译文

TB6612FNG

本资料是为了参考的目的由原始文档翻译而来。

使用本资料时，请务必确认原始文档关联的最新信息，并遵守其相关指示。

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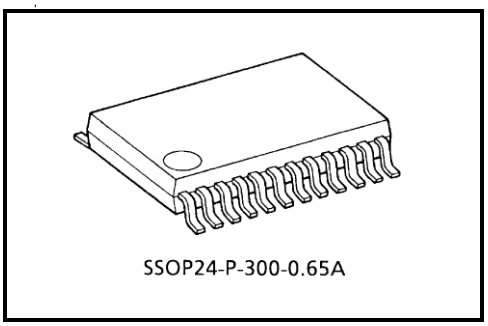
翻译日: 2015-11-11

TOSHIBA Bi-CD 单晶硅集成电路

TB6612FNG

双 DC 马达驱动 IC

TB6612FNG 是一种驱动 IC，用于带低导通电阻器的 LD MOS 结构中带输出晶体管的 DC 马达。可利用 IN1 和 IN2 这两个输入信号，选择 CW，CCW，短路制动器、和停机等四种模式的其中一种模式。



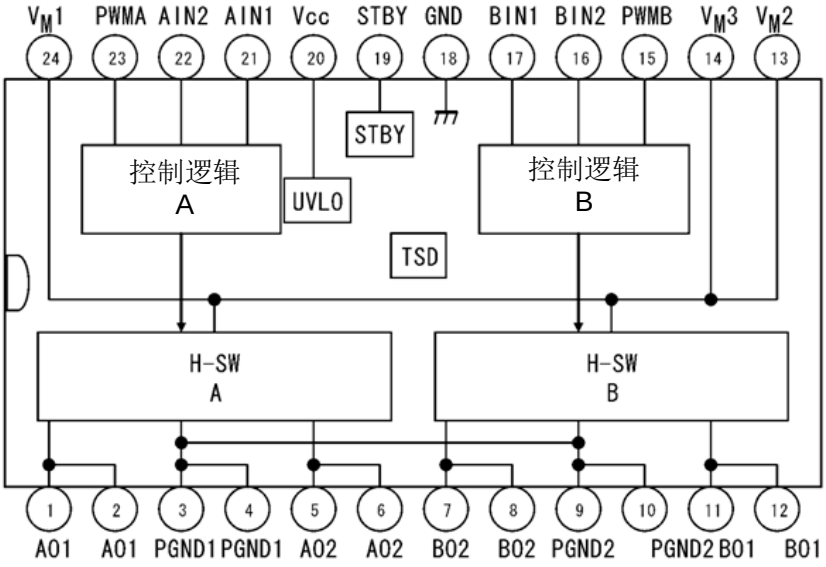
重量: 0.14 g(典型值)

特征

- 电源电压 VM = 15 V(最大值)
- 输出电流 I_{OUT} = 1.2 A(平均值)/3.2 A (峰值)
- 输出低导通电阻器：0.5 Ω (高+低典型值@ VM ≥ 5 V)
- 待机（省电模式)系统
- CW/CCW/短路制动器/停机功能模式
- 内置热关机电路和低电压检测电路
- 小面封装(SSOP24:0.65 mm 引线间距)

* 本产品带有 MOS 结构，并对静电放电敏感。在处理本产品时，应确保现场环境已配备一根接地母线，一块导电垫和一个离子产生器进行静电放电保护。确保环境温度和相对湿度维持在合理的水平。

