TF Semiconductor Solutions

Advance Info

TF2183(4)M

Half-Bridge Gate Driver

Features

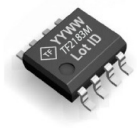
- **Floating high-side driver in bootstrap operation to 600V**
- **Drives two N-channel MOSFETs or IGBTs in a half bridge configuration**
- **1.9A source / 2.3A sink output current capability**
- **Outputs tolerant to negative transients**
- **Internal dead time of 400ns to protect MOSFETs**
- **Wide low side gate driver supply voltage: 10V to 20V**
- **Logic input (HIN and LIN*) 3.3V capability**
- **Schmitt triggered logic inputs with internal pull down**
- **Undervoltage lockout for high and low side drivers**
- **Extended temperature range: -40°C to +125°C**

Description

The TF2183(4)M is a high voltage, high speed gate driver capable of driving N-channel MOSFETs and IGBTs in a half bridge configuration. TF Semiconductor's high voltage process enables the TF2183(4)M's high side to switch to 600V in a bootstrap operation.

The TF2183(4)M 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. TF2183(4)M has a fixed internal deadtime of 400ns (typical).

The TF2183M is offered in an SOIC-8(N) package and the TF21834M is offered in an SOIC-14(N) package and operates over an extended -40 °C to +125 °C temperature range.



SOIC-8(N)

SOIC-14(N)

Applications

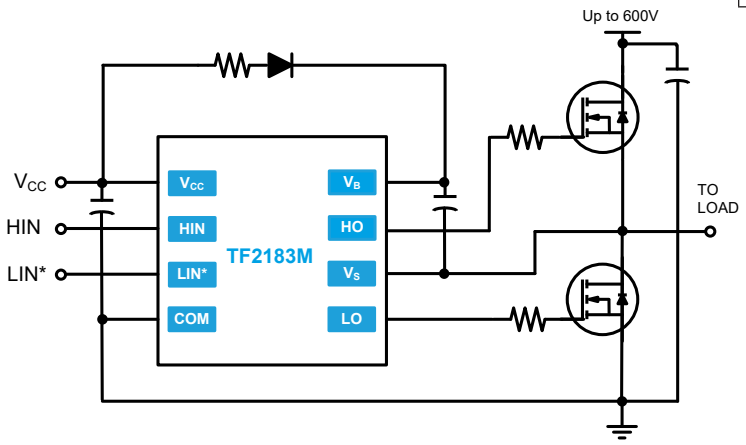
- DC-DC Converters
- AC-DC Inverters
- Motor Controls
- Class D Power Amplifiers

Ordering Information

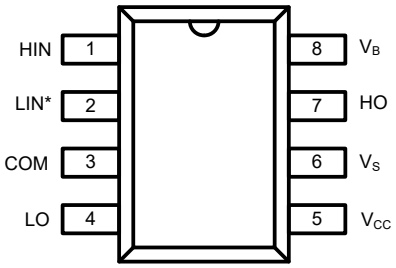
Year Year Week Week

PART NUMBER	PACKAGE	PACK / Qty	MARK
TF2183M-TAU	SOIC-8	Tube / 100	YYWW TF2183M Lot ID
TF2183M-TAH	SOIC-8	T&R / 2500	
TF21834M-TUU	SOIC-14	Tube / 100	YYWW TF21834M Lot ID
TF21834M-TUH	SOIC-14	T&R / 2500	

