



Is Now Part of



**ON Semiconductor®**

To learn more about ON Semiconductor, please visit our website at [www.onsemi.com](http://www.onsemi.com)

Please note. As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (\_), the underscore (\_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (\_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at [www.onsemi.com](http://www.onsemi.com). Please email any questions regarding the system integration to [Fairchild\\_questions@onsemi.com](mailto:Fairchild_questions@onsemi.com).

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.



May 2024

# FAN73611\_OP

## Single-Channel High-Side Gate Drive IC

### Features

- Floating Channel for Bootstrap Operation to +600V
- 250 mA/500 mA Sourcing/Sinking Current Driving Capability
- Common-Mode dv/dt Noise-Canceling Circuit
- 3.3 V and 5 V Input Logic Compatible
- Output In Phase with Input Signal
- Under-Voltage Lockout for  $V_{DD}$  and  $V_{BS}$
- 8-Lead Small Outline Package (SOP)

The FAN73611\_OP is a monolithic high-side gate drive IC that can drive MOSFETs and IGBTs operating up to +600 V. Fairchild's high-voltage process and common-mode noise canceling techniques provide stable operation of the high-side driver under high dv/dt noise circumstances. An advanced level-shift circuit offers high-side gate driver operation up to  $V_{GS} = -9.2$  V (typical) for  $V_{BS} = 15$  V. The UVLO circuit prevents malfunction when  $V_{DD}$  or  $V_{BS}$  is lower than the specified threshold voltage. The part offers typically source/sink 250 mA/500 mA; respectively, which is suitable for Plasma Display Panel (PDP) application, motor drive inverter, and switching mode power supply applications.

### Applications

- PDP Scan Driver
- Motor Driver
- Switching-Mode Power Supply (SMPS)

8-SOP



### Related Application Notes

- [AN-6076 — Design and Application Guide of Eoostrap Circuit for High-voltage Gate Drive IC](#)
- [AN-905 — Design Guide for Selection of Bootstrap Components](#)
- [AN-6102 — Recommendations to Avoid Short Pulse Width Issues in HVIC Gate Driver Applications](#)

### Description

### Ordering Information

| Part Number                  | Package | Operating Temperature | Packing Method | Description         |
|------------------------------|---------|-----------------------|----------------|---------------------|
| FAN73611MX_OP <sup>(1)</sup> | 8 SOP   | -40°C ~ 125°C         | Tape & Reel    | General Application |

#### Note:

1. This device passed wave soldering test by JESD22A-111.

Typical Application Diagrams

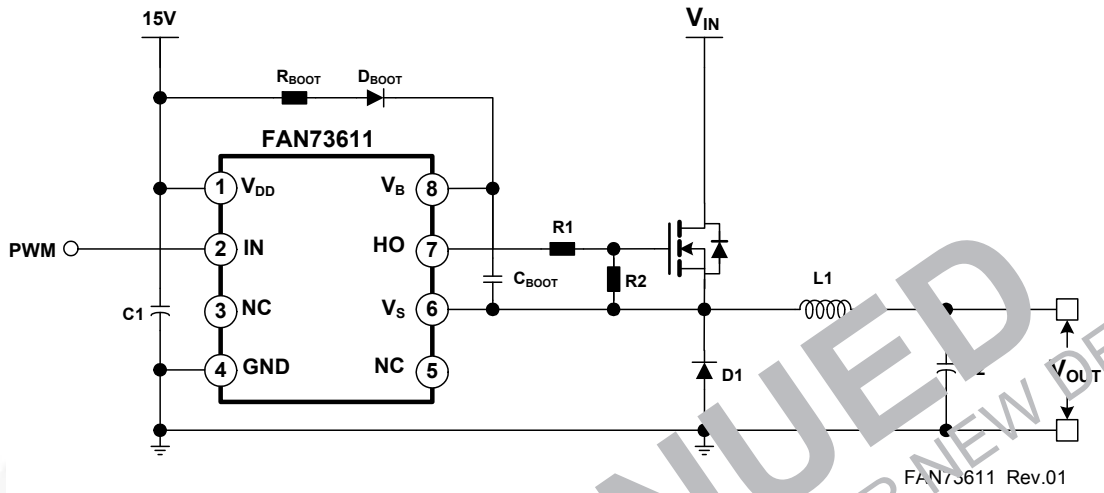


Figure 1. Step-Down (Buck) DC-DC Converter Application

Internal Block Diagram

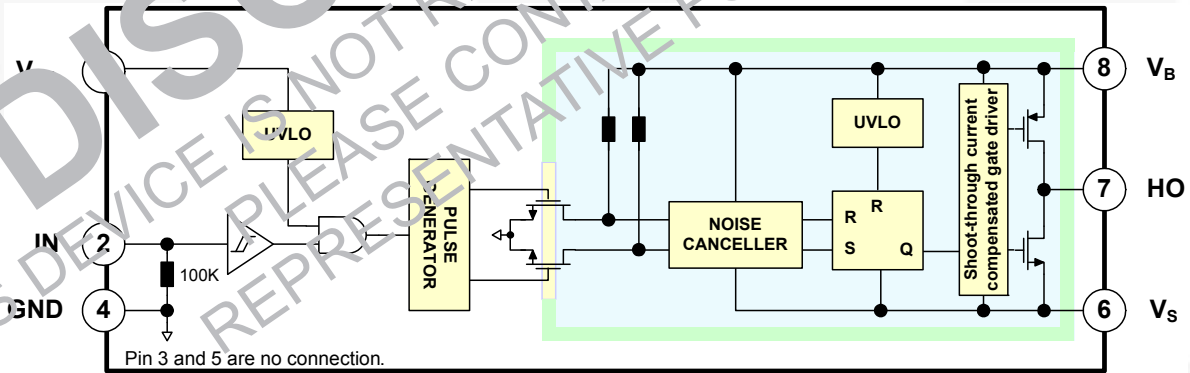
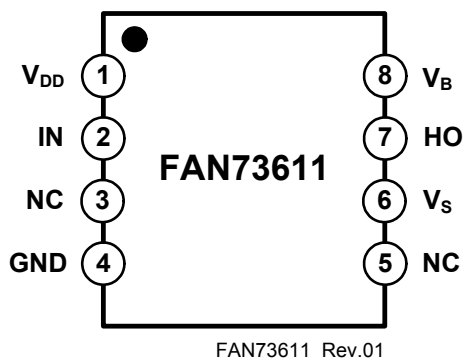


