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# FAN73832

## 半桥栅极驱动 IC

### 特性

- 浮动通道可实现高达 +600V 的自举运行
- 两个通道的源 / 灌电流驱动能力典型值为 350 mA/650 mA
- 在  $V_{DD} = V_{BS} = 15\text{ V}$  时信号传播过程中, 扩展允许负  $V_S$  摆幅低至  $-9.8\text{ V}$
- 高侧输出与 IN 输入信号同相
- 两个通道均内置欠压锁定 (UVLO) 功能
- 内置共模 dv/dt 噪声消除电路
- $R_{DT} = 20\text{ KW}$  时, 内部最小死区时间为 400 ns
- 可编程导通延时控制 (死区时间)

### 应用

- SMPS
- 电机驱动变频器
- 荧光灯镇流器
- HID 镇流器

### 说明

FAN73832 是一款半桥、栅极驱动 IC, 带关断和可编程死区时间控制功能, 能驱动 MOSFET 和 IGBT, 工作电压高达 +600V。

飞兆的高压工艺和共模噪声消除技术可使高侧驱动器在高 dv/dt 噪声环境下稳定运行。

先进的电平转换电路允许高侧驱动器的工作偏置电压达  $V_S = -9.8\text{ V}$  (典型值), 当  $V_{BS} = 15\text{ V}$  时。

当  $V_{DD}$  和  $V_{BS}$  小于指定阈值电压时, 两个通道的欠压锁定 (UVLO) 电路可防止发生故障。

输出驱动器的源电流 / 灌电流典型值分别为 350mA/650mA, 适用于各种各样的半桥和全桥逆变器。

8-SOP



8-DIP



### 订购信息

器件编号	封装	无铅	工作温度范围	包装方法
FAN73832M <sup>(1)</sup>	8-SOP	是	-40°C ~ 125°C	塑料管
FAN73832MX <sup>(1)</sup>				卷带和卷盘
FAN73832N	8-DIP			塑料管

