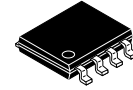


# High- and Low-Side Gate Driver

## FAN7842



SOIC8  
(8-SOP)  
CASE 751EG

### Description

The FAN7842, a monolithic high and low side gate drive IC, which can drive MOSFETs and IGBTs that operate up to +200 V.

onsemi's high-voltage process and common-mode noise canceling technique provide stable operation of the high-side driver under high-dv/dt noise circumstances. An advanced level-shift circuit allows high-side gate driver operation up to  $V_S = -9.8$  V (typical) for  $V_{BS} = 15$  V. The input logic level is compatible with standard TTL-series logic gates.

The UVLO circuits for both channels prevent malfunction when  $V_{CC}$  and  $V_{BS}$  are lower than the specified threshold voltage. Output driver current (source/sink) is typically 350 mA/650 mA, respectively.

### Features

- Floating Channels Designed for Bootstrap Operation to +200 V
- Typically 350 mA/650 mA Sourcing/Sinking Current Driving Capability for Both Channels
- Common-Mode dv/dt Noise Canceling Circuit
- Extended Allowable Negative  $V_S$  Swing to -9.8 V for Signal Propagation at  $V_{CC} = V_{BS} = 15$  V
- $V_{CC}$  &  $V_{BS}$  Supply Range from 10 V to 20 V
- UVLO Functions for Both Channels
- TTL Compatible Input Logic Threshold Levels
- Matched Propagation Delay Below 50 ns
- Output In-phase with Input Signal
- This Device is Pb-Free, Halide Free and is RoHS Compliant

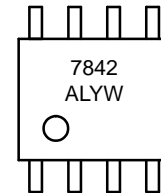
### Applications

- Battery Based Motor Applications (E-bike, Power Tool)
- Telecom DC-DC Converter

### Related Resources

- [AN-6076](#) – Design and Application Guide of Bootstrap Circuit for High-Voltage Gate-Drive IC
- [AN-9052](#) – Design Guide for Selection of Bootstrap Components
- [AN-8102](#) – Recommendations to Avoid Short Pulse Width Issues in HVIC Gate Driver Applications

### MARKING DIAGRAM



7842 = Specific Device Code  
 A = Assembly Site  
 L = Wafer Lot Number  
 YW = Assembly Start Week

### ORDERING INFORMATION

See detailed ordering and shipping information on page 11 of this data sheet.