Figure 2. Functional Block Diagram

### Pin Configuration



FAN73611 Rev.01

Figure 3. Pin Configuration (Top View)

### Pin Definitions

| Pin # | Name            | Description                                |
|-------|-----------------|--|
| 1     | V <sub>DD</sub> | Supply Voltage                             |
| 2     | IN              | Logic Input / High-Side Gate Driver Output |
| 3     | NC              | No Connection                              |
| 4     | GND             | Ground                                     |
| 5     | NC              | No Connection                              |
| 6     | V <sub>S</sub>  | High-Voltage Floating Supply Return        |
| 7     | HO              | High-Side Driver Output                    |
| 8     | V <sub>B</sub>  | High-Side Floating Supply                  |

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.  $T_A=25^{\circ}\text{C}$  unless otherwise specified.

| Symbol        | Characteristics                        | Min.      | Max.         | Unit                        |
|---------------|--|-----------|--------------|-----------------------------|
| $V_S$         | High-Side Floating Offset Voltage      | $V_B-25$  | $V_B+0.3$    | V                           |
| $V_B$         | High-Side Floating Supply Voltage      | -0.3      | 625.0        | V                           |
| $V_{HO}$      | High-Side Floating Output Voltage      | $V_S-0.3$ | $V_B+0.3$    | V                           |
| $V_{DD}$      | Low-Side and Logic Supply Voltage      | -0.3      | 25.0         | V                           |
| $V_{IN}$      | Logic Input Voltage                    | -0.3      | $V_{DD}+0.3$ | V                           |
| $dV_S/dt$     | Allowable Offset Voltage Slew Rate     |           | 50           | V/ns                        |
| $P_D$         | Power Dissipation <sup>(2, 3, 4)</sup> |           | 0.675        | W                           |
| $\theta_{JA}$ | Thermal Resistance                     |           | 200          | $^{\circ}\text{C}/\text{W}$ |
| $T_J$         | Junction Temperature                   | -55       | +150         | $^{\circ}\text{C}$          |
| $T_{STG}$     | Storage Temperature                    | -55       | +150         | $^{\circ}\text{C}$          |

### Notes:

- Mounted on 76.2 x 114.3 x 1.6 mm PCB (FR-4 glass epoxy material).
- Refer to the following standards:  
*JESD51-2: Integrated circuits thermal test method environmental conditions, natural convection, and*  
*JESD51-3: Low effective thermal conductivity test board for leaded surface mount packages.*
- Do not exceed power dissipation ( $P_D$ ) under any circumstances.

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to absolute maximum ratings.

| 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 | $6-V_{DD}$ | 600      | V                  |
| $V_{HO}$ | High-Side Output Voltage                 | $V_S$      | $V_B$    | V                  |
| $V_{IN}$ | Logic Input Voltage                      | GND        | $V_{DD}$ | V                  |
| $V_{DD}$ | Supply Voltage                           | 10         | 20       | V                  |
| $T_A$    | Operating Ambient Temperature            | -40        | +125     | $^{\circ}\text{C}$ |

## Electrical Characteristics

$V_{BIAS}(V_{DD}, V_{BS}) = 15.0\text{ V}$  and  $T_A = 25^\circ\text{C}$  unless otherwise specified. The  $V_{IN}$  and  $I_{IN}$  parameters are referenced to GND. The  $V_O$  and  $I_O$  parameters are relative to  $V_S$  and are applicable to the respective output HO.