Typical Application

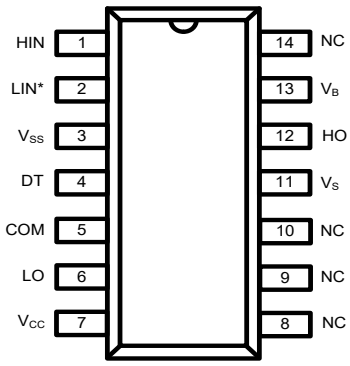


Pin Diagrams



Top View: SOIC-8

TF2183M



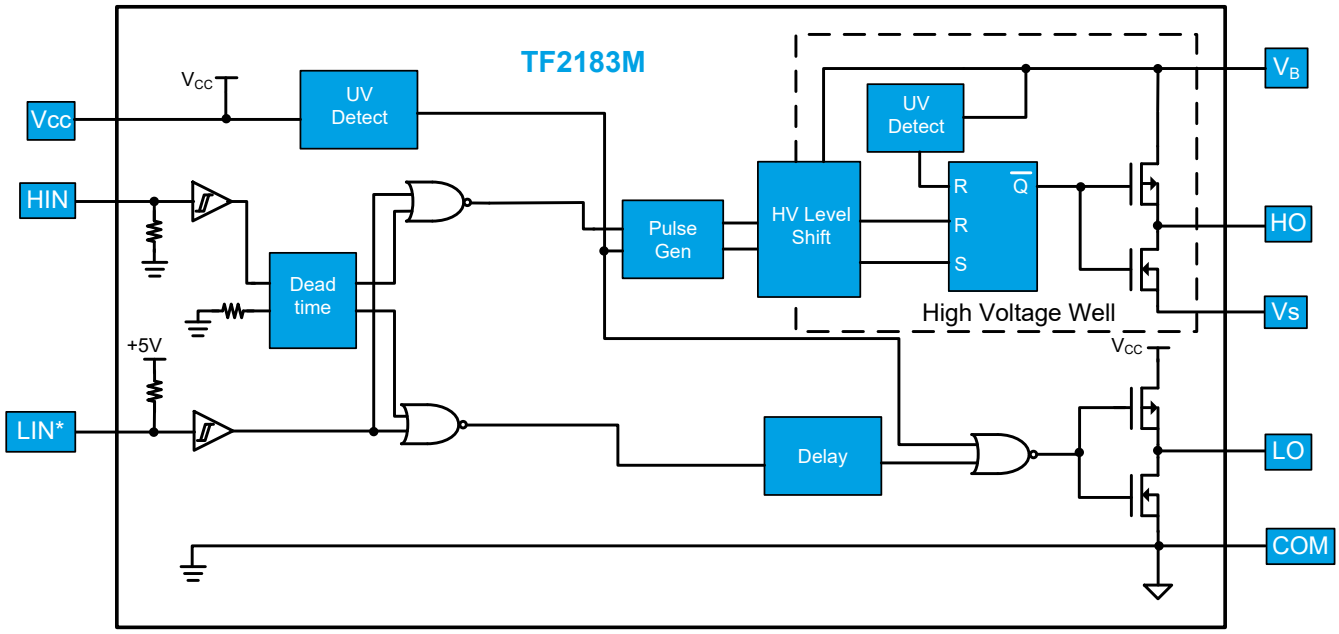
Top View: SOIC-14

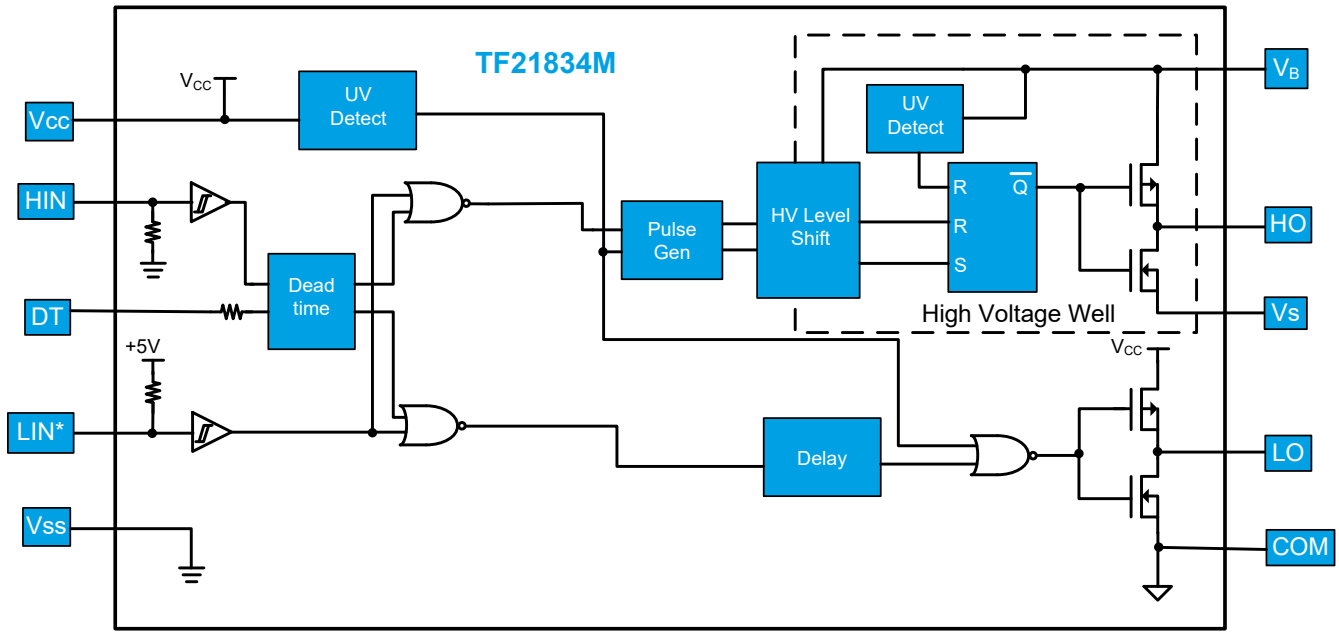
TF21834M

Pin Descriptions

PIN NAME	TF2183M Pin	TF21834M Pin	PIN DESCRIPTION
HIN	1	1	Logic input for high-side gate driver, in phase with HO.
LIN*	2	2	Logic input for low-side gate driver, out of phase with LO.
COM	3	5	Low-side and logic return (TF2183M).
LO	4	6	Low-side gate drive output.
V_{CC}	5	7	Low-side and logic fixed supply.
V_S	6	11	High-side floating supply return.
HO	7	12	High-side gate drive output.
V_B	8	13	High-side floating supply.
V_{SS}		3	Logic return.
DT		4	Programmable deadtime lead, set by external resistor to VSS.

Functional Block Diagrams





Absolute Maximum Ratings *(NOTE1)*

V_B - High side floating supply voltage.....-0.3V to +624V
V_S - High side floating supply offset voltage....V_B-24V to V_B+0.3V
V_{HO} - High side floating output voltage.....V_S-0.3V to V_B+0.3V
dV_S/dt - Offset supply voltage transient.....50 V/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 $T_A \leq 25$ °C
SOIC-8.....0.625W
SOIC-14.....1.0W

SOIC-8(N) Thermal Resistance ***(NOTE2)***
θ_{JA}.....200 °C/W
SOIC-14(N) Thermal Resistance ***(NOTE2)***
θ_{JA}.....120 °C/W

T_J - Junction operating temperature.....+150 °C
T_L - Lead Temperature (soldering, 10 seconds).....+300 °C
T_{stg} - Storage temerature .....-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***	600	
V_{HO}	High side floating output voltage	V_S	V_B	
V_{CC}	Low side fixed supply voltage	10	20	
V_{LO}	Low side output voltage	0	V_{CC}	
V_{IN}	Logic input voltage (HIN and LIN*)	0	5	
V_{DT}	Programmable deadtime pin voltage	V_{SS}	V_{CC}	
V_{SS}	Logic ground (referenced to COM)	-5	5	
T_A	Ambient temperature	-40	125	°C

NOTE3 *Logic operational for VS of -5V to +600V.*

DC Electrical Characteristics *(NOTE4)*

V_{BIAS} (V_{CC}, V_{BS}) = 15V, T_A = 25 °C , unless otherwise specified.