# FAN7842

## TYPICAL APPLICATION CIRCUIT

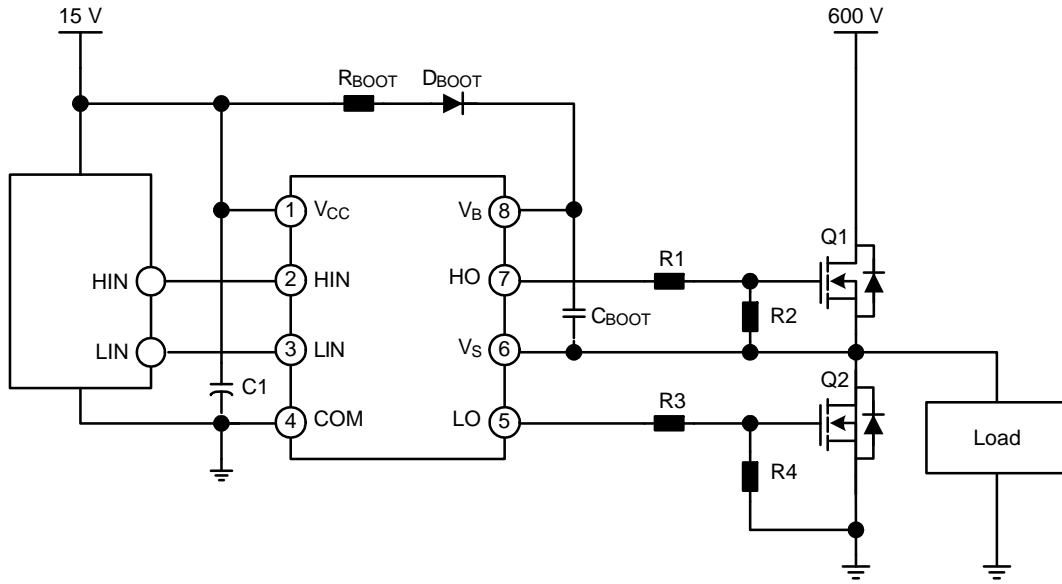


Figure 1. Application Circuit for Half-Bridge

## INTERNAL BLOCK DIAGRAM

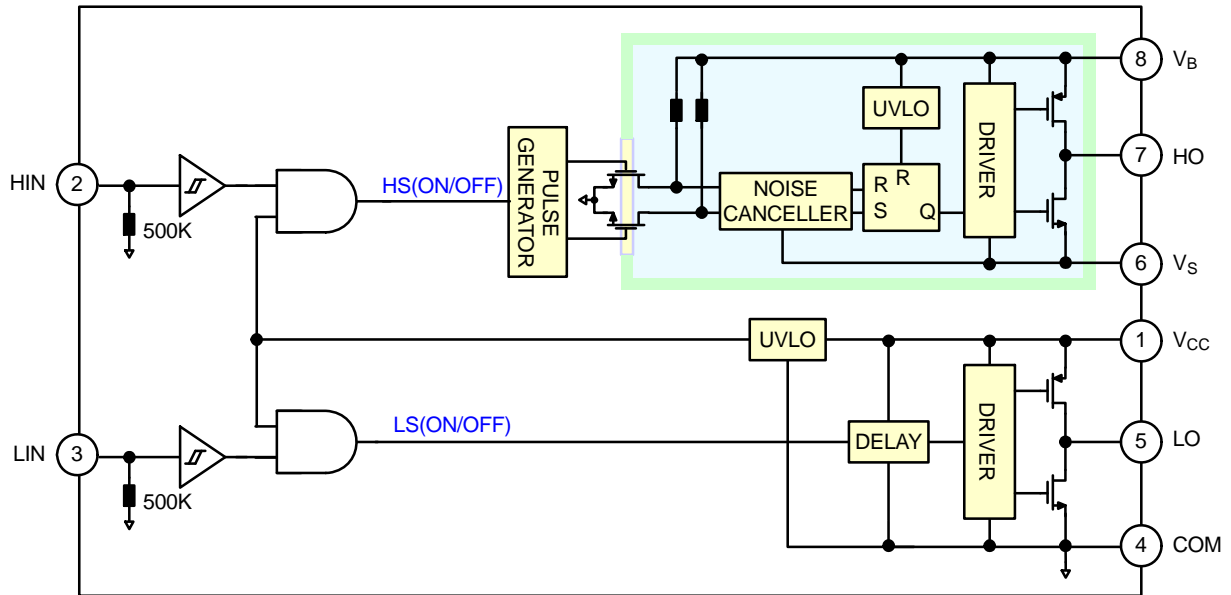


Figure 2. Functional Block Diagram

# FAN7842

## PIN ASSIGNMENTS

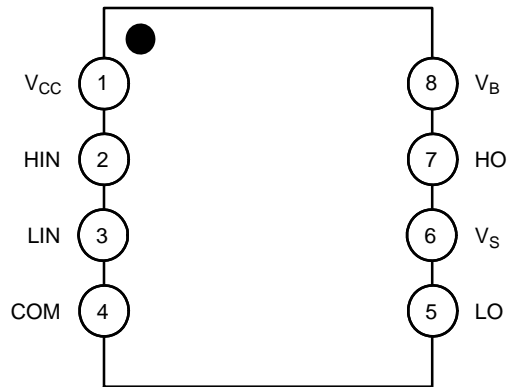


Figure 3. Pin Configuration (Top View)

### PIN DEFINITIONS

Name	Description
V <sub>CC</sub>	Low-Side Supply Voltage
HIN	Logic Input for High-Side Gate Driver Output
LIN	Logic Input for Low-Side Gate Driver Output
COM	Logic Ground and Low-Side Driver Return
LO	Low-Side Driver Output
V <sub>S</sub>	High-Voltage Floating Supply Return
HO	High-Side Driver Output
V <sub>B</sub>	High-Side Floating Supply

# FAN7842

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Min	Max	Unit
$V_S$	High-side Offset Voltage	$V_B - 25$	$V_B + 0.3$	V
$V_B$	High-side Floating Supply Voltage	-0.3	225	
$V_{HO}$	High-side Floating Output Voltage HO	$V_S - 0.3$	$V_B + 0.3$	
$V_{CC}$	Low-side and Logic Fixed Supply Voltage	-0.3	25	
$V_{LO}$	Low-side Output Voltage LO	-0.3	$V_{CC} + 0.3$	
$V_{IN}$	Logic Input Voltage (HIN, LIN)	-0.3	$V_{CC} + 0.3$	
COM	Logic Ground	$V_{CC} - 25$	$V_{CC} + 0.3$	
dV <sub>S</sub> /dt	Allowable Offset Voltage Slew Rate	-	50	V/ns
P <sub>D</sub> (Note 1) (Note 2) (Note 3)	Power Dissipation	-	0.625	W
$\theta_{JA}$	Thermal Resistance, Junction-to-ambient	-	200	°C/W
T <sub>J</sub>	Junction Temperature	-	150	°C
T <sub>STG</sub>	Storage Temperature	-	150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Mounted on 76.2 x 114.3 x 1.6 mm PCB (FR-4 glass epoxy material).
2. Refer to the following standards:  
 JESD51-2: Integral circuits thermal test method environmental conditions – natural convection  
 JESD51-3: Low effective thermal conductivity test board for leaded surface mount packages
3. Do not exceed P<sub>D</sub> under any circumstances.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
$V_B$	High-side Floating Supply Voltage	$V_S + 10$	$V_S + 20$	V
$V_S$	High-side Floating Supply Offset Voltage	$6 - V_{CC}$	200	
$V_{HO}$	High-side (HO) Output Voltage	$V_S$	$V_B$	
$V_{LO}$	Low-side (LO) Output Voltage	COM	$V_{CC}$	
$V_{IN}$	Logic Input Voltage (HIN, LIN)	COM	$V_{CC}$	
$V_{CC}$	Low-side Supply Voltage	10	20	
T <sub>A</sub>	Ambient Temperature	-40	125	°C

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

# FAN7842

**ELECTRICAL CHARACTERISTICS** ( $V_{BIAS}$  ( $V_{CC}$ ,  $V_{BS}$ ) = 15.0 V,  $T_A$  = 25°C, unless otherwise specified. The  $V_{IN}$  and  $I_{IN}$  parameters are referenced to COM. The  $V_O$  and  $I_O$  parameters are referenced to  $V_S$  and COM and are applicable to the respective outputs HO and LO.)

