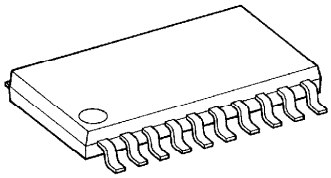
TENTATIVE

TOSHIBA INTELLIGENT POWER DEVICE SILICON MONOLITHIC POWER INTEGRATED CIRCUIT

TPD7200F

MOS GATE DRIVER FOR HALF BRIDGE CIRCUITS

TPD7200F is a MOS gate driver for half bridge circuit, used the level shift system, manufactured by the high voltage tolerant SOI process. A boots trap-system power supply is used for the high-side driver.



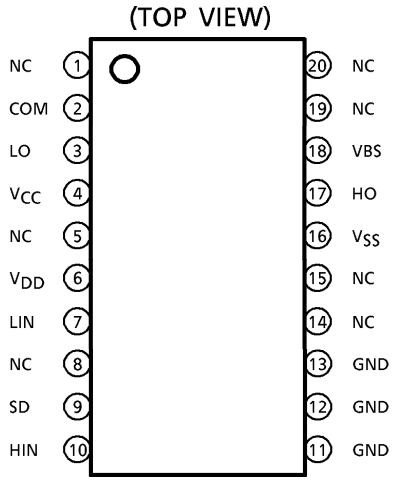
SSOP20-P-225-1.00

Weight : 0.17 g (Typ.)

FEATURES

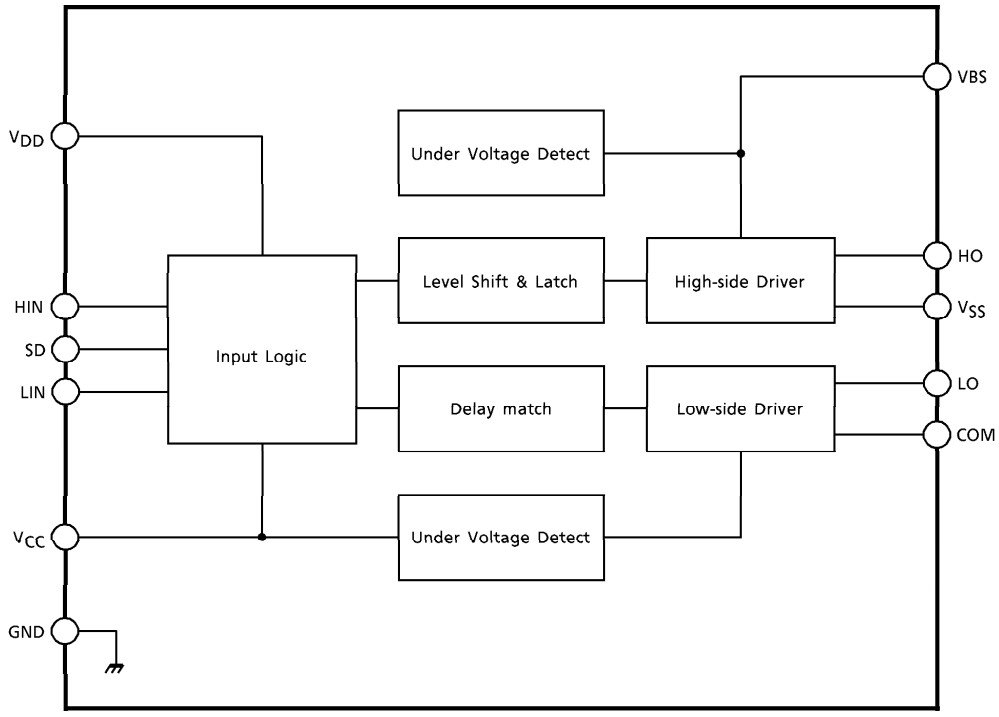
- MOS gate driver for half-bridge circuit.
- High voltage up to 600 V.
- Provides a large drive capacity : Source current of up to 0.25 A and sink current of up to 0.5 A
- Uses a bootstrap-system power supply for the high-side driver.
- Built-in a power supply under-voltage lockout with hysteresis.
- Comes in a 20-pin SSOP source mount package.

PIN ASSIGNMENT



(Note) : That because of its MOS structure, this product is sensitive to static electricity.

