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FPF2498 集成 28 V 输入 OVT 负载开关的可调节 OVP

特性

功能	高级负载开关
输入	3.5 – 12 V
特性	VIN 绝对额定值: 28 V 最大连续 电流能力: 1.7 A RON 典型值: 80 mΩ 过压保护 (OVP) 过流保护 (OCP) 热关断 欠压锁定 (UVLO) 反向电流阻隔 (RCB)
ESD	15 kV IEC 61000-4-2 气隙
工作温度范围	-40 至 + 85°C
封装	6 焊球 WLCSP 封装 (1.05 x 1.3 x 0.625 mm、0.4 mm 引脚间距)
订购信息	FPF2498BUCX
顶标	TK

说明

FPF2498 先进负载管理开关的目标应用为要求高集成解决方案的应用。它将与 DC 电源电压 (<12 V) 相连, 具有严格关闭状态电流目标的负载和高负载电容 (<100 μF) 断开。FPF2498 由压摆率控制低阻抗 MOSFET 开关组成。FPF2498 提供过压保护和过温保护功能。

应用

- 手机, 智能电话
- 平板电脑

相关资源

- FPF2498 评估板

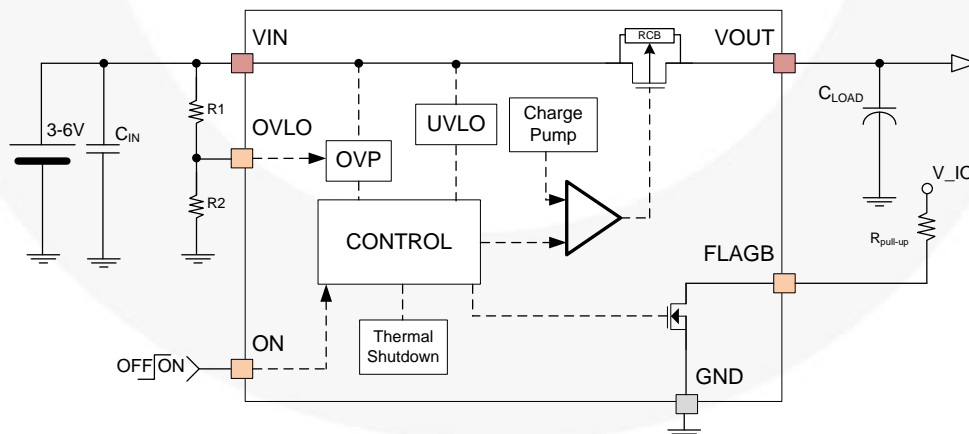


图 1. 原理框图和典型应用

注意:

