FAIRCHILD SEMICONDUCTOR®

June 2009

FAN73711
High-Current, High-Side Gate Drive IC

Features

- Floating Channel for Bootstrap Operation to +600V
- 4A/4A Sourcing/Sinking Current Driving Capability
- Common-Mode dv/dt Noise Canceling Circuit
- 3.3V and 5V Input Logic Compatible
- Output In-phase with Input Signal
- Under-Voltage Lockout for V_{BS}
- Built-In Shunt Regulator on V_{DD} and V_{BS}
- 8-Lead Small Outline Package (SOP)

Applications

- High-Speed Gate Driver
- Sustain Switch Driver in PDP Application
- Energy Recovery Circuit Switch Driver in PDP Application
- High-Power Buck Converter
- Motor Drive Inverter

Description

The FAN73711 is a monolithic high-side gate drive IC that can drive high-speed MOSFETs and IGBTs operating up to +600V. It has a buffered output stage with all NMOS transistors designed for high pulse current driving capability and minimum cross-conduction.

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_S=-9.8V (typical) for V_{BS}=15V. The UVLO circuit prevents malfunction when V_{BS} is lower than the specified threshold voltage.

The high-current and low-output voltage drop feature makes this device suitable for sustain and energy-recovery circuit switches driver in the plasma display panel application, motor drive inverter, switching power supply, and high-power DC-DC converter applications.

8-SOP

Ordering Information

Part Number	Operating Temperature Range	Package	Eco Status	Packing Method
FAN73711M	40°C ~ 125°C	8-SOP	RoHS	Tube
FAN73711MX				Tape and Reel

For Fairchild's definition of Eco Status, please visit: http://www.fairchildsemi.com/company/green/rohs_green.html.

