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FAIRCHILD SEMICONDUCTOR®

September 2013

FAN73901
High- and Low-Side, Gate-Drive IC

Features

- Floating Channels for Bootstrap Operation to +600 V
- Typically 2.5 A / 2.5 A Sourcing/Sinking Current Driving Capability
- Common-Mode dv/dt Noise Canceling Circuit
- Built-in Under-Voltage Lockout for Both Channels
- Matched Propagation Delay for Both Channels
- 3.3 V and 5 V Input Logic Compatible
- Output In-Phase with Input

Applications

- Half-Bridge Driver
- HID Lamp Ballast
- SMPS
- Motor Driver

Description

The FAN73901 is a monolithic high- and low-side gate-drive IC, which can drive high-speed MOSFETs and IGBTs that operate up to +600 V. 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 circum-stances. An advanced level-shift circuit offers high-side gate driver operation up to V_S=-9.8 V (typical) for V_{BS}=15 V.

The UVLO circuit prevents malfunction when V_{DD} and V_{BS} are lower than the specified threshold voltage.

The high current and low output voltage drop features mak sFAN73901 suitable for switching power supply, motor driver, and high-power DC-DC converter applications.

8-SOP

Ordering Information

Part Number	Package	Operating Temperature Range	Packing Method
FAN73901M	8-SOP	-40°C ~ 125°C	Tube
FAN73901MX			Tape & Reel