#### 注:

1. 这些器件通过了 JESD22A-111 波峰焊测试。

典型应用电路图

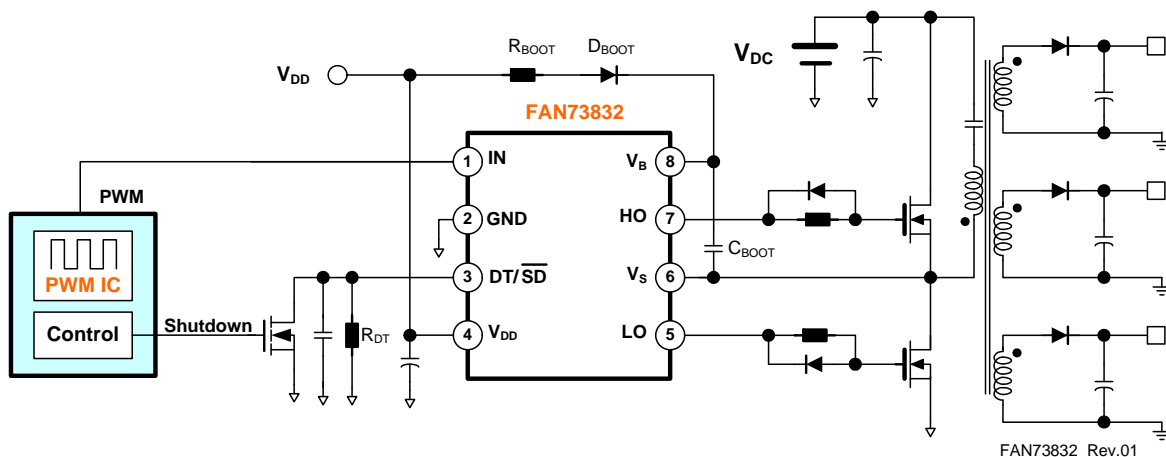


图 1. 半桥开关电源应用电路

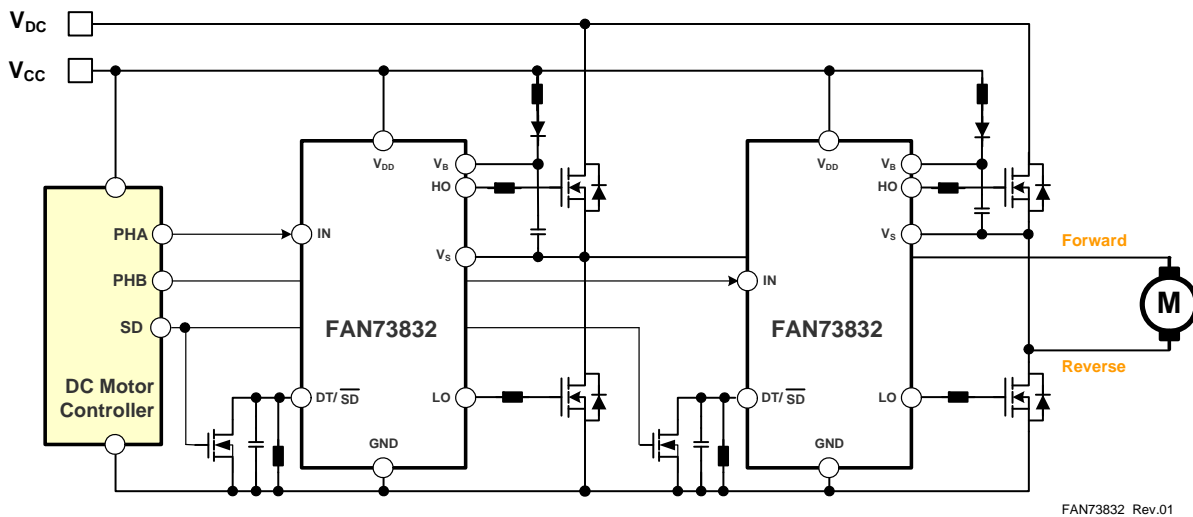


图 2. 全桥直流电机驱动器应用电路

内部框图

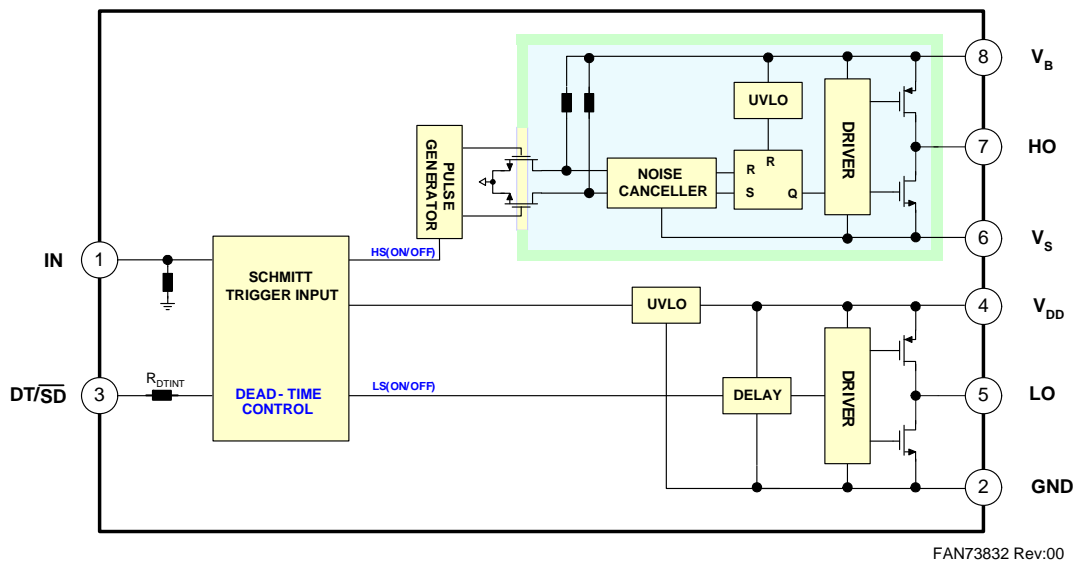
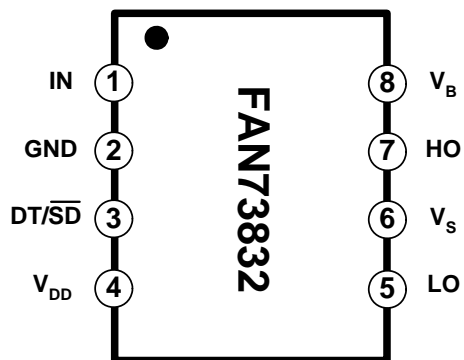


图 3. FAN73832 功能框图

## 引脚分配



FAN73832 Rev:00

图 4. 引脚配置（俯视图）

## 引脚定义

引脚号	名称	说明
1	IN	逻辑输入
2	GND	接地
3	DT/SD	通过外接电阻和关闭功能进行死区时间控制
4	V <sub>DD</sub>	低侧电源电压
5	LO	低侧栅极输出
6	V <sub>S</sub>	高侧浮动电源返回
7	HO	高侧驱动输出
8	V <sub>B</sub>	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， $T_A = 25^\circ\text{C}$ 。

符号	参数	最小值	最大值	单位
$V_S$	高侧偏置电压	$V_B - 25$	$V_B + 0.3$	V
$V_B$	高侧浮动电源电压	-0.3	625	V
$V_{HO}$	高侧浮动输出电压 HO	$V_S - 0.3$	$V_B + 0.3$	V
$V_{DD}$	低侧和固定逻辑电源电压	-0.3	25	V
$V_{LO}$	低侧输出电压 LO	-0.3	$V_{DD} + 0.3$	V
$V_{IN}$	逻辑输入电压 (IN)	-0.3	$V_{DD} + 0.3$	V
$V_{DT}/\overline{SD}$	死区时间和关闭控制电压	-0.3	5.0	V
GND	逻辑地	$V_{DD} - 25$	$V_{DD} + 0.3$	V
$dV_S/dt$	允许的偏置电压变化速率		50	V/ns
$P_D^{(2)(3)(4)}$	功耗	8-SOP	0.625	W
		8-DIP	1.25	
$\theta_{JA}$	结至环境热阻	8-SOP	200	$^\circ\text{C}/\text{W}$
		8-DIP	100	
$T_J$	结温		150	$^\circ\text{C}$
$T_{STG}$	存储温度		150	$^\circ\text{C}$

### 注意：

2. 安装到 76.2 x 114.3 x 1.6 mm PCB 板（FR-4 环氧玻璃材料）。
3. 参考以下标准：
  - 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
4. 在任何情况下，都不要超过  $P_D$ 。

## 推荐工作条件

推荐的操作条件表明了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。飞兆半导体建议不要超过推荐工作条件，也不能按照绝对最大额定值进行设计。

