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FAIRCHILD SEMICONDUCTOR®

2024 年 5 月

FAN7371
大电流高侧栅极驱动 IC

特性

- 浮动通道可实现高达 +600V 的自举运行
- 4 A/4 A 源电流 / 灌电流驱动能力
- 共模 dv/dt 噪声消除电路
- 兼容 3.3V 和 5V 逻辑输入电平
- 输出信号与输入信号同相位
- V_{BS} 欠压锁定
- V_{DD} 和 V_{BS} 上有 25 V 的 电压调节器
- 8- 引脚小尺寸封装 (SOP)

应用

- 高速栅极驱动器
- PDP 应用中的维持放电开关驱动器
- PDP 应用中的能量恢复电路开关驱动器
- 高功率降压转换器
- 电机驱动变频器

说明

FAN7371 是单片高侧栅极驱动器 IC，可以驱动工作电压最高达 +600V 的高速 MOSFET 和 IGBT。它具有缓冲输出级，且所有 NMOS 晶体管设计为具有高脉冲电流驱动能力和最低交叠导通。

飞兆的高压流程和共模噪声消除技术可使高端驱动器在高 dv/dt 噪声环境下稳定运行。先进的电平转换电路允许高侧栅极驱动器的偏置电压达到 V_S= -9.8 V （V_{BS}= 15 V 时的典型值）。

UVLO 电路可防止 V_{BS} 低于指定的阈值电压时发生故障。

大电流和低输出压降功能使得此器件适合作为等离子显示面板应用中的维持开关驱动器和能量恢复电路驱动器、电机驱动变频器、开关电源和大功率 DC-DC 转换器应用。

8-SOP

订购信息

器件编号	封装	工作温度范围	Eco 标志	包装方法
FAN7371M(1)	8-SOP	-40°C ~ 125°C	RoHS	塑料管
FAN7371MX(1)				卷带和卷盘

