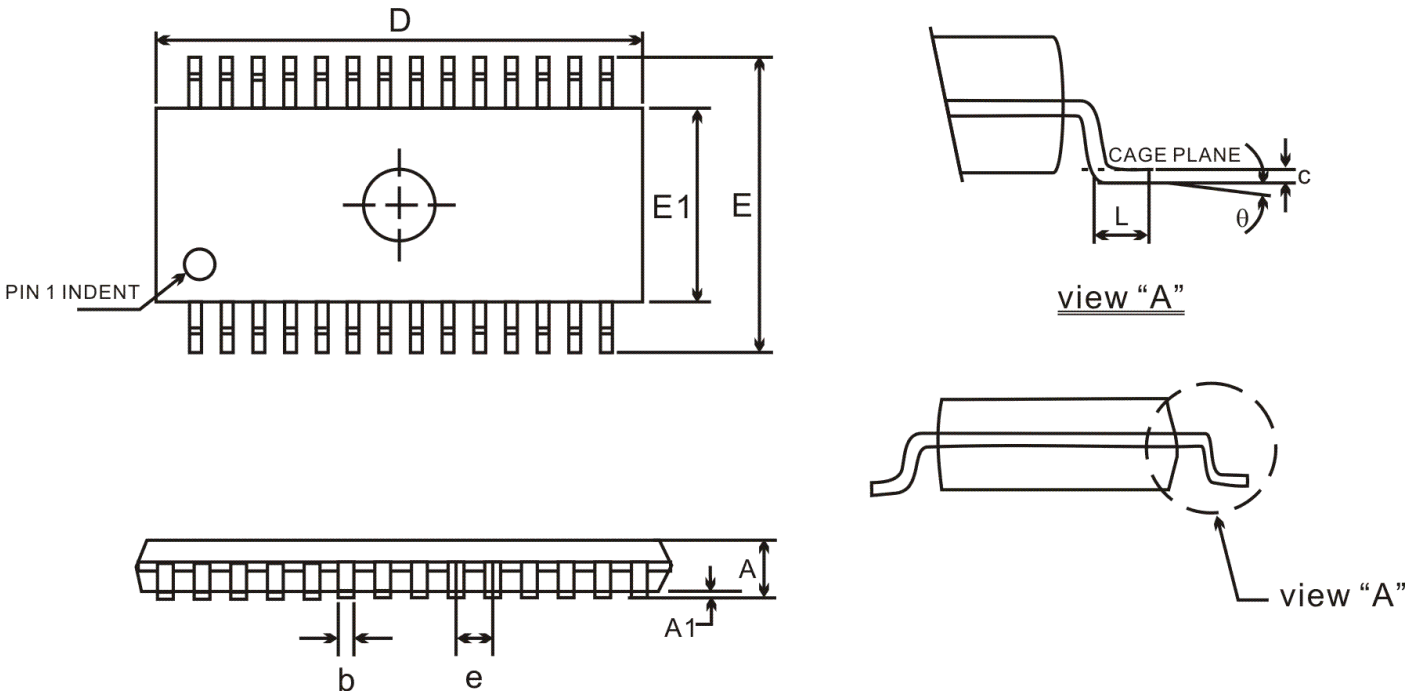
24-PIN, SOP, 300MIL



Symbol	Dimensions(mm)		
	Min.	Typ.	Max.
A	-	-	2.65
A1	0.10	-	0.30
b	0.31	-	0.51
c	0.20	-	0.33
e	1.27 BSC.		
D	15.40 BSC.		
E	10.30 BSC.		
E1	7.50 BSC.		
L	0.40	-	1.27
θ	0°	-	8°

Notes:
1. All controlling dimensions are in millimeter.
2. Refer to JEDEC MS-013 AD.

28-PIN, SOP 300MIL



Symbol	Dimensions(mm)		
	Min.	Nom.	Max.
A	-	-	2.65
A1	0.10	-	0.30
b	0.31	-	0.51
c	0.20	-	0.33
e	1.27BSC		
D	17.90BSC		
E	10.30BSC		
E1	7.50BSC		
L	0.38	-	1.27
θ	0°	-	8°

Notes:
1. Controlling dimension is Millimeter.
2. All dimensions refer to JEDEC standard MS-013 AE.

IMPORTANT NOTICE

Princeton Technology Corporation (PTC) reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products and to discontinue any product without notice at any time.
PTC cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a PTC product. No circuit patent licenses are implied.

Princeton Technology Corp.
2F, 233-1, Baociao Road,
Sindian Dist., New Taipei City 23145, Taiwan
Tel: 886-2-66296288
Fax: 886-2-29174598
http://www.princeton.com.tw

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Display Drivers & Controllers ***category:***

Click to view products by Princeton ***manufacturer:***

Other Similar products are found below :

ICB2FL01G LC74761M-9006-E MP3360DG-LF-P HV5812PJ-G-M904 TW8813-LB2-GR TW8819AT-NA2-GR TW8811-PC2-GR MAX1839EEP+ TW9907-TA1-GR S1D13503F00A200 MAX7370ETG+T LX27901IDW STVM100DC6F DS3994Z+T&R S1D13515F00A100 LX1686EIPW AM26C32IDR MAX7370ETG+ LX1688IPW MAX1739EEP+ MAX17126BETM+ MAX14515AEWA+T DS3992Z-18P BTM7710GXUMA1 DS3881E+C S1D13742F01A200 LX1688CPW MAX17126AETM+ MAX8729EEI+ MAX7370ETG TIOS1013DMWR TLD5097EL HV857LK7-G TLD5097ELXUMA1 AAT2823IBK-1-T1 DLPA1000YFFT ICB2FL01GXUMA2 DLP2000FQC SC401U IR2117PBF PAD1000YFFR S1D13746F01A600 S1D13748B00B100 FIN324CMLX STVM100DS6F HV850MG-G AD8138ARZ-R7 AD8387JSVZ ADDI9023BBCZ ADM3202ARUZ-REEL7