符号	参数	条件	最小值	最大值	单位
$V_B$	高侧浮动电源电压		$V_S + 15$	$V_S + 20$	V
$V_S$	高侧浮动电源偏置电压		$6 - V_{DD}$	600	V
$V_{DD}$	低侧电源电压		15	20	V
$V_{HO}$	高侧 (HO) 输出电压		$V_S$	$V_B$	V
$V_{LO}$	低侧 (LO) 输出电压		GND	$V_{DD}$	V
$V_{IN}$	逻辑输入电压 (IN)		GND	$V_{DD}$	V
$T_A$	环境温度		-40	125	$^\circ\text{C}$

## 电气特性

除非另有说明,  $V_{BIAS}$  ( $V_{DD}$ 、 $V_{BS}$ )=15.0V、 $R_{DT}$ =20K $\Omega$ 、 $T_A$ =25°C。  $V_{IN}$  和  $I_{IN}$  参数以 GND 作为基准。参数  $V_O$  和  $I_O$  以  $V_S$  和 COM 作为基准, 适用于相应的输出 HO 和 LO。

符号	参数	条件	最小值	典型值	最大值	单位
<b>电源电流部分</b>						
$I_{QBS}$	$V_{BS}$ 静态电源电流	$V_{IN}=0V$ 或 $5V$		35	90	$\mu A$
$I_{QDD}$	$V_{DD}$ 静态电源电流	$V_{IN}=0V$ 或 $5V$ 、 $R_{DT}=20K\Omega$		300	450	
$I_{SD}^{(5)}$	关闭电源电流	$DT/SD=GND$		650	900	
$I_{PBS}$	$V_{BS}$ 工作电源电流	$f_{IN}=20kHz$ , rms 值		400	700	
$I_{PDD}$	$V_{DD}$ 工作电源电流	$f_{IN}=20kHz$ , rms 值		650	850	
$I_{LK}$	偏置电源漏电流	$V_B=V_S=600V$			10	
<b>电源部分</b>						
$V_{DDUV+}$ $V_{BSUV+}$	$V_{DD}$ 和 $V_{BS}$ 电源欠压正向阈值		10.7	11.6	12.5	V
$V_{DDUV-}$ $V_{BSUV-}$	$V_{DD}$ 和 $V_{BS}$ 电源欠压负向阈值		10.0	10.8	11.6	V
$V_{DDUVH}$ $V_{BSUVH}$	$V_{DD}$ 电源欠压锁定的滞回电压回差			0.8		V
<b>死区时间控制部分</b>						
$R_{DTINT}$	内部死区时间设置电阻			20		K $\Omega$
$V_{DT}$	DT (死区) 时的标准电压	$R_{DT}=20K\Omega$		3.0		V
<b>栅极驱动器输出部分</b>						
$V_{OH}$	高电平输出电压, $V_{BIAS}-V_O$	$I_O=20mA$			1.0	V
$V_{OL}$	低电平输出电压, $V_O$				0.6	V
$I_{O+}$	输出高电平短路脉冲电流	$V_O=0V$ , $V_{IN}=5V$ , $PW<10\mu s$	250	350		mA
$I_{O-}$	输出低电平短路脉冲电流	$V_O=15V$ , $V_{IN}=0V$ , $PW<10\mu s$	500	650		mA
$V_S$	IN 信号传播到 HO 时允许的 $V_S$ 引脚负电压			-9.8	-7.0	V
<b>逻辑输入部分 (输入和关闭)</b>						
$V_{IH}$	逻辑“1”输入电压		2.9			V
$V_{IL}$	逻辑“0”输入电压				1.2	V
$I_{IN+}$	逻辑“1”输入偏置电流	$V_{IN}=5V$		50	100	$\mu A$
$I_{IN-}$	逻辑“0”输入偏置电流	$V_{IN}=0V$			2.0	$\mu A$
$\overline{SD+}$	关断“1”输入电压				1.2	V
$\overline{SD-}$	关断“0”输入电压		2.9			V
$R_{PD}$	输入下拉电阻			100		K $\Omega$

注:

5. 该参数由设计保证。

## 动态电气特性

除非另有说明,  $V_{BIAS}$  ( $V_{DD}$ 、 $V_{BS}$ )=15.0V、 $V_S$ =GND、 $C_L$ =1000pF、 $R_{DT}$ =20K $\Omega$  且  $T_A = 25^\circ\text{C}$ 。

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	$V_S=0V$ , $R_{DT}=20K\Omega$		580	730	ns
$t_{OFF}$	关断传播延时	$V_S=0V$ 或 $600V^{(5)}$ , $R_{DT}=20K\Omega$		180	230	
$t_R$	导通上升时间	$C_L=1000pF$		50	100	
$t_F$	关断下降时间	$C_L=1000pF$		30	80	
$t_{SD}^{(5)}$	关闭传播延时			100	180	
DT1, DT2	死区时间 LO 关断到 HO 导通与 HO 关断到 LO 导通	$R_{DT}=20K\Omega$	300	400	500	ns
		$R_{DT}=200K\Omega$	1.20	1.68	2.30	$\mu s$
DMT	死区时间匹配	$R_{DT}=20K\Omega$		0	60	ns
		$R_{DT}=200K\Omega$		0	150	

