



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.



FSB50450A / FSB50450AS / FSB50450AT

Motion SPM[®] 5 系列

产品特性

- 通过 UL 第 E209204 号认证 (UL1557)
- 500 V $R_{DS(on)}$ = 2.4 W (最大值) FRFET MOSFET 三相逆变模块, 带有栅极驱动器和保护功能
- 内置自举二极管以简化印刷电路板布局
- 低侧 MOSFET 的三个开源引脚用于三相电流感测
- 高电平有效接口, 可用于 3.3 / 5 V 逻辑电平, 施密特触发脉冲输入
- 针对低电磁干扰进行优化
- 内置于 HVIC 的温度感测
- 用于栅极驱动和欠压保护的 HVIC
- 绝缘等级: 1500 V_{rms} /分
- 湿度敏感等级 (MSL) 3
- 符合 RoHS 标准

应用

- 小功率交流电机驱动器的三相逆变器驱动

相关资料

- [RD-FSB50450A - Motion SPM 5 系列参考设计版本 2](#)
- [AN-9082 - Motion SPM5 Series Thermal Performance by Contact Pressure](#)
- [AN-9080 - User's Guide for Motion SPM 5 Series V2](#)

概述

FSB50450A/AS/AT 是一款先进的 Motion SPM[®] 5 模块, 为交流感应、无刷直流电机和 PMSM 电机提供非常全面的高性能逆变输出级。这些模块集成了优化的内置 MOSFET (FRFET[®] 技术) 的栅极驱动以最小化电磁干扰和能量损耗, 同时也提供多重模组保护特性, 包括欠压闭锁和热监测。内置的高速 HVIC 只需要一个单电源电压, 将逻辑电平栅极输入转化为适合驱动模块内部 MOSFET 的高电压、高电流驱动信号。独立的开源 MOSFET 端子在每个相位均有效, 可支持大量不同种类的控制算法。



封装标识与订购信息

器件封装	器件	封装	卷盘大小	包装类型	数量
FSB50450A	FSB50450A	SPM5P-023	不适用	Rail	15
FSB50450AS	FSB50450AS	SPM5Q-023	330mm	卷带和卷盘	450
FSB50450AT	FSB50450AT	SPM5N-023	NA	Rail	15

绝对最大额定值

逆变部分 (单个 MOSFET, 除非另有说明。)

符号	参数	工作条件	额定值	单位
V_{DSS}	单个 MOSFET 的漏极 - 源极电压		500	V
* I_{D25}	单个 MOSFET 的漏极持续电流	$T_C = 25^\circ\text{C}$	1.5	A
* I_{D80}	单个 MOSFET 的漏极持续电流	$T_C = 80^\circ\text{C}$	1.1	A
* I_{DP}	单个 MOSFET 的漏极峰值电流	$T_C = 25^\circ\text{C}$, $PW < 100 \mu\text{s}$	3.9	A
* I_{DRMS}	单个 MOSFET 的漏极电流有效值	$T_C = 80^\circ\text{C}$, $F_{PWM} < 20 \text{ kHz}$	0.8	A_{rms}
* P_D	最大功率	$T_C = 25^\circ\text{C}$, For Each MOSFET	14	W

控制部分 (单个 HVIC, 除非另有说明。)

符号	参数	工作条件	额定值	单位
V_{CC}	控制电源电压	施加在 V_{CC} 和 COM 之间	20	V
V_{BS}	高侧偏压	施加在 V_B 和 V_S 之间	20	V
V_{IN}	输入信号电压	施加在 V_{IN} 和 COM 之间	-0.3 ~ $V_{CC} + 0.3$	V

自举二极管部分 (单个自举二极管, 除非另有说明。)

符号	参数	工作条件	额定值	单位
V_{RRMB}	最大重复反向电压		500	V
* I_{FB}	正向电流	$T_C = 25^\circ\text{C}$	0.5	A
* I_{FPB}	正向电流 (峰值)	$T_C = 25^\circ\text{C}$, 脉冲宽度小于 1 ms	1.5	A