Symbol	Characteristics	Test Condition	Min	Typ	Max	Unit
$V_{CCUV+}$ $V_{BSUV+}$	$V_{CC}$ and $V_{BS}$ Supply Under-voltage Positive Going Threshold		8.2	9.2	10.0	V
$V_{CCUV-}$ $V_{BSUV-}$	$V_{CC}$ and $V_{BS}$ Supply Under-voltage Negative Going Threshold		7.6	8.7	9.6	
$V_{CCUVH}$ $V_{BSUVH}$	$V_{CC}$ Supply Under-voltage Lockout Hysteresis		–	0.6	–	
$I_{LK}$	Offset Supply Leakage Current	$V_B = V_S = 200$ V	–	–	50	$\mu$ A
$I_{QBS}$	Quiescent $V_{BS}$ Supply Current	$V_{IN} = 0$ V or 5 V	–	45	120	
$I_{QCC}$	Quiescent $V_{CC}$ Supply Current	$V_{IN} = 0$ V or 5 V	–	70	180	
$I_{PBS}$	Operating $V_{BS}$ Supply Current	$f_{IN} = 20$ kHz, rms value	–	–	600	$\mu$ A
$I_{PCC}$	Operating $V_{CC}$ Supply Current	$f_{IN} = 20$ kHz, rms value	–	–	600	
$V_{IH}$	Logic “1” Input Voltage		2.9	–	–	V
$V_{IL}$	Logic “0” Input Voltage		–	–	0.8	
$V_{OH}$	High-level Output Voltage, $V_{BIAS}-V_O$	$I_O = 20$ mA	–	–	1.0	
$V_{OL}$	Low-level Output Voltage, $V_O$		–	–	0.6	
$I_{IN+}$	Logic “1” Input Bias Current	$V_{IN} = 5$ V	–	10	20	$\mu$ A
$I_{IN-}$	Logic “0” Input Bias Current	$V_{IN} = 0$ V	–	1.0	2.0	
$I_{O+}$	Output High Short-circuit Pulsed Current	$V_O = 0$ V, $V_{IN} = 5$ V with $PW < 10$ $\mu$ s	250	350	–	mA
$I_{O-}$	Output Low Short-circuit Pulsed Current	$V_O = 15$ V, $V_{IN} = 0$ V with $PW < 10$ $\mu$ s	500	650	–	
$V_S$	Allowable Negative $V_S$ Pin Voltage for HIN Signal Propagation to HO		–	–9.8	–7.0	V

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

**DYNAMIC ELECTRICAL CHARACTERISTICS** ( $V_{BIAS}$  ( $V_{CC}$ ,  $V_{BS}$ ) = 15.0 V,  $V_S = COM$ ,  $C_L = 1000$  pF and,  $T_A = 25^\circ$ C, unless otherwise specified.)

Symbol	Characteristics	Test Condition	Min	Typ	Max	Unit
$t_{on}$	Turn-on Propagation Delay	$V_S = 0$ V	100	170	300	ns
$t_{off}$	Turn-off Propagation Delay	$V_S = 0$ V or 200 V (Note 4)	100	200	300	ns
$t_r$	Turn-on Rise Time		20	60	140	ns
$t_f$	Turn-off Fall Time		–	30	80	ns
MT	Delay Matching, HS & LS Turn-on/off		–	–	50	ns