Typical Application Circuit

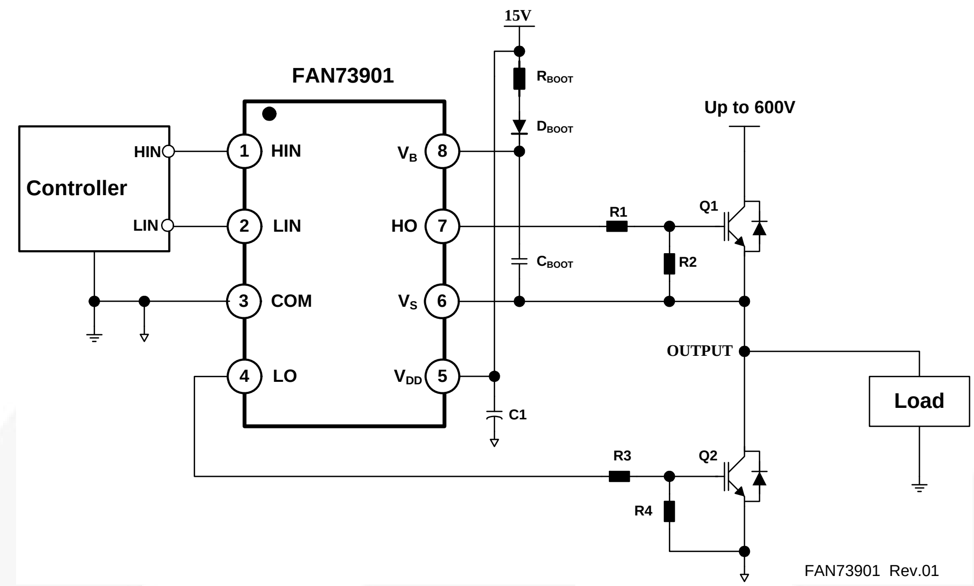


Figure 1. Application Circuit for Half-Bridge

Internal Block Diagram

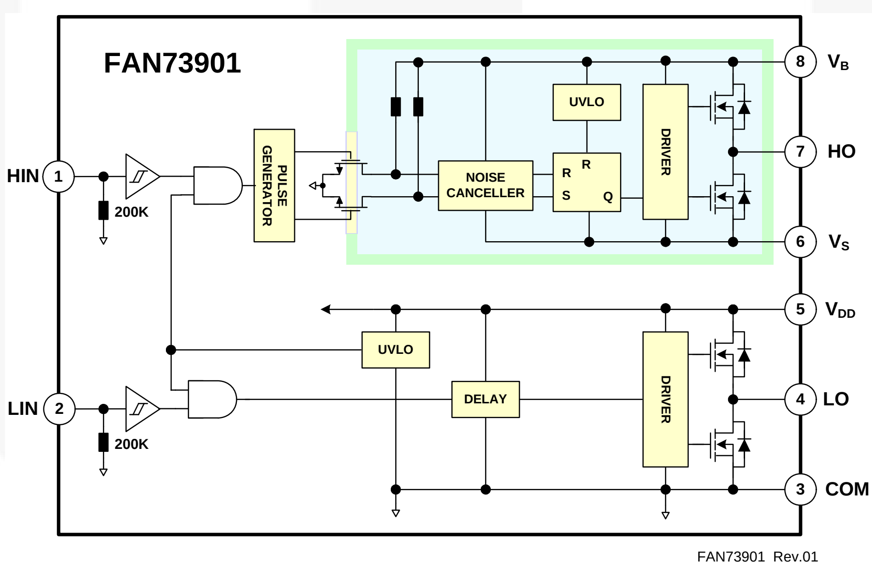
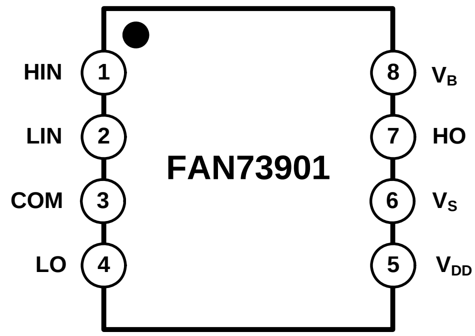


Figure 2. Functional Block Diagram

Pin Configuration



FAN73901 Rev.01

Figure 3. Pin Assignments (Top View)

Pin Definitions

Pin #	Name	Description
1	HIN	Logic Input for High-Side Gate Driver Output
2	LIN	Logic Input for Low-Side Gate Driver Output
3	COM	Low-Side Driver Return
4	LO	Low-Side Driver Output
5	V_{DD}	Low-Side and Logic Part Supply Voltage
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 Supply 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 HO	V_S-0.3	V_B+0.3	V
V_{DD}	Low-Side and Logic Fixed Supply Voltage	-0.3	25.0	V
V_{LO}	Low-Side Output Voltage LO	-0.3	V_{DD}+0.3	V
V_{IN}	Logic Input Voltage (HIN and LIN)	-0.3	V_{DD}+0.3	V
dV_S/dt	Allowable Offset Voltage Slew Rate		50	V/ns
P_D	Power Dissipation(1)(2)(3)		0.625	W
θ_{JA}	Thermal Resistance, Junction-to-Ambient		200	°C/W
T_J	Junction Temperature		+150	°C
T_{STG}	Storage Temperature		+150	°C

Notes:

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_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_{DD}	Low-Side and Logic Supply Voltage	10	20	V
V_{LO}	Low-Side Output Voltage	COM	V_{DD}	V
V_{IN}	Logic Input Voltage (HIN and LIN)	COM	V_{DD}	V
T_A	Operating Ambient Temperature	-40	+125	°C

Electrical Characteristics

V_{BIAS} (V_{DD}, V_{BS})=15.0 V, V_S=COM, T_A=25°C, unless otherwise specified. The V_{IL}, V_{IH}, and I_{IN} parameters are referenced to COM and are applicable to the respective input signals HIN and LIN. The V_O and I_O parameters are referenced to COM and V_S is applicable to the respective output signals HO and LO.

Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
POWER SUPPLY SECTION (V_{DD} AND V_{BS})						
V_{DDUV+} V_{BSUV+}	V_{DD} and V_{BS} Supply Under-Voltage Positive-Going Threshold		8.0	8.8	9.8	V
V_{DDUV-} V_{BSUV-}	V_{DD} and V_{BS} Supply Under-Voltage Negative-Going Threshold		7.4	8.3	9.0	V
V_{DDUVH} V_{BSUVH}	V_{DD} and V_{BS} Supply Under-Voltage Lockout Hysteresis Voltage			0.5		V
I_{LK}	Offset Supply Leakage Current	V_B=V_S=600 V			50	µA
I_{QBS}	Quiescent V_{BS} Supply Current	V_{IN}=0V or 5 V		45	80	µA
I_{QDD}	Quiescent V_{DD} Supply Current	V_{IN}=0V or 5 V		75	110	µA
I_{PBS}	Operating V_{BS} Supply Current	f_{IN}=20 kHz, rms value		530	640	µA
I_{PDD}	Operating V_{DD} Supply Current	f_{IN}=20 kHz, rms value		530	640	µA
LOGIC INPUT SECTION (HIN, LIN)						
V_{IH}	Logic "1" Input Voltage		2.5			V
V_{IL}	Logic "0" Input Voltage				1.2	V
I_{IN+}	Logic "1" Input Bias Current	V_{IN}=5 V		25	50	µA
I_{IN-}	Logic "0" Input Bias Current	V_{IN}=0 V		1.0	2.0	µA
R_{IN}	Input Pull-Down Resistance		100	200		KΩ
GATE DRIVER OUTPUT SECTION (HO, LO)						
V_{OH}	High-Level Output Voltage, V_{BIAS}-V_O	No Load			1.0	V
V_{OL}	Low-Level Output Voltage, V_O	No Load			35	mV
I_{O+}	Output High, Short-Circuit Pulsed Current(4)	V_O=0 V, V_{IN}=5 V with PW<10 µs	1.8	2.5		A
I_{O-}	Output Low, Short-Circuit Pulsed Current(4)	V_O=15 V, V_{IN}=0 V with PW<10 µs	1.8	2.5		A
V_S	Allowable Negative V_S Pin Voltage for HIN Signal Propagation to HO			-9.8	-7.0	V

Note:

4. This parameter guaranteed by design.

Dynamic Electrical Characteristics

V_{BIAS} (V_{DD}, V_{BS})=15.0 V, V_S=COM=0 V, C_L=1000 pF and T_A=25°C unless otherwise specified.

Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
t_{on}	Turn-on Propagation Delay	V_S=0 V		140	200	ns
t_{off}	Turn-off Propagation Delay	V_S=0 V		140	200	ns
MT	Delay Matching, HS & LS Turn-on/off			0	50	ns
t_r	Turn-on Rise Time			25	50	ns
t_f	Turn-off Fall Time			20	45	ns