热阻

符号	参数	工作条件	额定值	单位
R_{qJC}	结点 - 壳体的热阻	逆变工作条件下的单个 MOSFET (注 1)	8.9	$^\circ\text{C/W}$

整个系统

符号	参数	工作条件	额定值	单位
T_J	工作结温		-40 ~ 150	$^\circ\text{C}$
T_{STG}	存储温度		-40 ~ 125	$^\circ\text{C}$
V_{ISO}	隔离电压	60 Hz, 正弦波形, 1 分钟, 连接陶瓷基板到引脚	1500	V_{rms}

注:

- 关于壳体温度 T_C 的测量点, 参见图 4。
- 标记为 "*" 的为计算值或设计因数。

引脚描述

引脚号	引脚名	引脚描述
1	COM	IC 公共电源接地
2	$V_{B(U)}$	U 相高端侧 MOSFET 驱动的偏压
3	$V_{CC(U)}$	U 相 IC 和低侧 MOSFET 驱动的偏压
4	$IN_{(UH)}$	U 相高端侧的信号输入
5	$IN_{(UL)}$	U 相低侧的信号输入
6	N.C	无连接
7	$V_{B(V)}$	V 相高端侧 MOSFET 驱动的偏压
8	$V_{CC(V)}$	V 相 IC 和低侧 MOSFET 驱动的偏压
9	$IN_{(VH)}$	V 相高端侧的信号输入
10	$IN_{(VL)}$	V 相低侧的信号输入
11	V_{TS}	HVIC 温度感测输出
12	$V_{B(W)}$	W 相高端侧 MOSFET 驱动的偏压
13	$V_{CC(W)}$	W 相 IC 和低侧 MOSFET 驱动的偏压
14	$IN_{(WH)}$	W 相高端侧的信号输入
15	$IN_{(WL)}$	W 相低侧的信号输入
16	N.C	无连接
17	P	直流输入正端
18	U, $V_{S(U)}$	高侧 MOSFET 驱动的 U 相偏压接地输出
19	N_U	U 相的直流输入负端
20	N_V	V 相的直流输入负端
21	V, $V_{S(V)}$	高端 MOSFET 驱动的 V 相偏压接地输出
22	N_W	W 相的直流输入负端
23	W, $V_{S(W)}$	高侧 MOSFET 驱动的 W 相偏压接地输出

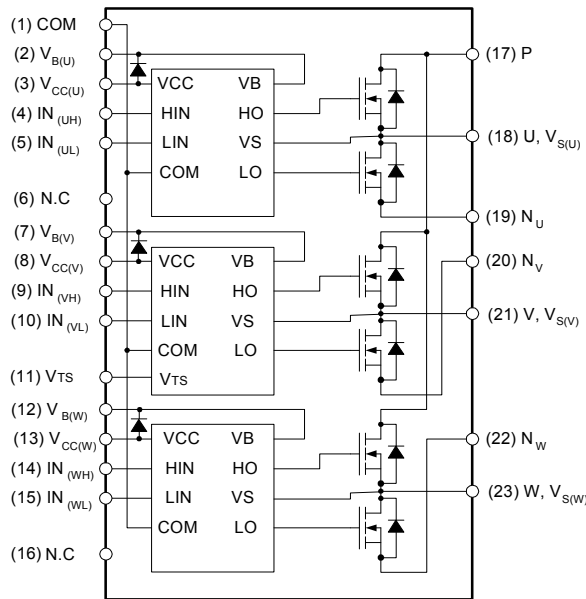


图 1. 引脚布局和内部框图（仰视图）

注:

3. 每个低侧 MOSFET 的源极端子与 Motion SPM® 5 中的电源接地或偏压接地不连接。外部连接应当如图 3 所示。

电气特性 ($T_J = 25^\circ\text{C}$ 、 $V_{CC} = V_{BS} = 15\text{V}$ ，除非另有说明。)**逆变器部分** (单个 MOSFET，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
BV_{DSS}	漏极 - 源极 击穿电压	$V_{IN} = 0\text{V}$ 、 $I_D = 1\text{mA}$ (第二个注 1)	500	-	-	V
I_{DSS}	零栅极电压 漏极电流	$V_{IN} = 0\text{V}$ 、 $V_{DS} = 500\text{V}$	-	-	1	mA
$R_{DS(on)}$	漏极至源极静态 导通电阻	$V_{CC} = V_{BS} = 15\text{V}$ 、 $V_{IN} = 5\text{V}$ 、 $I_D = 1.0\text{A}$	-	1.9	2.4	Ω
V_{SD}	漏极 - 源极二极管 正向电压	$V_{CC} = V_{BS} = 15\text{V}$ 、 $V_{IN} = 0\text{V}$ 、 $I_D = -1.0\text{A}$	-	-	1.2	V
t_{ON}	开关时间	$V_{PN} = 300\text{V}$ 、 $V_{CC} = V_{BS} = 15\text{V}$ 、 $I_D = 1.0\text{A}$ $V_{IN} = 0\text{V} \leftrightarrow 5\text{V}$ 、电感负载 $L = 3\text{mH}$ 高侧和低侧 MOSFET 开关 (注 2)	-	1250	-	ns
t_{OFF}			-	680	-	ns
t_r			-	200	-	ns
E_{ON}			-	60	-	μJ
E_{OFF}			-	10	-	μJ
RBSOA	反向偏压安全工作区	$V_{PN} = 400\text{V}$ 、 $V_{CC} = V_{BS} = 15\text{V}$ 、 $I_D = I_{DP}$ $V_{DS} = BV_{DSS}$ 、 $T_J = 150^\circ\text{C}$ 高侧和低侧 MOSFET 开关 (注 3)	整个区域			

控制部分 (单个 HVIC，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
I_{QCC}	V_{CC} 静态电流	$V_{CC} = 15\text{V}$ 、 $V_{IN} = 0\text{V}$ 施加在 V_{CC} 和 COM 之间	-	-	200	μA
I_{QBS}	V_{BS} 静态电流	$V_{BS} = 15\text{V}$ 、 $V_{IN} = 0\text{V}$ 施加在 $V_{B(U)}$ -U 之间 $V_{B(V)}$ -V、 $V_{B(W)}$ -W	-	-	100	μA
I_{PCC}	V_{CC} 工作电源电流	V_{CC} - COM $V_{CC} = 15\text{V}$ 、 $f_{PWM} = 20\text{kHz}$ 、 占空比 = 50%，施加于低端的一个 PWM 信号输入	-	-	800	μA
I_{PBS}	V_{BS} 工作电源电流	$V_{B(U)} - V_{S(U)}$ 、 $V_{B(V)} - V_{S(V)}$ 、 $V_{B(W)} - V_{S(W)}$ $V_{CC} = V_{BS} = 15\text{V}$ 、 $f_{PWM} = 20\text{kHz}$ 、占空比 = 50%， 施加于高端的一个 PWM 信号输入	-	-	700	μA
UV_{CCD}	低侧欠压 保护 (图 8)	V_{CC} 欠压保护检测电平	7.4	8.0	9.4	V
UV_{CCR}		V_{CC} 欠压保护复位电平	8.0	8.9	9.8	V
UV_{BSD}	高侧欠压 保护 (图 9)	V_{BS} 欠压保护检测电平	7.4	8.0	9.4	V
UV_{BSR}		V_{BS} 欠压保护复位电平	8.0	8.9	9.8	V
V_{TS}	HVIC Temperature Sensing Voltage Output	$V_{CC} = 15\text{V}$ 、 $T_{HVIC} = 25^\circ\text{C}$ (第二个注 4)	600	790	980	mV
V_{IH}	导通阈值电压	逻辑高电平	-	-	2.9	V
V_{IL}	关断阈值电压	逻辑低电平	0.8	-	-	V