Symbol	Parameter	Conditions	MIN	TYP	MAX	Unit
V_{IH}	Logic "1" (HIN) and logic "0" (LIN*) input voltage	V_{CC} = 10V to 20V *NOTE5*	2.5			V
V_{IL}	Logic "0" (HIN) and logic "1" (LIN*) input voltage				0.8	
V_{OH}	High level output voltage, V_{BIAS} - V_O	I_O = 0A			1.2	
V_{OL}	Low level output voltage, V_O	I_O = 20mA			0.1	
I_{LK}	Offset supply leakage current	VB = VS = 600V			50	µA
I_{BSQ}	Quiescent V_{BS} supply current	V_{IN} = 0V or 5V	20	60	150	
I_{CCQ}	Quiescent V_{CC} supply current	V_{IN} = 0V or 5V	0.4	1.6	2.0	mA
I_{IN+}	Logic "1" input bias current	HIN = 5V, LIN* = 0V		25	60	µA
I_{IN-}	Logic "0" input bias current	HIN = 0V, LIN* = 5V			1.0	
V_{BSUV+}	V_{BS} supply under-voltage positive going threshold		8.0	8.9	9.8	V
V_{BSUV-}	V_{BS} supply under-voltage negative going threshold		7.4	8.2	9.0	
V_{CCUV+}	V_{CC} supply under-voltage positive going threshold		8.0	8.9	9.8	
V_{CCUV-}	V_{CC} supply under-voltage negative going threshold		7.4	8.2	9.0	
I_{O+}	Output high short circuit pulsed current	V_O = 0V, PW ≤ 10 µs	1.4	1.9		A
I_{O-}	Output low short circuit pulsed current	V_O = 15V, PW ≤ 10 µs	1.7	2.3		

NOTE4 *The V_{IN}, V_{TH}, and I_{IN} parameters are applicable to the two logic input pins: HIN and LIN*. The V_0 and I_0 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 an amplitude of 2.5V minimum with a pulse width of 800ns minimum.*

AC Electrical Characteristics

V_{BIAS} (V_{CC}, V_{BS}) = 15V, C_L = 1000pF, and T_A = 25 °C , unless otherwise specified.

Symbol	Parameter	Conditions	MIN	TYP	MAX	Unit
t_{on}	Turn-on propogation delay	V_S = 0V		180	270	ns
t_{off}	Turn-off propogation delay	V_S = 0V or 600V		220	330	
t_{DM}	Delay matching				50	
t_r	Turn-on rise time			40	60	
t_f	Turn-off fall time			20	35	
t_{DT}	Deadtime: $t_{DT\ LO\text{-}HO}$ & $t_{DT\ HO\text{-}LO}$	R_{DT} = 0Ω	280	400	520	
		R_{DT} = 200kΩ (TF21834)	4	5	6	µs
t_{DTM}	Deadtime matching: $t_{DT\ LO\text{-}HO}$ - $t_{DT\ HO\text{-}LO}$	R_{DT} = 0Ω		0	50	ns
		R_{DT} = 200kΩ (TF21834)		0	600	