注：

1. 这些器件通过了 JESD22A-111 波峰焊测试。

对于飞兆公司的生态标志定义，请访问：*http://www.fairchildsemi.com/company/green/rohs_green.html*。

应用电路图

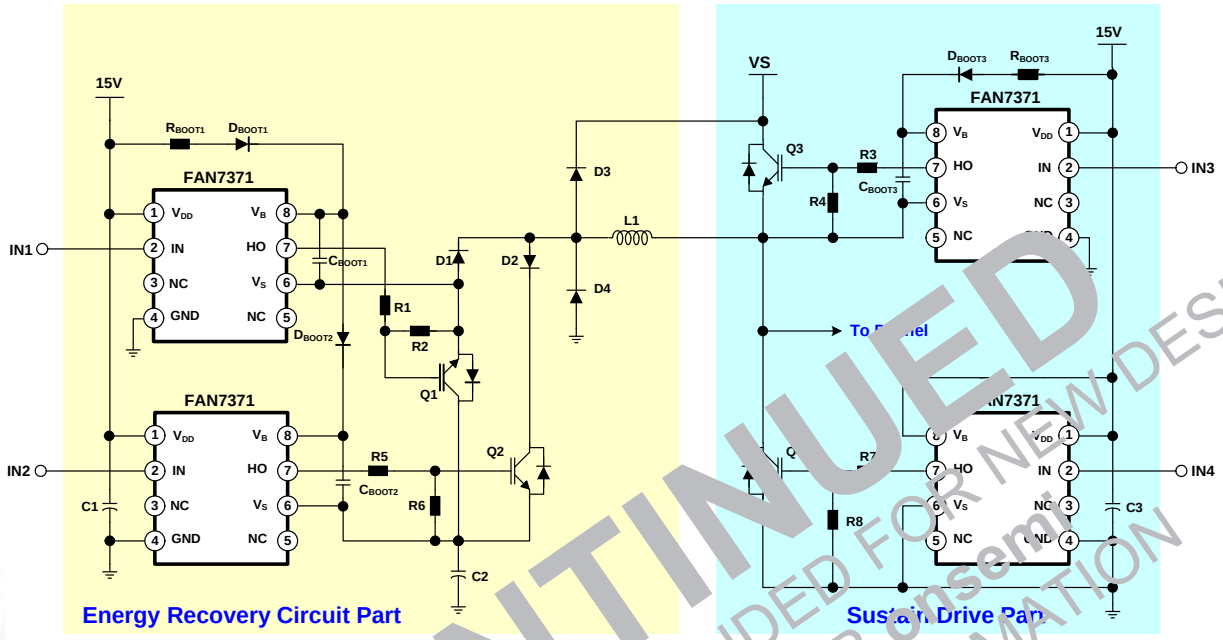

图 1. 自动方向开关和半桥驱动器：PDP 应用

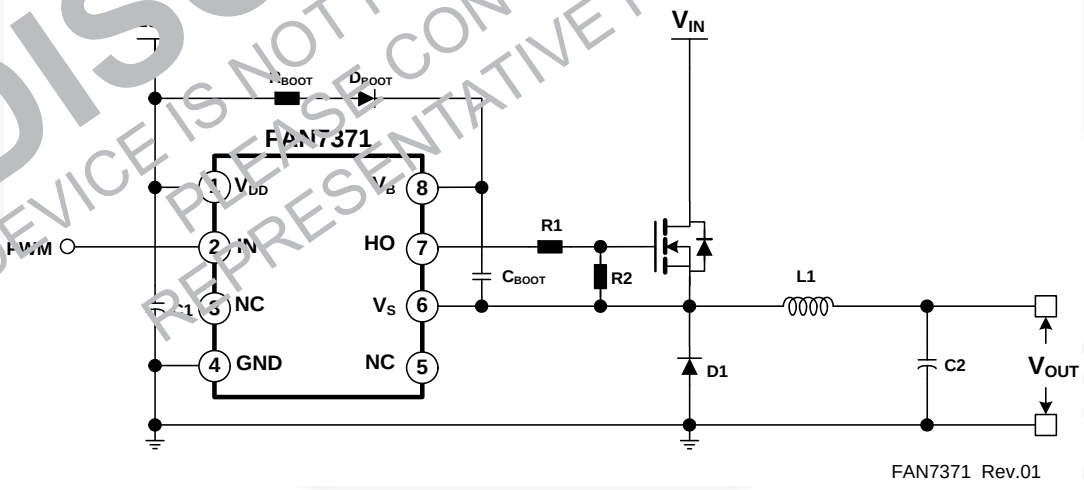

图 2. 降压直流 - 直流转换器应用

内部框图

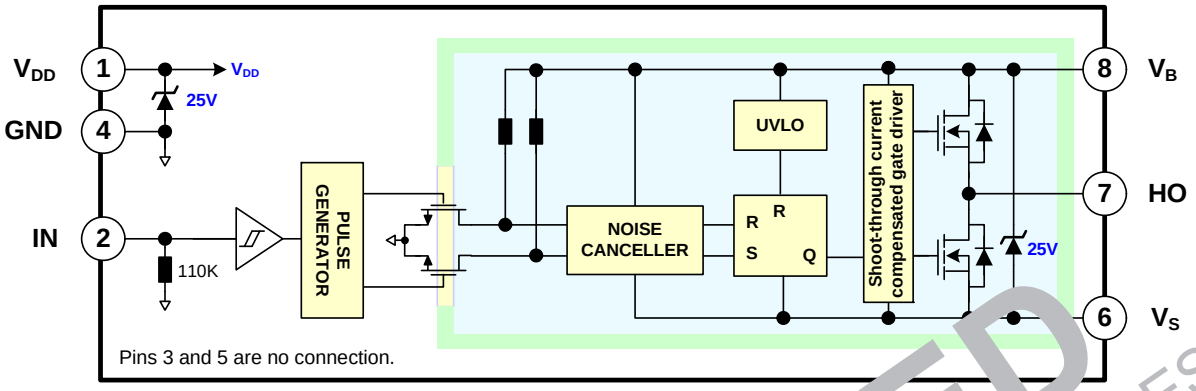

图 3. 功能框图

引脚配置

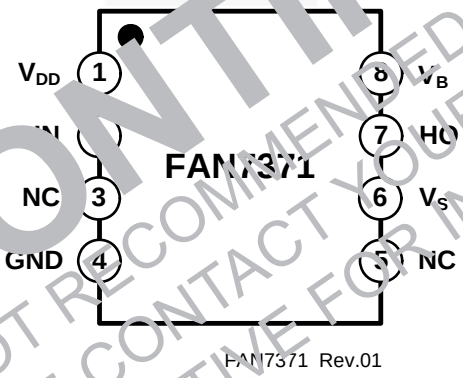

图 4. 引脚配置（俯视图）

引脚定义

引脚号	名称	说明
1	V_{DD}	电源电压
2	IN	高侧栅极驱动器输出的逻辑输入
3	NC	无连接
4	GND	接地
5	NC	无连接
6	V_S	高侧浮动电源电压返回
7	HO	高侧驱动输出
8	V_B	高侧浮动电源

