



Is Now Part of



ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at www.onsemi.com

Please note. As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

FLS0116

内置MOSFET具有功率因数校正功能的智能 LED 灯驱动器集成电路

特性

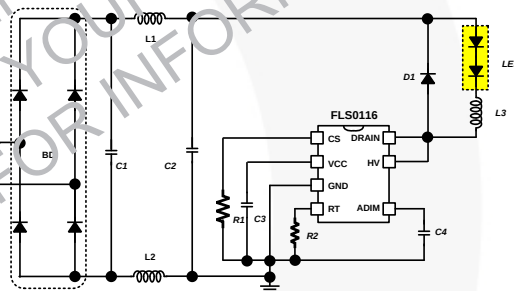
- 内置 MOSFET (1 A / 550 V)
- 数字实施有源PFC 功能
- 无达到高PF的额外电路
- 应用输入范围: 80 V_{AC} ~ 308 V_{AC}
- 内置HV电源电路: 自偏置
- 支持自动重启模式的AOC功能
- 内置过温保护 (OTP)
- 逐周期限流
- 电流传感引脚开路保护
- 低工作电流: 0.85 μ A (典型值)
- 带有 5 V 滞回的欠电压锁定
- 可编程 振荡频率
- 可编程 LED 电流
- 亮度调节功能
- 软启动功能
- 精确的内部参考: $\pm 3\%$

应用

- 装饰照明用 LED 灯
- 低能耗照明器材用 LED 灯

说明

FLS0116 LED 灯驱动器是一个具有集成 MOSFET 功能和 PFC 功能的简单、高效的“已采用数字”技术可自动检测输入电压情况, 并发送内部参考信号来实现高功率因数。当 AC 输入应用于 IC 时, 系统会自动启用 PFC 功能。当 DC 输入应用于 IC 时, 系统会自动禁用 PFC 功能。FLS0116 不需要大电解电容来维持供电的稳定性, 这能有效延长 LED 灯寿命。



□ 1. 典型应用

订购信息

器件编号	工作温度范围	封装	包装方法
FLS0116MX	-40° C to +125° C	7 引脚小型封装集成电路 (SOIC), JEDEC MS-012, .150 英寸, 窄体	卷带和卷盘

框图

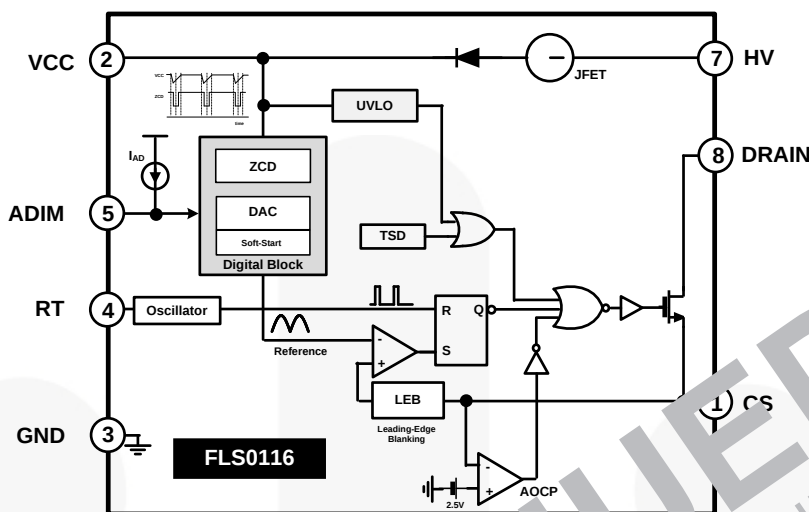


图2. 框图

引脚布局

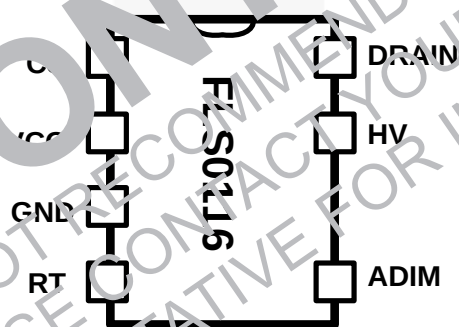


图3. 引脚布局

引脚定义

引脚号	名称	说明
1	CS	电流检测。 依靠检测电阻电压限制输出电流 CS引脚还用于设置 LED 电流调节
2	VCC	VCC. 电源引脚用于集成电路稳定运行；ZCD 信号检测用于精确的 PFC 功能。
3	GND	接地。 IC接地
4	RT	RT. 通过外部电阻可编程工作频率；当此引脚开路或悬空时，IC工作于预设固定的频率。
5	ADIM	模拟调光。 连接到内部电流源。通过外部电阻改变输出电流。如果 ADIM 没有使用，在 ADIM 和 GND 之间连接一个 0.1 μ F 的旁路电容器。
7	HV	高压。 连接高压线，给IC提供电流。
8	DRAIN	DRAIN. 内部 MOSFET 漏极引脚