Typical Characteristics

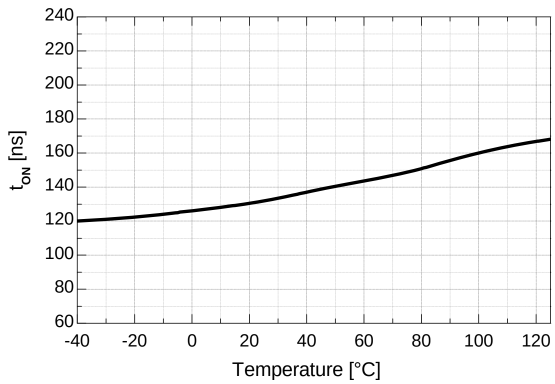


Figure 4. Turn-on Propagation Delay vs. Temperature

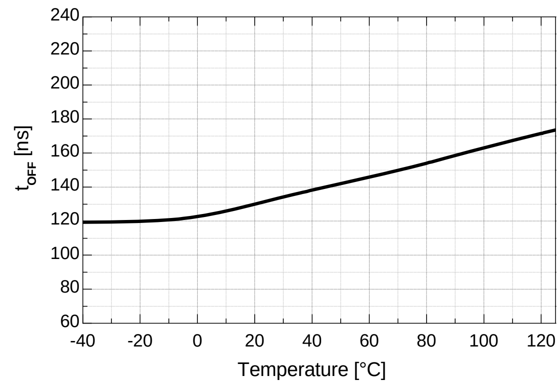


Figure 5. Turn-off Propagation Delay vs. Temperature

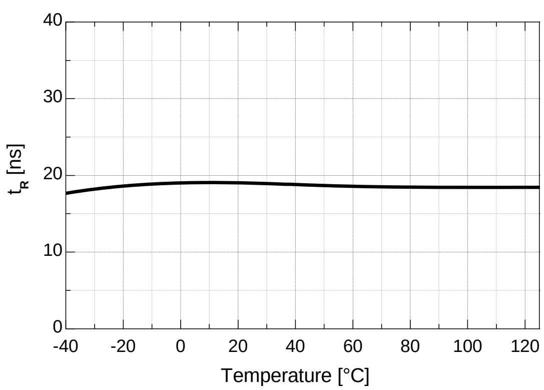


Figure 6. Turn-on Rise Time vs. Temperature

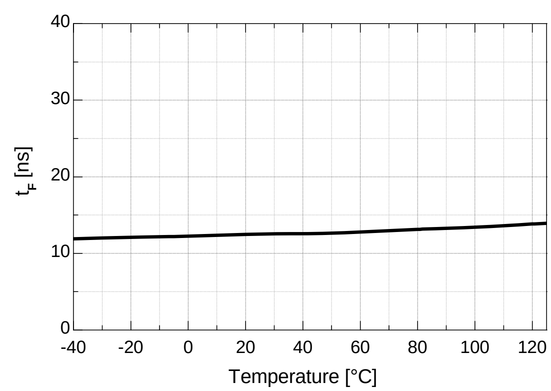


Figure 7. Turn-off Fall Time vs. Temperature

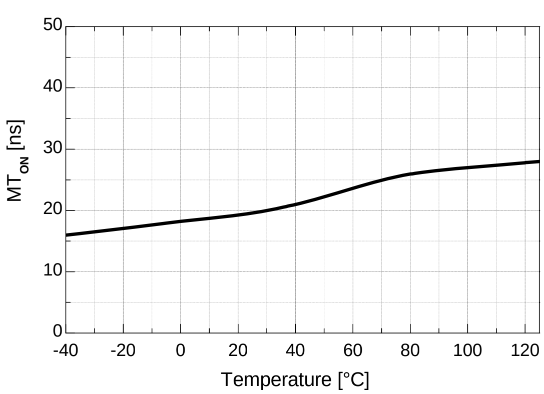


Figure 8. Turn-on Delay Matching vs. Temperature

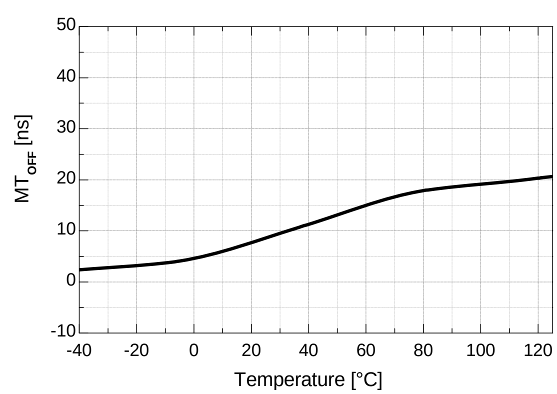


Figure 9. Turn-off Delay Matching vs. Temperature

Typical Characteristics (Continued)