绝对最大额定值

应力超过绝对最大额定值，可能会损坏器件。在超出推荐的工作条件的情况下，该器件可能无法正常工作，所以不建议让器件在这些条件下长期工作。此外，长期在高于推荐的工作条件下工作，会影响器件的可靠性。绝对最大额定值仅是应力规格值。除非另有说明， T_A= 25°C。

符号	特性	最小值	最大值	单位
V_S	高侧浮动偏置电压	V_B-V_{SHUNT}	V_B+0.3	V
V_B	高侧浮动电源电压 (2)	-0.3	625.0	V
V_{HO}	高侧浮动输出电压	V_S-0.3	V_B+0.3	V
V_{DD}	低侧和逻辑电源电压 (2)	-0.3	V_{SHUNT}	V
V_{IN}	逻辑输入电压	-0.3	V_{DD}+0.3	V
dV_S/dt	允许的偏置电压变化速率		50	V/ns
P_D	功耗 (3, 4, 5)		0.25	W
θ_{JA}	热阻		200	°C/W
T_J	结温	-55	+150	°C
T_{STG}	存储温度	-55	+150	°C
T_A	操作环境温度	-40	+125	°C

注意：

2 该 IC 在 V_{DD} 和 V_{BS} 上包含一个电压调节器，标称齐穿电压为 20 V。请注意该电源引脚不能由比电气特性部分指定的 V_{SHUNT} 高的低阻抗电压源驱动。

3 安装到 76.2 x 114.3 x 1.6mm PCB 板 (FR-4 玻氧玻璃材料)。

4 参照下列标准：
JESD51-2：集成电路热测试方法环境条件 — 自然对流；
JESD51-3：含铅表面贴装封装的低有效导热系数测试板

5 任何情况下，都不得超过功耗 (P_D)。

推荐工作条件

推荐的操作条件表明确保器件的真实工作条件。指定推荐的工作条件，以确保器件的最佳性能达到数据表中的规格。飞兆不建议超出额定或按照绝对最大额定值进行设计。

符号	参数	最小值	最大值	单位
V_B	高侧浮动电源电压	V_S+10	V_S+20	V
V_S	高侧浮动电源偏置电压	6-V_{DD}	600	V
V_{HO}	高侧输出电压	V_S	V_B	V
V_{IN}	逻辑输入电压	GND	V_{DD}	V
V_{DD}	电源电压	10	20	V

电气特性

除非另有说明，V_{BIAS}(V_{DD}、V_{BS})=15.0V、T_A = 25°C。V_{IN} 和 I_{IN} 参数以 GND 作为基准。V_O 和 I_O 参数以 V_S 为参考点，适用于对应的输出 HO。