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，过度暴露在高于推荐的工作条件下，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_{CC}	IC 电源电压		20	V
HV	高压检测		550	V
DRAIN	内部漏极电压		550	V
V_{ADIM}	模拟调光		5	V
V_{RT}	设置频率引脚电压		5	V
V_{CS}	容许的电流检测电压			V
T_A	工作环境温度范围	-40	125	°C
T_J	工作结温	-40	+150	°C
T_{STG}	存储温度范围	-65	+150	°C
θ_{JA}	结至环境热阻 ^(1,2)		135	°C/W
P_D	功耗		660	mW
ESD	静电放电能力	人体模式, JESD2-A114	2000	V
		器件充电模式, JESD22-C101	1000	

注意：

- 热阻测试板。尺寸：76.2 mm x 76.2 mm x 1.6 mm (1SOP)。JEDEC 标准：JESD51-2, JESD51-3。
- 假设无环境气流。

电气特性

典型值为 $T_A = +25^\circ\text{C}$ 时的值。 $-40^\circ\text{C} \sim 125^\circ\text{C}$ 的参数规格值由设计保证。

符号	参数	条件	最小值	典型值	最大值	单位
V _{CC} 偏置部分						
V _{CC}	V _{CC} 稳压器输出电压	V _{HV} =100 V _{DC}	14.0	15.5	17.0	V
V _{CCST+}	UVLO 正向阈值	V _{CC} 增加	12	13	14	V
V _{CCST-}	UVLO 负向阈值	V _{CC} 降低	7	8	9	V
V _{CCHYS}	UVLO 滞回		4	5	6	V
I _{HV}	高压引脚电流	V _{HV} = 100 V _{DC} , RT = 开路		0.85	1.20	mA
I _{ST}	启动电流			1	50	μA
开关部分						
f _{OSC}	工作频率	R _T =5.95 kΩ	200	250	300	kHz
		R _T =87 kΩ		20	24	kHz
		R _T Open	40	45.0	49.5	kHz
t _{MIN}	最短导通时间 ⁽³⁾			400		ns
D _{MAX}	最大占空比			50		%
t _{LEB}	前沿消隐时间 ⁽³⁾			200		ns
V _{RT}	RT引脚基准电压			1.5		V
软启动部分						
t _{SS}	软启动时间 ⁽³⁾	直流电模式	40	60	72	ms
		交流电模式		7		周期
基准部分						
V _{CS1}	CS 引脚基准电压	直流电模式	0.354	0.365	0.376	V
V _{CS2}		交流电模式 ⁽⁵⁾	0.485	0.500	0.515	
保护部分						
V _{PPV_{CC}}	V _{CC} 引脚过压保护		17.7	18.7	19.7	V
V _{PPCS}	CS引脚异常过流保护电位 ⁽³⁾			2.5		V
t _{AOCF}	异常检测时间 ⁽³⁾			70		ns
T _{TSDH}	热关断阈值 ⁽³⁾		140	150		°C
T _{TSDHY}	热关断阈值滞回 ⁽³⁾			50		°C
调光部分						
V _{ADIM(ST+)}	模拟调光正向阈值 ⁽³⁾		3.15	3.50	3.85	V
V _{ADIM(ST-)}	模拟调光负向阈值 ⁽³⁾			0.50	0.75	V
I _{AD}	ADIM 引脚内部电流源		9	12	15	μA

接下页

电气特性 (续)

典型值为 $T_A = +25^\circ\text{C}$ 时的值。 $-40^\circ\text{C} \sim 125^\circ\text{C}$ 的参数规格值由设计保证。

符号	参数	条件	最小值	典型值	最大值	单位
MOSFET 部分						
BV_{DSS}	击穿电压	$V_{GS}=0\text{ V}, I_D=250\text{ }\mu\text{A}$	550			V
I_{LKMOS}	内部 MOSFET 泄漏电流	$V_{DS}=550\text{ V}_{DC}, V_{GS}=0\text{ V}$			250	μA
$R_{ON(ON)}$	漏源电阻 ⁽³⁾	$V_{GS}=10\text{ V}, V_{DS}=0\text{ V}, T_C=25^\circ\text{C}$		7.3	10.0	Ω
C_{ISS}	输入电容 ⁽³⁾	$V_{GS}=0\text{ V}, V_{DS}=25\text{ V}, f=1\text{ MHz}$		135		pF
C_{OSS}	输出电容 ⁽³⁾	$V_{GS}=0\text{ V}, V_{DS}=25\text{ V}, f=1\text{ MHz}$		21		pF
C_{RSS}	反向传输电容 ⁽³⁾	$V_{GS}=0\text{ V}, V_{DS}=25\text{ V}, f=1\text{ MHz}$		5.1		pF
$t_{d(ON)}$	导通延时 ⁽³⁾	$V_{DD}=350\text{ V}, I_D=1\text{ A}$		10		ns
t_r	上升时间 ⁽³⁾	$V_{DD}=350\text{ V}, I_D=1\text{ A}$		13.4		ns
$t_{d(OFF)}$	关断延时 ⁽³⁾	$V_{DD}=350\text{ V}, I_D=1\text{ A}$		4.9		ns
t_f	下降时间 ⁽³⁾	$V_{DD}=350\text{ V}, I_D=1\text{ A}$		36.2		ns