| Symbol                             | Characteristics   | Test Condition   | Min. | Typ. | Max. | Unit             |
|------------------------------------|---|--|------|------|------|------------------|
| <b>Power Supply Section</b>        |   |  |      |      |      |                  |
| $I_{QDD}$                          | Quiescent $V_{DD}$ Supply Current   | $V_{IN}=0\text{ V}$ or $5\text{ V}$ , $C_{LOAD}=1000\text{ pF}$        |      | 80   | 140  | $\mu\text{A}$    |
| $I_{PDD}$                          | Operating $V_{DD}$ Supply Current   | $C_{LOAD}=1000\text{ pF}$ , $f_{IN}=20\text{ KHz}$ , RMS value         |      | 80   | 160  | $\mu\text{A}$    |
| $V_{DDUV+}$<br>$V_{BSUV+}$         | $V_{DD}$ and $V_{BS}$ Supply Under-Voltage Positive Going Threshold Voltage | $V_{DD}=\text{Sweep}$ , $V_{BS}=\text{Sweep}$                          | 7.8  | 8.8  | 9.8  | V                |
| $V_{DDUV-}$<br>$V_{BSUV-}$         | $V_{DD}$ and $V_{BS}$ Supply Under-Voltage Negative Going Threshold Voltage | $V_{DD}=\text{Sweep}$ , $V_{BS}=\text{Sweep}$                          | 7.8  | 8.3  | 9.3  | V                |
| $V_{DDHYS}$<br>$V_{BSHYS}$         | $V_{DD}$ and $V_{BS}$ Supply Under-Voltage Lockout Hysteresis Voltage       | $V_{DD}=\text{Sweep}$ , $V_{BS}=\text{Sweep}$                          |      | 0.5  |      | V                |
| $I_{LK}$                           | Offset Supply Leakage Current   | $V_B=V_S=600\text{ mV}$  |      |      | 10   | $\mu\text{A}$    |
| $I_{QBS}$                          | Quiescent $V_{BS}$ Supply Current   | $V_{IN}=0\text{ V}$ or $5\text{ V}$ , $C_{LOAD}=1000\text{ pF}$        |      | 60   | 100  | $\mu\text{A}$    |
| $I_{PBS}$                          | Operating $V_{BS}$ Supply Current   | $C_{LOAD}=1000\text{ pF}$ , $f_{IN}=20\text{ KHz}$ , RMS value         |      | 420  | 600  | $\mu\text{A}$    |
| <b>Input Logic Section</b>         |   |  |      |      |      |                  |
| $V_{IH}$                           | Logic "1" Input Voltage   |  | 2.5  |      |      | V                |
| $V_{IL}$                           | Logic "0" Input Voltage   |  |      |      | 0.8  | V                |
| $I_{IN+}$                          | Logic Input High Bias Current   | $V_{IN}=5\text{ V}$  |      | 50   | 75   | $\mu\text{A}$    |
| $I_{IN-}$                          | Logic Input Low Bias Current  | $V_{IN}=0\text{ V}$  |      |      | 2    | $\mu\text{A}$    |
| $R_{IN}$                           | Input Drive Resistance  |  | 60   | 100  |      | $\text{K}\Omega$ |
| <b>Gate Driver Characteristics</b> |   |  |      |      |      |                  |
| $V_{OH}$                           | High Level Output Voltage ( $V_{BIAS} - V_O$ )                              | No Load  |      |      | 0.1  | V                |
| $V_{OL}$                           | Low Level Output Voltage  | No Load  |      |      | 0.1  | V                |
| $I_{OH}$                           | Output High, Short-Circuit Pulsed Current                                   | $V_{HO}=0\text{ V}$ , $V_{IN}=5\text{ V}$ , $PW \leq 10\ \mu\text{s}$  | 200  | 250  |      | mA               |
| $I_{OL}$                           | Output Low, Short-Circuit Pulsed Current                                    | $V_{HO}=15\text{ V}$ , $V_{IN}=0\text{ V}$ , $PW \leq 10\ \mu\text{s}$ | 400  | 500  |      | mA               |
| $V_S$                              | Allowable Negative $V_S$ Pin Voltage for IN Signal Propagation to HO        | $V_{BS}=15\text{ V}$   |      | -9.8 | -7.0 | V                |

## Dynamic Electrical Characteristics

$V_{DD}=V_{BS}=15\text{ V}$ ,  $C_{LOAD}=1000\text{ pF}$ , and  $T_A=25^\circ\text{C}$ , unless otherwise specified.

| Symbol    | Parameter                       | Conditions       | Min. | Typ. | Max. | Unit |
|-----------|---------------------------------|------------------|------|------|------|------|
| $t_{on}$  | Turn-On Propagation Delay Time  | $V_S=0\text{ V}$ | 70   | 120  | 170  | ns   |
| $t_{off}$ | Turn-Off Propagation Delay Time | $V_S=0\text{ V}$ | 70   | 120  | 170  | ns   |
| $t_r$     | Turn-On Rise Time               |                  |      | 70   | 140  | ns   |
| $t_f$     | Turn-Off Fall Time              |                  |      | 30   | 60   | ns   |

