



TFB0527

Half-Bridge Gate Driver

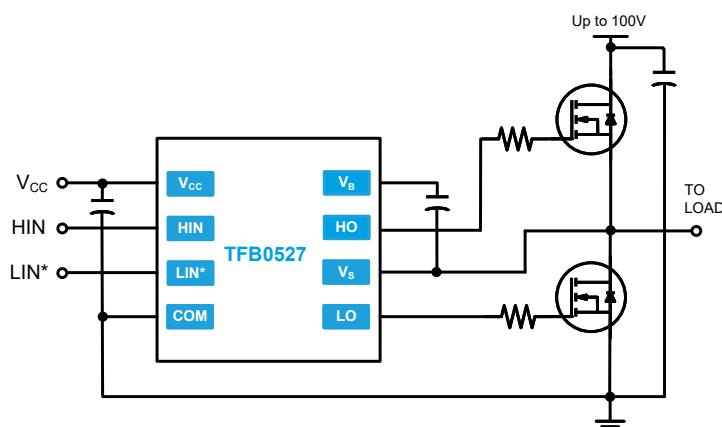
Features

- Floating high-side driver in bootstrap operation to 100V
- Drives two N-channel MOSFETs or IGBTs in a half bridge configuration
- Integrated bootstrap diode for compact design
- 290mA source/600mA sink output current capability
- Outputs tolerant to negative transients
- Internal dead time of 420ns to protect MOSFETs
- Wide low side gate driver supply voltage: 10V to 20V
- Logic input (HIN and LIN*) 3.3V capability
- Schmitt triggered logic inputs
- Undervoltage lockout for V_{CC} (logic and low side supply)
- Extended temperature range: -40°C to +125°C
- Space saving TDFN-10, 3x3mm package

Applications

- Stepper motor drives
- DC-DC Converters
- Battery powered tools
- BLDC motor drive

Typical Application



Description

The TFB0527 is a half-bridge gate driver with integrated bootstrap diode capable of driving N-channel MOSFETs and IGBTs in a half-bridge configuration. TF Semiconductor's advanced process enables the floating high-side driver to operate to 100V in a bootstrap configuration.

The TFB0527 logic inputs are compatible with standard TTL and CMOS levels (down to 3.3V) to interface easily with controlling devices. The driver outputs feature high pulse current buffers designed for minimum driver cross conduction. TFB0527 has a fixed internal deadtime of 420ns (typical).

To simplify design and decrease the BOM, the TFB0503 has an integrated bootstrap diode. Also the TFB0503 is offered in a space saving TDFN-10 package and operates over an extended -40 °C to +125 °C temperature range.