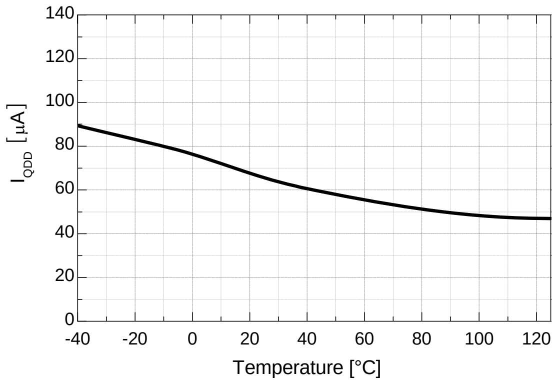


Figure 10. Quiescent V_{DD} Supply Current vs. Temperature

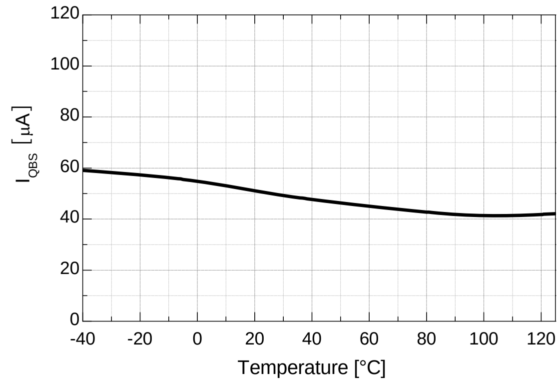


Figure 11. Quiescent V_{BS} Supply Current vs. Temperature

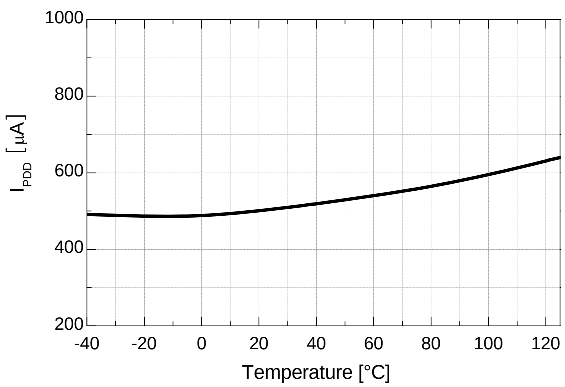


Figure 12. Operating V_{DD} Supply Current vs. Temperature

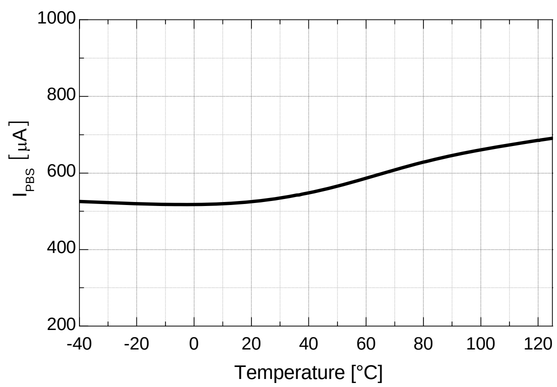


Figure 13. Operating V_{BS} Supply Current vs. Temperature

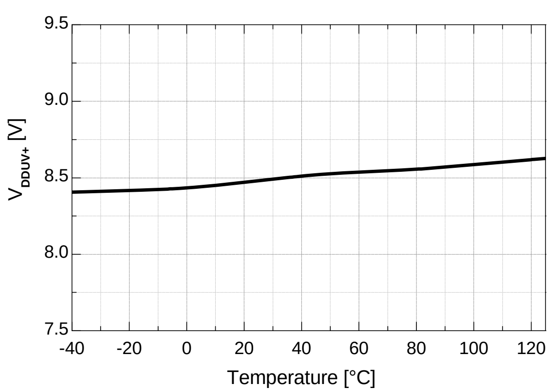


Figure 14. V_{DD} UVLO+ vs. Temperature

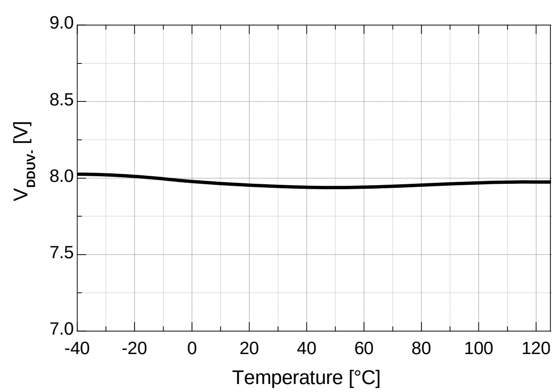


Figure 15. V_{DD} UVLO- vs. Temperature

Typical Characteristics (Continued)