符号	特性	测试条件	最小值	典型值	最大值	单位
电源部分						
I_{QDD}	V_{DD} 静态电源电流	V_{IN}= 0 V 或 5 V		25	70	μA
I_{PDD}	V_{DD} 工作电源电流	f_{IN}= 20 KHz，空载		35	100	μA
自举电源部分						
V_{BSUV+}	V_{BS} 电源欠压正向阈值	V_{BS}= 扫描	8.2	9.2	10.2	V
V_{BSUV-}	V_{BS} 电源欠压负向阈值	V_{BS}= 扫描	7.5	8.5	9.5	V
V_{BSHYS}	V_{BS} 电源欠压锁定滞回电压回差	V_{BS}= 扫描		0.7		V
I_{LK}	偏置漏电流	V_B=V_S=600V			10	μA
I_{QBS}	V_{BS} 静态电源电流	V_{IN}= 0 V 或 5 V			120	μA
I_{PBS}	V_{BS} 工作电源电流	C_{LOAD}= 1 nF， f_{IN}= 20 KHz，rms 值		1.0	2.8	mA
电压调节器部分						
V_{SHUNT}	V_{DD} 和 V_{BS} 电压调节器钳位电压	I_{SHUNT}=5mA	24	25		V
输入逻辑部分						
V_{IH}	逻辑 “1” 输入电压		2.5			V
V_{IL}	逻辑 “0” 输入电压				0.8	V
I_{IN+}	逻辑输入高电平偏置电流	V_{IN}=5V		45	70	μA
I_{IN-}	逻辑输入低电平偏置电流	V_{IN}=0V			2	μA
R_{IN}	输入下拉电阻		70	110		KΩ
栅极驱动器输出部分						
V_{OH}	高电平输出电压 (V_{BIAS} - V_O)	无负载			1.2	V
V_{OL}	低电平输出电压	无负载			30	mV
I_{O+}	输出高电平短路脉冲电流 (6)	V_{HO}=0V, V_{IN}=5V, PW ≤10μs	3.0	4.0		A
	输出低电平短路脉冲电流 (6)	V_{HO}=15V,V_{IN}=0V, PW ≤10μs	3.0	4.0		A
V_S	VIN 信号传播到 HO 时允许的 V_S 引脚负电压			-9.8	-7.0	V

注：

6 这些参数由设计保证。

动态电气特性

除非另有说明， V_{DD}=V_{BS}=15V、 GND=0V、 C_{LOAD}=1000pF、 T_A=25°C。

符号	参数	工作条件	最小值	典型值	最大值	单位
t_{on}	导通传播延时时间	V_S=0V		150	210	ns
t_{off}	关断传播延时时间	V_S=0V		150	210	ns
t_r	导通上升时间			25	50	ns
t_f	关断下降时间			15	40	ns

.