1. 建议 C_LOAD 值大于 2.2 μF。

引脚配置

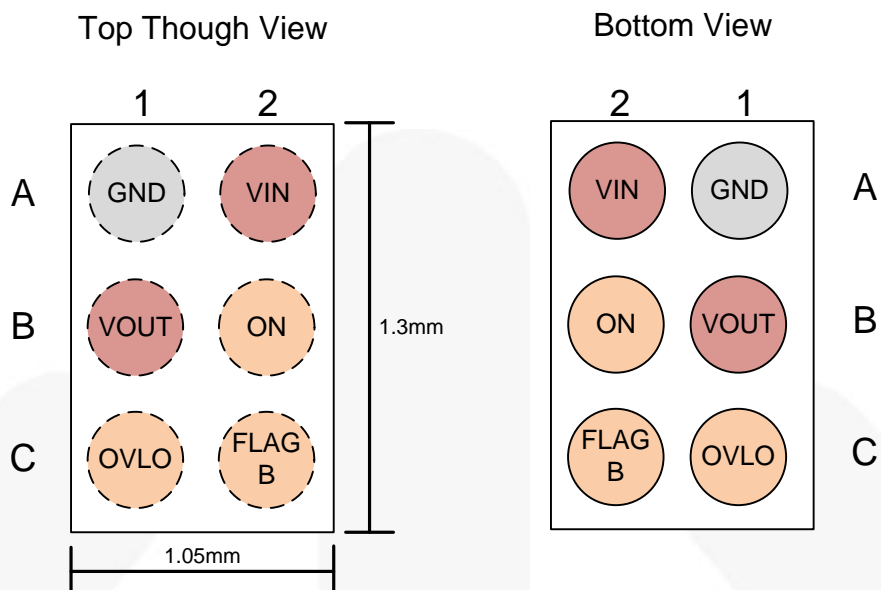


图 2. 引脚分配

引脚图

名称	引脚号	类型	缺省状态	说明					
VIN	A2	输入	N/A	输入电压路径					
VOUT	B1	输出	N/A	输出电压路径					
导通	B2	输入	低	器件开启/关断控制	<table border="1"> <tr> <td>V_{IH}=HIGH</td> <td>使能</td> </tr> <tr> <td>V_{IL}=LOW</td> <td>禁用</td> </tr> </table>	V_{IH} =HIGH	使能	V_{IL} =LOW	禁用
V_{IH} =HIGH	使能								
V_{IL} =LOW	禁用								
OVLO	C1	输入		由 R1 和 R2 实现 OVP 调节设置，并与 $1.2\text{ V} - V_{IN} \times R2 / (R1+R2) > 1.2\text{ V}$ 相比较					
FLAGB	C2	开漏输出	高阻抗	表示 OVP / OCP / OTP 故障	<table border="1"> <tr> <td>LOW / GND</td> <td>有效 - 表示: OVP (3 - 6 V 时超 6.5 V) OCP (超过 2 A) OTP (超过 150°C)</td> </tr> <tr> <td>HIGH / V_IO</td> <td>正常运行</td> </tr> </table>	LOW / GND	有效 - 表示: OVP (3 - 6 V 时超 6.5 V) OCP (超过 2 A) OTP (超过 150°C)	HIGH / V_IO	正常运行
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HIGH / V_IO	正常运行								
GND	A1	GND	GND	设备接地					

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。

符号	参数		最小值	最大值	单位
V_{PIN}	VIN 到 GND 电压、VIN 到 VOUT 电压 OVLO 引脚		-0.3	28.0	V
	ON、FLAGB 引脚上的电压		-0.3	6.0	
	VOUT 至 GND 引脚电压		-0.3	20.0	
I_{SW}	最大开关电流			1.75	A
t_{PD}	总功率损耗（在 $T_A=25^\circ\text{C}$ 时）			1	W
T_J	工作结温		-40	+150	$^\circ\text{C}$
T_{STG}	存储结温		-65	+150	$^\circ\text{C}$
Θ_{JA}	结至环境热阻（每平方英寸焊盘为 2 oz 铜片）			95 ⁽²⁾	$^\circ\text{C}/\text{W}$
				110 ⁽³⁾	
ESD	静电放电能力	人体放电模型，ANSI / ESDA / JEDEC JS-001-2012	3		kV
		元件充电模型，JEDEC JESD22-C101	2		
	IEC61000-4-2 系统级	空气放电 (V_{IN}, V_{ON}, V_{OUT} 到 GND)	15		
		接触放电 (V_{IN}, V_{ON}, V_{OUT} 到 GND)	8		

注意：

- 采用 2S2P JEDEC 标准测量。PCB。
- 使用 2S2P JEDEC PCB 冷板方法测得。

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	最小值	最大值	单位
V_{IN}	电源电压	3.5	12.0	V
I_{SW}	最大连续开关电流 ⁽⁴⁾		1.7	A
T_A	工作环境温度	-40	85	$^\circ\text{C}$

注意：

- 最大结温 = 85°C

电气特性

$V_{IN}=3.5$ 至 5.5 V, $T_A=-40$ 至 $+85^{\circ}\text{C}$; 在 $V_{IN}=5$ V 和 $T_A=25^{\circ}\text{C}$ 时的典型值, 除非另有说明。