Typical Application Diagrams

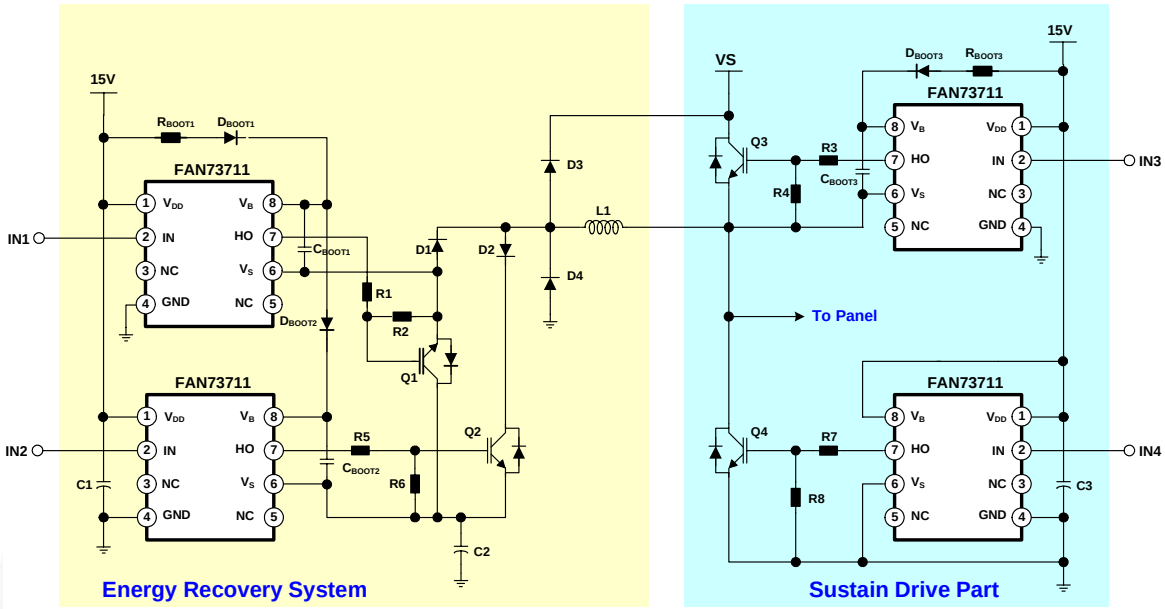

Figure 1. Floated Bi-Directional Switch and Half-Bridge Driver: PDP Application

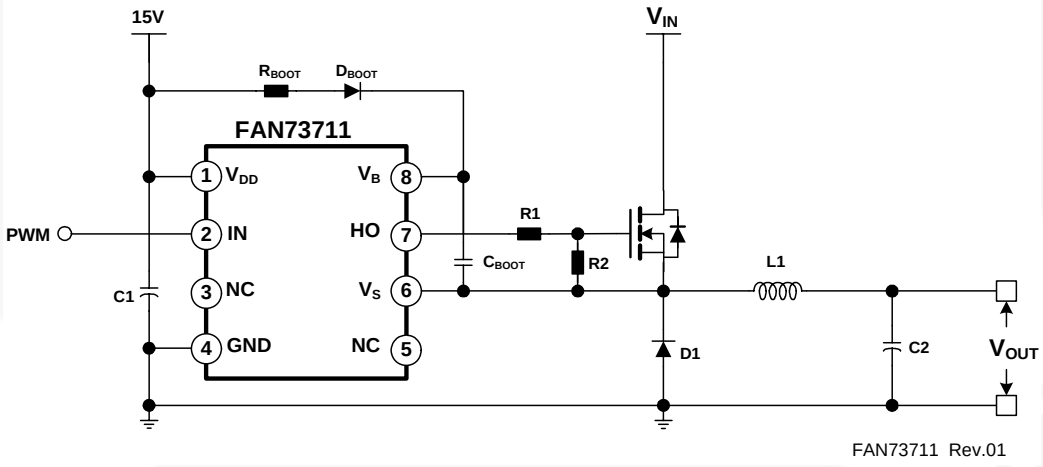

Figure 2. Step-Down (Buck) DC-DC Converter Application