典型特性

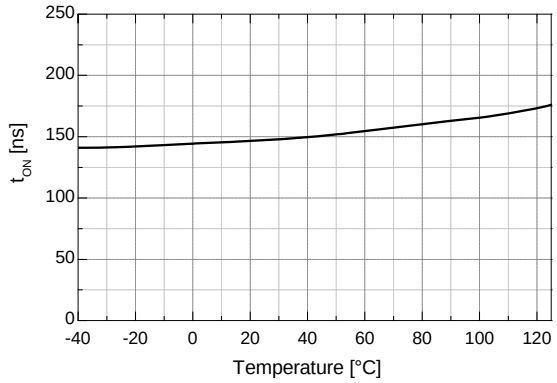

图 5. 导通传播延时与温度的关系

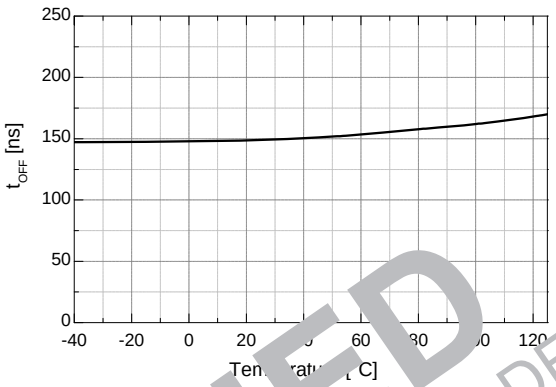

图 6. 关断传播延时与温度的关系

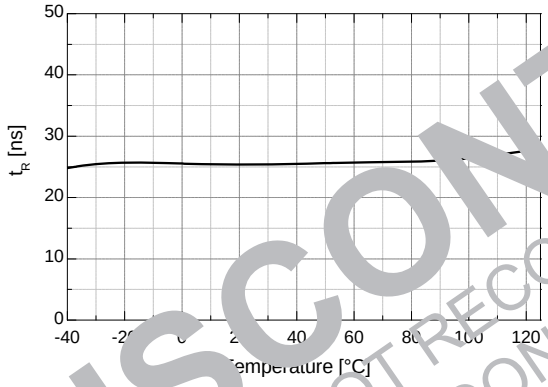

图 7. 导通上升时间与温度的关系

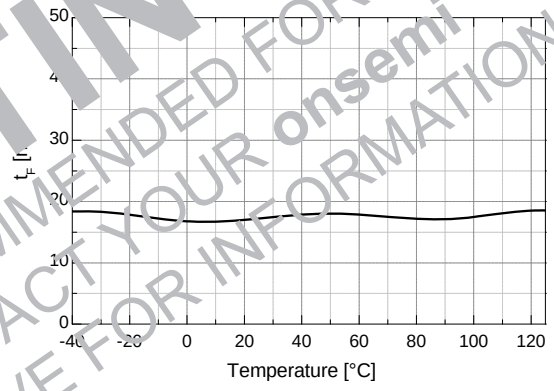

图 8. 关断下降时间与温度的关系

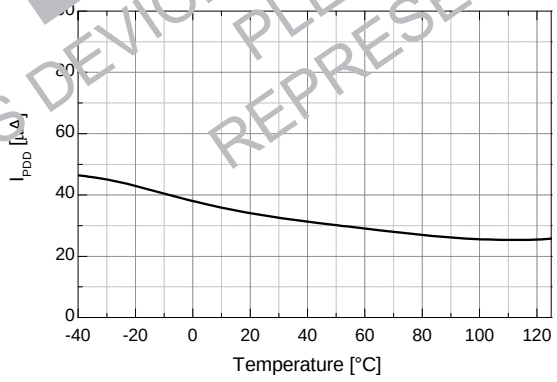

图 9. 工作时 V_{DD} 电源电流与温度的关系

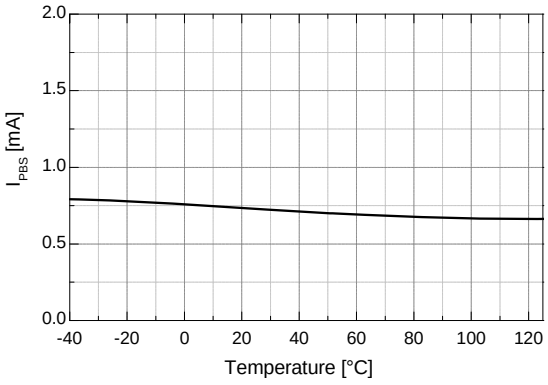