符号	参数	工作条件	最小值	典型值	最大值	单位
基本工作						
$I_{SD(OFF)}$	关断电流	$V_{IN}=5.5$ V, $V_{OUT}=0$ V, $V_{ON}=GND$		0.4	3.0	μA
I_Q	静态电流	$V_{IN}=5.5$ V, V_{OUT} = 浮动, $I_{OUT}=0$ mA		90	125	μA
R_{ON}	导通电阻	$V_{IN}=3.7$ V, $I_{OUT}=200$ mA		90		m Ω
		$V_{IN}=5.0$ V, $I_{OUT}=200$ mA		80	95 ⁽⁵⁾	
		$V_{IN}=9$ V, $I_{OUT}=200$ mA				
		$V_{IN}=12$ V, $I_{OUT}=200$ mA				
V_{IH}	导通输入逻辑高电压	$V_{IN}=3.5$ V 至 5.5 V	1.15			V
V_{IL}	导通输入逻辑低电压	$V_{IN}=3.5$ V 至 5.5 V			0.65	V
V_{OL_FLAG}	FLAGB 输出逻辑低电压	$V_{IN}=5$ V, $I_{SINK}=1$ mA		0.10	0.20	V
I_{FLAG_LK}	FLAGB 输出高漏电流	$V_{IN}=5$ V, 开关导通			0.5	μA
RPD	ON 引脚下拉电阻	$V_{IN}=5$ V, $OVLO=GND$		3		M Ω
过压保护						
V_{OV_TRIP}	默认输入 OVP 闭锁	V_{IN} 上升阈值, $OVLO=GND$	6.2	6.5	6.8	V
		V_{IN} 下降阈值, $OVLO=GND$		6.2		
V_{OVLO_SEL}	选择 OVLO 的电压阈值	$V_{IN}=3.5$ V 至 5.5 V, $OVLO=GND$		0.3		V
V_{OVP_HYS}	输入 OVP 滞回	V_{IN} 下降阈值, $OVLO$ = 外部设置		0.3		V
V_{OVLO_TH}	OVLO 设置阈值	$V_{IN}=3.5$ 至 V_{OVLO}		1.20		V
t_{OVP}	响应时间	$I_{OUT}=0.5$ A, $C_L=0$ μF , $T_A=25^{\circ}\text{C}$, $V_{IN}=6$ V 至 7 V		0.5	1	μs
V_{UVLO}	欠压锁定	V_{IN} 上升		3.2		V
		V_{IN} 降		3.0		
V_{UVLO_HYS}	UVLO 滞环			200		mV
I_{RCB}	RCB 电流	$V_{ON}=0$ V, $V_{OUT}=5.5$ V, $V_{IN}=0$ V		2	5	μA
TSD	热关断	关断阈值		150		$^{\circ}\text{C}$
		从关闭中恢复		130		
		滞回		20		
过流保护						
I_{OCP}	过流保护跳变点	$I_{SW} > I_{OCP}$		2		A
动态特性						
t_{DON}	导通延迟 ⁽⁷⁾	$V_{IN}=5$ V, $R_L=100$ Ω , $C_L=10$ μF , $T_A=25^{\circ}\text{C}$		4.3		ms
t_R	V_{OUT} 上升时间 ⁽⁷⁾			3.0		ms
t_{ON}	开启时间 ⁽⁸⁾			7.3		ms
t_{DOFF}	关断延迟 ^(6,7)			600		μs
t_F	V_{OUT} 下降时间 ^(6,7)			2.0		ms
t_{OFF}	关断时间 ^(6,9)			2.5		ms
t_{READY}	大负载电流时的器件就绪时间 ⁽¹⁰⁾		$C_L=10$ μF		5	

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电气特性

$V_{IN}=3.5$ 至 5.5 V, $T_A=-40$ 至 $+85^\circ\text{C}$; 在 $V_{IN}=5$ V 和 $T_A=25^\circ\text{C}$ 时的典型值, 除非另有说明。

符号	参数	工作条件	最小值	典型值	最大值	单位
t_{RESTART}	过流消隐时间 ⁽⁶⁾	$V_{IN}=5$ V $I_{OUT} \geq 1.7$ A		64		ms
t_{OCP}	过流响应时间 ⁽⁶⁾	中等过流条件; $I_{OUT} \geq I_{LIM}$ $V_{OUT} \leq V_{IN}$		4		μs
t_{HOCP}	硬过流响应时间	中等过流条件; $I_{OUT} \geq I_{LIM}$ $V_{OUT} \leq 0$ V		3		μs
$t_{\text{FLAGB_Release}}$	过流/过压/过温 标志释放时间 ⁽⁶⁾	移除故障条件后的标志释放时间		100		ms

注意:

- $T_A=25^\circ\text{C}$
- 该参数通过设计和特性得到保证, 无需生产测试。
- $t_{\text{DON}}/t_{\text{DOFF}}/t_{\text{R}}/t_{\text{F}}$ 如下图所示定义。
- $t_{\text{ON}}=t_{\text{R}} + t_{\text{DON}}$.
- $t_{\text{OFF}}=t_{\text{F}} + t_{\text{DOFF}}$.
- t_{READY} 后, 器件针对最大 DC 电流负载条件准备就绪。