4. This parameter guaranteed by design.

TYPICAL CHARACTERISTICS

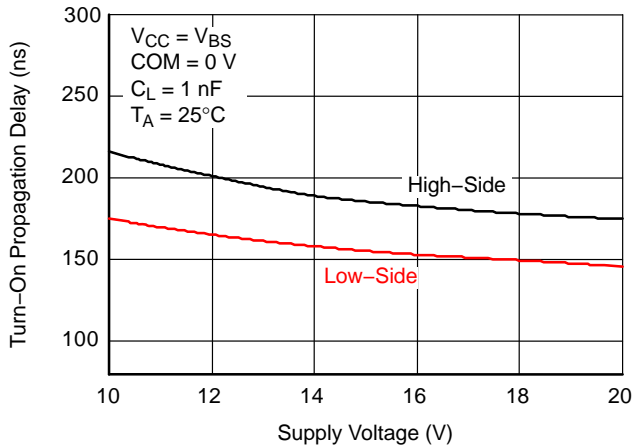


Figure 4. Turn-On Propagation Delay vs. Supply Voltage

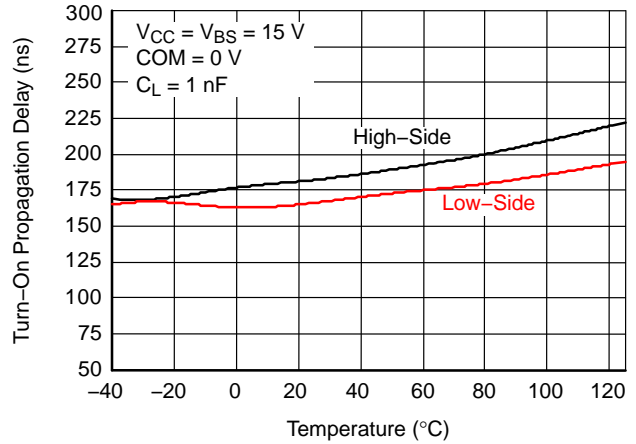


Figure 5. Turn-On Propagation Delay vs. Temperature

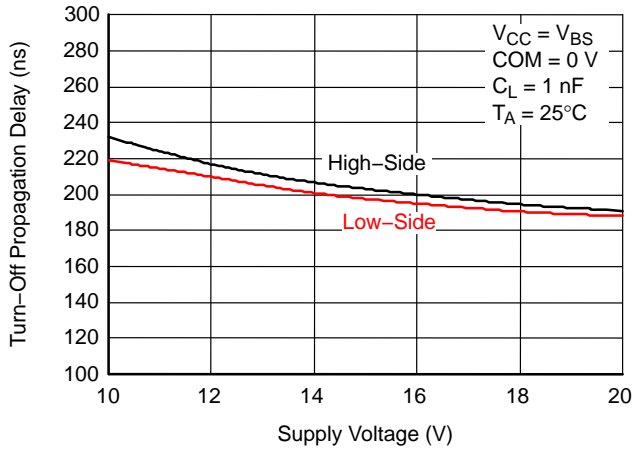


Figure 6. Turn-Off Propagation Delay vs. Supply Voltage

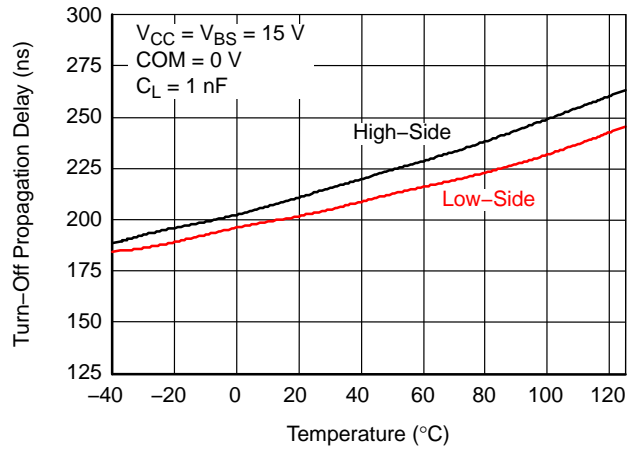


Figure 7. Turn-Off Propagation Delay vs. Temperature

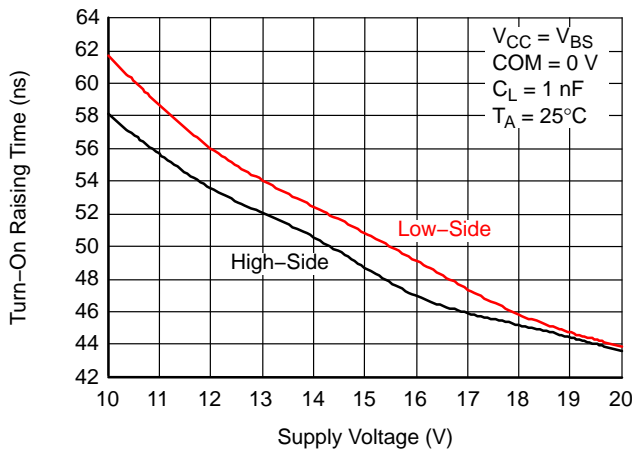


Figure 8. Turn-On Rising Time vs. Supply Voltage

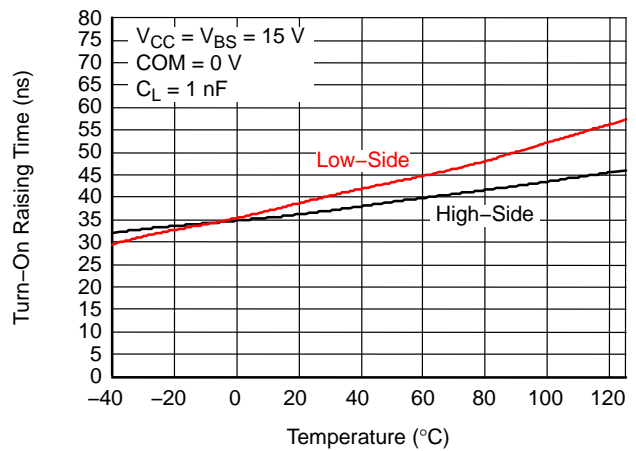


Figure 9. Turn-On Rising Time vs. Temperature

TYPICAL CHARACTERISTICS (CONTINUED)