Typical Characteristics

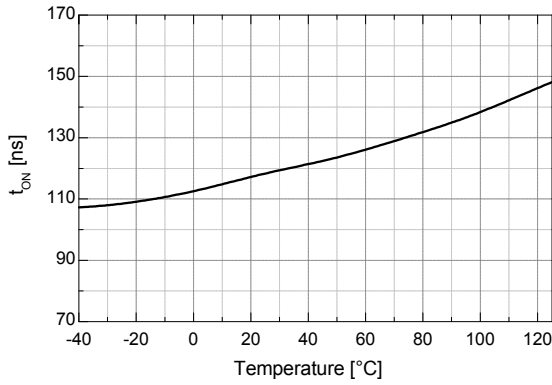


Figure 5. Turn-On Propagation Delay vs. Temperature

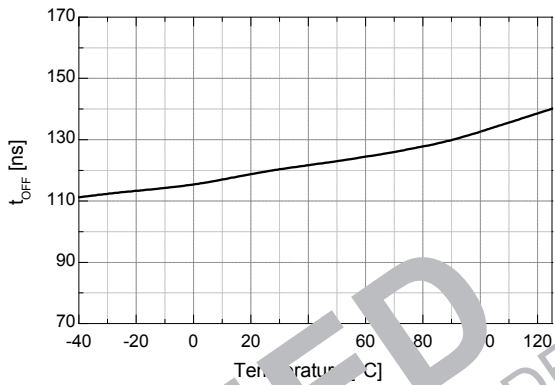


Figure 6. Turn-Off Propagation Delay vs. Temperature

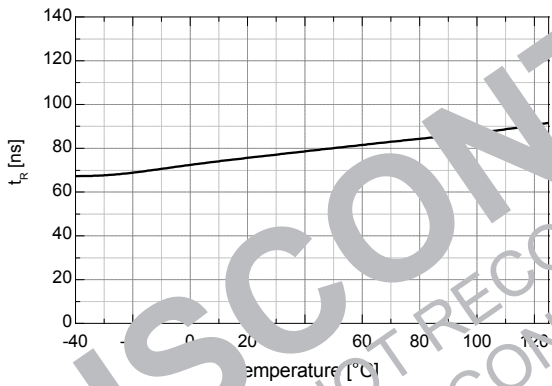


Figure 7. Turn-On Rise Time vs. Temperature

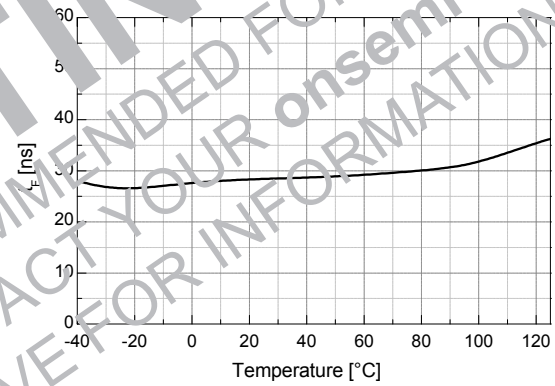


Figure 8. Turn-Off Fall Time vs. Temperature

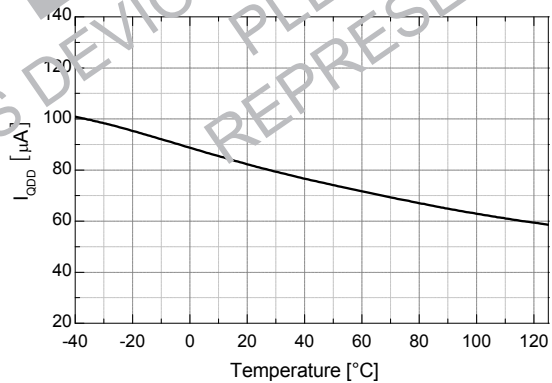


Figure 9. Quiescent V<sub>DD</sub> Supply Current vs. Temperature

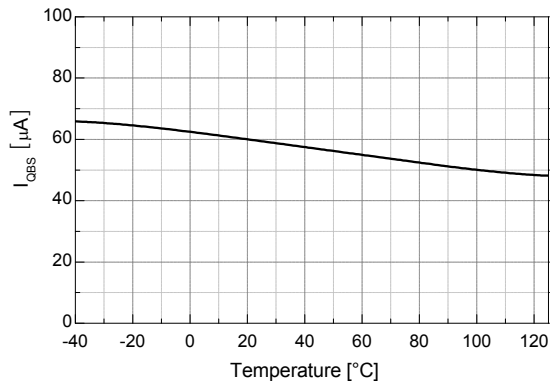


Figure 10. Quiescent V<sub>BS</sub> Supply Current vs. Temperature

Typical Characteristics (Continued)