注:

3. 该参数由设计保证; 未经 100% 产品测试。

功能说明

FLS0116 是一种采用降压转换拓扑结构的基本PWM控制器，工作于连续导通模式（CCM），通过数字控制算法实现的智能功率因数校正功能。一个使用高压开关器件的内部自偏压电路。该IC不像典型反激控制集成电路或 PSR 产品系列需要辅助电源连接至 VCC 引脚。

当施加在 HV 引脚上的输入电压在工作范围内（25 V 至 500 V）时，FLS0116 在 VCC 引脚保持 15.5 V 的直流电压以维持稳定运行。UVLO 模块功能是，当 V_{CC} 电压高于 V_{CCST+} 时，内部 UVLO 模块启动，开始运行。否则，当 V_{CC} 降低至 V_{CCST-} 时，集成电路停止运行。通常来说，即使输入电压处于干扰极大或不稳定的情况下运行，滞后特性也可以保证稳定运行。

FLS0116 拥有“智能”内部数字单元来确定输入情况：交流或直流。当 50 Hz 或 60 Hz 的交流电源应用于 IC 时，IC 会自动转变内部基准信号，使其与输入信号相近，从而实现高功率因数。当直流电源连接集成电路时，内部基准会直接转变为直流。

软启动功能

FLS0116 具有内部软启动功能，以降低启动时的冲击电流。当 IC 依照内部时序开始工作时，内部基准会以预设的固定时间缓慢增加。在这个瞬态时期后，内部基准会到达一个稳定水平。此时，IC 不断试图从 HV 引脚获取相位信息。如果 IC 成功获取相位信息，它会自动产生七个周期的过渡时间中产生的相似波形的参考电压。如果没能获取，IC 生成直流基准水平。

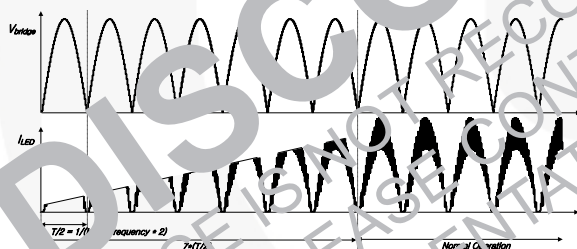


图4. 交流输入模式中的软启动功能

内部功率因数校正功能：如何实现高功率因数

FLS0116 具有一个简单“智能”的内部功率因数校正功能，无需额外的引脚来检测输入相位信息，也无需电解电容器来保证电源电压稳定。要实现高功率因数，FLS0116 在桥式二极管后不使用整流电容器 这是至关重要的，因为 IC 采用检测 VCC 引脚上的信号波动。基本上来说，为 IC 供电的 VCC 引脚具有和经桥式整流后的整流电压一样的电压纹波，电平值根据 V_{CC} 电容值不同而改

变。利用 VCC 引脚上的这种电压波动，IC 可以检测时间参考值，产生内部零电流检测信号。

为获得输入电压信号的精确可靠内部参考电压，FLS0116 使用数字技术（西格玛/增量调制）产生新的内部信号（DAC_OUT），该信号与输入电压具有相同的相位，如图图5所示。该信号进入最终比较器，与来自检测电阻的电流信号进行比较。

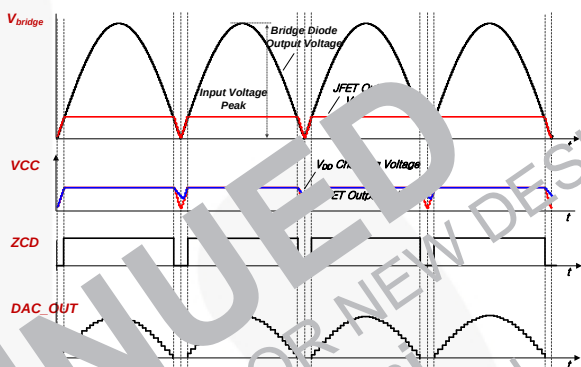


图5. 内部功率因数校正功能

自偏压功能

自偏压功能使用高压器件，可以向 IC 供应足够的工作电流，确保在整个输入电压范围内（80 V~308 V_{AC}）具有近似的启动时间。然而，在高压条件下，自偏压功能存在一个缺点。高压器件通常用作恒流源，因此当高输入电压连接高压引脚时，内部高压器件会有功率损耗。这些功率损耗与输入电压成正比。为了降低功率损耗，一个可行的解决办法是在输入电压源和高压引脚间额外安置一个电阻，如图所示图6。