Internal Block Diagram

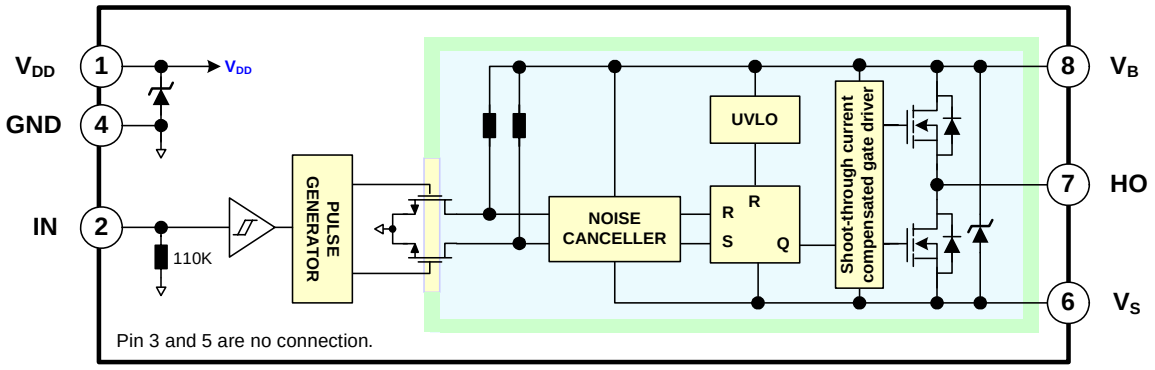

Figure 3. Functional Block Diagram

Pin Configuration

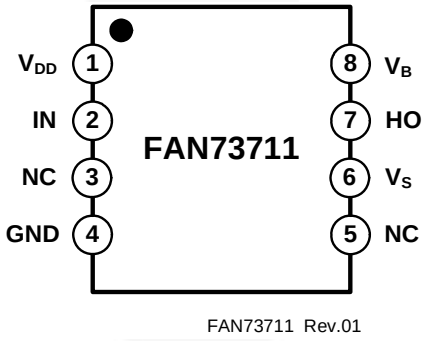

Figure 4. Pin Configuration (Top View)