图 10. V_{BS} 工作电源电流与温度的关系

典型特性（续）

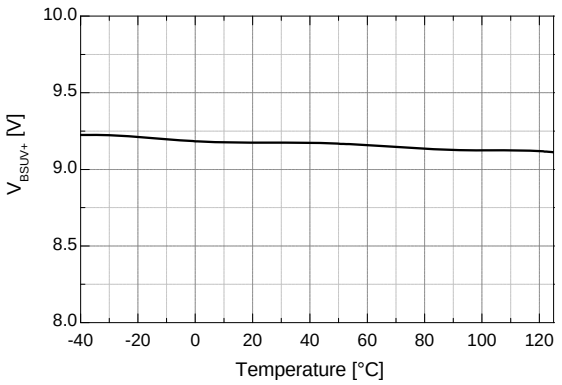

图 11. V_{BS} UVLO+ 与温度的关系

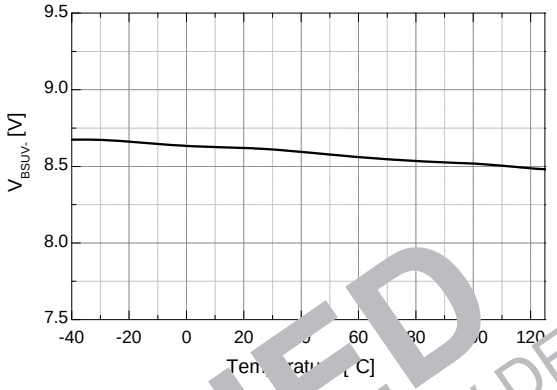

图 12. V_{BS} UVLO- 与温度的关系

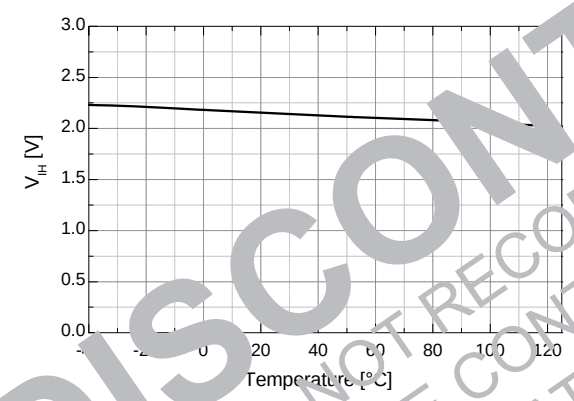

图 13. 逻辑高电平输入电压与温度的关系

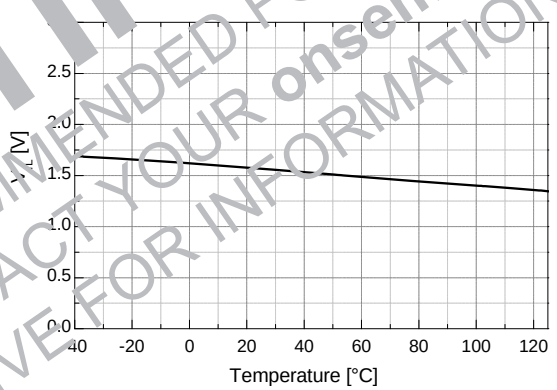

图 14. 逻辑低电平输入电压与温度的关系

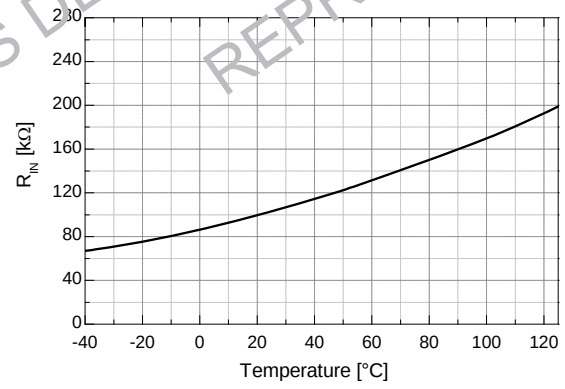