### 注:

5. 这些参数由设计保证。



典型特性

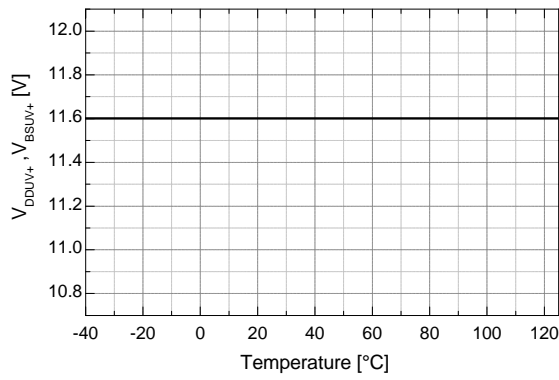


图 5. V<sub>DD</sub>/V<sub>BS</sub> UVLO (+) 与温度的关系

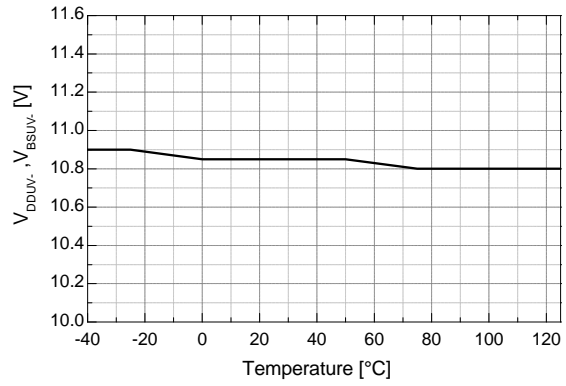


图 6. V<sub>DD</sub>/V<sub>BS</sub> UVLO (-) 与温度的关系

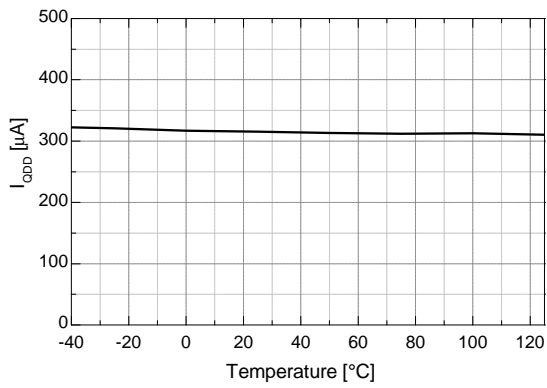


图 7. V<sub>DD</sub> 静态电流与温度的关系

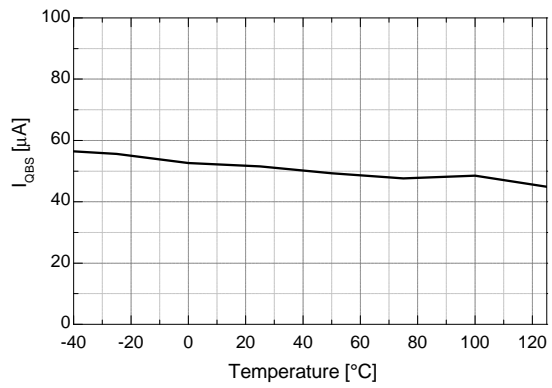


图 8. V<sub>BS</sub> 静态电流与温度的关系

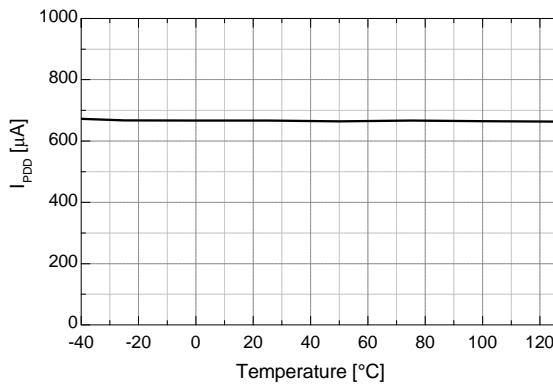


图 9. V<sub>DD</sub> 工作电流与温度的关系

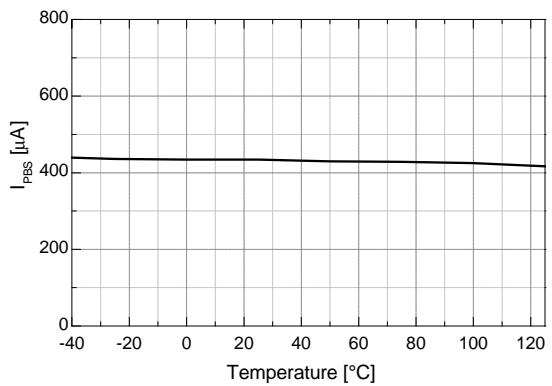


图 10. V<sub>BS</sub> 工作电流与温度的关系

典型特性 (续)