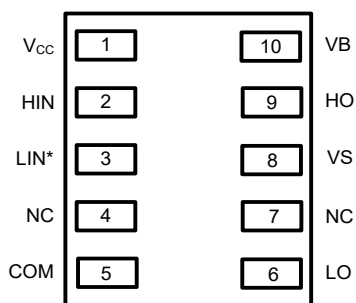
TDFN-10

Ordering Information

Year Year Week Week

PART NUMBER	PACKAGE	PACK / Qty	MARK
TFB0527-NHS	TDFN-10	Tube / 120	YYWW TFB0527
TFB0527-NHP	TDFN-10	T&R / 3,000	

Pin Diagram

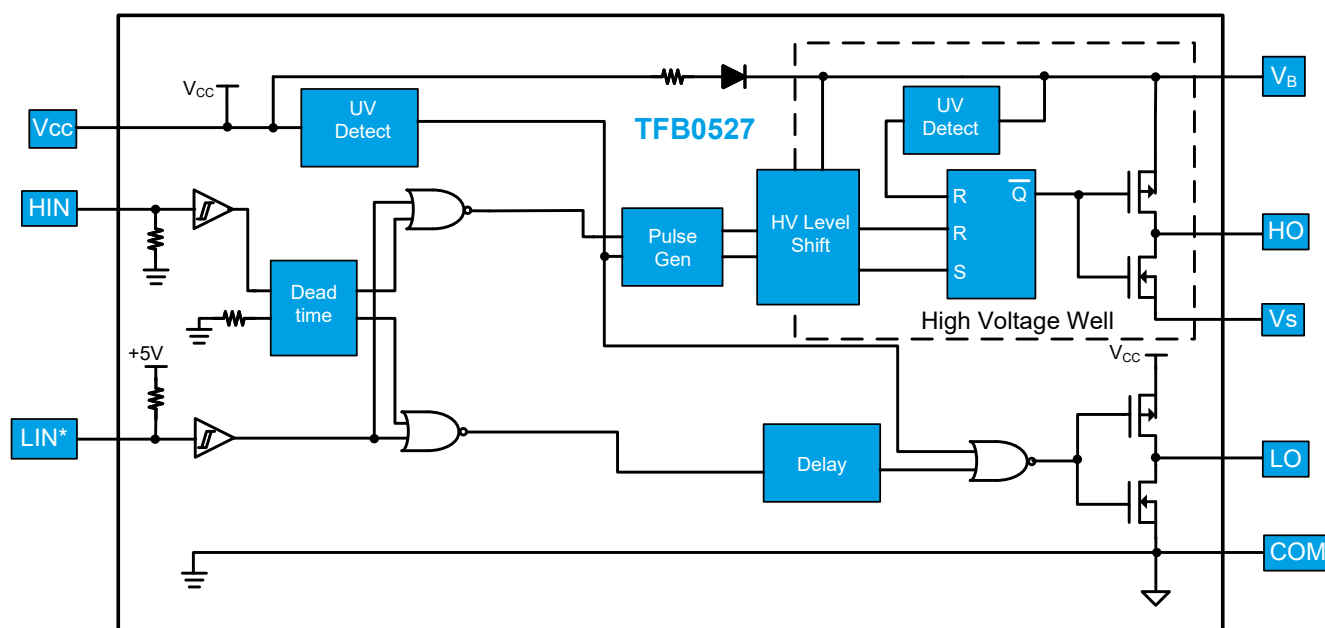


Pin Descriptions

Top View: TDFN-10

PIN NAME	PIN NUMBER	PIN DESCRIPTION
V _{CC}	1	Logic and low side supply
HIN	2	Logic input for high-side gate driver output in phase with HO
LIN*	3	Logic input for low-side gate driver output out of phase with LO
NC	5, 7	No connect
COM	5	Low-side and logic return
LO	6	Low-side gate drive output
V _S	8	High-side floating supply return
HO	9	High-side gate drive output
V _B	10	High-side floating supply

Functional Block Diagram





Half-Bridge Gate Driver

Absolute Maximum Ratings (NOTE1)

V_B - High side floating supply voltage.....-0.3V to +124V
 V_S - High side floating supply offset voltage... V_B -24V to V_B +0.3V
 V_{HO} -Highside floating output voltage..... V_S -0.3Vto V_B +0.3V
 dV_S/dt - Offset supply voltage transient.....50V/ns

V_{CC} - Low-side fixed supply voltage.....-0.3V to +24V
 V_{LO} - Low-side output voltage.....-0.3V to V_{CC} +0.3V
 V_{IN} - Logic input voltage (HIN and LIN*).....-0.3V to V_{CC} +0.3V

NOTE1 Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

P_D - Package power dissipation at $T_A \leq 25^\circ\text{C}$
 TDFN-10.....0.4W

TDFN-10 Thermal Resistance (NOTE2)

θ_{JA}64°C/W
 θ_{JC}42°C/W

T_J - Junction operating temperature.....+150 °C
 T_L - Lead Temperature (soldering, 10 seconds).....+300 °C
 T_{stg} - Storage temperature-55 to 150 °C

NOTE2 When mounted on a standard JEDEC 2-layer FR-4 board.

Recommended Operating Conditions

Symbol	Parameter	MIN	MAX	Unit
V_B	High side floating supply absolute voltage	$V_S + 10$	$V_S + 20$	V
V_S	High side floating supply offset voltage	NOTE3	100	V
V_{HO}	High side floating output voltage	V_S	V_B	V
V_{CC}	Low side fixed supply voltage	10	20	V
V_{LO}	Low side output voltage	0	V_{CC}	V
V_{IN}	Logic input voltage (HIN and LIN*)	0	5	V
T_A	Ambient temperature	-40	125	°C

NOTE3 Logic operational for V_S of -5V to +100V.



DC Electrical Characteristics (NOTE4)

$V_{BIAS} (V_{CC}, V_{BS}) = 15V, T_A = 25^\circ C$, unless otherwise specified.

Symbol	Parameter	Conditions	MIN	TYP	MAX	Unit
V_{IH}	Logic "1" (HIN) & Logic "0" (LIN*) input voltage	$V_{CC} = 10V$ to $20V$ NOTE5	2.5			V
V_{IL}	Logic "0" (HIN) & Logic "1" (LIN*) input voltage				0.8	
V_{OH}	High level output voltage, $V_{BIAS} - V_O$	$I_O = 2mA$		0.05	0.2	
V_{OL}	Low level output voltage, V_O	$I_O = 2mA$		0.02	0.1	
I_{LK}	Offset supply leakage current	$V_B = V_S = 100V$			50	μA
I_{BSQ}	Quiescent V_{BS} supply current	$V_{IN} = 0V$ or $5V$		7		
I_{CCQ}	Quiescent V_{CC} supply current	$V_{IN} = 0V$ or $5V$		350	500	
I_{IN+}	Logic "1" input bias current	$HIN = 5V, LIN^* = 0V$		3	10	
I_{IN-}	Logic "0" input bias current	$HIN = 0V, LIN^* = 5V$			5	
V_{CCUV+}	V_{CC} supply under-voltage positive going threshold		7.0	8.9	9.8	V
V_{CCUV-}	V_{CC} supply under-voltage negative going threshold		6.5	8.2	9.3	
V_{BSUV+}	V_{BS} supply under-voltage positive going threshold			3.8		V
V_{BSUV-}	V_{BS} supply under-voltage negative going threshold			3.1		V
I_{O+}	Output high short circuit pulsed current	$V_O = 0V, PW \leq 10 \mu s$	130	290		mA
I_{O-}	Output low short circuit pulsed current	$V_O = 15V, PW \leq 10 \mu s$	270	600		