Pin Definitions

Pin #	Name	Description
1	V_{DD}	Supply Voltage
2	IN	Logic Input for High-Side Gate Driver Output
3	NC	No Connection
4	GND	Ground
5	NC	No Connection
6	V_S	High-Voltage Floating Supply Return
7	HO	High-Side Driver Output
8	V_B	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°C unless otherwise specified.

Symbol	Characteristics	Min.	Max.	Unit
V_S	High-Side Floating Offset Voltage(1)	V_B-V_{SHUNT}	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(1)	-0.3	V_{SHUNT}	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(2, 3, 4)		0.625	W
θ_{JA}	Thermal Resistance		200	°C/W
T_J	Junction Temperature	-55	+150	°C
T_{STG}	Storage Temperature	-55	+150	°C

Notes:

1. This IC contains a shunt regulator on V_{DD} and V_{BS} . This supply pin should not be driven by a low-impedance voltage source greater than the V_{SHUNT} specified in the electrical characteristics section.
2. Mounted on 76.2 x 114.3 x 1.6mm PCB (FR-4 glass epoxy material).
3. Refer to the following standards:
   JESD51-2: Integral circuits thermal test method environmental conditions, natural convection, and
   JESD51-3: Low effective thermal conductivity test board for leaded surface-mount packages.
4. 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	°C

Electrical Characteristics

$V_{BIAS}(V_{DD}, V_{BS})$=15.0V, T_A = 25°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
Power Supply Section						
I_{QDD}	Quiescent V_{DD} Supply Current	V_{IN}=0V or 5V		25	70	µA
I_{PDD}	Operating V_{DD} Supply Current	f_{IN}=20KHz, No Load		35	100	µA
Bootstrapped Supply Section						
V_{BSUV+}	V_{BS} Supply Under-Voltage Positive-Going Threshold Voltage	V_{BS}=Sweep	8.0	9.0	10.0	V
V_{BSUV-}	V_{BS} Supply Under-Voltage Negative-Going Threshold Voltage	V_{BS}=Sweep	7.3	8.3	9.3	V
V_{BSHYS}	V_{BS} Supply Under-Voltage Lockout Hysteresis Voltage	V_{BS}=Sweep		0.7		V
I_{LK}	Offset Supply Leakage Current	V_B=V_S=625V			10	µA
I_{QBS}	Quiescent V_{BS} Supply Current	V_{IN}=0V or 5V		60	120	µA
I_{PBS}	Operating V_{BS} Supply Current	C_{LOAD}=1000pF, f_{IN}=20KHz, rms Value		470	800	µA
Shung Regulator Section						
V_{SHUNT}	V_{DD} and V_{BS} Shunt Regulator Clamping Voltage	V_{DD}=Sweep or V_{BS}=Sweep I_{SHUNT}=5mA	21	23	25	V
Input Logic Section						
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}=5V		40	65	µA
I_{IN-}	Logic Input Low Bias Current	V_{IN}=0V			2	µA
R_{IN}	Input Pull-Down Resistance		90	110		KΩ
Gate Driver Output Section						
V_{OH}	High Level Output Voltage (V_{BIAS} - V_O)	No Load			1.2	V
V_{OL}	Low Level Output Voltage	No Load			30	mV
I_{O+}	Output High, Short-Circuit Pulsed Current(5)	V_{HO}=0V, V_{IN}=5V, PW ≤10µs	3	4		A
I_{O-}	Output Low, Short-Circuit Pulsed Current(5)	V_{HO}=15V,V_{IN}=0V, PW ≤10µs	3	4		A
V_S	Allowable Negative V_S Pin Voltage for IN Signal Propagation to HO			-9.8	-7.0	V