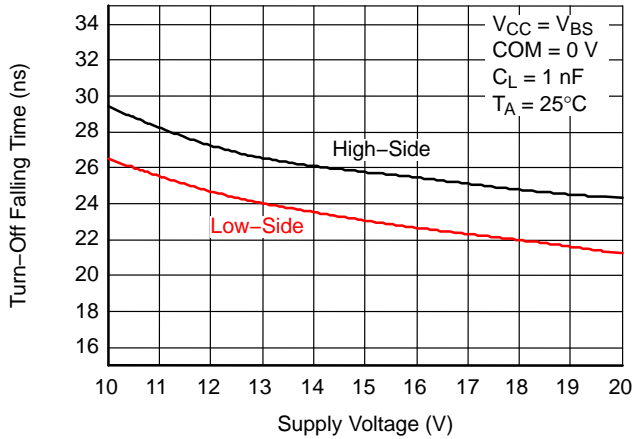


Figure 10. Turn-Off Falling Time vs. Supply Voltage

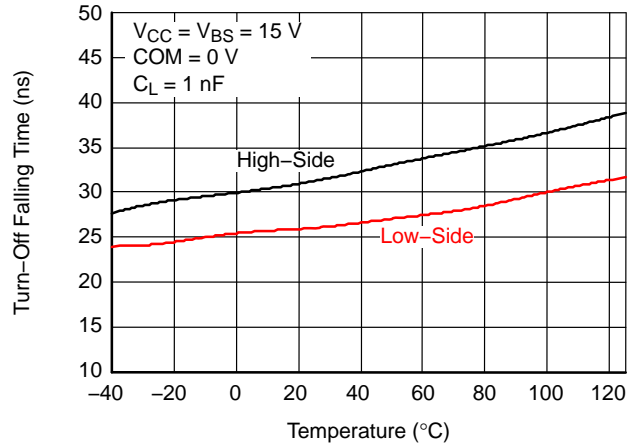


Figure 11. Turn-Off Falling Time vs. Temperature

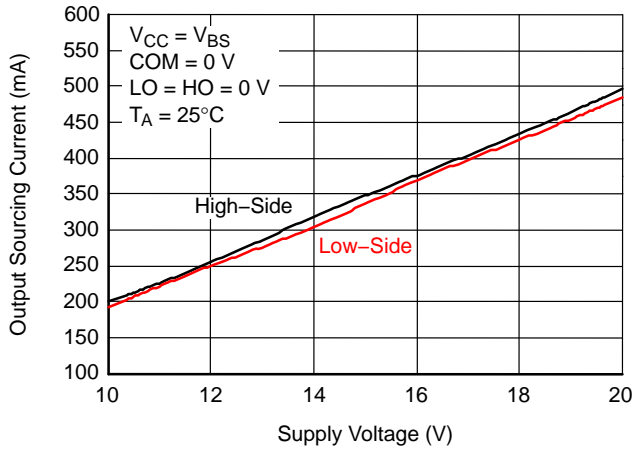


Figure 12. Output Sourcing Current vs. Supply Voltage

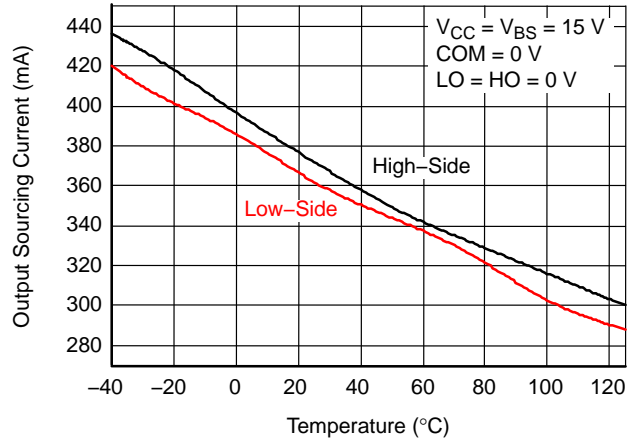


Figure 13. Output Sourcing Current vs. Temperature

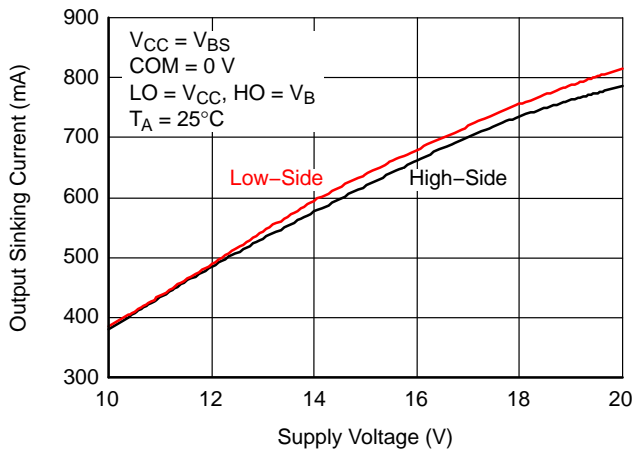


Figure 14. Output Sinking Current vs. Supply Voltage

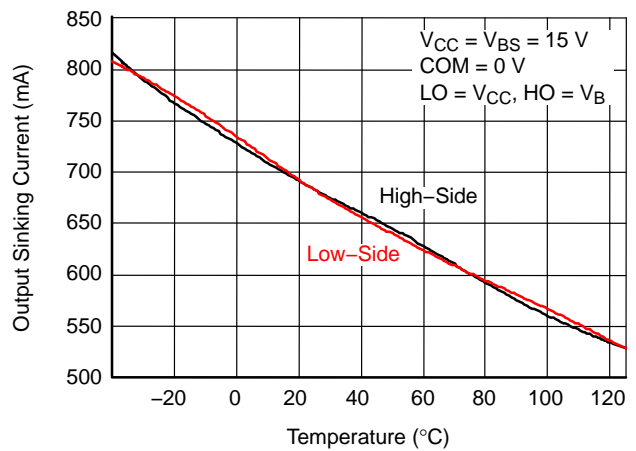


Figure 15. Output Sinking Current vs. Temperature

TYPICAL CHARACTERISTICS (CONTINUED)

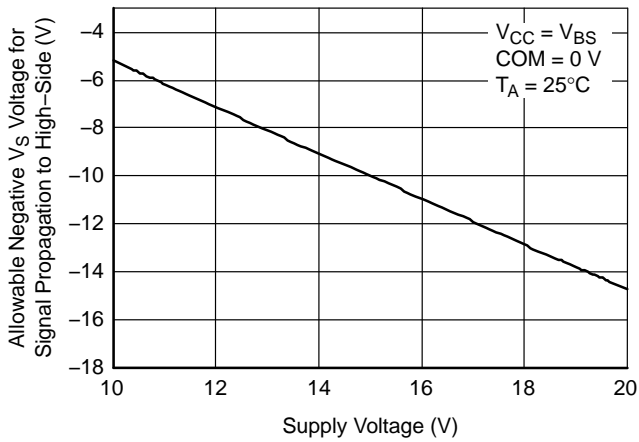


Figure 16. Allowable Negative  $V_S$  Voltage for Signal Propagation to High Side vs. Supply Voltage

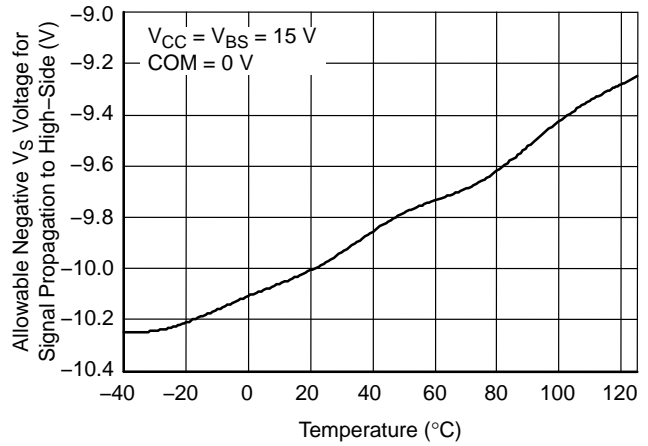


Figure 17. Allowable Negative  $V_S$  Voltage for Signal Propagation to High Side vs. Temperature