自举二极管部分 (单个自举二极管，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
V_{FB}	正向电压	$I_F = 0.1\text{A}$ 、 $T_C = 25^\circ\text{C}$ (第二个注 5)	-	2.5	-	V
t_{rB}	反向恢复时间	$I_F = 0.1\text{A}$ 、 $T_C = 25^\circ\text{C}$	-	80	-	ns

推荐工作条件

符号	参数	工作条件	最小值	典型值	最大值	单位
V_{PN}	电源电压	施加在 P 和 N 之间	-	300	400	V
V_{CC}	控制电源电压	施加在 V_{CC} 和 COM 之间	13.5	15.0	16.5	V
V_{BS}	高端偏压	施加在 V_B 和 V_S 之间	13.5	15.0	16.5	V
$V_{IN(ON)}$	输入导通阈值电压	施加在 V_{IN} 和 COM 之间	3.0	-	V_{CC}	V
$V_{IN(OFF)}$	输入关断阈值电压		0	-	0.6	V
t_{dead}	防止桥臂直通的死区时间	$V_{CC} = V_{BS} = 13.5 \sim 16.5 \text{ V}, T_J \leq 150^\circ\text{C}$	1.0	-	-	μs
f_{PWM}	PWM 开关频率	$T_J \leq 150^\circ\text{C}$	-	15	-	kHz

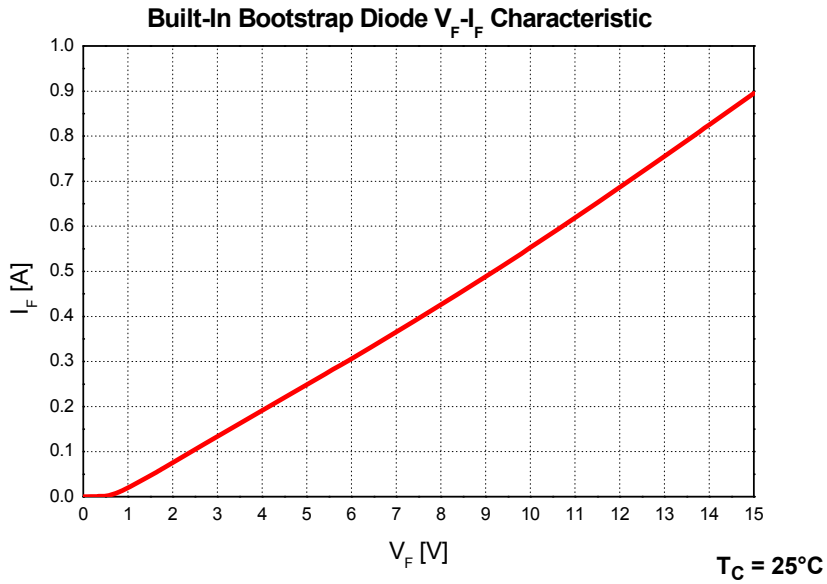


图 2. 内置自举二极管特性（典型值）

注:

- BV_{DSS} 是 Motion SPM® 5 产品中的单个 MOSFET 的漏极和源极端子之间的绝对最大额定电压。考虑到寄生电感, V_{PN} 应远低于该值, 因此 V_{PN} 在任何情况下不得超过 BV_{DSS} 。
- t_{ON} 和 t_{OFF} 包括内部驱动 IC 的传输延迟。所列出的数值是在实验室测试条件下测得, 在实际应用中因为印刷电路板和布线的差异, 数值也会有所不同。请参阅图 6 介绍的开关时间定义, 以及图 7 中的开关测试电路。
- 每个 MOSFET 在开关工作时的峰值电流和电压也应在安全工作区 (SOA) 的范围内。请参阅图 7 中的 RBSOA 测试电路, 它与开关测试电路相同。
- V_{IS} 只能用作模块的温度感测, 但不能自动关闭 MOSFET。
- 内置自举二极管其阻抗特性约为 15Ω 。请参阅图 2。