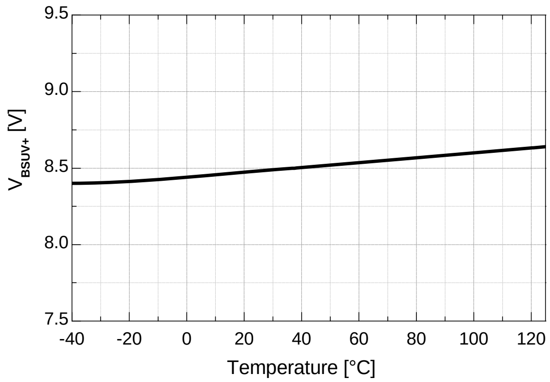


Figure 16. V_{BS} UVLO+ vs. Temperature

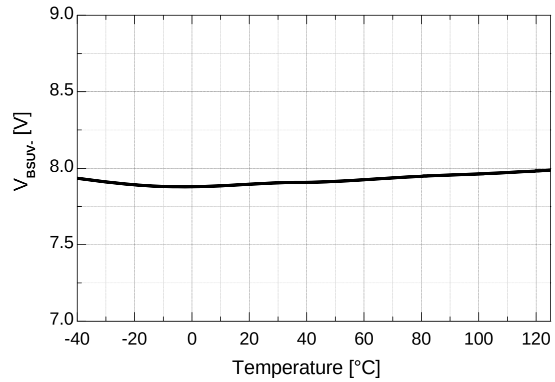


Figure 17. V_{BS} UVLO- vs. Temperature

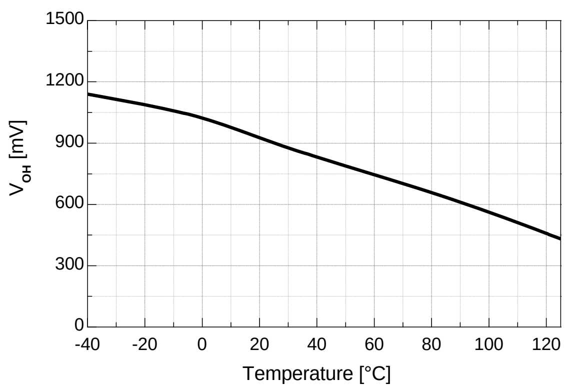


Figure 18. High-Level Output Voltage vs. Temperature

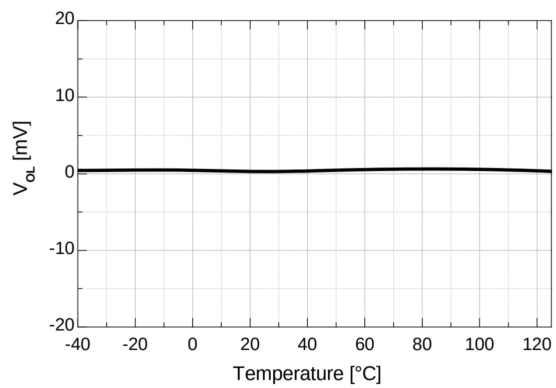


Figure 19. Low-Level Output Voltage vs. Temperature

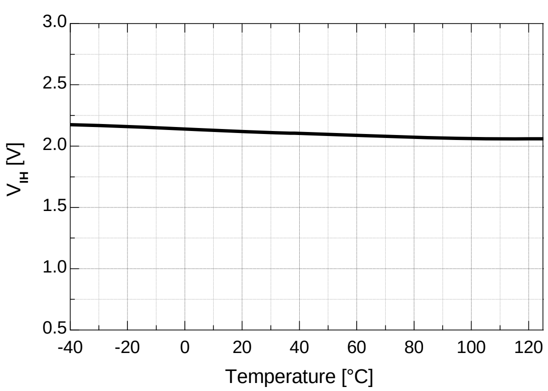


Figure 20. Logic High Input Voltage vs. Temperature

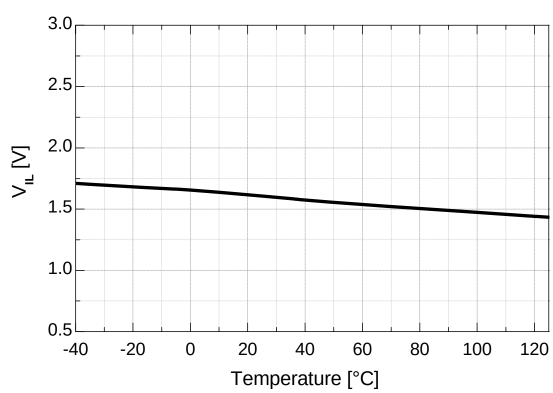


Figure 21. Logic Low Input Voltage vs. Temperature

Typical Characteristics (Continued)