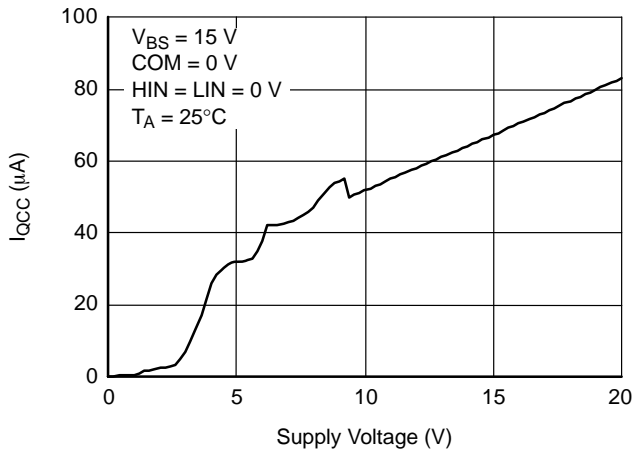


Figure 18.  $I_{QCC}$  vs. Supply Voltage

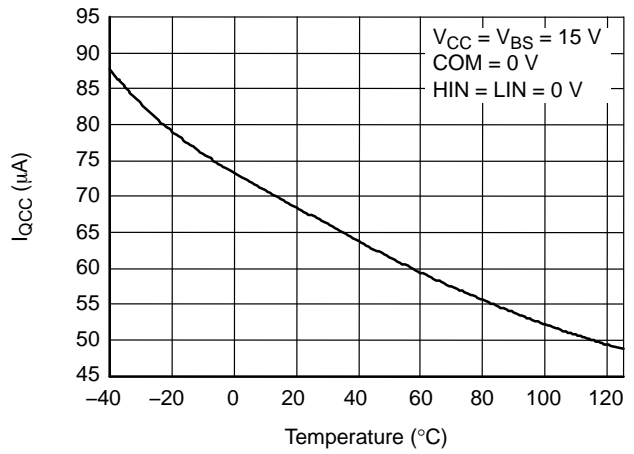


Figure 19.  $I_{QCC}$  vs. Temperature

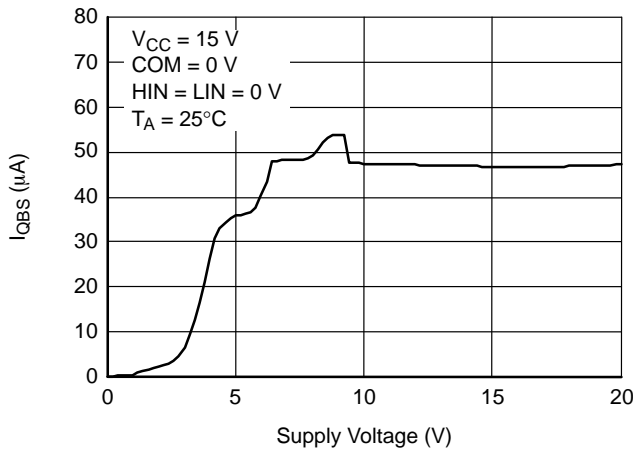


Figure 20.  $I_{QBS}$  vs. Supply Voltage

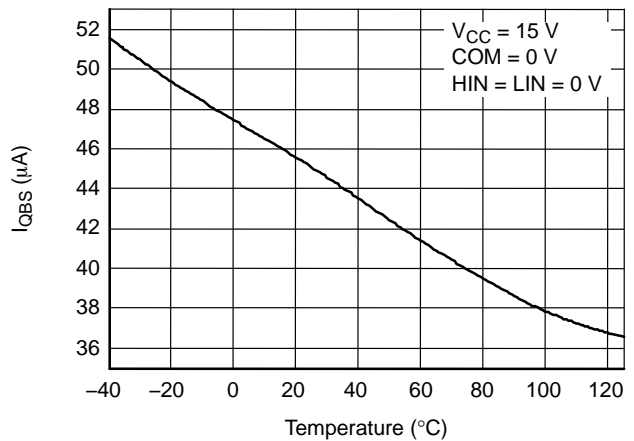


Figure 21.  $I_{QBS}$  vs. Temperature



TYPICAL CHARACTERISTICS (CONTINUED)