方块图



引脚功能

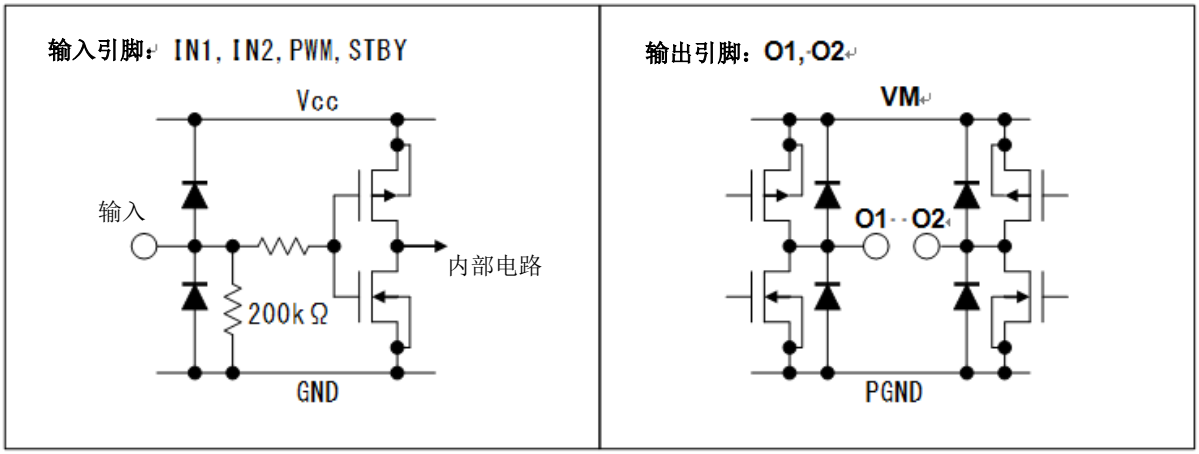
序号.	引脚名称	I/O	功能
1	AO1	O	ch A 输出 1
2	AO1		
3	PGND1	—	电源 GND1
4	PGND1		
5	AO2	O	ch A 输出 2
6	AO2		
7	BO2	O	ch B 输出 2
8	BO2		
9	PGND2	—	电源 GND 2
10	PGND2		
11	BO1	O	ch B 输出 1
12	BO1		
13	VM2	—	马达电源
14	VM3		
15	PWMB	I	ch B PWM 输入/200 kΩ 内部下拉
16	BIN2	I	ch B 输入 2/200 kΩ 内部下拉
17	BIN1	I	ch B 输入 1/200 kΩ 内部下拉
18	GND	—	小信号 GND
19	STBY	I	“L” = 待机/ 200 kΩ 内部下拉
20	Vcc	—	小信号电源
21	AIN1	I	ch A 输入 1/ 200 kΩ 内部下拉
22	AIN2	I	ch A 输入 2/ 200 kΩ 内部下拉
23	PWMA	I	ch A PWM 输入/ 200 kΩ 内部下拉
24	VM1	—	马达电源

绝对最大额定值（Ta = 25°C）

特性	符号	额定值	单位	备注
电源电压	VM	15	V	
	V_{CC}	6		
输入电压	V_{IN}	-0.2 ~ 6	V	IN1,IN2,STBY,PWM 引脚
输出电压	V_{OUT}	15	V	O1,O2 引脚
输出电流	I_{OUT}	1.2	A	每 1 ch
	I_{OUT}（峰值）	2		tw = 20 ms 连续脉冲，占空比 ≤ 20%
		3.2		tw = 10 ms 单脉冲
功耗	P_D	0.78	W	仅 IC
		0.89		PCB 贴装时，50 mm × 50 mm t = 1.6 mm Cu ≥ 40%
		1.36		PCB 贴装时，76.2 mm × 114.3 mm t = 1.6 mm Cu ≥ 30%
工作温度	T_{opr}	-20 ~ 85	°C	
贮存温度	T_{stg}	-55 ~ 150	°C	

工作范围(Ta = -20 ~ 85°C)

特性	符号	最小值	典型值	最大值	单位	备注
电源电压	V_{CC}	2.7	3	5.5	V	
	VM	2.5	5	13.5	V	
输出电流 (H-SW)	I_{OUT}	—	—	1.0	A	VM ≥ 4.5 V
		—	—	0.4		4.5 V > VM ≥ 2.5 V 无 PWM 运行
开关频率	f_{PWM}	—	—	100	kHz	