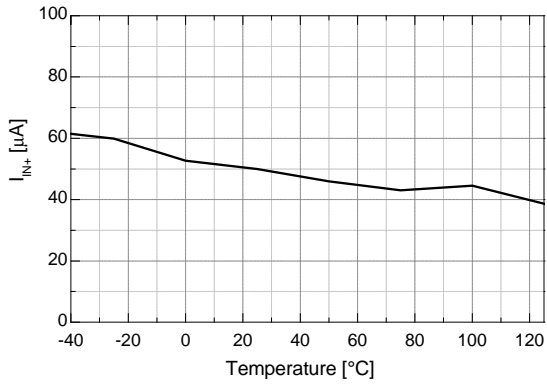


图 11. 逻辑输入电流与温度的关系

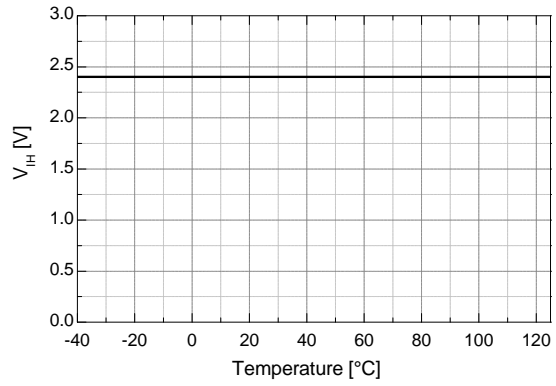


图 12. 逻辑输入高电压与温度的关系

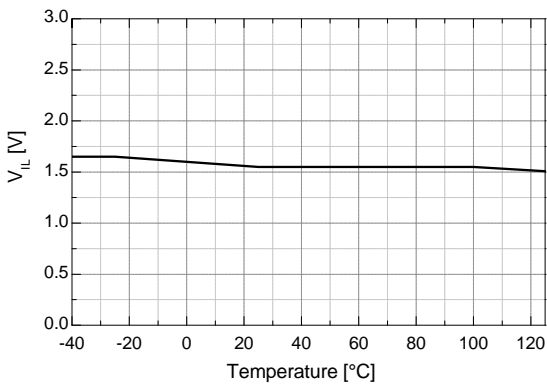


图 13. 逻辑输入低电压与温度的关系

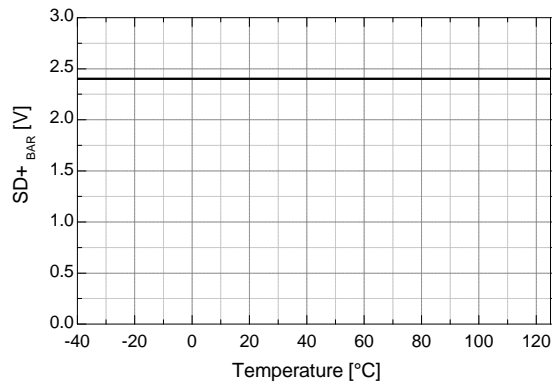


图 14.  $\overline{SD+}$  正向阈值与温度的关系

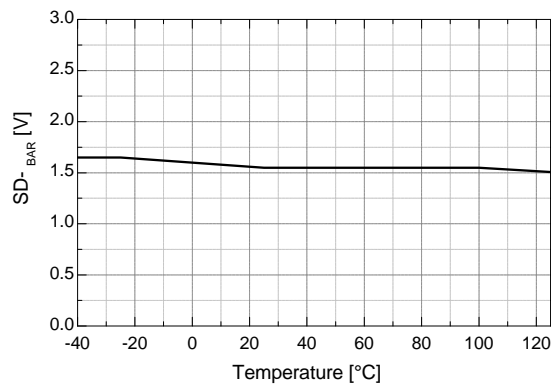


图 15.  $\overline{SD-}$  负向阈值与温度的关系

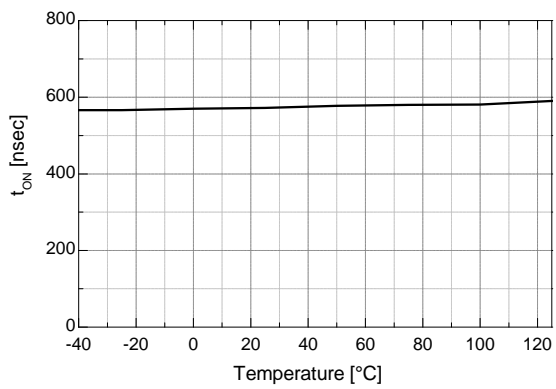


图 16. 导通延时时间与温度的关系

典型特性 (续)