NOTE4 The V_{IH} , V_{IL} , and I_{IN} parameters are applicable to the two logic input pins: HIN and LIN*. The V_O and I_O parameters are applicable to the respective output pins: HO and LO.

NOTE5 For optimal operation, it is recommended that the input pulse (to HIN and LIN*) should have a minimum amplitude of 2.5V with a minimum pulse width of 400ns.

**AC Electrical Characteristics**

$V_{BIAS} (V_{CC}, V_{BS}) = 15V$, $C_L = 1000pF$, and $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified.

Symbol	Parameter	Conditions	MIN	TYP	MAX	Unit
t_{on}	Turn-on propagation delay	$V_S = 0V$		100	200	ns
t_{off}	Turn-off propagation delay	$V_S = 100V$		100	200	
t_{DM}	Delay matching, HS & LS turn-on/turn-off				50	
t_r	Turn-on rise time	$V_S = 0V$		70	150	
t_f	Turn-off fall time			35	90	
t_{DT}	Deadtime: $t_{DT\ LO-HO}$ & $t_{DT\ HO-LO}$		300	420	650	



Timing Waveforms

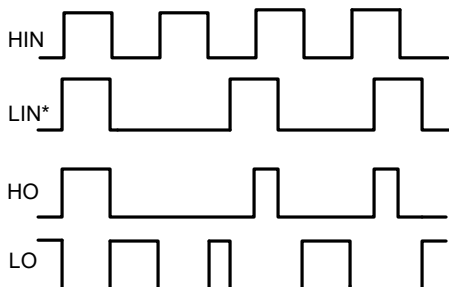


Figure 1. Input / Output Timing Diagram

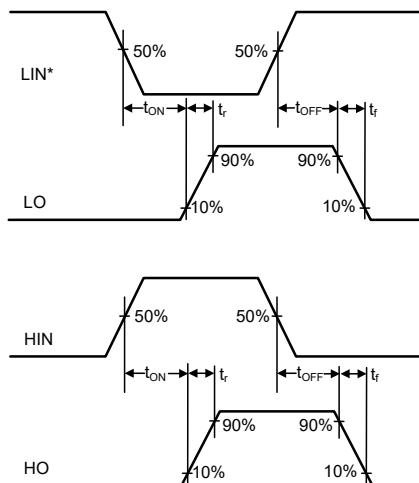


Figure 2. Switching Time Waveform Definitions

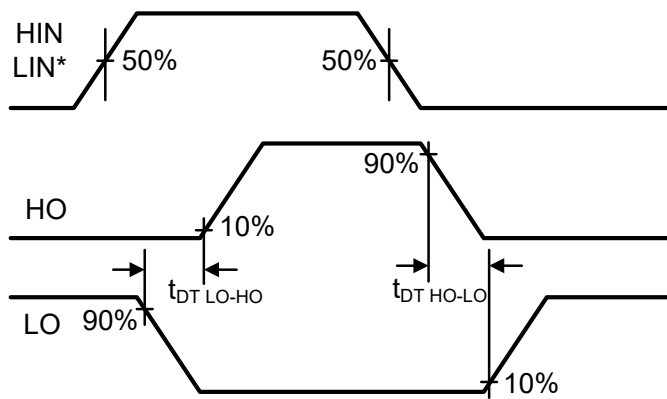


Figure 3. Deadtime Waveform Definitions



Application Information

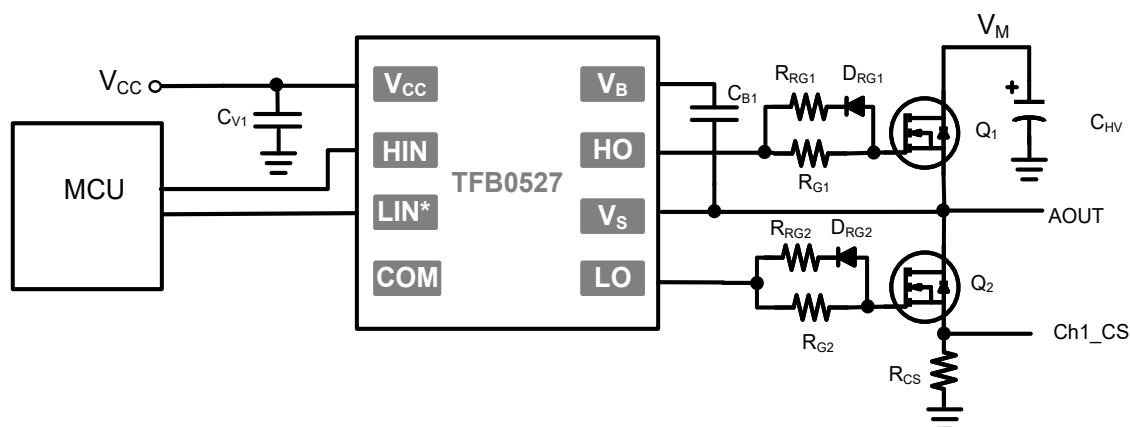
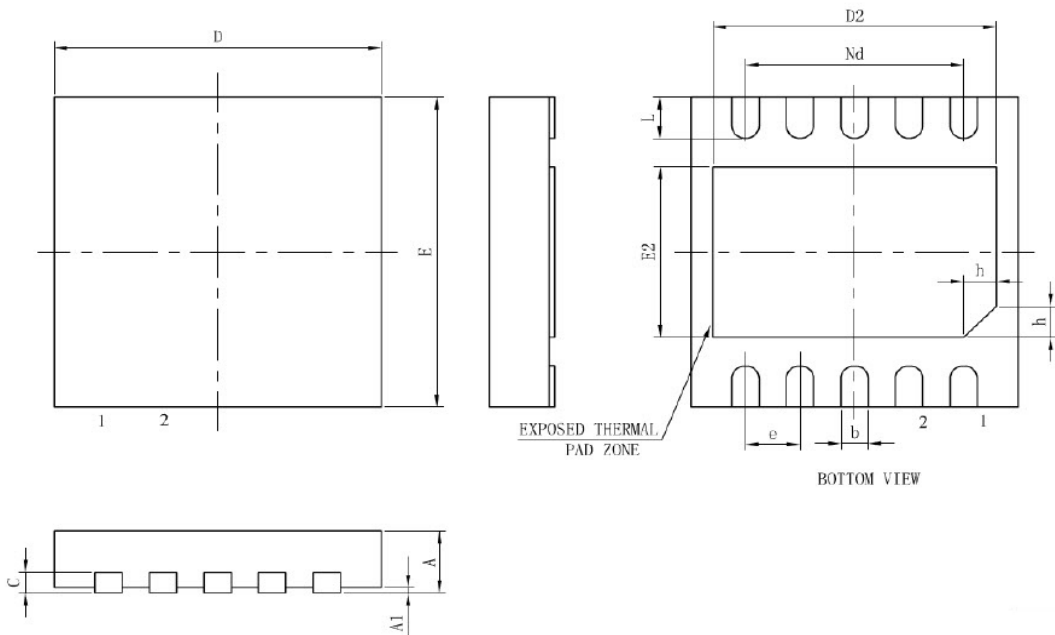