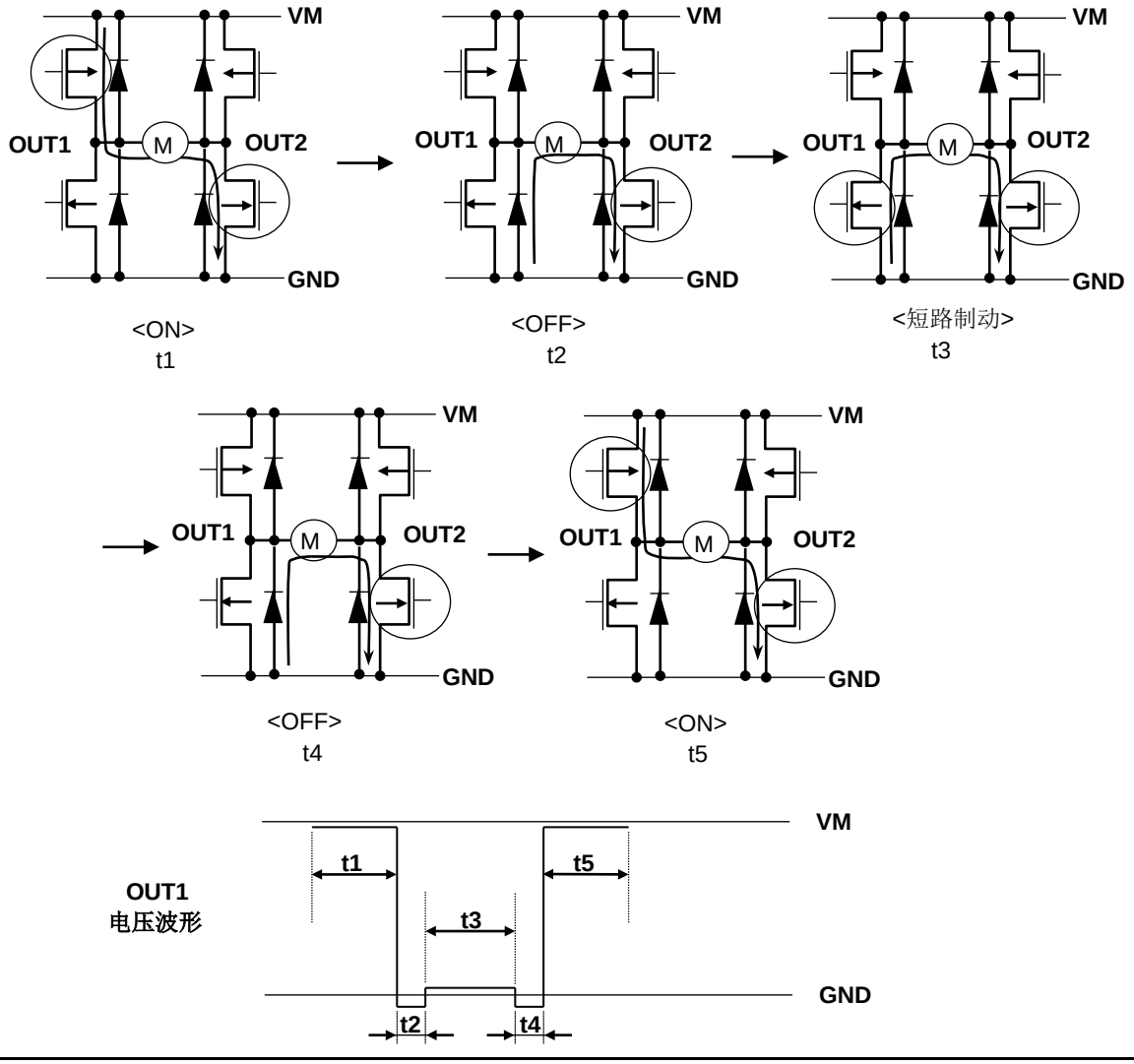


H-SW 控制功能

输入				输出		
IN1	IN2	PWM	STBY	OUT1	OUT2	模式
H	H	H/L	H	L	L	短路制动
L	H	H	H	L	H	CCW
		L	H	L	L	短路制动
H	L	H	H	H	L	顺时针
		L	H	L	L	短路制动
L	L	H	H	OFF (高阻抗)		停止
H/L	H/L	H/L	L	OFF (高阻抗)		待机

H-SW 操作说明

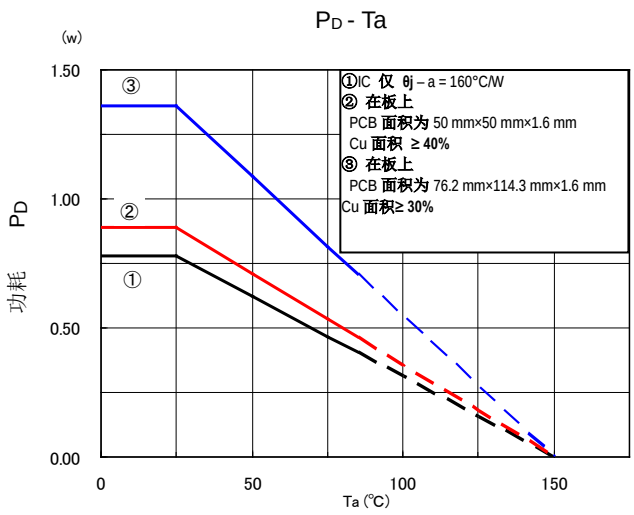
・为防止出现穿透电流，在 IC 中切换为各模式时可提供死区时间 t2 和 t4。