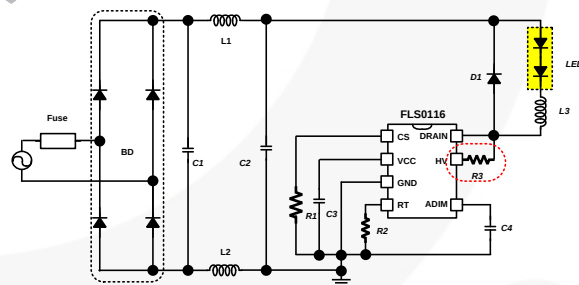


图6. 高压应用

调光功能

FLS0116 使用 ADIM 引脚来模拟或者使用电阻分压器来在 0 V 至 10 V 间进行调光。内部参考电压的峰值（即图5DAC_OUT 信号），会被 V_{ADIM} 水平而改变，如图所示图7，根据不同的运行模式，有不同的峰值水平。

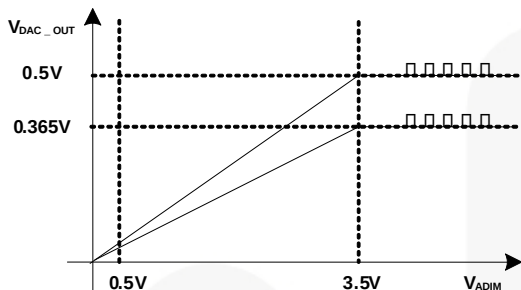


图7. V_{ADIM} 与 $V_{DAC_OUT(peak)}$ 对比

电感设计

固定内部最大占空比低于 50%，最小导通时间为 400 ns。该范围取决于输入电压和串联 LED 数量。

最低占空比计算为：

$$D_{min} = \frac{n \cdot V_f}{\eta \cdot V_{in(max)}} \quad (1)$$

其中，

η = 系统效率；

$V_{in(max)}$ = 最大输入电压；

V_f = LED正向压降 且

n = 串联 LED 数量。

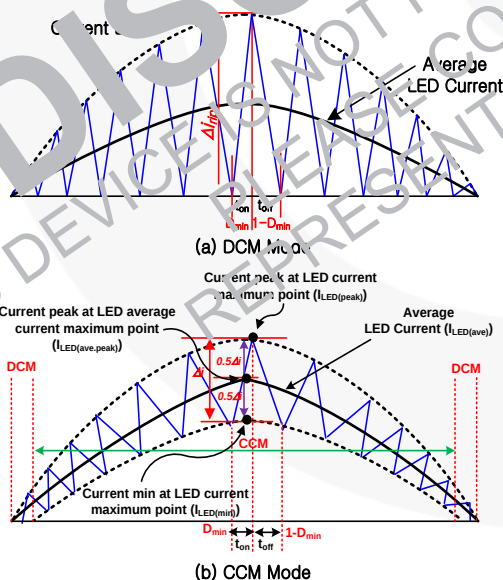


图8.DCM 和 CCM 运行

在 DCM 模式下，电感为：

$$L_m = \frac{n \cdot V_f \cdot (1 - D_{min})}{f_s \cdot \Delta i_{rip}} [H] \quad (2)$$