时序图

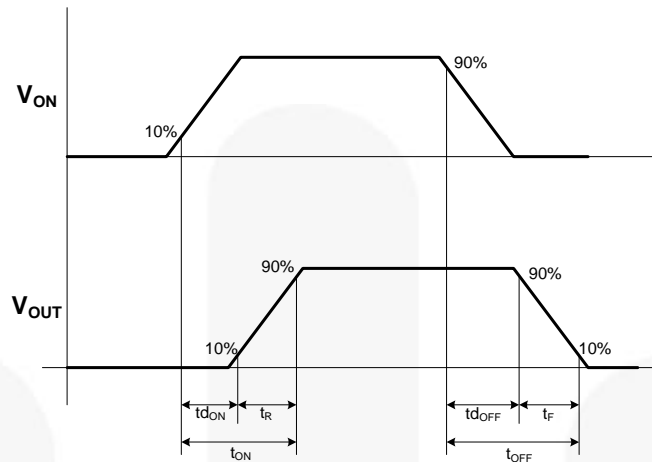


图 3. 时序图

其中：

t_{DON} = 延迟导通时间；

t_r = V_{OUT} 上升时间；

t_{ON} = 开启时间；

t_{DOFF} = 延迟关断时间；

t_f = V_{OUT} 下降时间；且

t_{OFF} = 关断时间。

器件故障特性时序

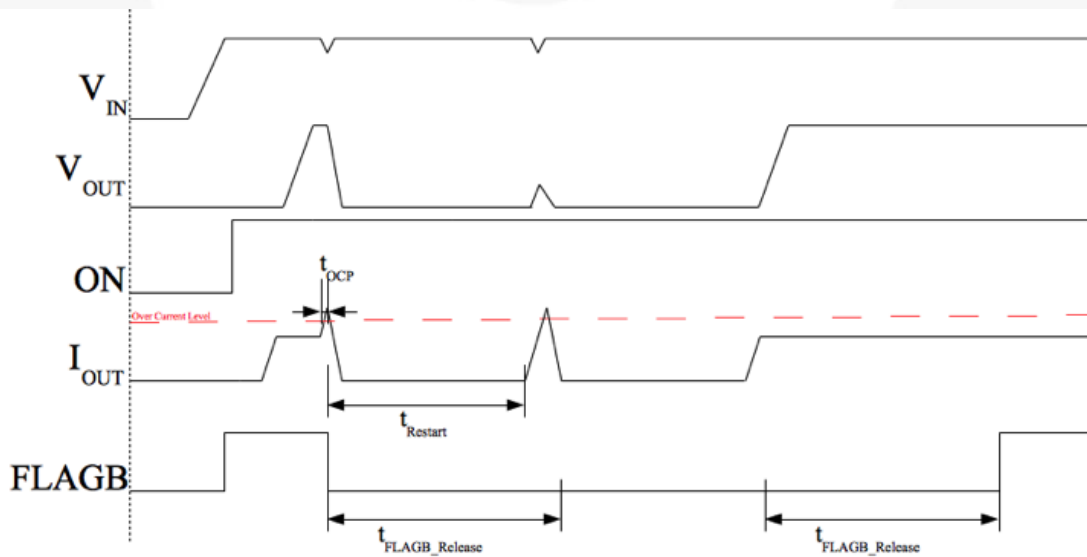


图 4. OCP 关断时序图

操作和应用描述

输入电容

当开关打开变成放电负载电容时，为防止因瞬态浪涌电流造成输入电源电压下降，必须在 VIN 与 GND 引脚之间放置一个电容。可使用较高值的电容 C_{IN} 来降低高电流应用中的电压降。

输出电容

输出电容应放置在 VOUT 和 GND 引脚之间。开关接通时，该电容可防止电路板寄生电感强制将 V_{OUT} 降至 GND 以下。该电容还可以防止反向浪涌电流产生电压尖峰，在 V_{OUT} 短路的情况下这可能会损坏器件。

故障报告

一旦检测到过压、过流或过温条件，FLAGB 通过启动 LOW 发出故障信号。

欠压锁定 (UVLO)

当输入电压降至锁定阈值以下时，欠压锁定功能将关闭开关。当 ON 引脚有效时，输入电压将超过 UVLO 阈值，解除封锁并打开开关。

过压锁定 (OVLO)

OVLO 引脚通过电阻分压器网络设置过压锁定跳变点。由 R1 和 R2 实现 OVLO 调节设置，并与 $1.2 V - V_{IN} \times R2 / (R1+R2) > 1.2 V$ 相比较。当 $V_{IN} > V_{OVLO}$ 时，开关关闭，从而保护连接 VOUT 的器件。建议 R1 采用 1 MΩ 或数值更高的电阻，降低待机功耗。如需为 V_{OVLO} 采用默认 5.8 V，可将 OVLO 引脚直接连接 GND。