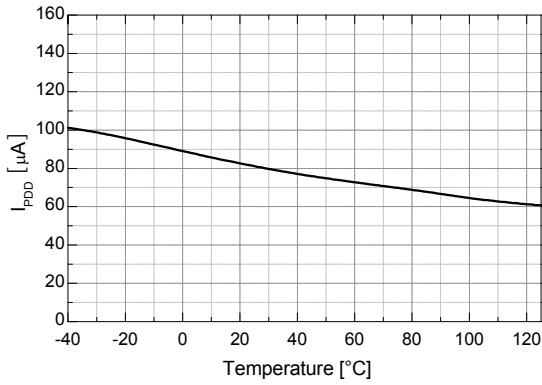


Figure 11. Operating  $V_{DD}$  Supply Current vs. Temperature

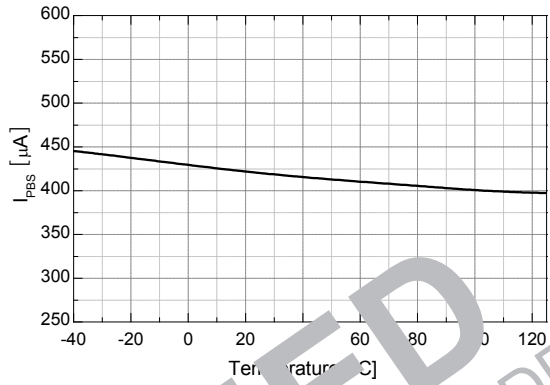


Figure 12. Operating  $V_{BS}$  Supply Current vs. Temperature

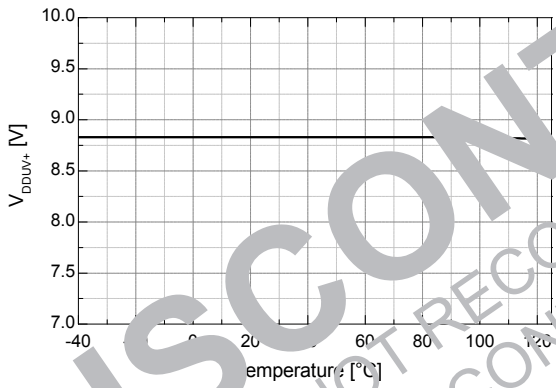


Figure 13.  $V_{DD}$  UVLO+ vs. Temperature

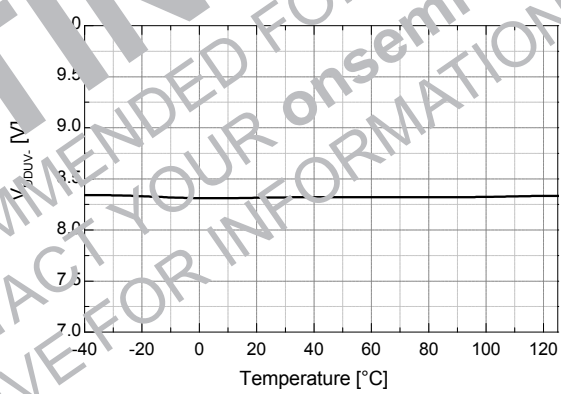


Figure 14.  $V_{DD}$  UVLO- vs. Temperature

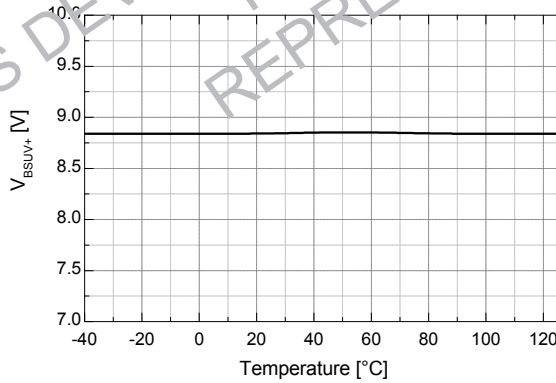


Figure 15.  $V_{BS}$  UVLO+ vs. Temperature

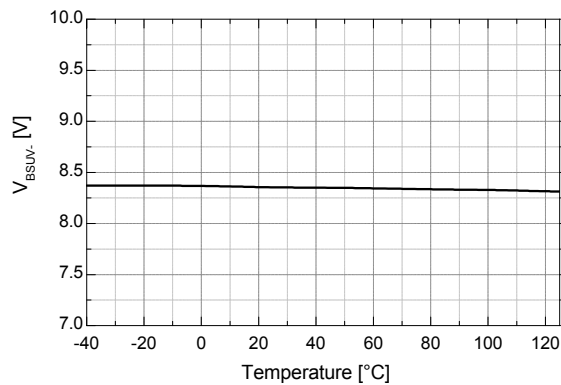


Figure 16.  $V_{BS}$  UVLO- vs. Temperature



Typical Characteristics (Continued)