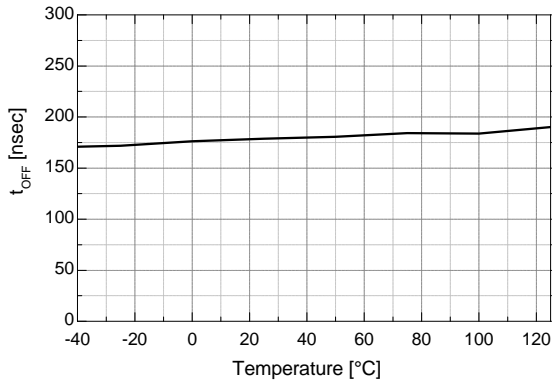


图 17. 关断延时时间与温度的关系

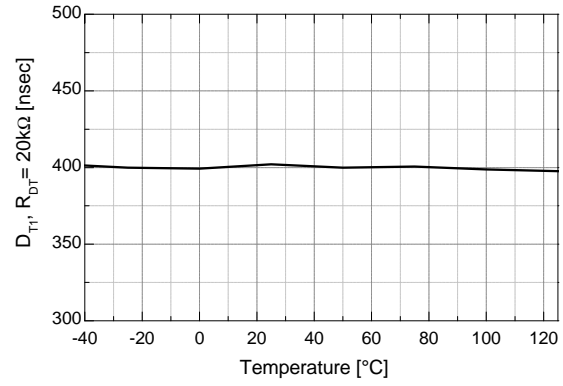


图 18. 死区时间 (R<sub>DT</sub>= 20 kW) 与温度的关系

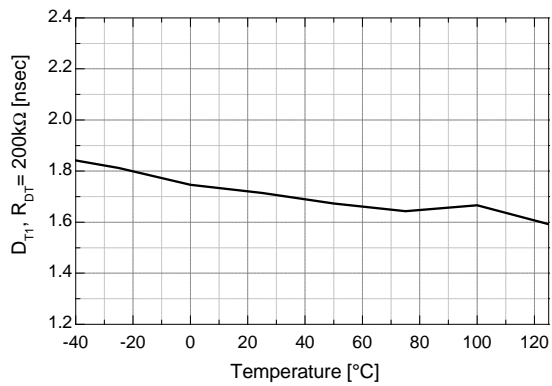


图 19. 死区时间 (R<sub>DT</sub>= 200 kW) 与温度的关系

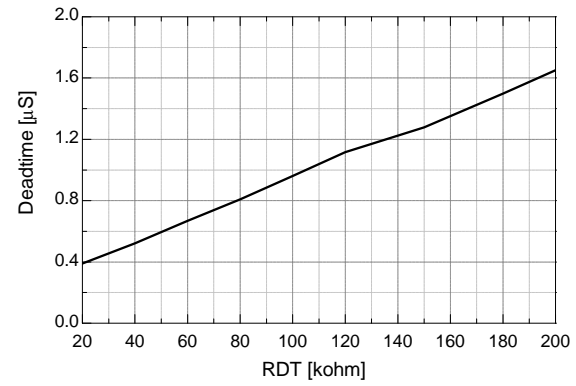


图 20. R<sub>DT</sub> 与死区时间的关系

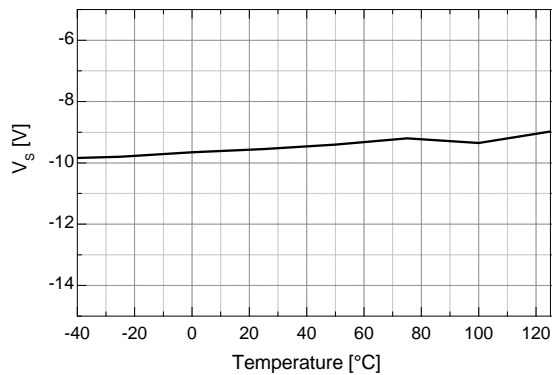
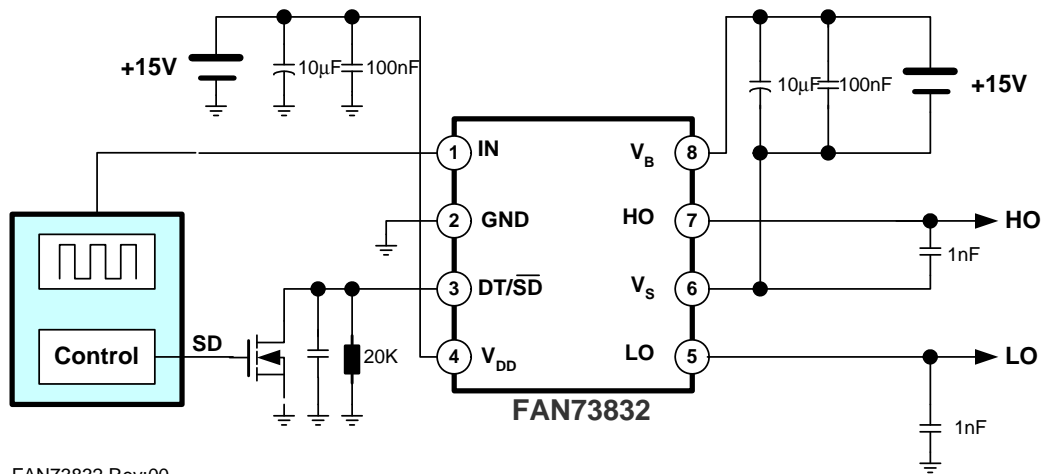


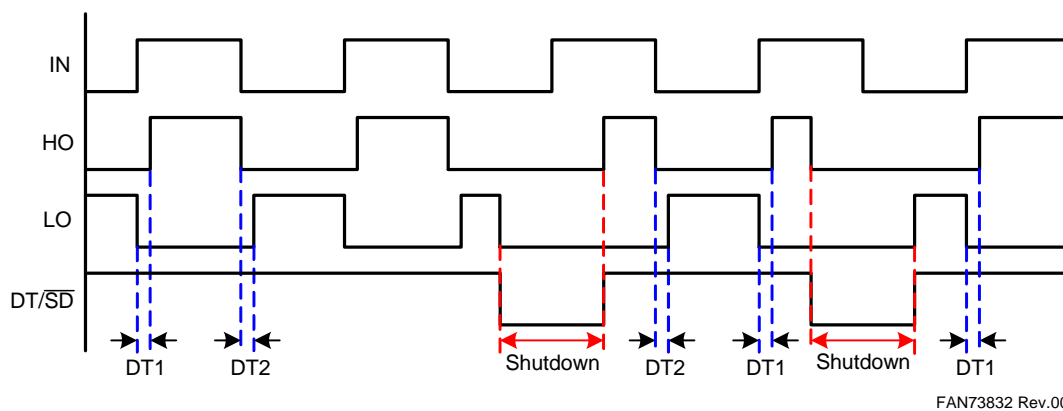
图 21. 信号传播到高侧时允许的 V<sub>S</sub> 负电压与温度的关系

开关时间定义



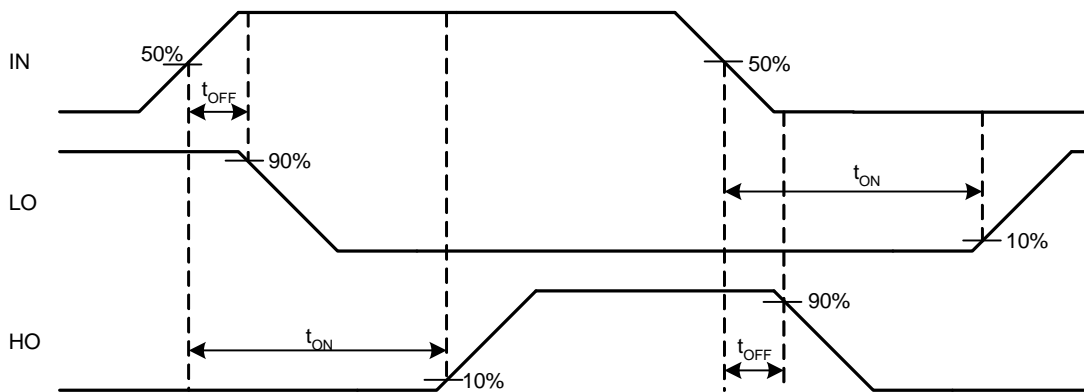
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图 22. 开关时间测试电路