Figure 4. Single phase (of four) for Stepper motor driver application using the TFB0527

- RRG1 and RRG2 values are typically between 0Ω and 10Ω , exact value decided by MOSFET junction capacitance and drive current of gate driver; 10Ω is used in this example.
- It is **highly recommended** that the input pulse (to HIN and LIN*) should have an amplitude of 2.5V minimum (for VDD=15V) with a minimum pulse width of 400ns.
- RG1 and RG2 values are typically between 20Ω and 100Ω , exact value decided by MOSFET junction capacitance and drive current of gate driver; 50Ω is used in this example.
- CV1 and CB1 are decoupling capacitors for the low side/logic supply and high side gate driver supply respectively. Values are typically between $0.1\ \mu\text{F}$ to $2.2\ \mu\text{F}$ using a low ESR ceramic capacitor close to the device; $1.0\ \mu\text{F}$ is used in this example.



Package Dimensions (TDFN-10)



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	—	0.02	0.05
b	0.18	0.25	0.30
c	0.18	0.20	0.25
D	2.90	3.00	3.10
D2	2.40	2.50	2.60
e	0.50BSC		
Nd	2.00BSC		
E	2.90	3.00	3.10
E2	1.45	1.55	1.65
L	0.30	0.40	0.50
h	0.20	0.25	0.30



Revision History

Rev.	Change	Owner	Date
1.0	First release, AI datasheet	Keith Spaulding	10/19/2022

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