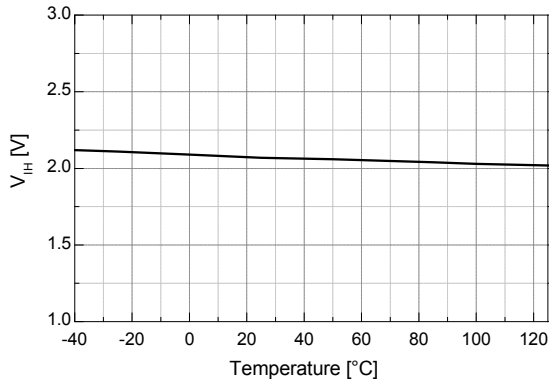


Figure 17. Logic HIGH Input Voltage vs. Temperature

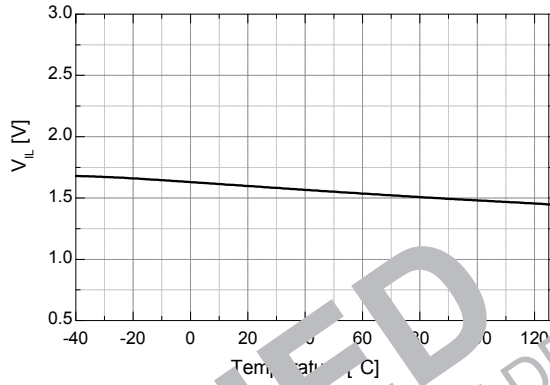


Figure 18. Logic LOW Input Voltage vs. Temperature

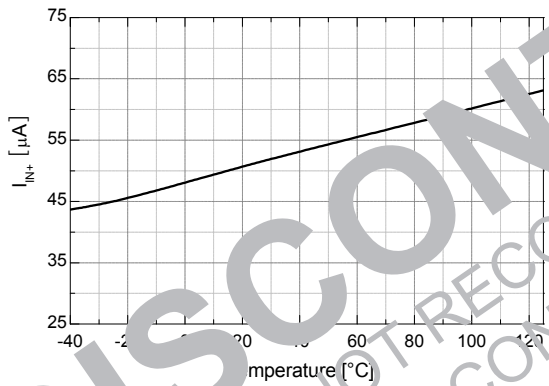


Figure 19. Logic HIGH Input Bias Current vs. Temperature

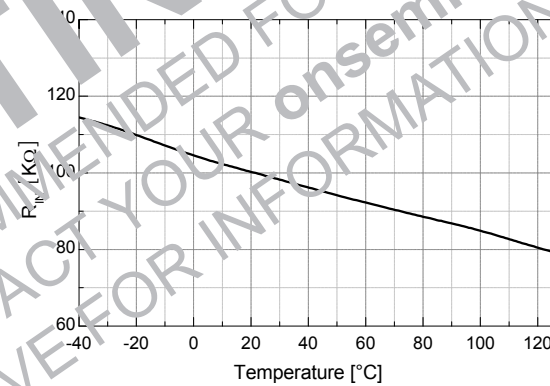


Figure 20. Input Pull-Down Resistance vs. Temperature

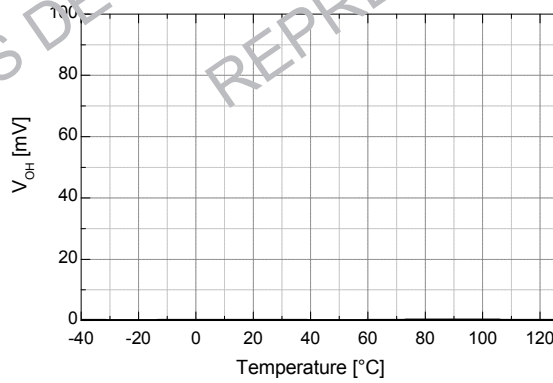


Figure 21. High-Level Output Voltage vs. Temperature

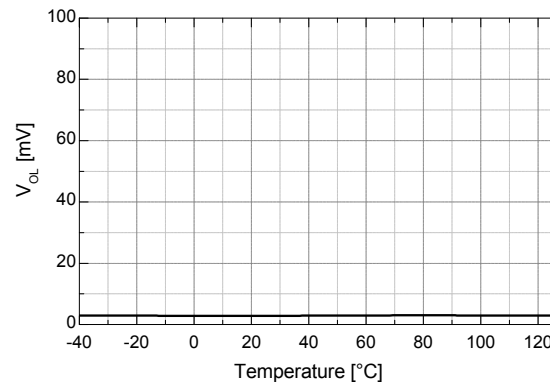


Figure 22. Low-Level Output Voltage vs. Temperature

Typical Characteristics (Continued)