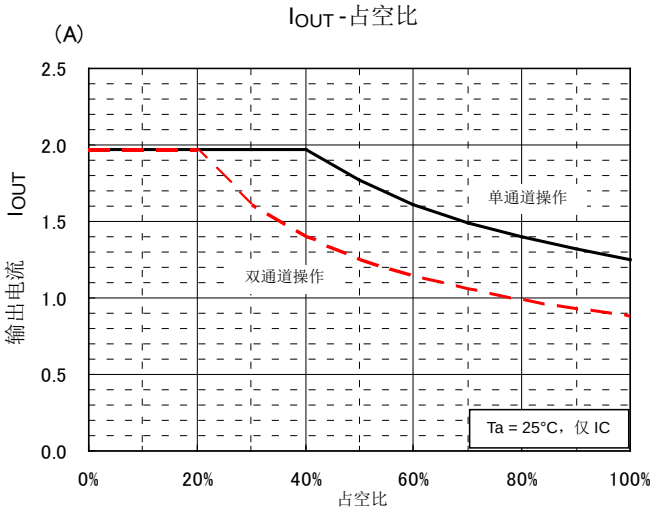


电气特性 (除非另有规定，则 Ta = 25°C, Vcc = 3 V, VM = 5 V)

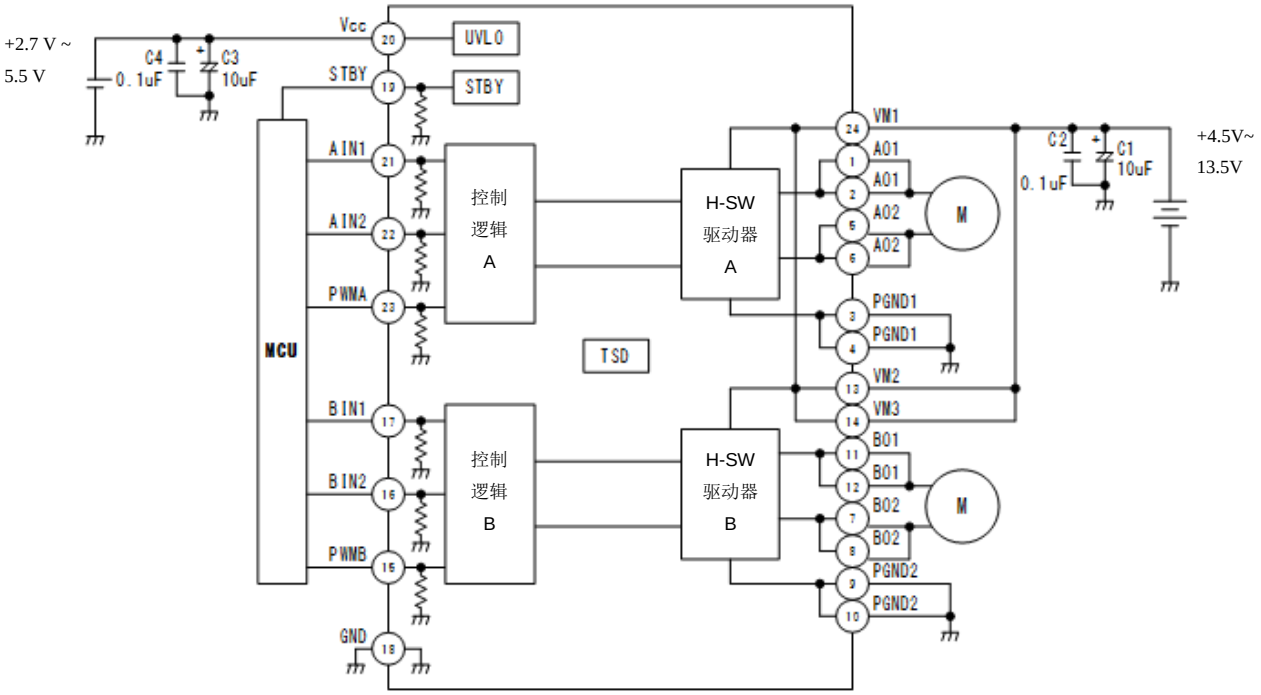
特性	符号		测试条件	最小值	典型值	最大值	单位
电源电流	I_{CC}(3 V)		STBY = Vcc = 3 V, VM = 5 V	—	1.1	1.8	mA
	I_{CC}(5.5 V)		STBY = Vcc = 5.5 V, VM = 5 V	—	1.5	2.2	
	$I_{CC(STB)}$		STBY = 0 V	—	—	1	μA
	$I_{M(STB)}$			—	—	1	
控制输入电压	V_{IH}		—	Vcc×0.7	—	Vcc+0.2	V
	V_{IL}			-0.2	—	Vcc×0.3	
控制输入电流	I_{IH}		V_{IN} = 3 V	5	15	25	μA
	I_{IL}		V_{IN} = 0 V	—	—	1	
待机输入电压	$V_{IH(STB)}$		—	Vcc×0.7	—	Vcc+0.2	V
	$V_{IL(STB)}$			-0.2	—	Vcc×0.3	