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图 23. 输入 / 输出波形



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图 24. 开关时间波形定义

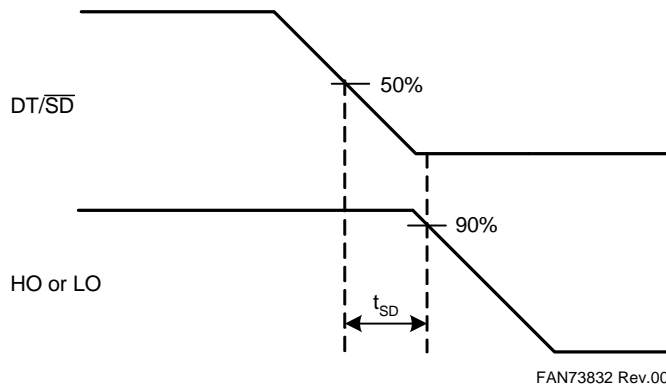


图 25. 关闭断波形定义

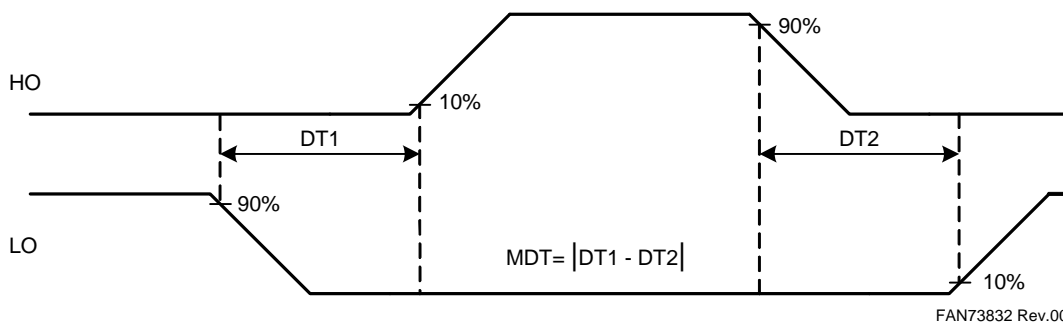


图 26. 死区时间控制波形定义

## 典型应用信息

### 1. 正常工作考量

FAN73832 是单 PWM 输入，半桥栅极驱动 IC，提供可编程的死区时间和关断功能。

死区时间通过  $\overline{DT/SD}$  引脚的电阻 ( $R_{DT}$ ) 设置。较宽的可编程死区时间范围为优化所选开关器件 (MOSFET 或 IGBT) 和应用的驱动信号时序提供灵活性。

导通延时电路 (死区时间) 支持的电阻值范围是 20 kW 至 200 kW，死区时间与  $R_{DT}$  电阻成正比。

如果正常运行中  $\overline{DT/SD}$  引脚电压跌至 1.2 V 以下，IC 进入关闭模式。

在典型应用的正常运行中，外部死区时间设置电阻 ( $R_{DT}$ ) 至少要超过 20 kW。

### 2. 欠压锁定 (UVLO)

FAN73832 有一个高低侧通道欠压锁定 (UVLO) 保护电路，当  $V_{DD}$  和  $V_{BS}$  低于指定阈值电压时，该电路能够防止发生故障。该欠压闭锁电路监控电源电压 ( $V_{DD}$ ) 和自举电容电压 ( $V_{BS}$ )。

### 3. 布局思路

为了获得高低侧栅极驱动器的最佳性能，必须在印制电路板 (PCB) 布局时就进行考虑。

#### 3.1 电源电容

如果输出级能够以大电流值快速导通开关器件，电源电容必须尽可能靠近器件引脚 (接地电源的  $V_{DD}$  和 GND、浮动电源的  $V_B$  和  $V_S$ ) 放置，以最小化寄生电感和电阻。

