DESCRIPTION

The PT5606 is a high speed high voltage (600V) driver to control power devices like MOS-transistors or IGBTs in half bridge systems with dependent high and low side referenced output channels. The logic input is compatible with standard CMOS or LSTTL output, down to 3.3V logic. The device includes an under-voltage detection unit with hysteresis characteristic and prevents power devices against large amount of conduction loss, when voltage margin of gate is not high enough. The output drivers feature a high pulse current buffer stage designed for minimum driver cross-conduction. The floating channel can be used to drive an N-channel power MOSFET or IGBT, in the high side configuration which operates up to 600 volts.

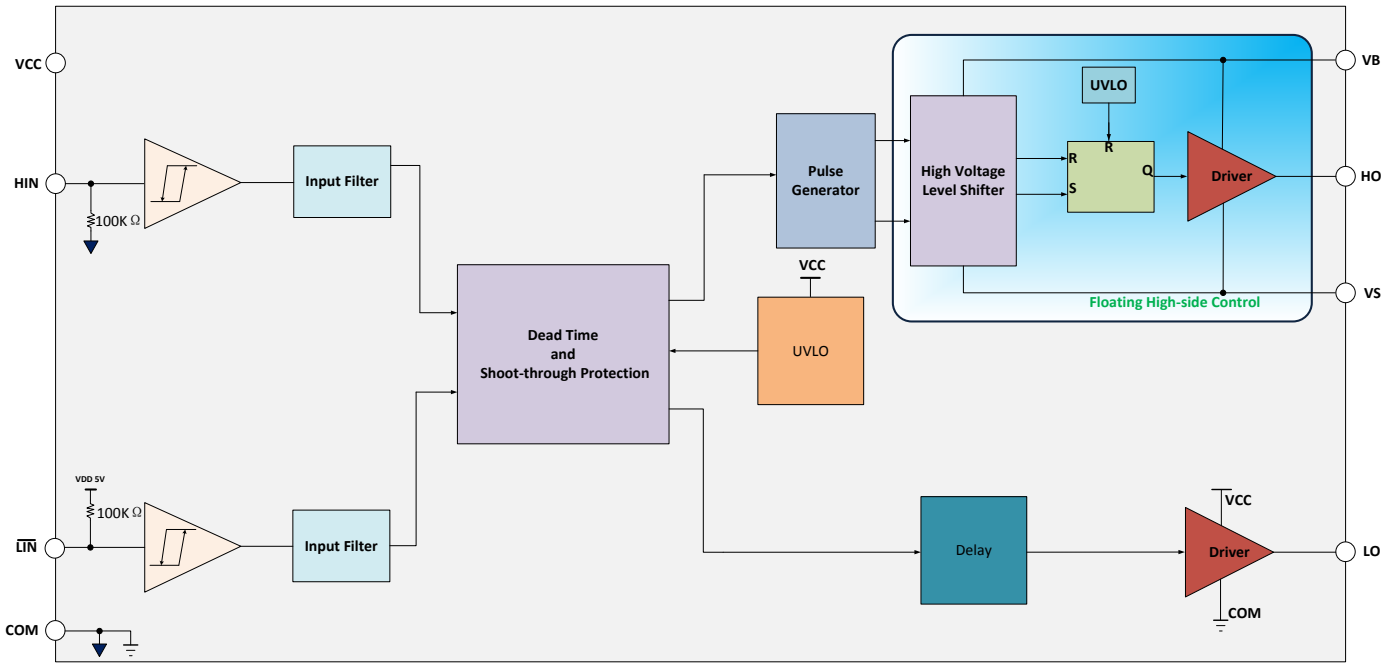
APPLICATIONS

- Appliance motor drives—air conditioners, washing machines, refrigerator, dish washer, Fans
- General purpose inverters
- Electric bike, Electric tools
- Lighting, switching power supply