图 15. 输入下拉电阻与温度的关系

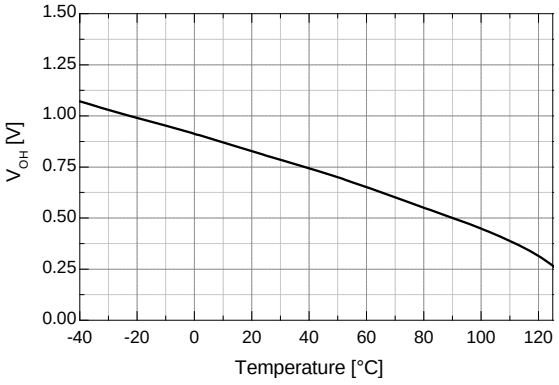

图 16. 高电平输出电压与温度的关系

典型特性（续）

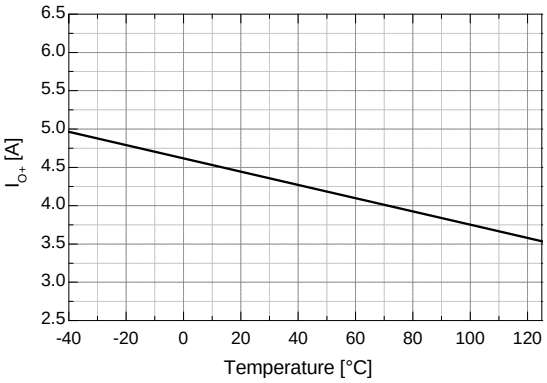

图 17. 输出高电平短路脉冲电流与温度的关系

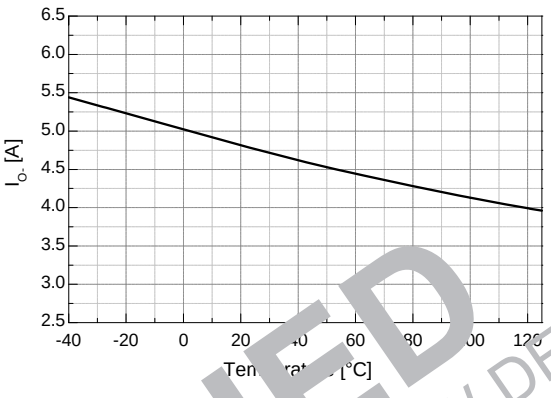

图 18. 输出低电平短路脉冲电流与温度的关系

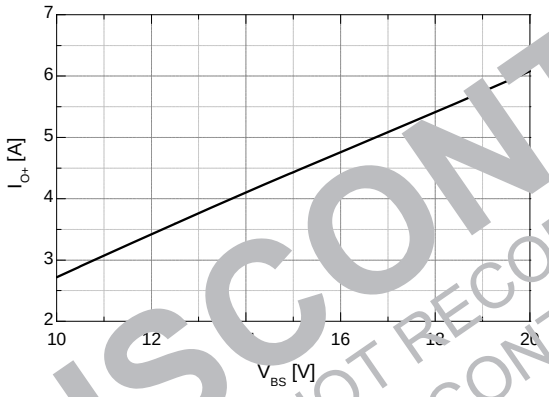

图 19. 输出高电平短路脉冲电流与电源电压的关系

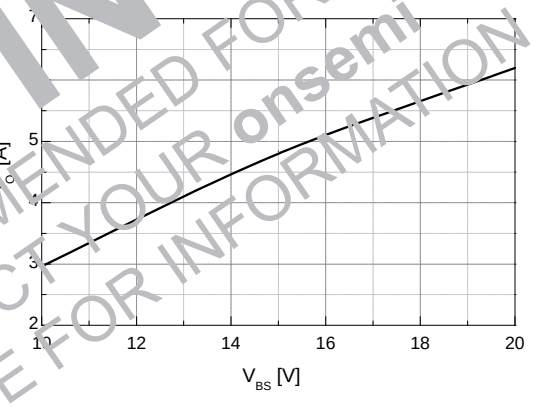

图 20. 输出低电平短路脉冲电流与电源电压的关系