Package Specific Dimensions

D	E	X	Y
1.300±0.030	1.050±0.030	0.325	0.250

反向电流阻隔 (RCB)

反向电流阻隔功能可保护输入源免受输出流向输入的电流影响。负载开关关断时，没有电流从输出流向输入。

热关断 (TSD)

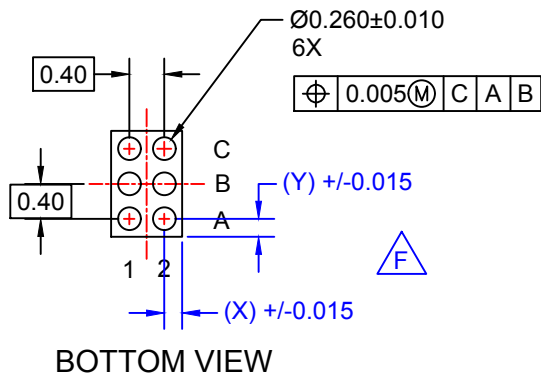
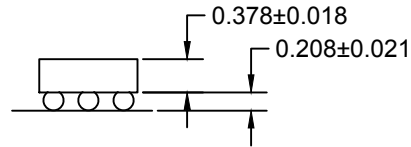
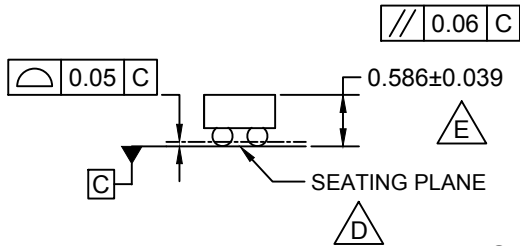
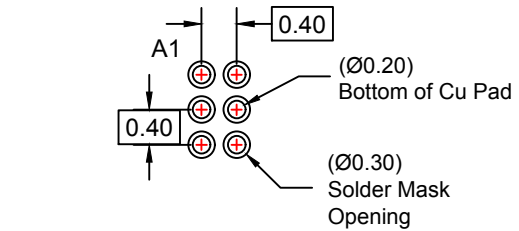
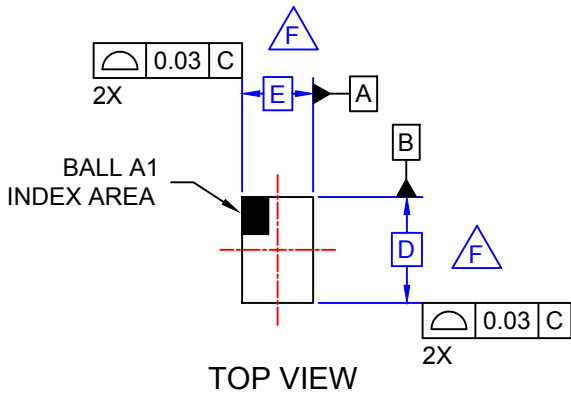
热关闭可防止晶圆内部或外部产生过高温度。过温状态下，开关关闭。当裸片温度降至阈值温度以下时，开关将再次自动打开。

限流

限流功能确保流过开关的电流不超过某个最大值；若超过则有可能损坏器件。若流过开关的电流超过跳变点，则开关关断并进入消隐时间。消隐时间过后，开关再次开启，并检查故障条件是否依旧存在。

线路板布局

若要实现最佳效果，所有的线路应尽量短。输入和输出电容应尽可能靠近器件放置，从而尽量降低正常和短路工作时的寄生走线电感。VIN、VOUT 和 GND 引脚使用较宽走线，有助于最大限度地降低寄生电气效应，以及壳至环境热阻。



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- A. NO JEDEC REGISTRATION APPLIES.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASMEY14.5M, 2009.
- D.** DATUM C, THE SEATING PLANE IS DEFINED BY THE SPHERICAL CROWNS OF THE BALLS.
- E.** PACKAGE TYPICAL HEIGHT IS 586 MICRONS ±39 MICRONS (547-625 MICRONS).
- F.** FOR DIMENSIONS D, E, X, AND Y, SEE PRODUCT DATASHEET.
- G. DRAWING FILENAME: MKT-UC006ACrev6.



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