如果峰值电流固定在 350 mA_{pk}，则峰值电流的计算公式为：

$$I_{LED(ave, peak)} = \Delta i_{con} + \frac{\Delta i_{rip}}{2} [A] \quad (3)$$

对于 FL7701，LED RMS 电流确定电感参数。为了能够获得 CCM 模式，需要首先确定 LED RMS 电流：

$$I_{LED(rms)} = \frac{I_{LED(ave, peak)}}{\sqrt{2}} [A] \quad (4)$$

将方程式 (2) 替换为方程式 (4)，可求电感。

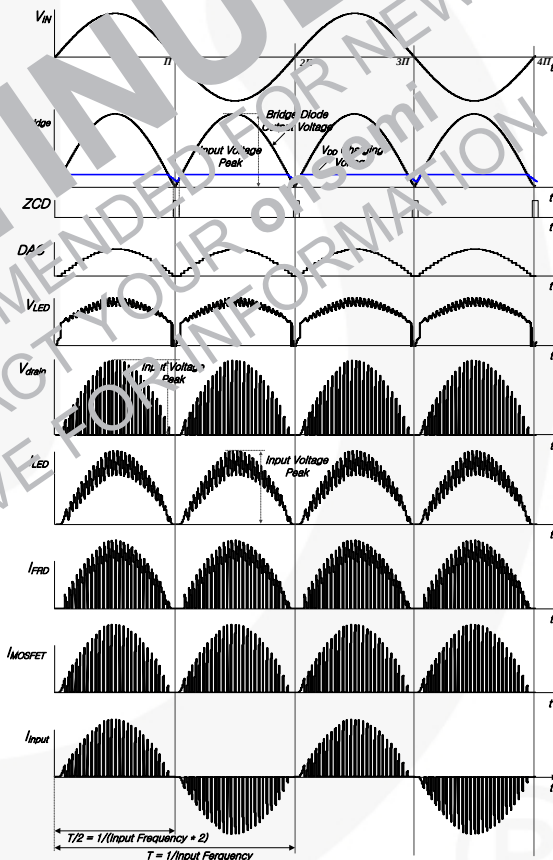


图9. 典型性能特征

应用电路实例

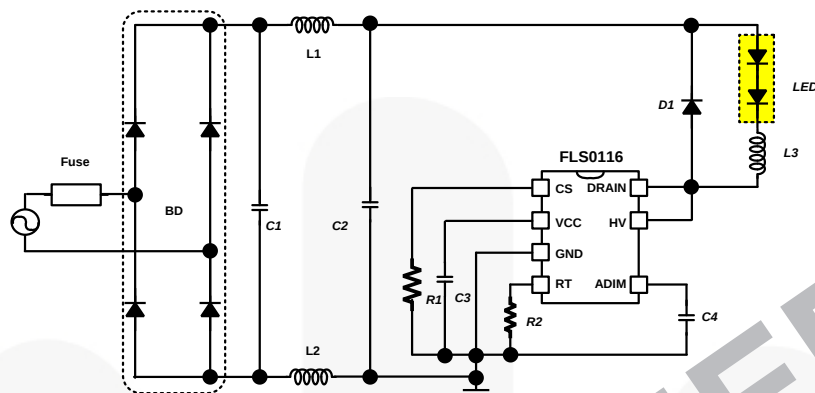


图10. 无电解电容器的应用电路

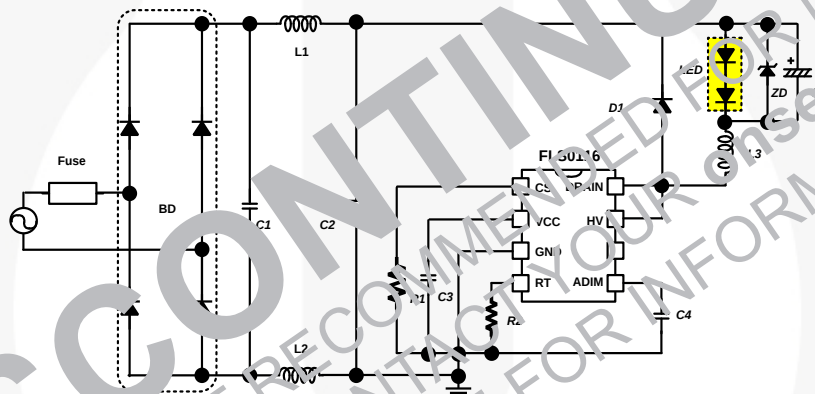


图11. 有电解电容器的应用电路

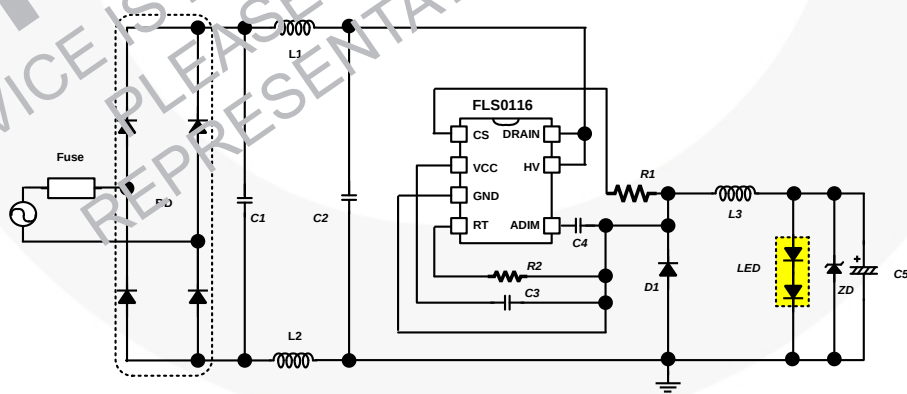


图12. 有电解电容器的高侧运行应用电路

典型特性

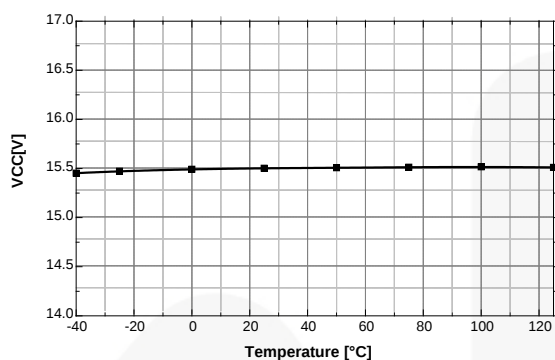