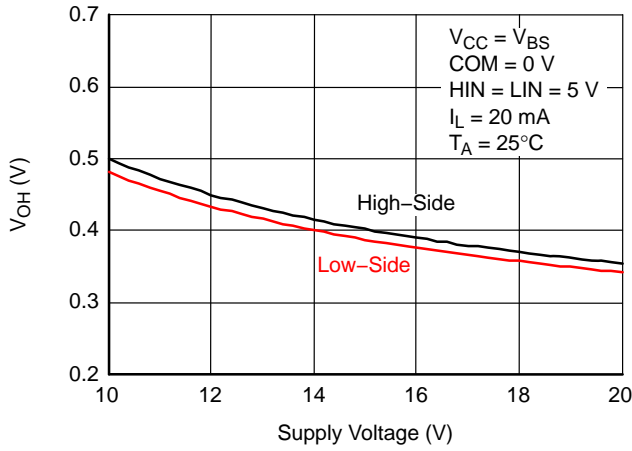


Figure 22. High-Level Output Voltage vs. Supply Voltage

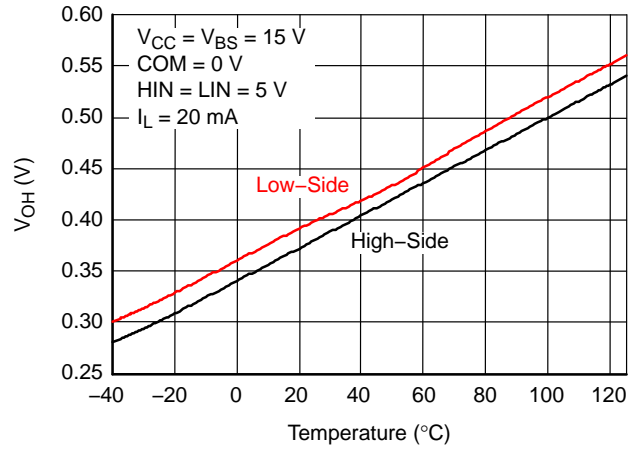


Figure 23. High-Level Output Voltage vs. Temperature

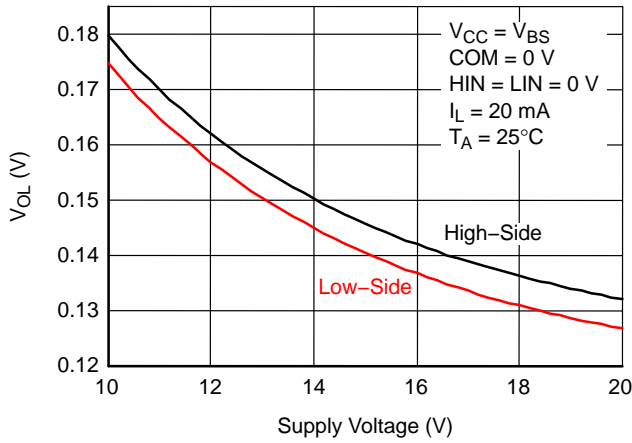


Figure 24. Low-Level Output Voltage vs. Supply Voltage

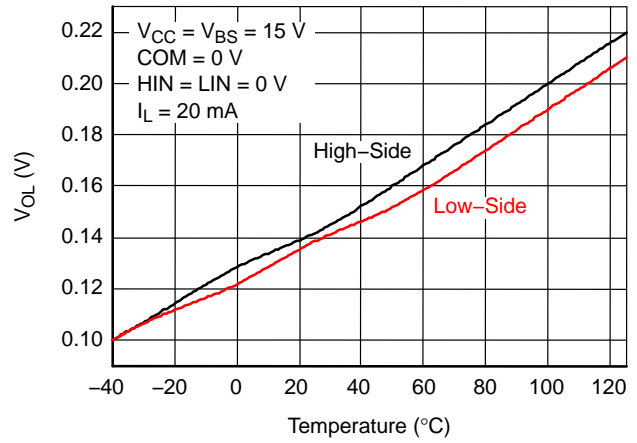


Figure 25. Low-Level Output Voltage vs. Temperature

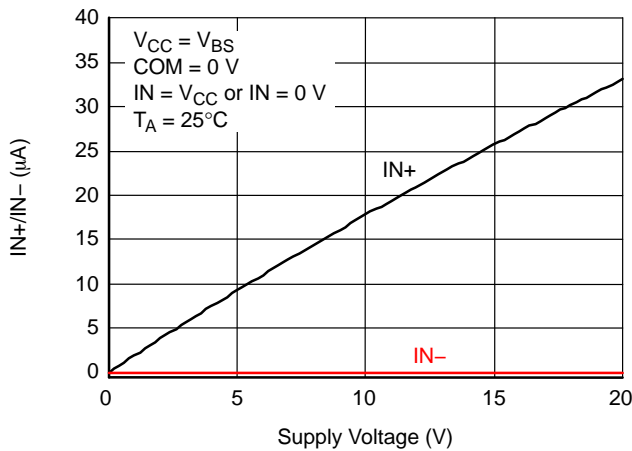


Figure 26. Input Bias Current vs. Supply Voltage

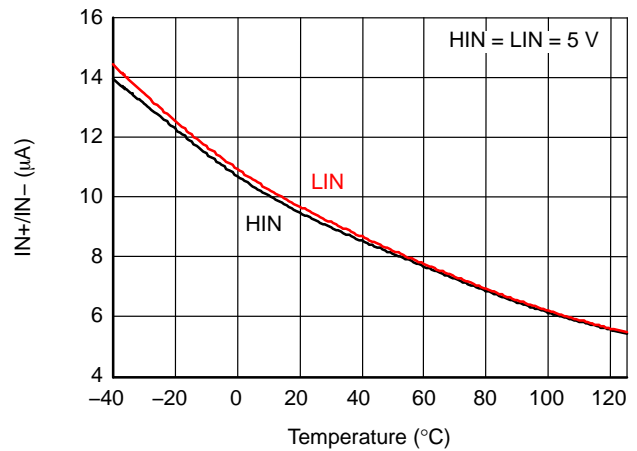


Figure 27. Input Bias Current vs. Temperature

TYPICAL CHARACTERISTICS (CONTINUED)