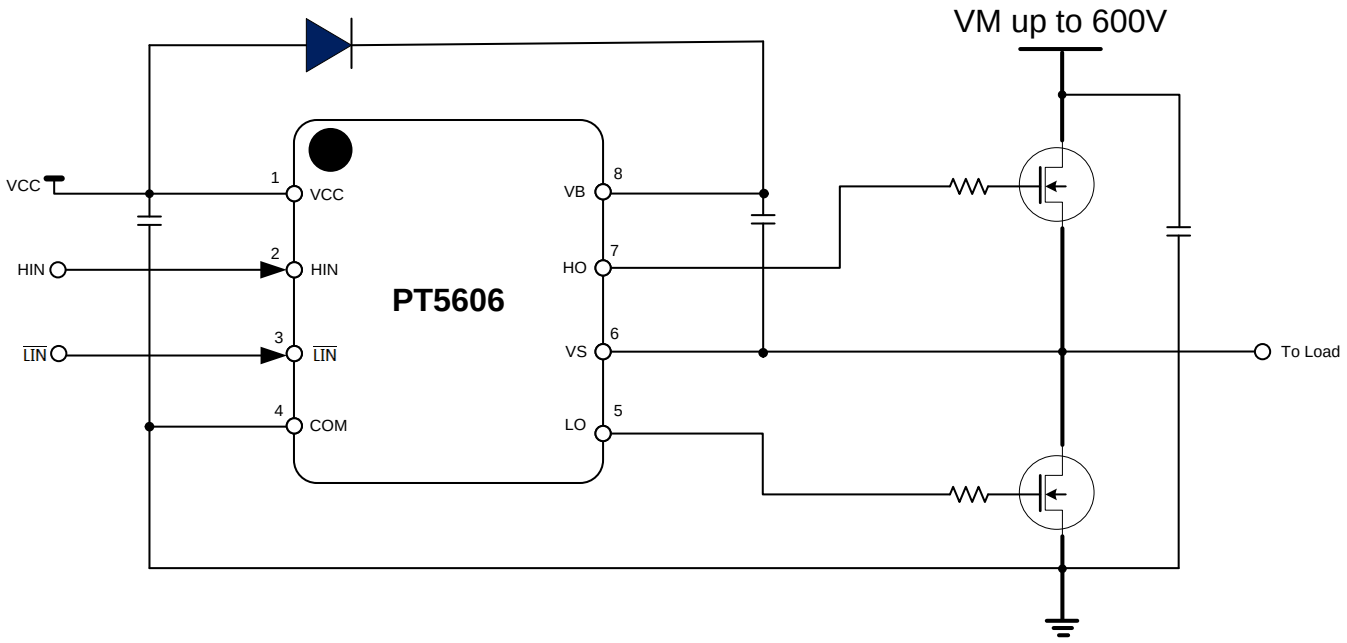
FEATURES

- Drives two IGBT/MOSFET power devices
- high side channel fully operate up to +600V
- Gate drive supplies from 10V to 20 V per channel
- Under-voltage lockout
- Advanced input filter
- Built-in dead-time protection: 0.5us
- IO+/-: 290/620mA, large sourcing current to bypass miller effect
- Shoot-through (cross-conduction) protection
- 3.3 V/5V/15V input logic compatible
- Matched propagation delays for all channels
- Matched dead time
- High side output in phase with HIN input
- Low side output out of phase with $\overline{\text{LIN}}$ input
- Tolerant to negative transient voltage, immunity of dv/dt up to 50V/ns
- Low di/dt gate drive for better noised immunity
- -40˚C to 125˚C operating range
- SOP8L Package available
- Lead-free

BLOCK DIAGRAM



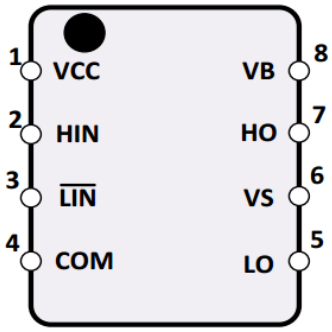
TYPICAL APPLICATION



ORDER INFORMATION

Valid Part Number	Package Type	Top Code
PT5606	8-Pin, SOP, 150 MIL	PT5606-S

PIN CONFIGURATION



PT5606-S

Pin Configuration of PT5606

PIN DESCRIPTION

Pin Name	Description	Pin No.
VCC	Low-side supply voltage	1
HIN	Logic input for high-side gate driver output(HO), in phase	2
$\overline{\text{LIN}}$	Logic input for low-side gate driver output(LO), out of phase	3
COM	Low-side gate drive return	4
LO	Low-side driver output	5
VS	High voltage floating supply return	6
HO	High-side driver output	7
VB	High-side gate drive floating supply	8