图13. V_{OV} 与温度的关系

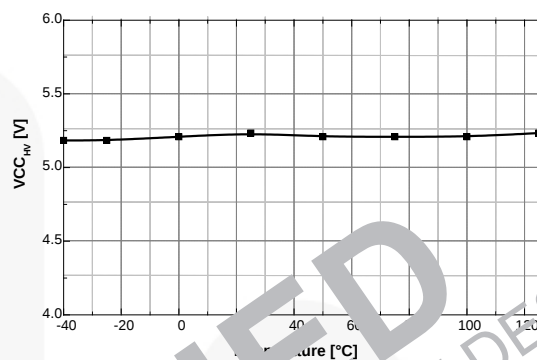


图14. V_{OCHYS} 与温度的关系

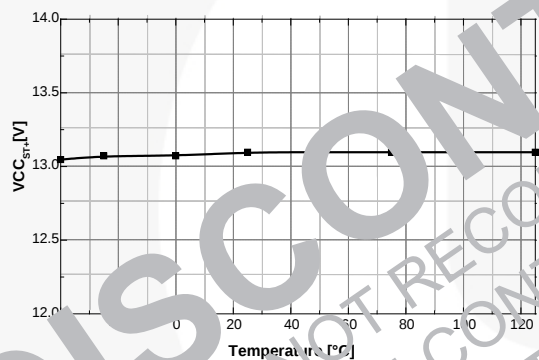


图15. V_{OCSL} 与温度的关系

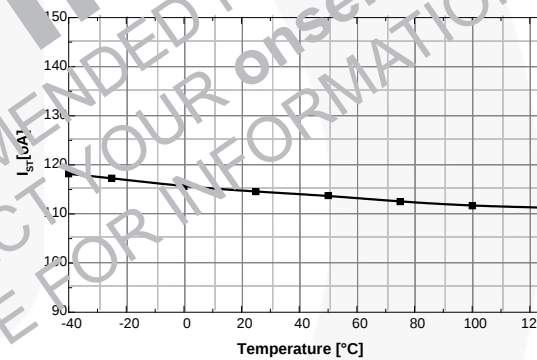


图16. I_{ST} 与温度的关系

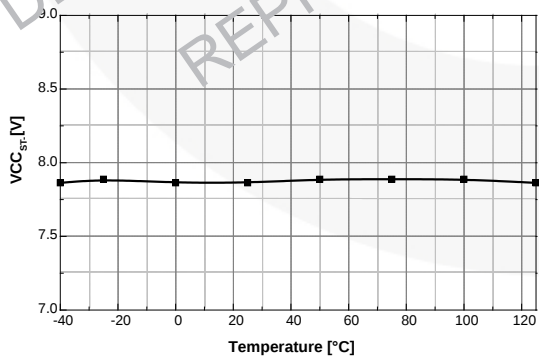


图17. V_{OCSL} 与温度的关系

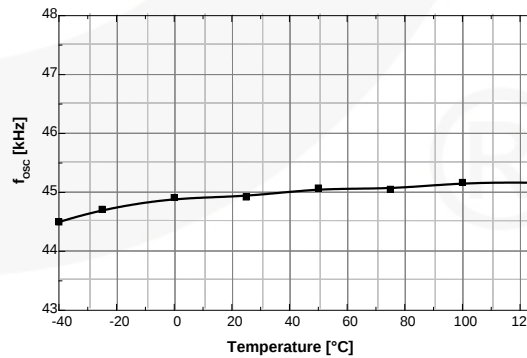


图18. f_{osc} 与温度的关系 (RT= 开路)

典型特性

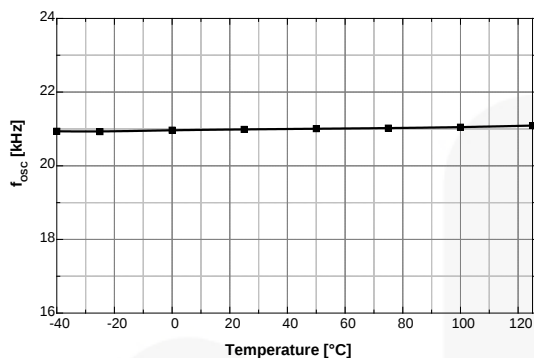


图19. f_{osc} 与温度的关系 ($R_T=87k\Omega$)

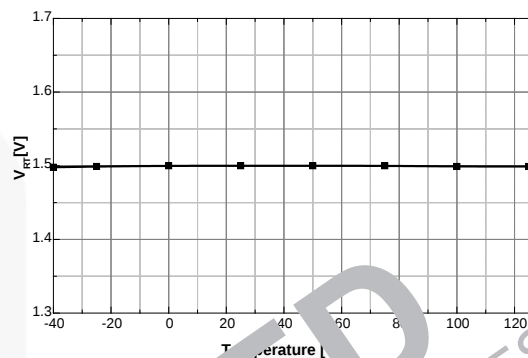


图20. V_R 与温度的关系

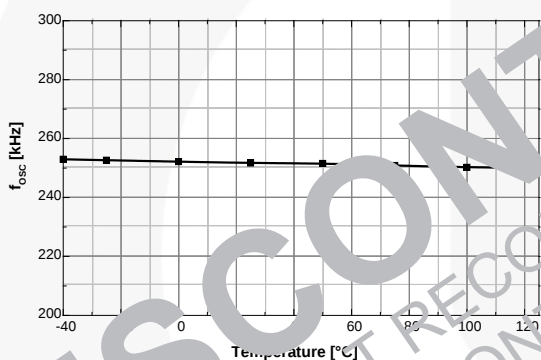


图21. f_{osc} 与温度的关系 ($\eta=5.95k\Omega$)