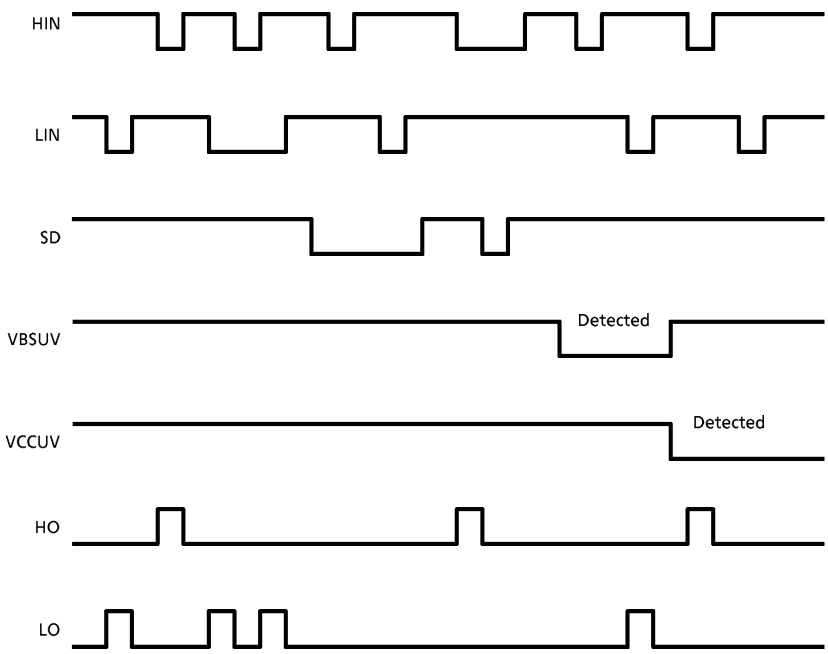
BLOCK DIAGRAM



PIN DESCRIPTION

PIN No.	SYMBOL	PIN DESCRIPTION
1	NC	This pin is unused (not connected to the chip).
2	COM	Low-side driver circuit reference pin. Connect the emitter (source) of IGBT (MOSFET) to this pin.
3	LO	Low-side driver output pin. Connect the gate to this pin.
4	V_{CC}	Low-side driver power supply pin.
5	NC	This pin is unused (not connected to the chip).
6	V_{DD}	Power supply pin necessary to determine the high and low voltage levels of the logic circuit.
7	LIN	Low-side driver input pin. This input is turned on when pulled low.
8	NC	This pin is unused (not connected to the chip).
9	SD	Shutdown pin. Output is turned off when this pin is low.
10	HIN	High-side driver input pin. This input is turned on when pulled low.
11	GND	Ground pin. All GND pins must be grounded.
12	GND	Ground pin. All GND pins must be grounded.
13	GND	Ground pin. All GND pins must be grounded.
14	NC	This pin is unused (not connected to the chip).
15	NC	This pin is unused (not connected to the chip).
16	V_{SS}	High-side driver circuit reference pin. Connect the intermediate arm point of IGBT (MOSFET) to this pin.
17	HO	High-side driver output pin. Connect the gate to this pin.
18	VBS	High-side driver power supply pin. Connect the positive pole of the bootstrap capacitor to this pin.
19	NC	This pin is unused (not connected to the chip).
20	NC	This pin is unused (not connected to the chip).

TIMING CHART



TRUTH TABLE

INPUT			UNDER VOLTAGE		OUTPUT	
HIN	LIN	SD	Upper Arm	Lower Arm	Upper Arm	Lower Arm
H	H	H	Normal	Normal	L	L
H	L	H	Normal	Normal	L	H
L	H	H	Normal	Normal	H	L
L	L	H	Normal	Normal	L	L
H	H	L	Normal	Normal	L	L
H	L	L	Normal	Normal	L	L
L	H	L	Normal	Normal	L	L
L	L	L	Normal	Normal	L	L
L	H	H	Under Voltage	Normal	L	L
H	L	H	Normal	Under Voltage	L	L
L	L	H	Under Voltage	Under Voltage	L	L
H	L	H	Under Voltage	Normal	L	H
L	H	H	Normal	Under Voltage	H	L

MAXIMUM RATING (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
High-side Floating Power Supply Voltage	VBS	$-0.5 \sim V_{SS} + 20$	V
High-side Floating Power Supply Offset Voltage	V_{SS}	$-5 \sim 600$	V
High-side Floating Offset Power Supply dv / dt Tolerance	dVS / dt	20	kV / μs
High-side Output Voltage	VHO	$V_{SS} - 0.5 \sim$ VBS + 0.5	V
Low-side Power Supply Voltage	V_{CC}	$-0.5 \sim 20$	V
Low-side Output Voltage	VLO	$-0.5 \sim V_{CC} + 0.5$	V
Logic Circuit Power Supply Voltage	V_{DD}	$-0.5 \sim 20$	V
Logic Input Voltage	VIN	$-0.5 \sim V_{DD} + 0.5$	V
Power Dissipation	P_D	0.4	W
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	$-55 \sim 150$	°C
Operating Junction Temperature	T_{jopr}	$-20 \sim 125$	°C