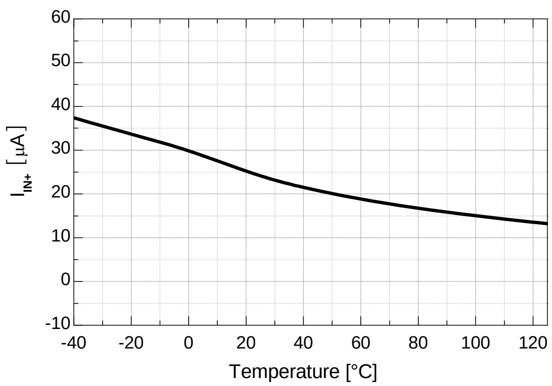


Figure 22. Logic Input High Bias Current vs. Temperature

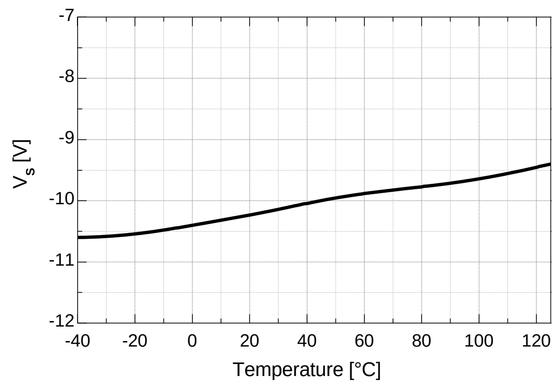


Figure 23. Allowable Negative V_S Voltage vs. Temperature

Switching Time Definitions

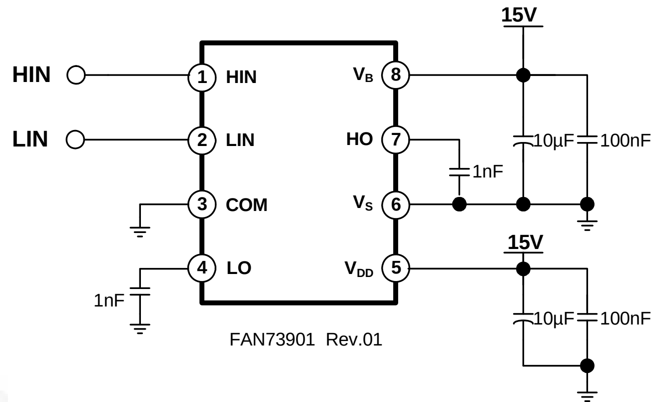


Figure 24. Switching Time Test Circuit

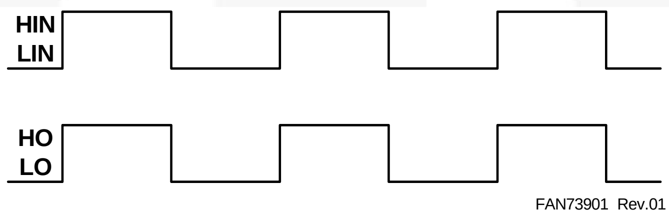


Figure 25. Input / Output Timing Diagram

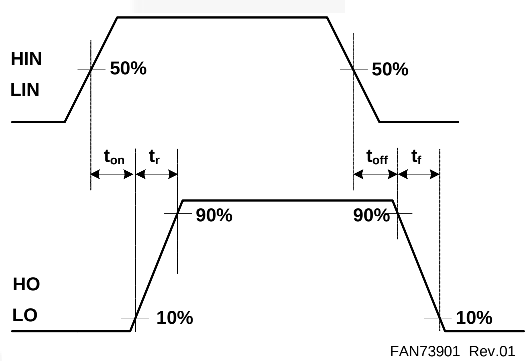


Figure 26. Switching Time Waveform Definitions

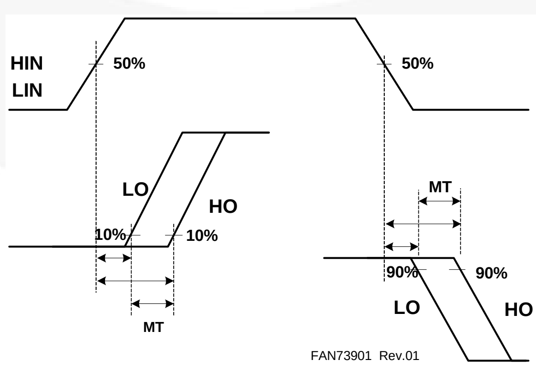


Figure 27. Delay Matching Waveform Definitions

Mechanical Dimensions

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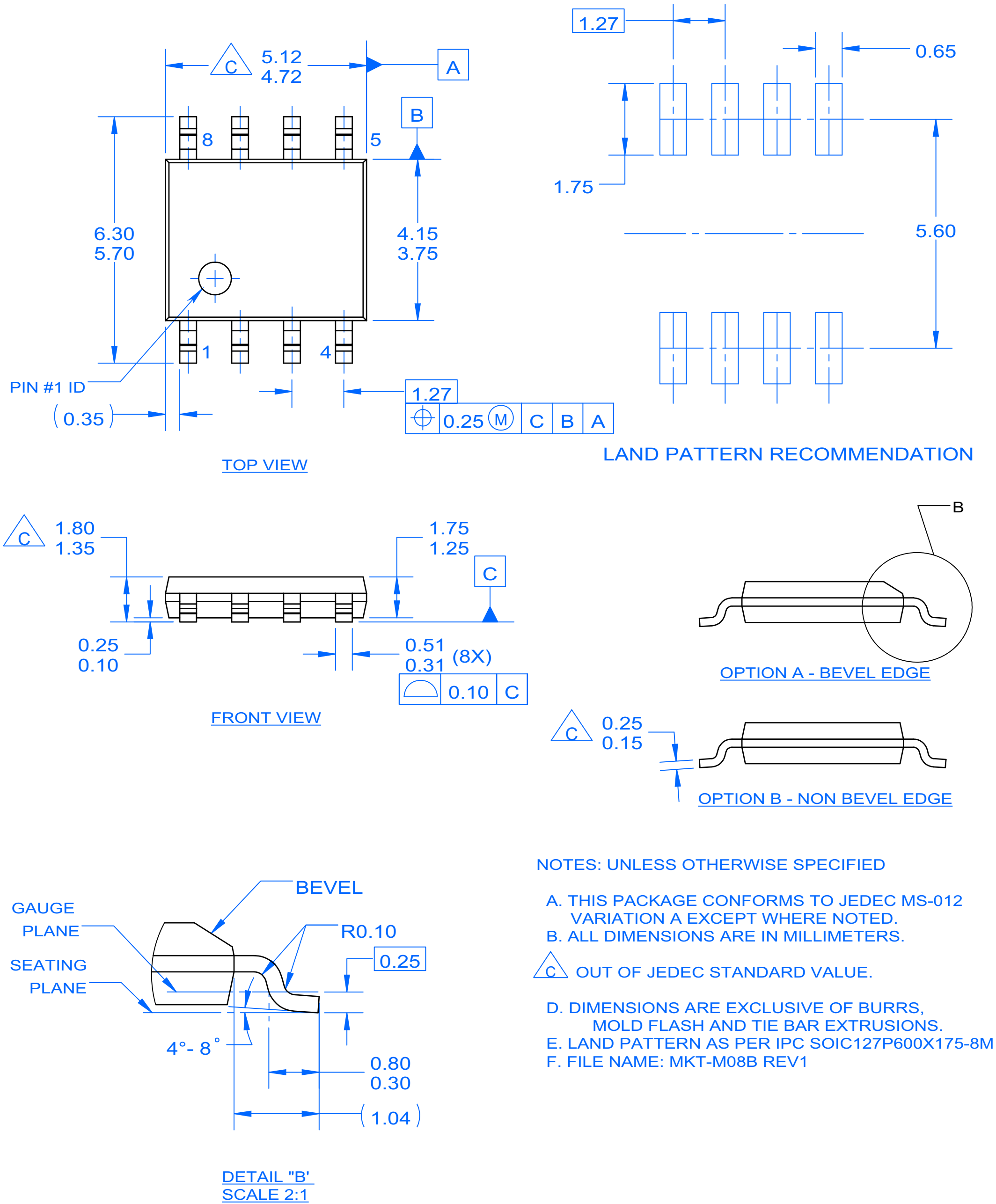

Figure 28. 8-Lead Small Outline Package (SOP)

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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I66

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OCEAN CHIPS
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- Поставка сложных, дефицитных, либо снятых с производства позиций;
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- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения **«JONHON»**, а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов **«FORSTAR»**.

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

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