Note:

5. These parameters guaranteed by design.

Dynamic Electrical Characteristics

V_{DD}=V_{BS}=15V, GND=0V, C_{LOAD}=1000pF, T_A=25°C, unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
t_{on}	Turn-On Propagation Delay Time	V_S=0V		150	210	ns
t_{off}	Turn-Off Propagation Delay Time	V_S=0V		150	210	ns
t_r	Turn-On Rise Time			25	50	ns
t_f	Turn-Off Fall Time			15	40	ns

Typical Characteristics

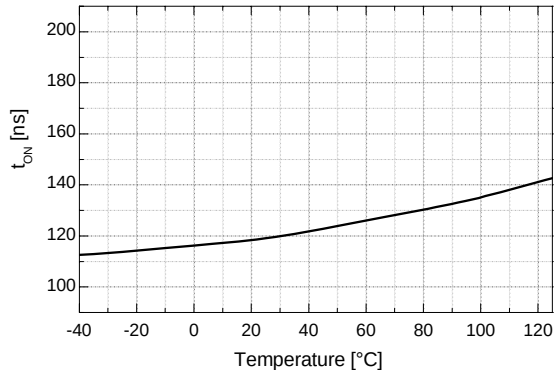

Figure 5. Turn-On Propagation Delay vs. Temperature

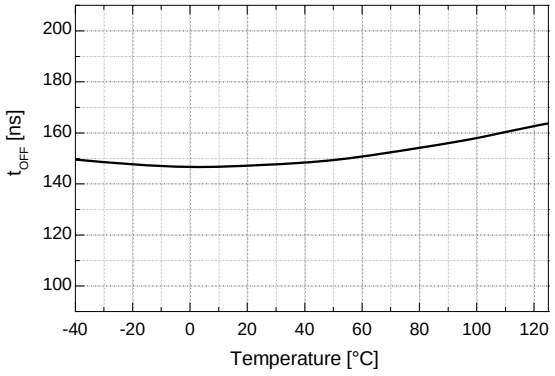

Figure 6. Turn-Off Propagation Delay vs. Temperature

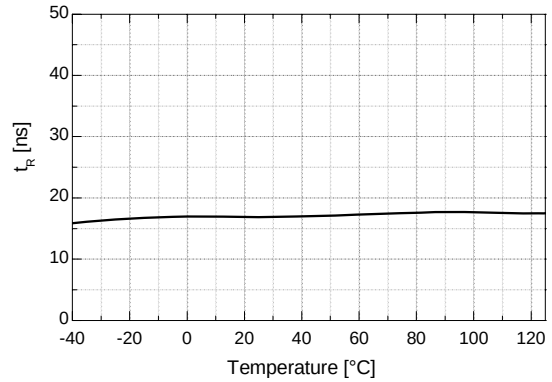

Figure 7. Turn-On Rise Time vs. Temperature

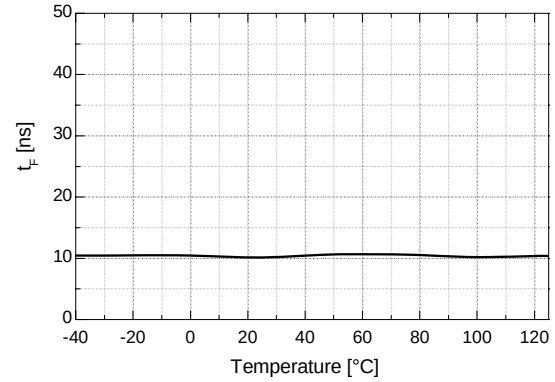

Figure 8. Turn-Off Fall Time vs. Temperature

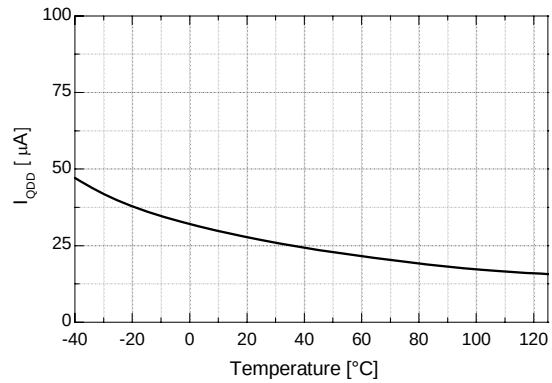

Figure 9. Quiescent V_{DD} Supply Current vs. Temperature

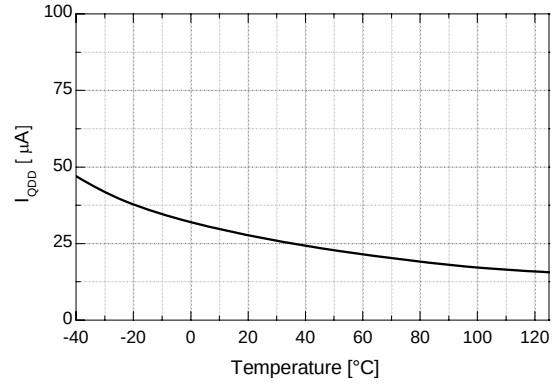

Figure 10. Quiescent V_{BS} Supply Current vs. Temperature

Typical Characteristics (Continued)