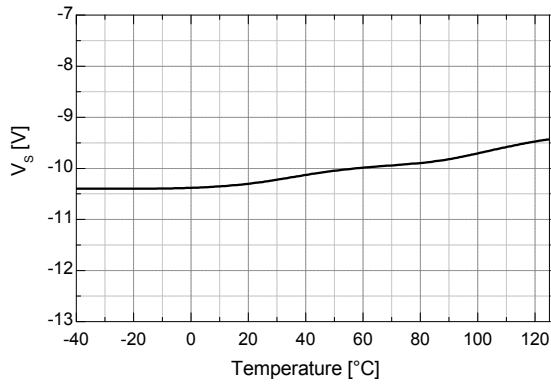


Figure 23. Allowable Negative  $V_S$  Voltage vs. Temperature

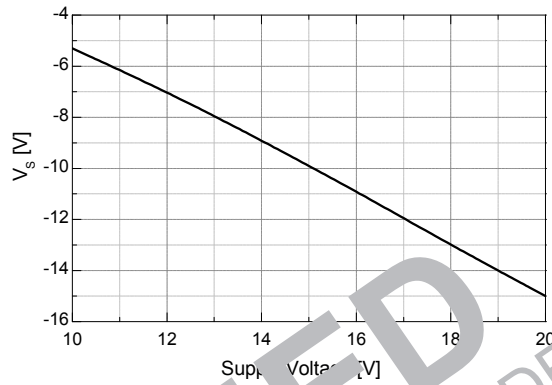


Figure 24. Allowable Negative  $V_S$  Voltage vs. Supply Voltage

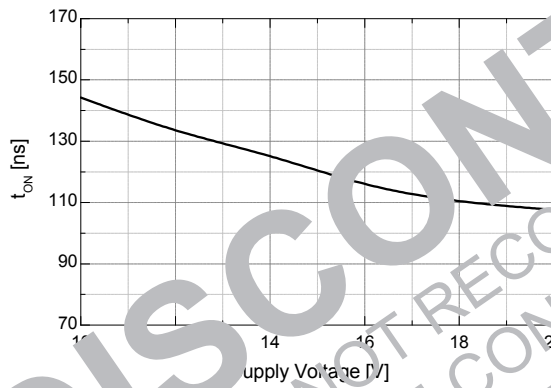


Figure 25. Turn-On Propagation Delay vs. Supply Voltage

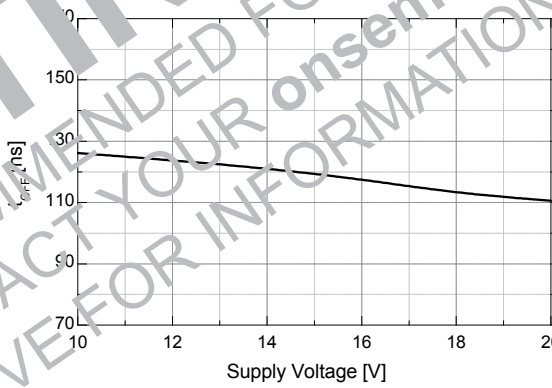


Figure 26. Turn-Off Propagation Delay vs. Supply Voltage

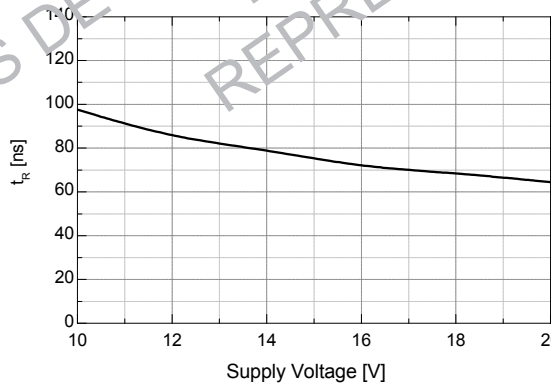


Figure 27. Turn-On Rise Time vs. Supply Voltage

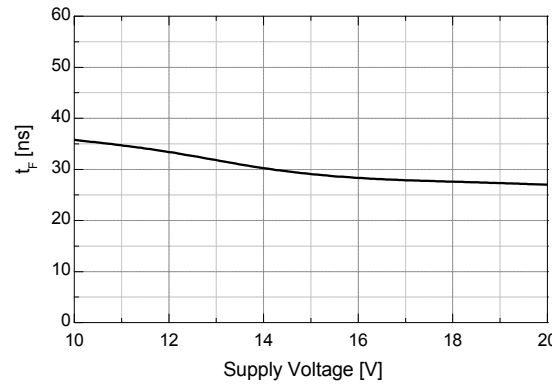


Figure 28. Turn-Off Fall Time vs. Supply Voltage

Typical Characteristics (Continued)