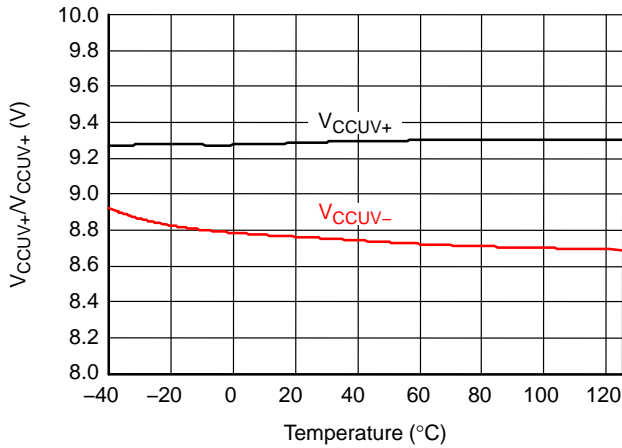


Figure 28. V<sub>CC</sub> UVLO Threshold Voltage vs. Temperature

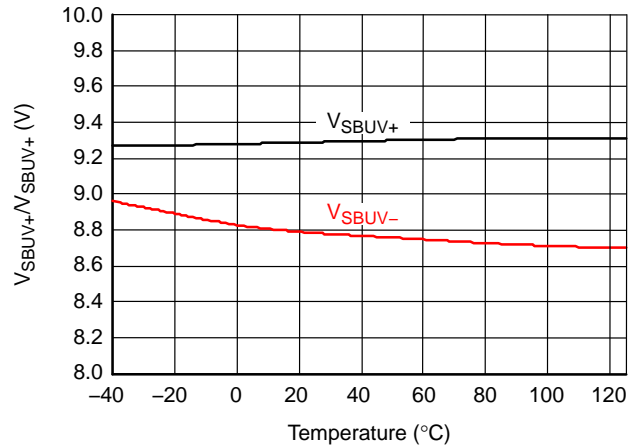


Figure 29. V<sub>BS</sub> UVLO Threshold Voltage vs. Temperature

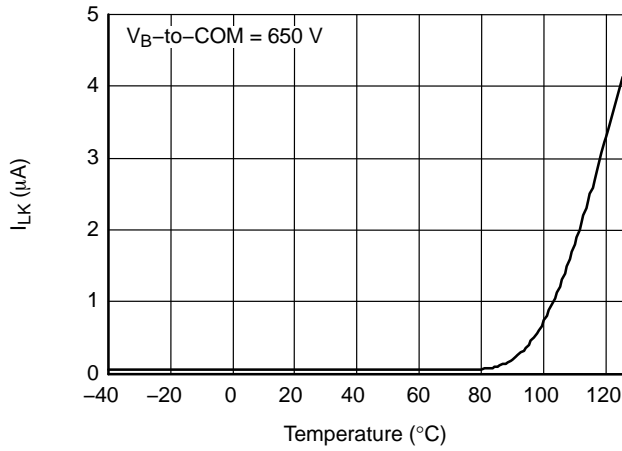


Figure 30. V<sub>B</sub> to COM Leakage Current vs. Temperature

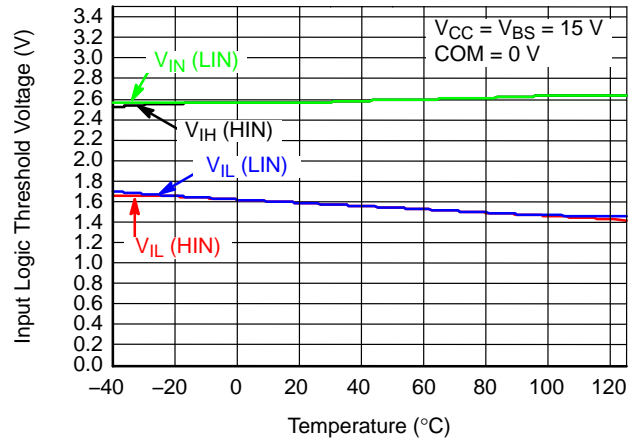


Figure 31. Input Logic Threshold Voltage vs. Temperature

# FAN7842

## TYPICAL CHARACTERISTICS (CONTINUED)

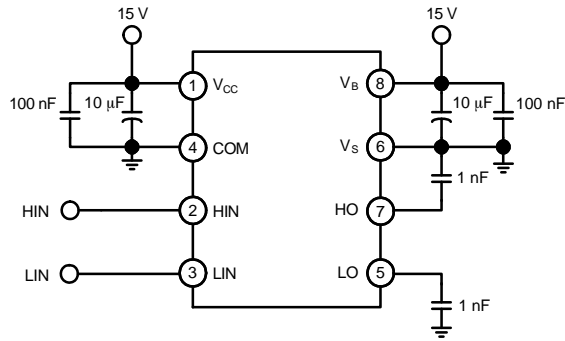


Figure 32. Switching Time Test Circuit

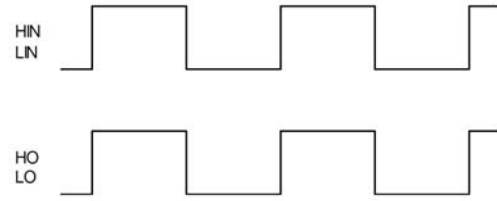


Figure 33. Input / Output Timing Diagram

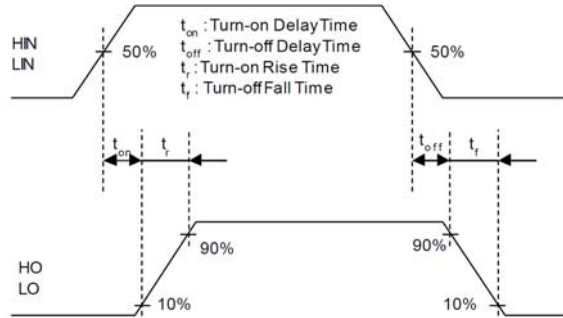


Figure 34. Switching Time Waveform Definition

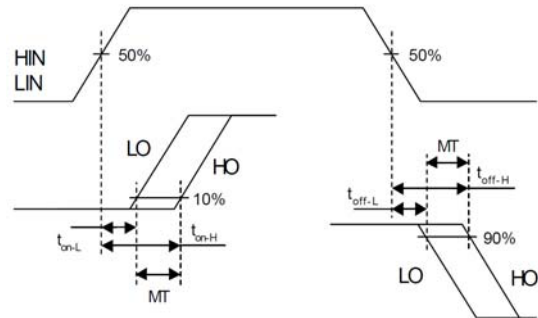


Figure 35. Delay Matching Waveform Definition

### ORDERING INFORMATION

Part Number	Package	Operating Temperature Range	Shipping†
FAN7842MX (Note 5)	SOIC8 (8-SOP) (Pb-Free, Halide Free)	-40°C~125°C	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

5. These devices passed wave soldering test by JESD22A-111.

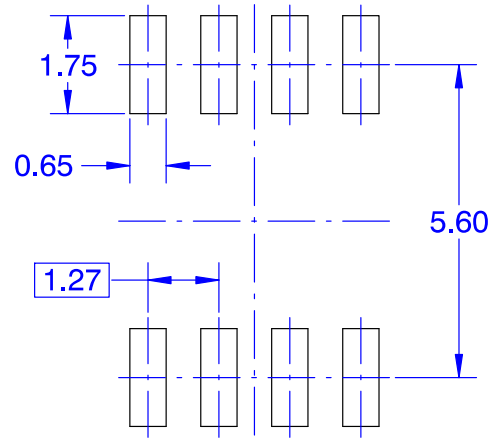
**MECHANICAL CASE OUTLINE**  
**PACKAGE DIMENSIONS**

ON Semiconductor®



**SOIC8**  
**CASE 751EG**  
**ISSUE O**

DATE 30 SEP 2016



**NOTES: UNLESS OTHERWISE SPECIFIED**

- A. THIS PACKAGE CONFORMS TO JEDEC MS-012 VARIATION A EXCEPT WHERE NOTED.
- B. ALL DIMENSIONS ARE IN MILLIMETERS
- C. OUT OF JEDEC STANDARD VALUE
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
- E. LAND PATTERN AS PER IPC SOIC127P600X175-8M

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