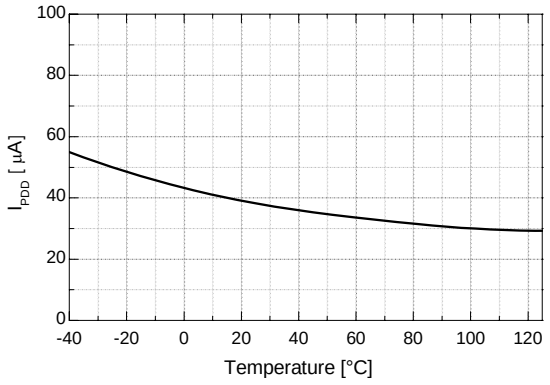

Figure 11. Operating V_{DD} Supply Current vs. Temperature

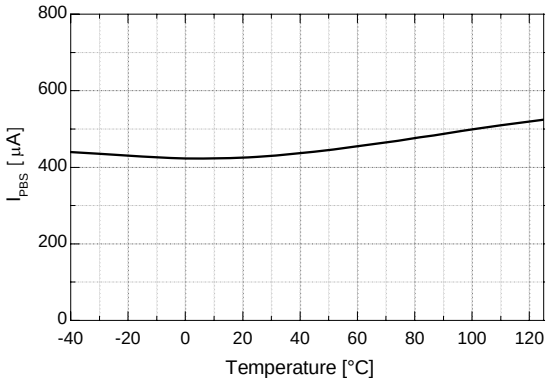

Figure 12. Operating V_{BS} Supply Current vs. Temperature

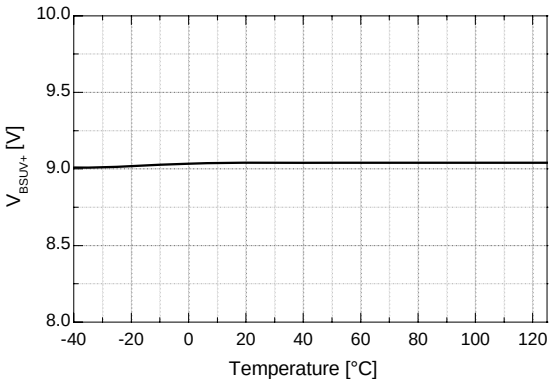

Figure 13. V_{BS} UVLO+ vs. Temperature

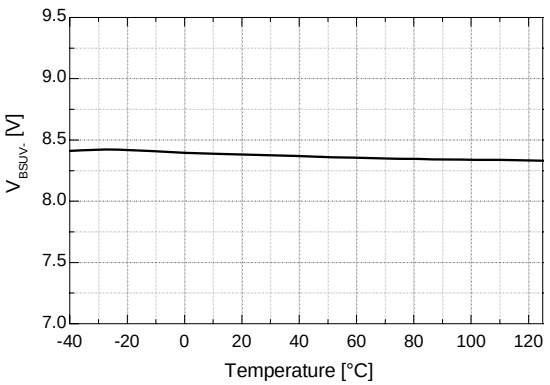

Figure 14. V_{BS} UVLO- vs. Temperature

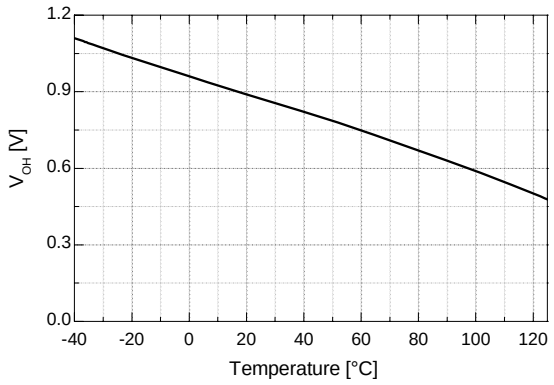

Figure 15. High-Level Output Voltage vs. Temperature

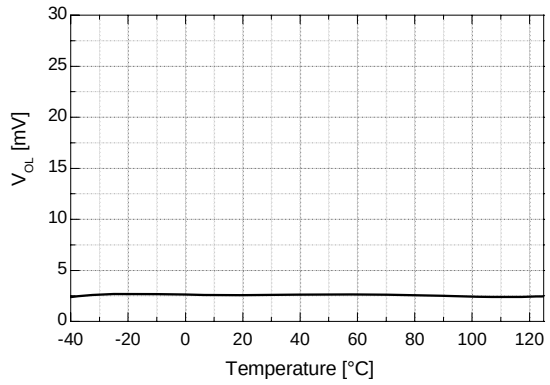

Figure 16. Low-Level Output Voltage vs. Temperature

Typical Characteristics (Continued)