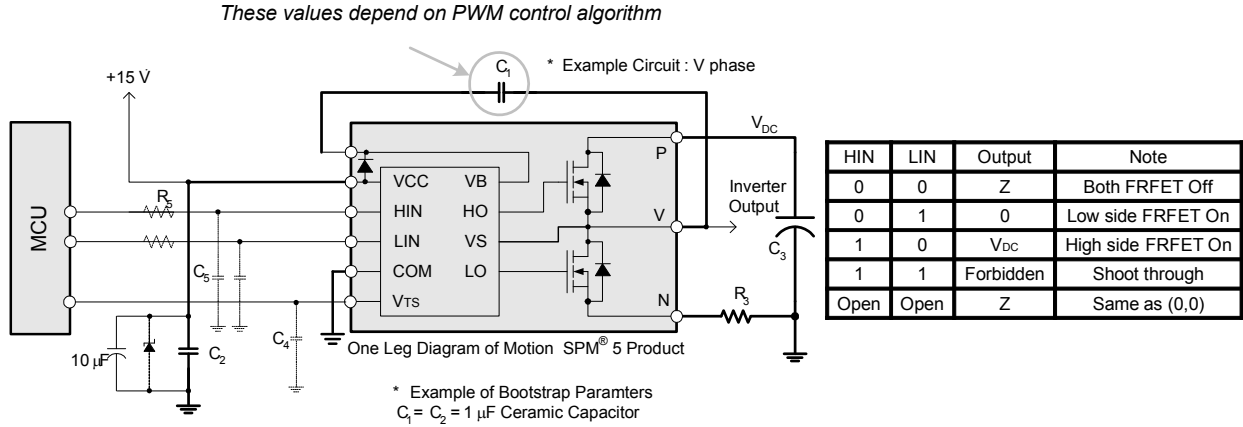


图 3. 推荐的 MCU 接口和自举电路及其参数

注:

1. 自举电路元件的参数取决于 PWM 算法。上述为开关频率为 15 kHz 时的参数的典型例子。
2. RC 耦合 (R₅, R₆ 和 C₄) 在 Motion SPM 5 产品和 MCU (虚线显示部分) 的每个输入端都可用于防止由浪涌噪声产生的错误信号。
3. 印刷电路板图形中的粗线应尽量短且粗, 以减少电路中的寄生电感, 从而导致浪涌电压的降低。旁路电容如 C₁、C₂ 和 C₃ 应具有良好的高频特性, 以吸收高频纹波电流。

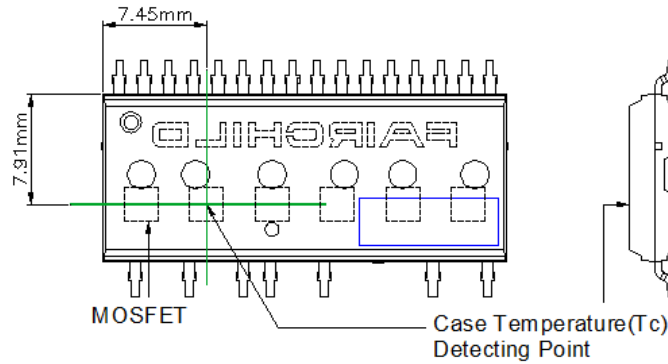


图 4. 壳体温度测量

注:

4. 将热电偶贴在 SPM 5 封装 (如果应用到, 放在 SPM 5 封装和散热片中间) 的散热片的顶部, 以获得正确的温度测量数值。

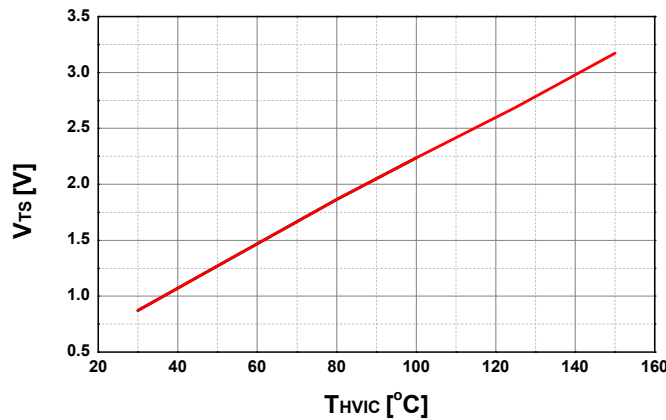


图 5. V_{TS} 温度曲线 (典型)