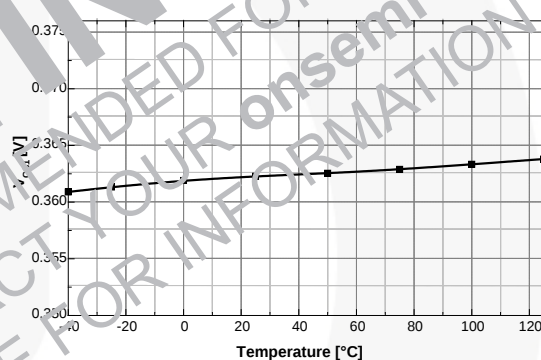


图22. V_{OS} 与温度的关系

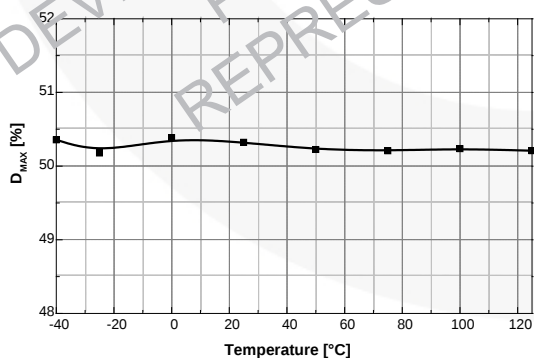


图23. D_{max} 与温度的关系

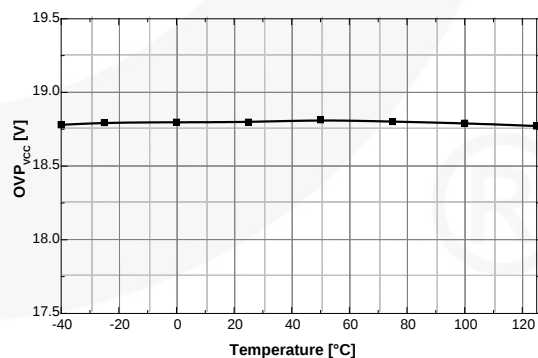


图24. OVP_{VOC} 与温度的关系

典型特性

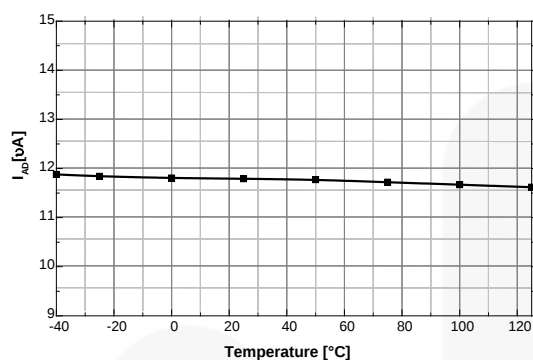


图25. I_{AD} 与温度的关系

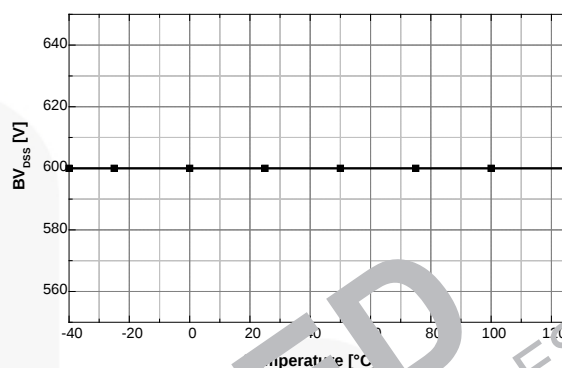


图26. BV_{DSS} 与温度的关系

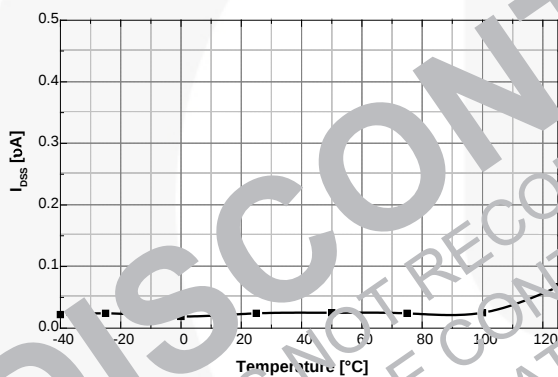


图27. I_{DSS} 与温度的关系

物理尺寸

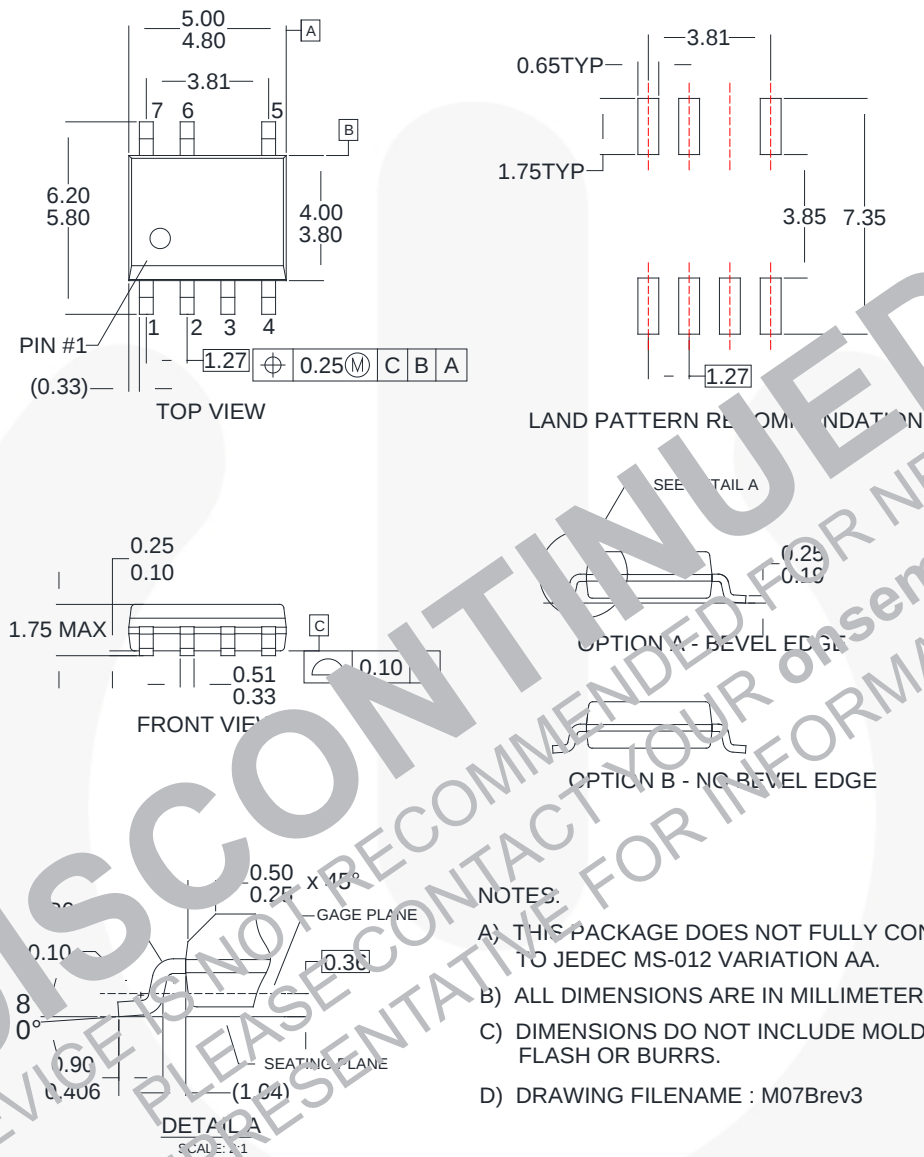


图28. 7 引线小型封装集成电路 (S01C), JEDEC MS-012, .150 英寸窄体

封装图纸是作为一项服务而提供给考虑选用飞兆半导体产品的客户。具体参数可能会有变化, 且不会做出相应通知。请注意图纸上的版本和/或日期, 并联系飞兆半导体代表核实或获得最新版本。封装规格并不扩大飞兆公司全球范围内的条款与条件, 尤其是其中涉及飞兆公司产品的保修。

随时访问飞兆半导体在线封装网页, 可以获得最新的封装图:

<http://www.fairchildsemi.com/packaging/>.



TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

2Cool™	FPS™	PowerTrench®	Sync-Lock™
AccuPower™	F-PFET™	PowerXS™	SYSTEM GENERAL®
AX-CAP®*	FRFET®	Programmable Active Droop™	TinyBoost™
BitSiC™	Global Power Resource™	QFET®	TinyBuck™
Build it Now™	GreenBridge™	QST™	TinyCalc™
CorePLUS™	Green FPS™	Quiet Series™	TinyLogic®
CorePOWER™	Green FPS™ e-Series™	RapidConfigure™	TINYOPTO™