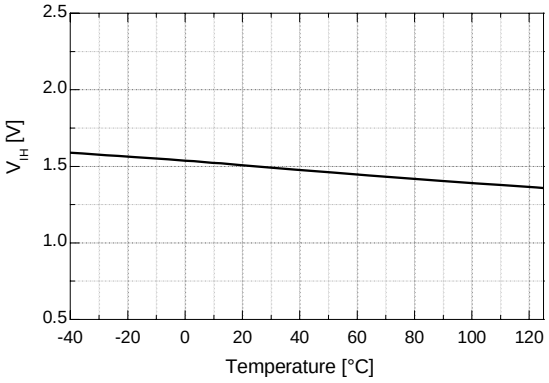

Figure 17. Logic High Input Voltage vs. Temperature

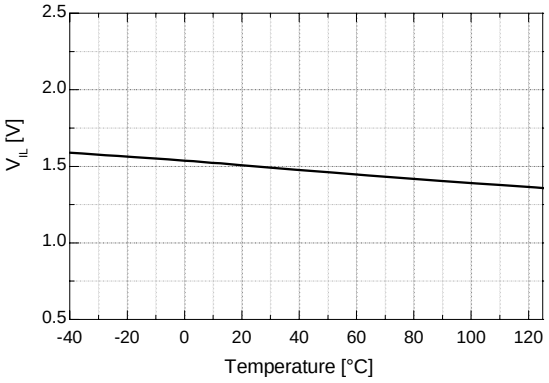

Figure 18. Logic Low Input Voltage vs. Temperature

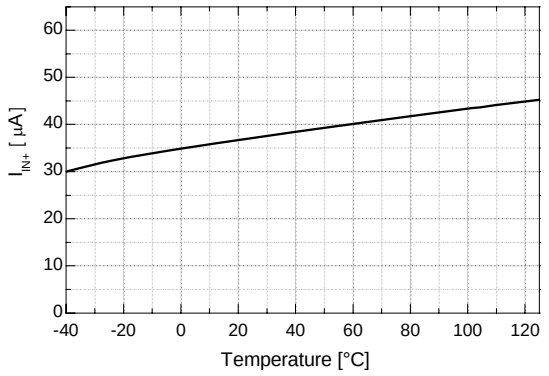

Figure 19. Logic Input High Bias Current vs. Temperature

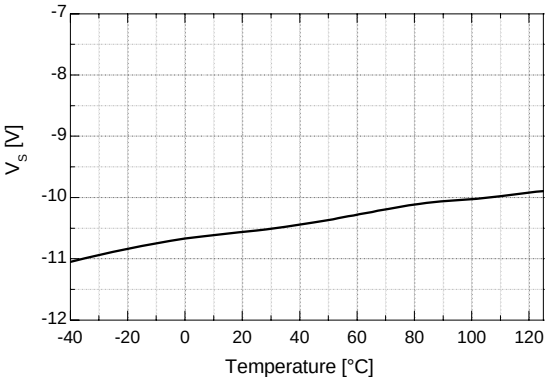

Figure 20. Allowable Negative V_S Voltage vs. Temperature