Timing Waveforms

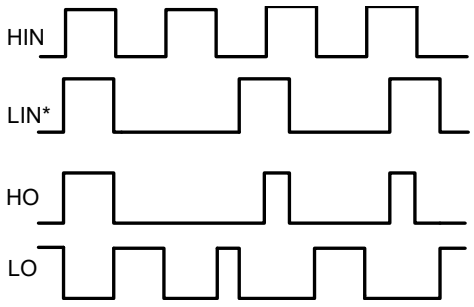


Figure 1. Input / Output Timing Diagram

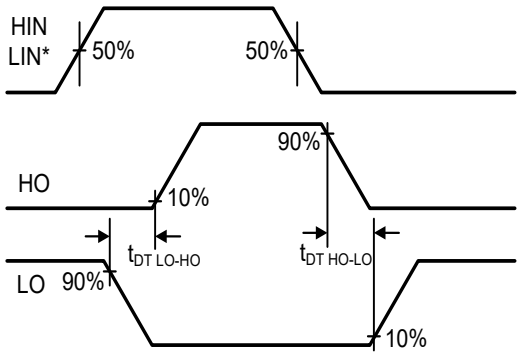


Figure 2. Deadtime Waveform Definitions

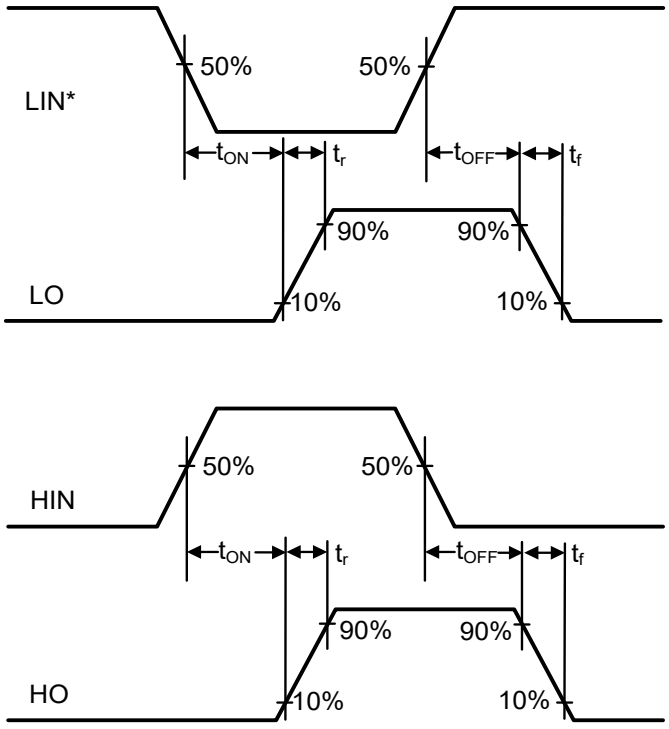
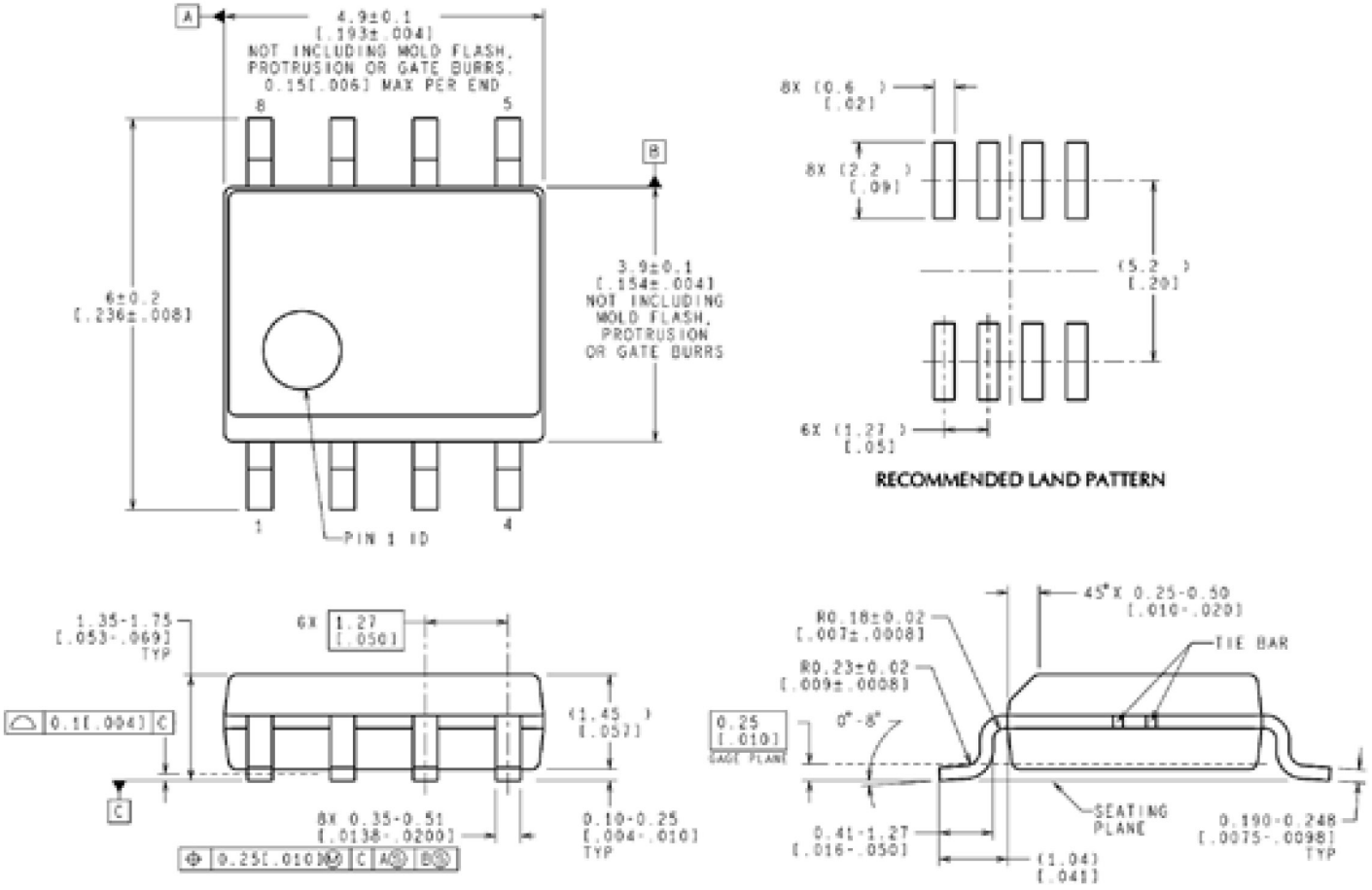