#### 3.2 栅极驱动环路

电流环路类似天线，能够接收和发送噪声。为了减少噪声耦合 / 发射并提高电源开关的导通和关断性能，必须尽量减小栅极驱动环路面积。

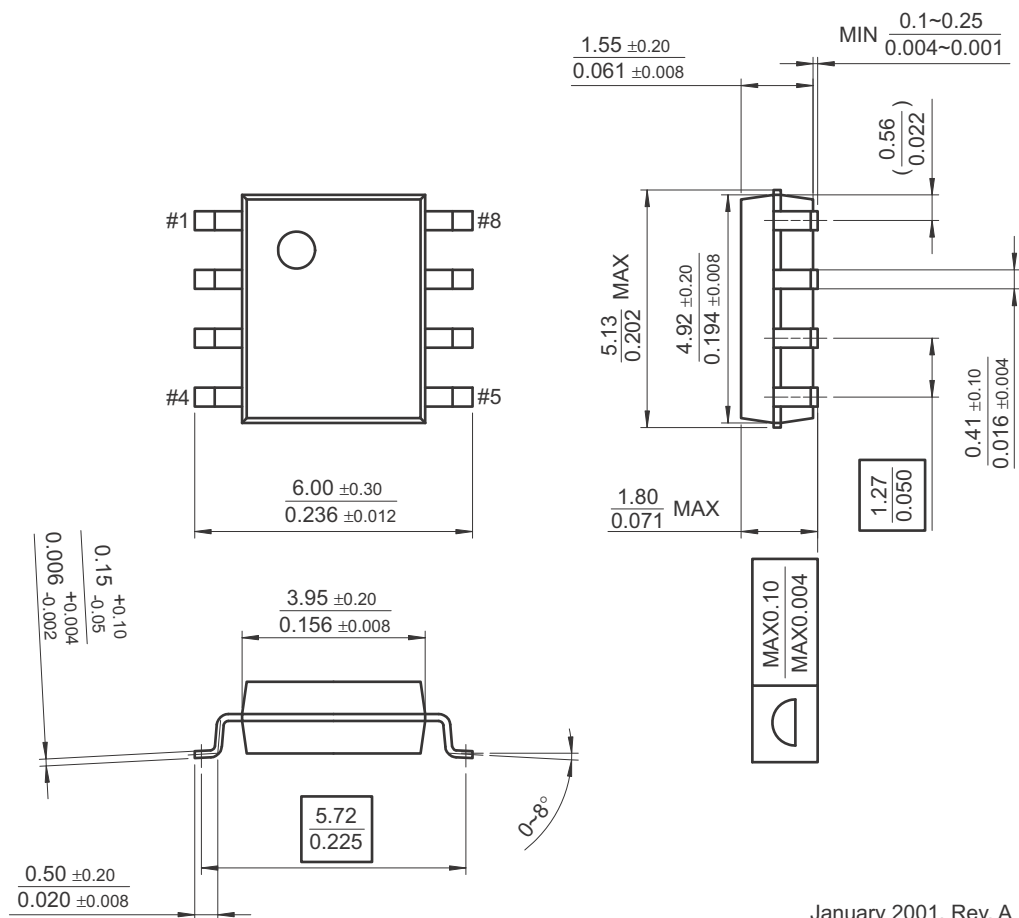
#### 3.3 接地层

为了最小化噪声耦合，避免将接地层放置在高压浮动端的下面或附近。

### 机械尺寸

#### 8-SOP

除非另有说明，否则尺寸单位为毫米（英寸）。



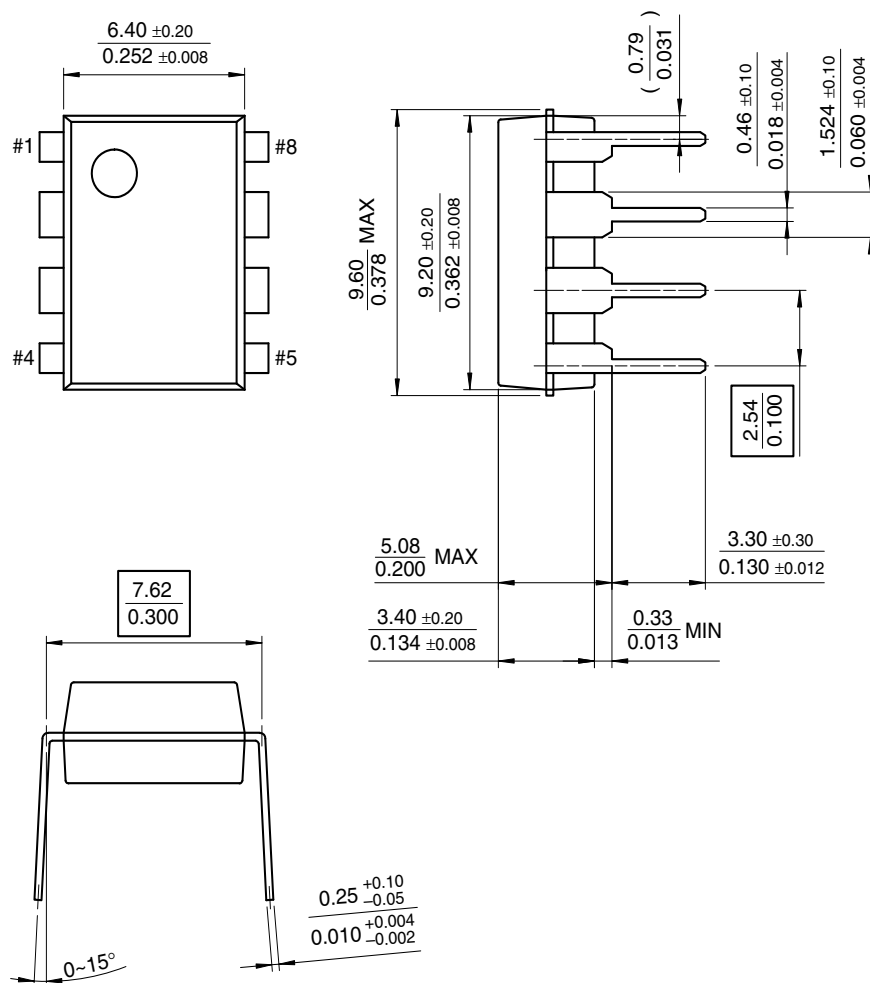
January 2001, Rev. A  
8sop225\_dim.pdf

图 27. 8- 引脚小尺寸封装 (SOP)

机械尺寸 (续)

8-DIP

除非另有说明, 否则尺寸单位为毫米 (英寸)。



September 1999, Rev B  
pdip8\_dim.pdf


图 28.8 引脚双列直插封装 (DIP)





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