FUNCTION DESCRIPTION

LOW SIDE POWER SUPPLY

VCC is the low side supply and it provides power both to input logic and to low side output power stage. 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+} =8.6 is present, shown as Figure 1. The IC shuts down the gate drivers outputs, when the VCC supply voltage is below V_{CCUV-} =8.1 V, shown as Figure 1. This prevents the external power devices from extremely low gate voltage levels during on-state and therefore from excessive power dissipation.

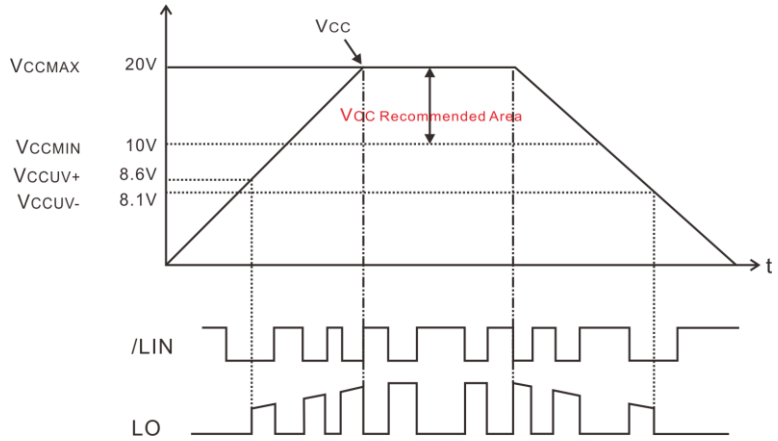


Figure.1: VCC supply UVLO operating area

HIGH SIDE POWER SUPPLY

VB to VS is the high side supply voltage. The totally high side circuitry can float with respect to COM 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 capacitor tied between PIN VB and PIN VS.
The device operating area as a function of the supply voltage is given in Figure2.

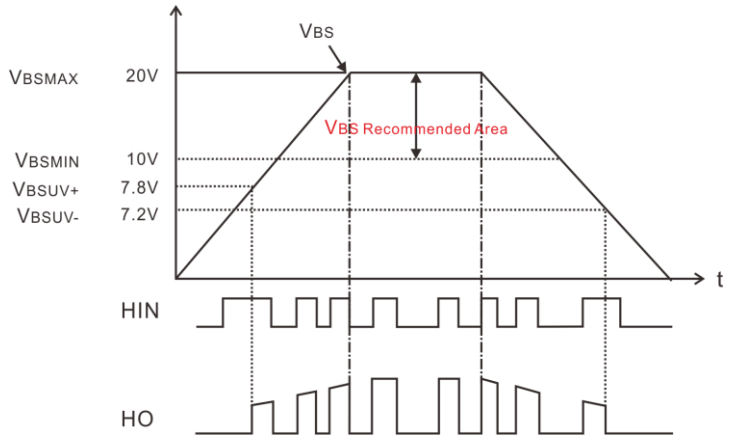


Figure.2: VBS supply UVLO operating area

LOW SIDE AND HIGH CONTROL INPUT LOGIC

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.