ELECTRICAL CHARACTERISTICS (STATIC) (VBS = V_{CC} = V_{DD} = 15 V, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Voltage	VIH	INPUT = "H", V_{DD} = 5 V	3.5	—	—	V
		INPUT = "H", V_{DD} = 10 V	7.0	—	—	
		INPUT = "H", V_{DD} = 15 V	10.5	—	—	
		INPUT = "H", V_{DD} = 20 V	14.0	—	—	
	VIL	INPUT = "L", V_{DD} = 5 V	—	—	1.5	
		INPUT = "L", V_{DD} = 10 V	—	—	3.0	
		INPUT = "L", V_{DD} = 15 V	—	—	4.5	
		INPUT = "L", V_{DD} = 20 V	—	—	6.0	
Input Current	IIH	VIN = 15 V	—	—	10	μA
	IIL	VIN = 0 V	—	50	200	
Current Dissipation	IBS	INPUT = "H"	—	800	1000	μA
	ICC	INPUT = "H"	—	1200	1500	
	IDD	INPUT = "H"	—	300	500	
Offset Power Supply Leakage Current	ILK	VB = V_{SS} = 600 V	—	—	50	μA
High Level Output Voltage	VOH	VIN = 0 V, IO = 0 A	—	—	0.1	V
Low Level Output Voltage	VOL	VIN = V_{DD}, IO = 0 A	—	—	0.1	V
Source ON-Resistance	RSOR	VIN = 0 V, I_{SOR} = −125 mA	—	12	20	Ω

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Sink ON-Resistance	RSIN	VIN = V_{DD}, I_{SIN} = 250 mA	—	10	15	Ω
Power-On Protective Voltage	VO	IO = 30 mA, entire range of power supply voltage	—	—	2.8	V
VBS Supply Undervoltage Positive Going Threshold	VBS UV +		7.7	8.7	9.7	V
VBS Supply Undervoltage Negative Going Threshold	VBS UV –		7.3	8.3	9.3	V
V_{CC} Supply Undervoltage Positive Going Threshold	V_{CC} UV +		7.6	8.6	9.6	V
V_{CC} Supply Undervoltage Negative Going Threshold	V_{CC} UV –		7.2	8.2	9.2	V
Output HIGH Load Shorting. Pulse Current	IO +	VOUT = 0 V, VIN = 0 V PW ≦ 10 μs	0.25	—	—	A
Output LOW Load Shorting. Pulse Current	IO –	VOUT = 15 V, VIN = 15 V PW ≦ 10 μs	0.45	—	—	A

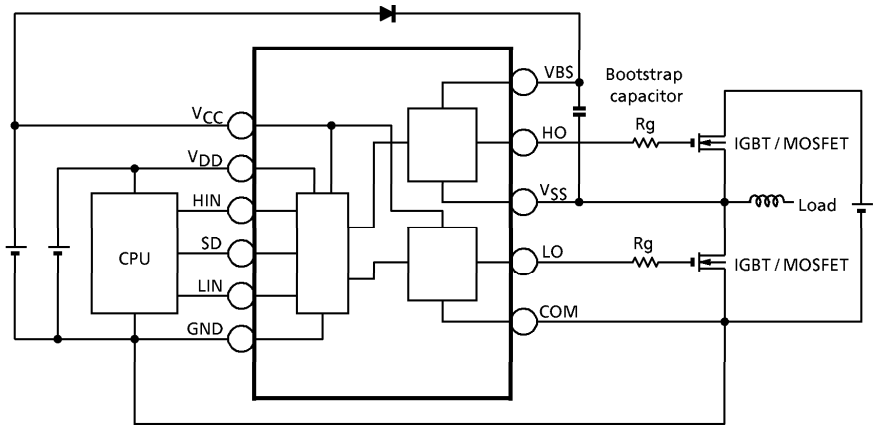
ELECTRICAL CHARACTERISTICS (DYNAMIC) (VBS = V_{CC} = V_{DD} = 15 V)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Turn-On Delay Time	ton	V_{SS} = 0 V	—	2.5	3	μs
Turn-Off Delay Time	toff	V_{SS} = 300 V	—	2.5	3	μs
Shutdown Delay Time	tsd	V_{SS} = 300 V	—	2.5	3	μs
Turn-On Rise Time	tr	CL = 1000 pF	—	80	160	ns
Turn-Off Fall Time	tf	CL = 1000 pF	—	50	100	ns
Turn-On Response Time Difference	Mton	|Hton-Lton|	—	0	300	ns
Turn-Off Response Time Difference	Mtoff	|Htoff-Ltoff|	—	0	300	ns
Dead Time (HS On, LS Off)	DHton	(Hton-Ltoff)	1	2	2.5	μs
Dead Time (LS On, HS Off)	DLton	(Lton-Htoff)	1	2	2.5	μs