CROSSVOLT™	Gmax™	Saving our world, 1mW/W/kW at a time™	TinyPower™
CTL™	GTO™	SignalWise™	TinyPVM™
Current Transfer Logic™	IntelliMAX™	SmartMax™	TinyWire™
DEUXPEED®	ISOPLANAR™	SMART START™	TriFault Protect™
Dual Cool™	Making Small Speakers Sound Louder and Better™	Solutions for Your Success™	TRUECURRENT®
EcoSPARK®	MegaBuck™	SPM®	UltraDes™
EfficientMax™	MICROCOUPLER™	STEALTH™	UHC®
ESBC™	MicroFET™	SuperFET®	Ultra FRFET™
Fairchild®	MicroPak™	SuperSOT™	UNIFET™
Fairchild Semiconductor®	MicroPak2™	SuperSOT™	VIX™
FACT Quiet Series™	MillerDrive™	SuperSOT™	VisualMax™
FACT®	MotionMax™	Supra™	VoltagePlus™
FAST®	mWSaver™	Supra™	XS™
FastvCore™	OptoHi™	Supra™	
FETBench™	OPTOLOGIC®	Supra™	
	OPTOPLANAR®	Supra™	

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which (a) are intended for human implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

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. 164

DISCONTINUED

THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN
PLEASE CONTACT YOUR onsemi
REPRESENTATIVE FOR INFORMATION

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local
Sales Representative