DEAD TIME

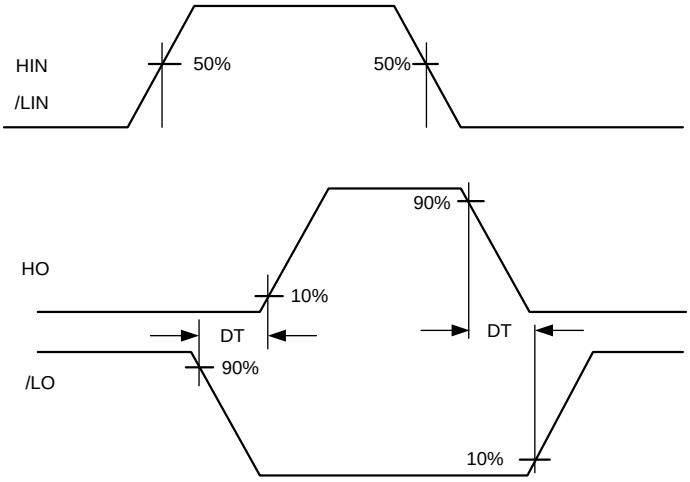


Figure.3: Dead Time

INPUT/OUTPUT TIMING DIAGRAM

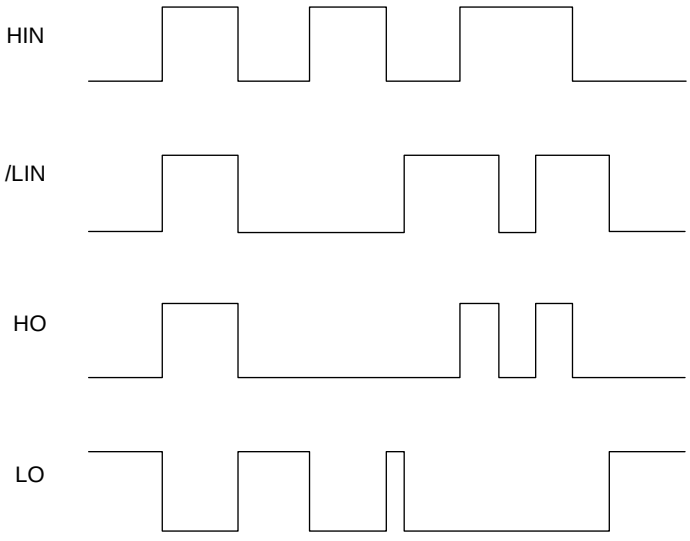


Figure.4: Timing diagram

SWITCHING TIME WAVEFORM

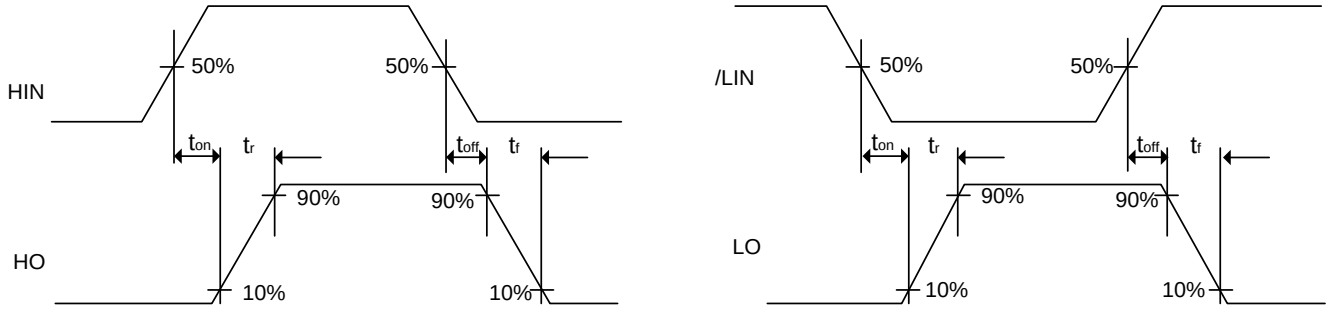


Figure.5: switching time waveform

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 COM unless otherwise stated in the table.

Parameter	Symbol	Min.	Max.	Units
High-side floating supply voltage	V_B	-0.3	625	V
High-side offset voltage	V_S	V_B -25	V_B +0.3	
High-side gate driver output voltage	V_{HO}	V_S -0.3	V_S +0.3	
Low-side gate driver output voltage	V_{LO}	COM-0.3	V_{CC}+0.3	
Logic input voltage(HIN, $\overline{LIN}$)	V_{HIN} $V_{\overline{LIN}}$	-0.3	25	
Low-side supply voltage	V_{CC}	-0.3	25	
Allowable offset voltage slew rate	DV/DT	-	50	V/ns
Package power dissipation @ $T_A \leq +25℃$	PD	-	0.625	W
Thermal resistance, junction to ambient	Rth_{JA}		200	°C/W
Junction temperature	T_J	-50	+150	°C
Storage temperature	T_S	-50	+150	
Lead temperature (soldering, 10 seconds)	T_L	-	300	