待机输入电流	$I_{IH(STB)}$		V_{IN} = 3 V	5	15	25	μA
	$I_{IL(STB)}$		V_{IN} = 0 V	—	—	1	
输出饱和电压	$V_{sat(U+L)1}$		I_O = 1 A, Vcc = VM = 5 V	—	0.5	0.7	V
	$V_{sat(U+L)2}$		I_O= 0.3 A, Vcc = VM = 5 V	—	0.15	0.21	
输出泄漏电流	$I_{L(U)}$		VM = V_{OUT} = 15 V	—	—	1	μA
	$I_{L(L)}$		VM = 15 V, V_{OUT} = 0 V	-1	—	—	
再生二极管 VF	$V_{F(U)}$		I_F = 1A	—	1	1.1	V
	$V_{F(L)}$			—	1	1.1	
低电压检测电压	UVLD		(仅为设计目标)	—	1.9	—	V
恢复电压	UVLC			—	2.2	—	
响应速度	t_r		(仅为设计目标)	—	24	—	ns
	t_f			—	41	—	
	死区时间	H ~ L	穿透保护时间	—	50	—	
		L ~ H	(仅为设计目标)	—	230	—	
过热关机电路工作温度	TSD		(仅为设计目标)	—	175	—	°C
热击穿迟滞	ΔTSD			—	20	—	