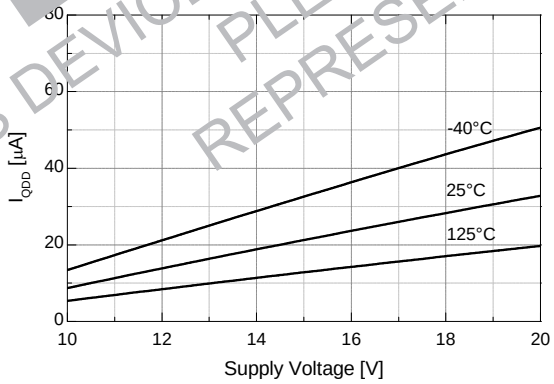

图 21. V_{DD} 静态电源电流与电源电压的关系

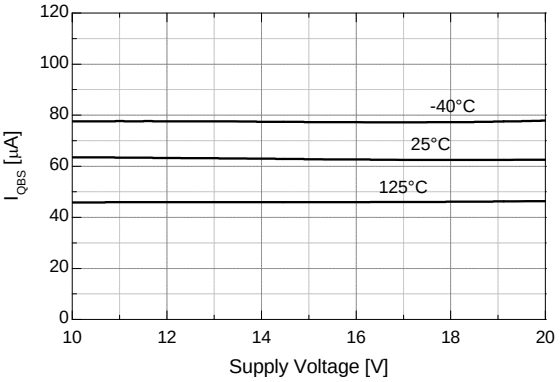

图 22. V_{BS} 静态电源电流与电源电压的关系

开关时间定义

时序图

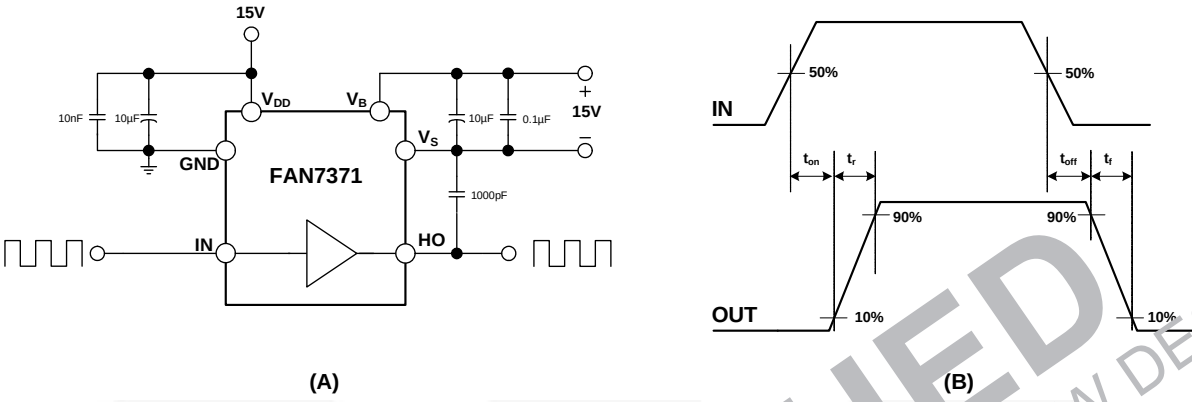

图 23. 开关时间测试电路和波形定义

物理尺寸

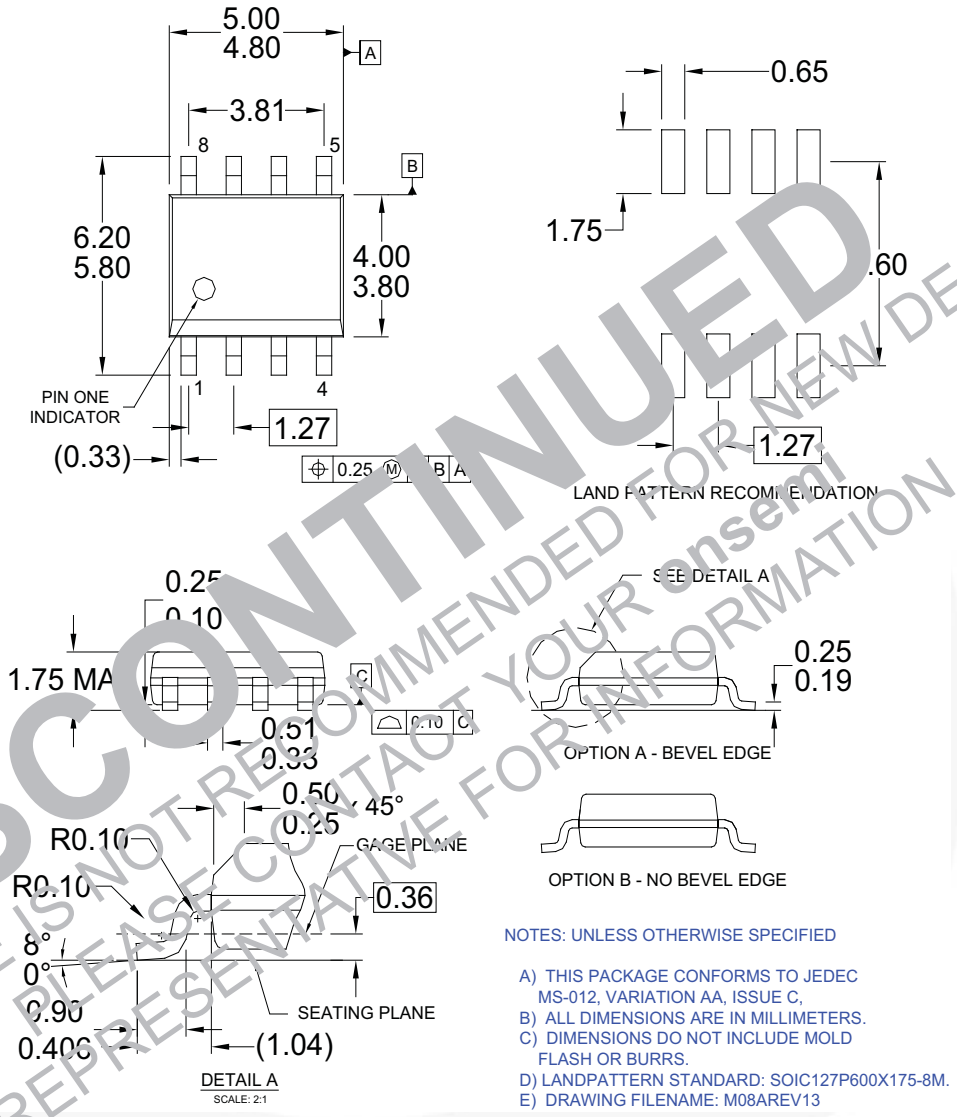

图 24. 8- 引脚小尺寸封装 (SOP)

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