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min.	Typ.	Max.	Units
Low-side supply voltage	V_{CC}	10	-	20	V
High-side Floating Supply Offset Voltage(Note1)	V_S	-6	-	600	
High-side Floating Supply Voltage	V_B	V_S+10	-	V_S+20	
High-side gate driver output voltage	V_{HO}	V_S	-	V_B	
Low-side gate driver output voltage	V_{LO}	COM	-	V_{CC}	
Logic input voltage	V_{HIN} $V_{\overline{LIN}}$	0	-	5	
IC operating junction temperature	T_J	-40	-	+125	°C

Note:

1) For normal logic operation, it is recommended to keep the VS above -6V referenced to COM.

STATIC ELECTRICAL CHARACTERISTICS

(V_{CC}-COM)=(V_B-V_S)=15V. T_{AMB}=25℃ unless otherwise specified, The V_{IN}, V_{TH} and I_{IN} parameters are referenced to COM. The V_O and I_O parameters are referenced to COM and are applicable to the respective output leads: HO or LO.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Low Side Power Supply Characteristics						
VCC quiescent current	I_{QVCC}	V_{HIN} =0,$V_{\overline{LIN}}$ =5V	-	180	250	μA
VCC supply under-voltage positive going threshold	V_{CCUV+}		7.7	8.6	9.5	V
VCC supply under-voltage negative going threshold	V_{CCUV-}		7.2	8.1	9	
V_{CC} supply under-voltage lockout hysteresis	V_{CCHYS}		-	0.5	-	
High Side Floating Power Supply Characteristics						
High side VBS supply under-voltage positive going threshold	V_{BSUV+}		6.6	7.8	9	V
High side VBS supply under-voltage negative going threshold	V_{BSUV-}		6	7.2	8.4	
High side VBS supply under-voltage lockout hysteresis	$V_{BSUVHYS}$		-	0.6	-	
High side VBS quiescent current	I_{QBS}	V_{BS}=15V	-	50	85	μA
Offset supply leakage current	I_{LK}	V_B=V_S=600V V_{CC}=0V	-	-	10	
Gate Driver Output Section						
Output High Short-Circuit Pulse Current	I_{O+}	V_{HO}=V_S=0, V_{HO}=V_B=15V, PW<10us	-	290	-	mA
Output Low Short-Circuit Pulse Current	I_{O-}	V_{LO}=COM=0, V_{LO}=V_{CC}=15V, PW<10us	-	620	-	
High level output voltage drop, V_{CC}-V_{LO},V_{BS}-V_{HO}	ΔV_{OH}	I_{O+}= 20 mA	-	0.4	1	V
Low level output voltage drop	ΔV_{OL}	I_{O-}= 20 mA	-	0.15	0.3	V
Allowable Negative V_S Pin Voltage for COM	V_{SN}	Fixed V_{BS}=15V	-6	-	-	V
Logic Input Section						
Logic"1" Input voltage HIN and $\overline{LIN}$	V_{IH}		2.5	-	-	V
Logic"0" Input voltage HIN and $\overline{LIN}$	V_{IL}		-	-	0.8	
Input positive going threshold	$V_{IN,TH+}$		-	1.9	-	
Input negative going threshold	$V_{IN,TH-}$		-	1.4	-	
Logic "1" Input bias current	I_{HIN+}	V_{IN}=5V	-	50	90	μA
Logic "0" Input bias current	I_{HIN-}	V_{IN}=0V	-	0	1	
Logic "1" Input bias current	$I_{\overline{LIN}+}$	V_{IN}=5V	-	0	1	
Logic "0" Input bias current	$I_{\overline{LIN}-}$	V_{IN}=0V	-	50	90	