Figure 3. Switching Time Waveform Definitions

Package Dimensions (SOIC-8 N)

Please contact support@tfsemi.com for package availability.



NOTES: UNLESS OTHERWISE SPECIFIED

1. REFERENCE JEDEC REGISTRATION MS-012, VARIATION AA.

CONTROLLING DIMENSION IS MILLIMETER
VALUES IN [ ] ARE INCHES
DIMENSIONS IN ( ) FOR REFERENCE ONLY

Revision History

Rev.	Change	Owner	Date
1.0	First release, AI datasheet	Keith Spaulding	7/15/2022

Important Notice

TF Semiconductor Solutions (TFSS) PRODUCTS ARE NEITHER DESIGNED NOR INTENDED FOR USE IN MILITARY AND/OR AEROSPACE, AUTOMOTIVE OR MEDICAL DEVICES OR SYSTEMS UNLESS THE SPECIFIC TFSS PRODUCTS ARE SPECIFICALLY DESIGNATED BY TFSS FOR SUCH USE. BUYERS ACKNOWLEDGE AND AGREE THAT ANY SUCH USE OF TFSS PRODUCTS WHICH TFSS HAS NOT DESIGNATED FOR USE IN MILITARY AND/OR AEROSPACE, AUTOMOTIVE OR MEDICAL DEVICES OR SYSTEMS IS SOLELY AT THE BUYER'S RISK.

TFSS assumes no liability for application assistance or customer product design. Customers are responsible for their products and applications using TFSS products.

Resale of TFSS products or services with statements different from or beyond the parameters stated by TFSS for that product or service voids all express and any implied warranties for the associated TFSS product or service. TFSS is not responsible or liable for any such statements.

For additional information please contact support@tfsemi.com or visit www.tfsemi.com.