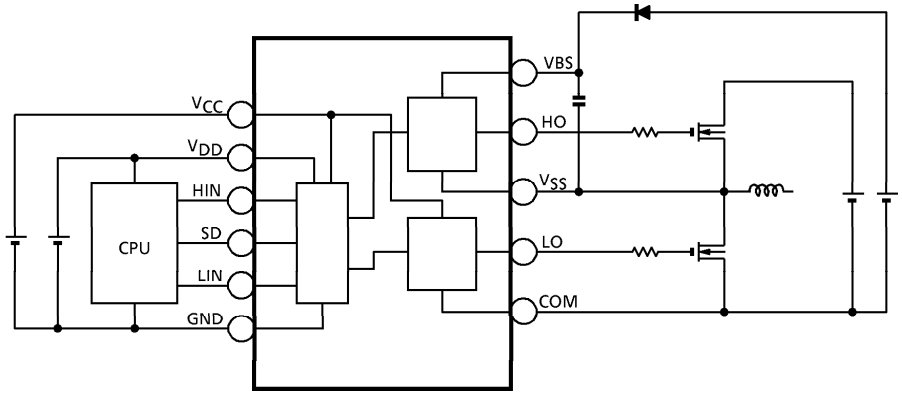
EXAMPLE OF APPLICATION CIRCUIT

Shown below is the basic connection diagram of the TPD7200F when driving a half-bridge. A three-phase bridge can be configured using three sets of this basic connection to drive a DC brushless motor.

(A) Example for cases where the high-voltage power supply for load and the low-voltage power supply for control IC are grounded to the same GND



(B) Example for cases where the high-voltage power supply for load and the low-voltage power supply for control IC are referenced to different voltages

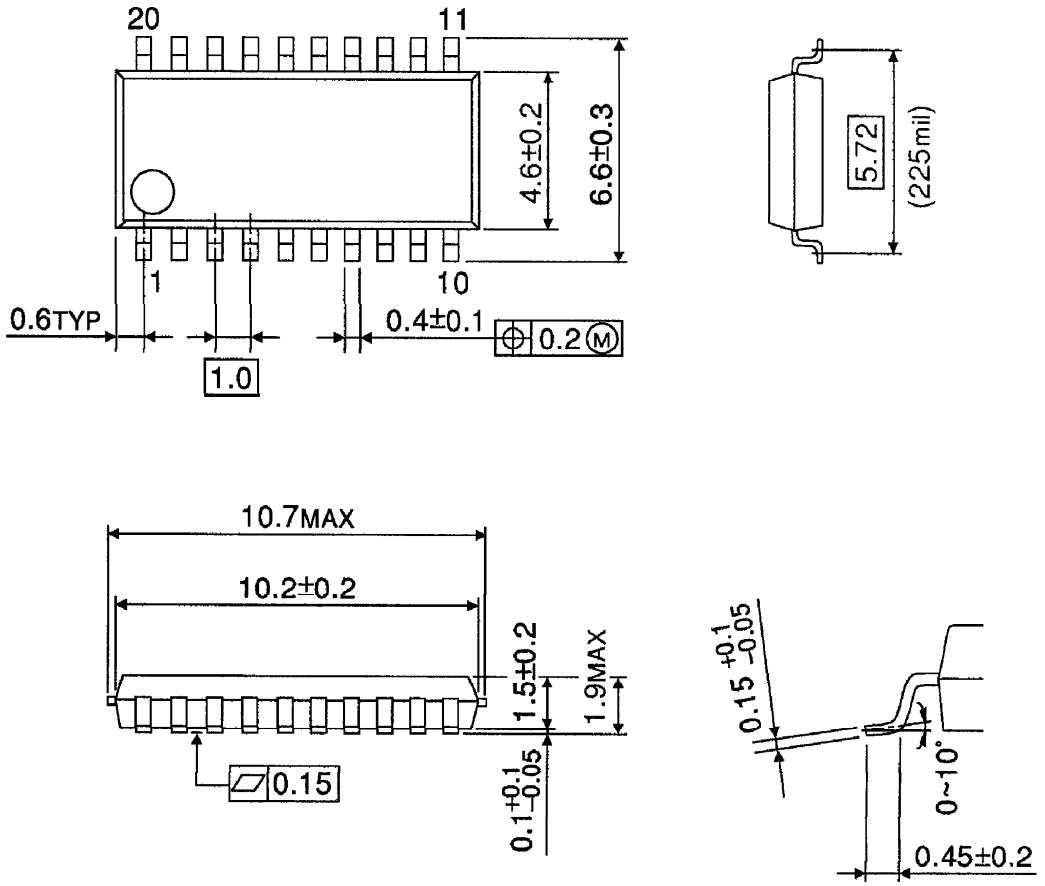


V_{CC} power supply voltage = VBS power supply voltage

OUTLINE DRAWING

SSOP20-P-225-1.00

Unit : mm



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