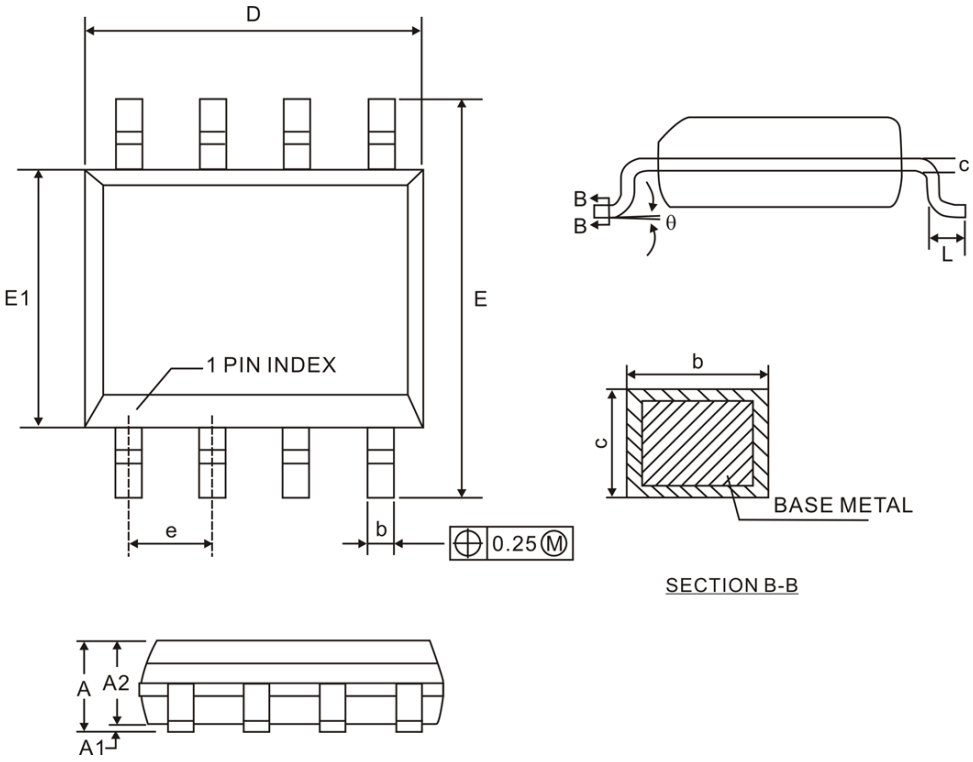
DYNAMIC ELECTRICAL CHARACTERISTICS

（V_{CC}-COM）=(V_B-V_S)=15V ,V_S=COM, and C_{HO}=C_{LO}=1nF unless otherwise specified, T_{AMB}=25℃.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
VCC operating Vcc supply current	I_{VCCOP}	$f_{\overline{LIN}}$=20K, f_{HIN} =20K,	-	1	1.5	mA
Turn-On propagation delay	t_{ON}		300	500	700	ns
Turn-Off propagation delay	t_{OFF}		300	500	700	
Turn-On rise time	t_R		-	70	-	
Turn-Off fall time	t_F		-	32	-	
Input filter	t_{flt}	V_{IN}=0 or 5V,	100	250	400	
Dead Time	DT	HIN and $\overline{LIN}$ inputs without external dead time	250	500	750	
Delay Matching(t_{ON}, t_{OFF})	MT	HIN and $\overline{LIN}$ inputs with external dead time >2μs	-	-	50	
Output Pulse-Width Matching	PM	PW_{IN}=10μs, PM=PW_{OUT}-PW_{IN}	-	-	50	

PACKAGE INFORMATION

8 PINS, SOP, 150MIL



Symbol	Dimension		
	Min.	Nom.	Max.
A	1.35	1.60	1.77
A1	0.08	0.15	0.28
A2	1.20	1.40	1.65
b	0.33	-	0.51
c	0.17	-	0.26
e	1.27 BSC		
D	4.70	4.90	5.10
E	5.80	6.00	6.20
E1	3.70	3.90	4.10
L	0.38	0.60	1.27
θ	0°	-	8°

Notes:

1. Refer to JEDEC MS-012 AA
2. Unit: mm