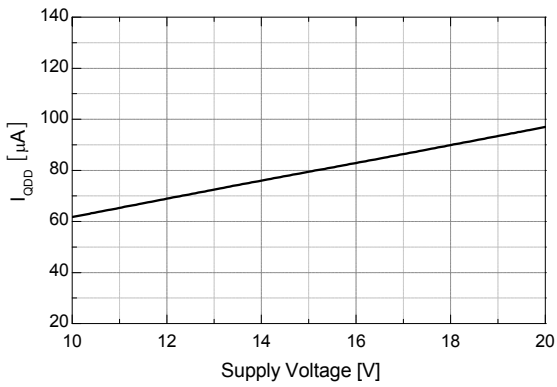


Figure 29. Quiescent  $V_{DD}$  Supply Current vs. Supply Voltage

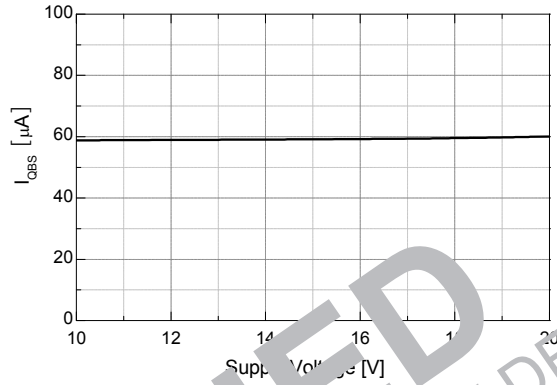


Figure 30. Quiescent  $V_{BS}$  Supply Current vs. Supply Voltage

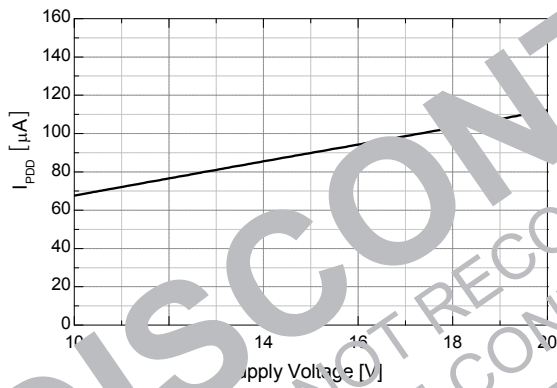


Figure 31. Operating  $V_{DD}$  Supply Current vs. Supply Voltage

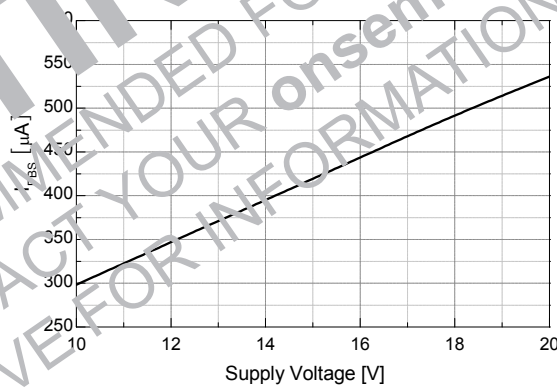


Figure 32. Operating  $V_{BS}$  Supply Current vs. Supply Voltage

### Switching Time Definitions

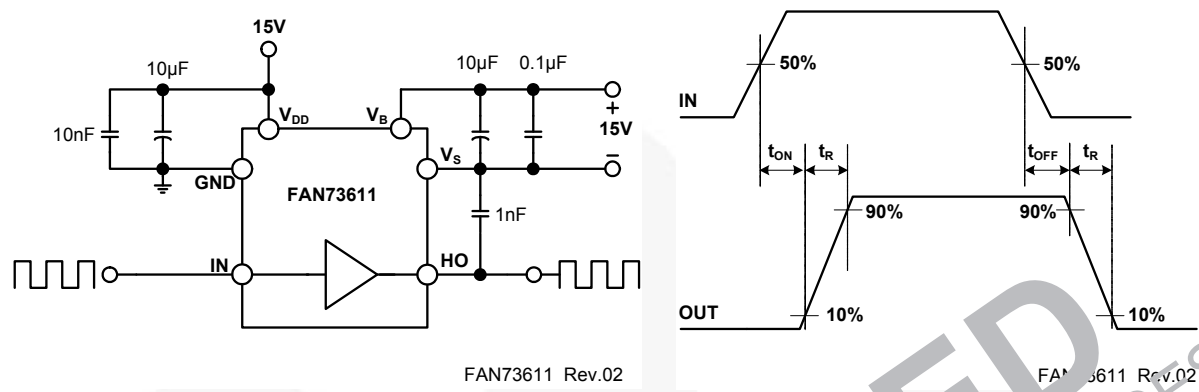


Figure 33. Switching Time Test Circuit and Waveform Definition

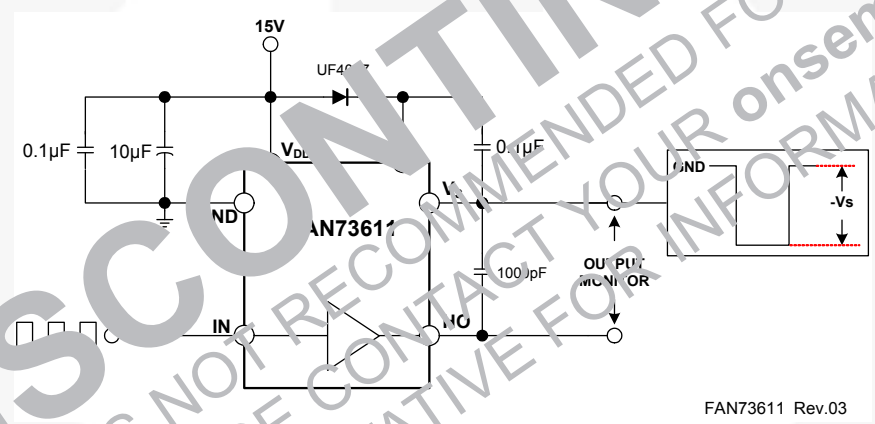
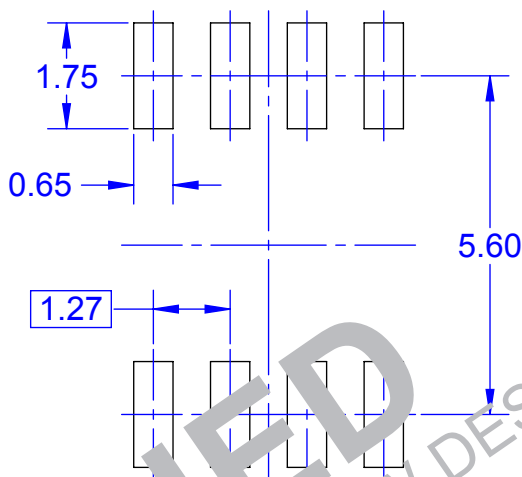


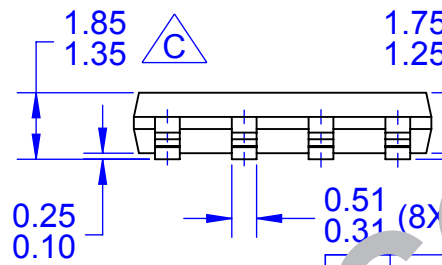
Figure 34. Floating Supply Voltage Transient Test



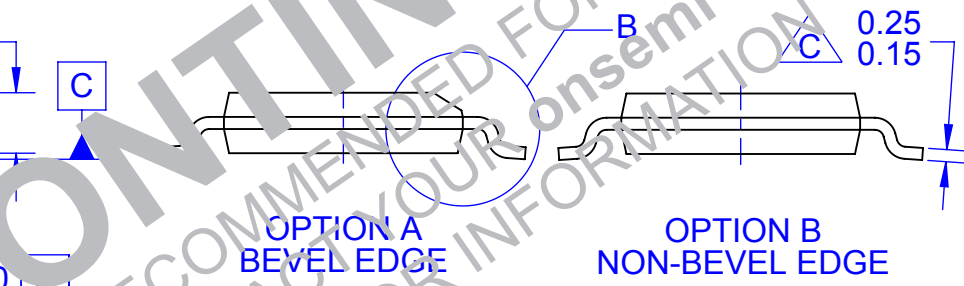
TOP VIEW



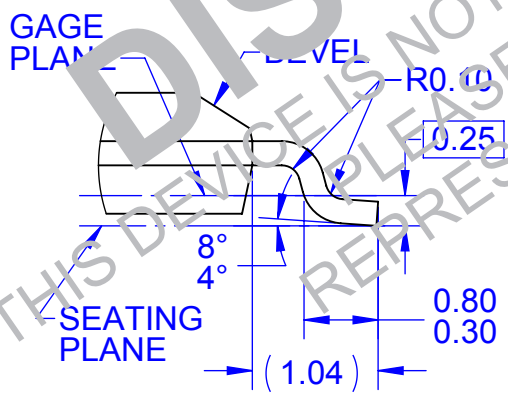
LAND PATTERN RECOMMENDATION



FRONT VIEW



SIDE VIEW




DETAIL "B"  
SCALE 2:1

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
- F. DRAWING FILENAME: MKT-M08Brev2



**DISCONTINUED**  
THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN  
PLEASE CONTACT YOUR onsemi  
REPRESENTATIVE FOR INFORMATION

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

#### PUBLICATION ORDERING INFORMATION

##### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910  
**Japan Customer Focus Center**  
Phone: 81-3-5817-1050

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>  
For additional information, please contact your local  
Sales Representative