目标特性


PD - Ta
(w)
1.50
1.00
0.50
0.00
PD
功耗
0
50
100
150
Ta (°C)
③
②
①
①IC 仅 θj – a = 160°C/W
② 在板上
PCB 面积为 50 mm×50 mm×1.6 mm
Cu 面积 ≥ 40%
③ 在板上
PCB 面积为 76.2 mm×114.3 mm×1.6 mm
Cu 面积≥ 30%


IOUT - 占空比
(A)
2.5
2.0
1.5
1.0
0.5
0.0
IOUT
输出电流
0%
20%
40%
60%
80%
100%
占空比
单通道操作
双通道操作
Ta = 25°C，仅 IC

典型应用图

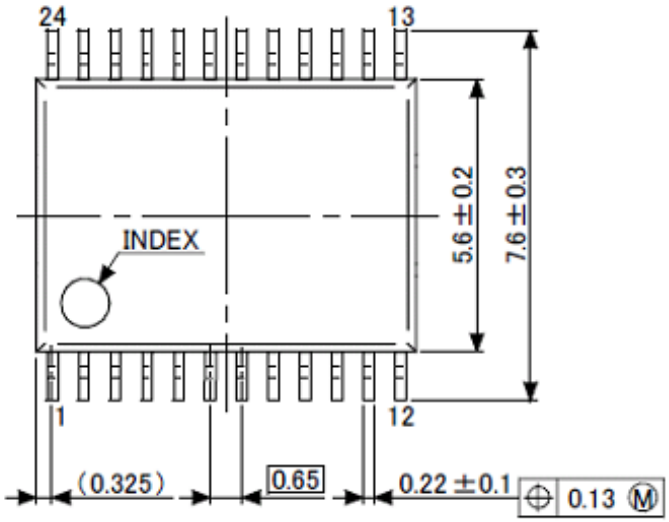


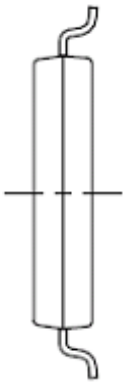
注： 应将噪声吸收冷凝器(C1 ,C2,C3 和 C4)尽量靠近 IC 连接。

封装尺寸

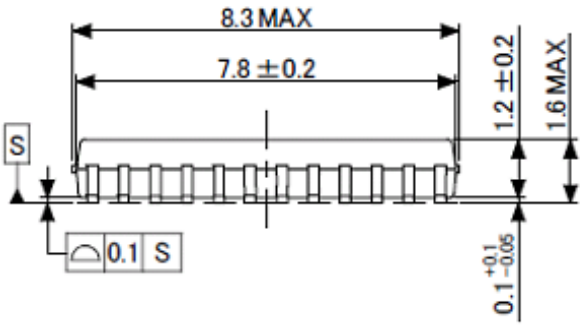
SSOP24-P-300-0.65A

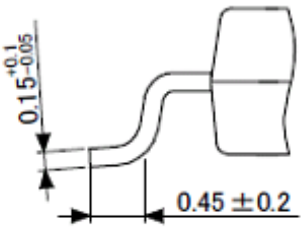
“单位： mm”





端子详图





重量：0.14 g(典型值)

内容注释

1. 方块图

出于解释目的，可能忽略或简化部分功能块，电路或常数。

2. 等效电路

出于解释目的，可能简化等效电路图或忽略其中的一部分。

3. 时序图

出于解释目的，可能简化时序图。

4. 应用电路

本文件所示应用电路仅供参考。在大规范生产设计阶段，必须进行全面评估。

东芝不因提供这些应用电路示例而授予任何工业产权许可。

5. 测试回路

测试回路中的部件仅用于获取及确认装置特性。不保证这些部件和电路能防止在应用设备中发生故障或失效。

IC 使用注意事项

IC 处理注意事项

[1] 半导体装置绝对最大额定值是一套在任何时候都不得超过的额定值。严禁超过这些额定值。
如超过额定值，则可能导致装置故障，损坏或劣化，并可因爆炸或燃烧导致人身伤害。

[2] 为确保在过电流和/或 IC 故障时不会持续通过大电流，应使用适当的电源保险丝。当在超过绝对最大额定值的条件下使用,接线路径不对，或者在接线或负载处产生异常脉冲噪声而造成大电流持续通过时，IC 会被完全击穿，并导致烟雾或起火。为尽量减小击穿时大电流流过的影响，必须进行正确设置，例如保险丝容量，熔断时间及插入电路的位置。

[3] 如您的设计包括诸如电机线圈之类的电感负荷，应将保护电路结合到设计中，以防止设备发生故障，或被接通电源时涌流导致的电流或断电时反电动势产生的负电流所击穿。进而造成伤害，烟雾或起火。
应使用带 IC 的具有内置保护功能的稳定电源。若电源不稳定，保护功能可能不工作而造成集成电路击穿，进而造成伤害，烟雾或起火。

[4] 严禁装置插错方向或插入错误。
保证电源的正负极端子接线正确。
否则电流消耗或功耗会超过绝对最大额定值而造成装置击穿，损坏或变坏，并因爆炸或燃烧而使人受伤。
此外，严禁任何阻止插错方向或插入错误，哪怕对其施加电流只有一次。

IC 处理记住要点

(1) 热关机电路

热关机电路不一定能在所有情况下对 IC 进行保护。若热关机电路在超温下工作，应立即消除发热状况。视使用方法及使用条件而定，超过绝对最大额定值会造成热关机电路不能正常工作或者造成 IC 在工作前击穿。

(2) 热辐射设计

在使用功率放大器、稳压器或驱动器等电流较大的 IC 时，该装置的设计应能确保适当散热，并在任何时间和情况下均不会超过所规定的结温(Tj)。这些 IC 甚至在正常使用时会发热。对于 IC 散热不足的设计，会造成 IC 特性变差或击穿。此外，在设计装置时，请考虑集成电路散热对外围部件的影响。

(3) 反电动势

当电机突然反转，停止或放慢时，由于反电动势的影响，电流会回流到电机电源。若电源的电流吸收能力小，装置的电机电源和输出引脚就会存在超过绝对最大额定值的风险。为了避免出现这种问题，在系统设计中应考虑反电动势的影响。

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