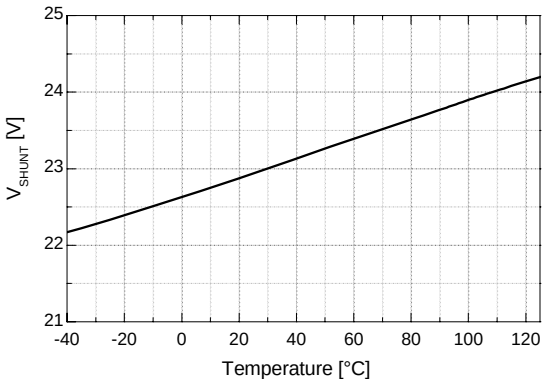

Figure 21. Shunt Regulator Clamping Voltage vs. Temperature

Switching Time Definitions

Timing Diagram

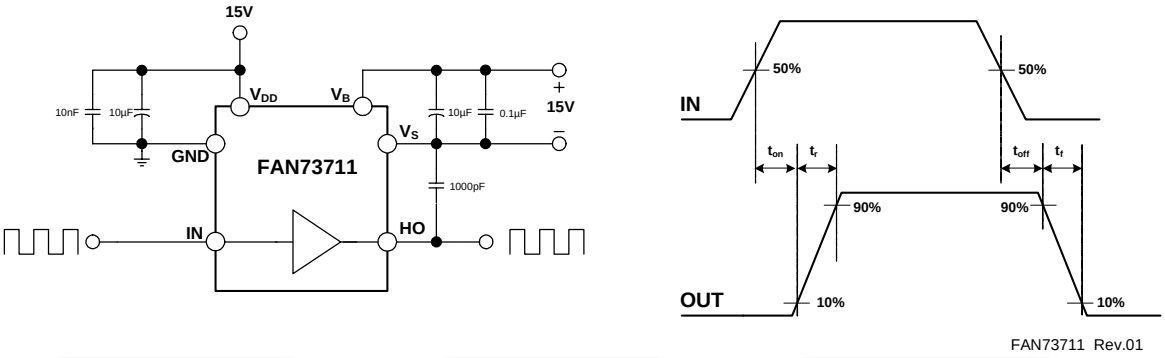

Figure 22. Switching Time Test Circuit and Waveform Definitions

Package Dimensions

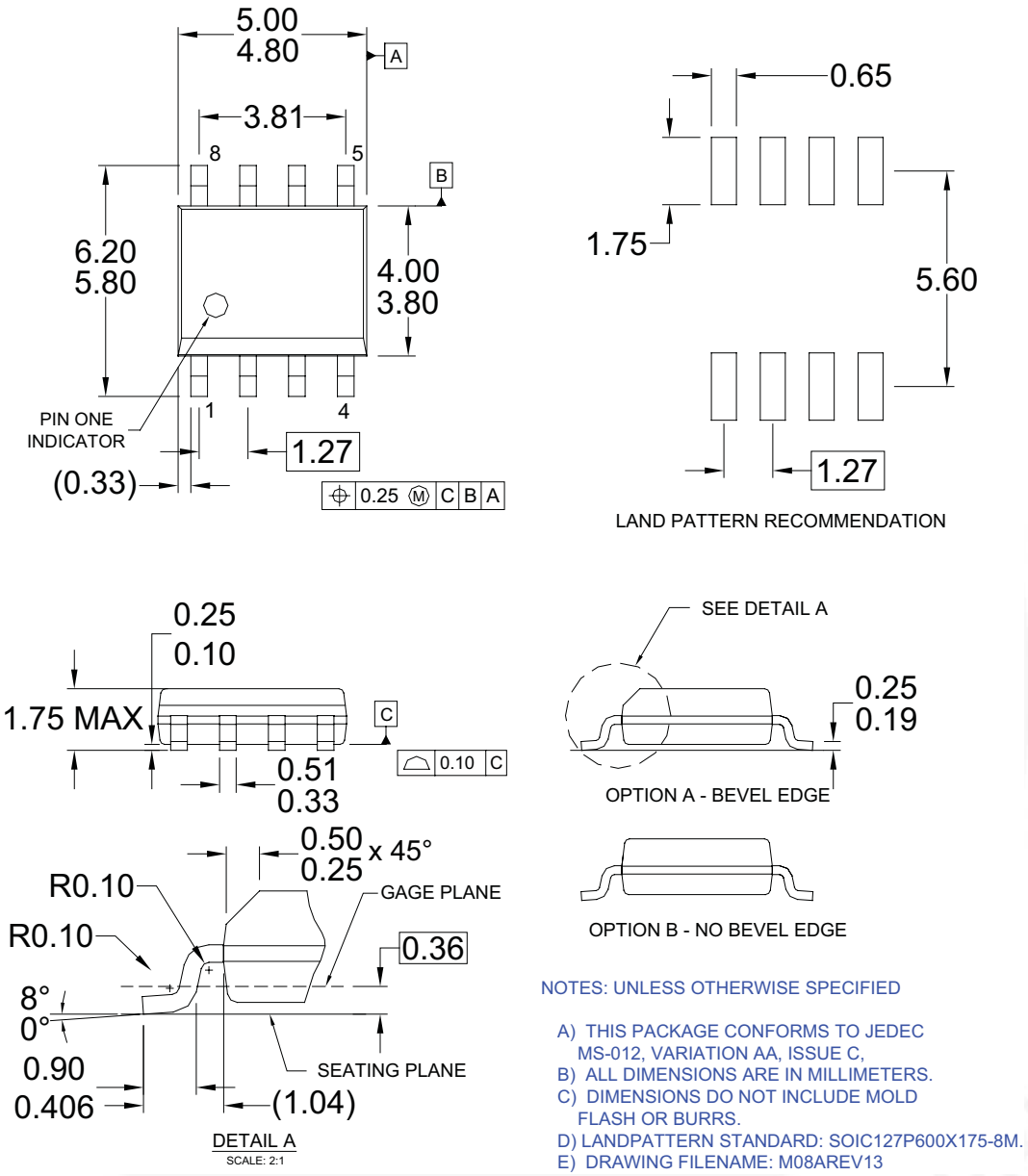

Figure 23. 8-Lead Small Outline Package (SOP)

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