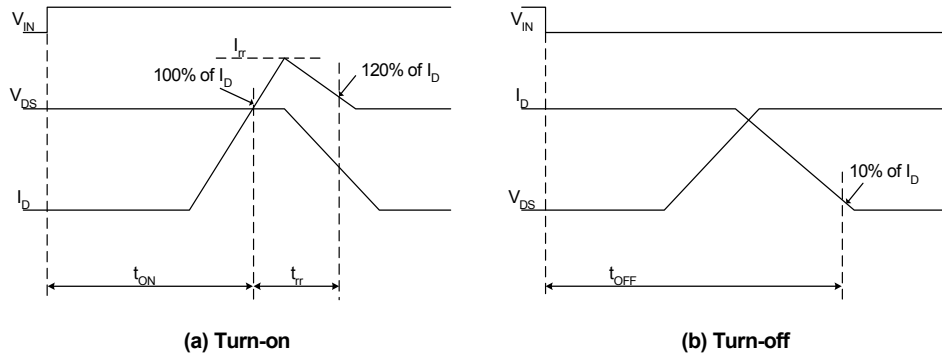


图 6. 开关时间定义

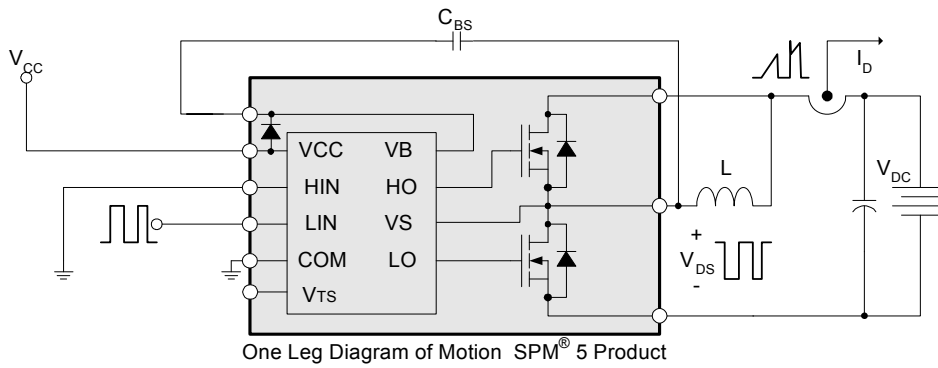


图 7. 开关和 RBSOA (单脉冲) 测试电路 (低端)

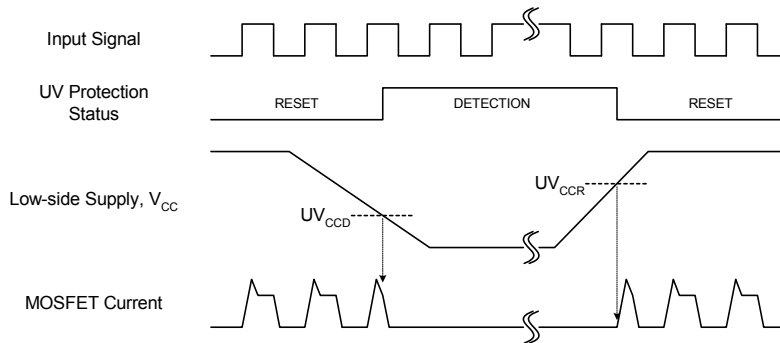


图 8. 欠压保护 (低侧)

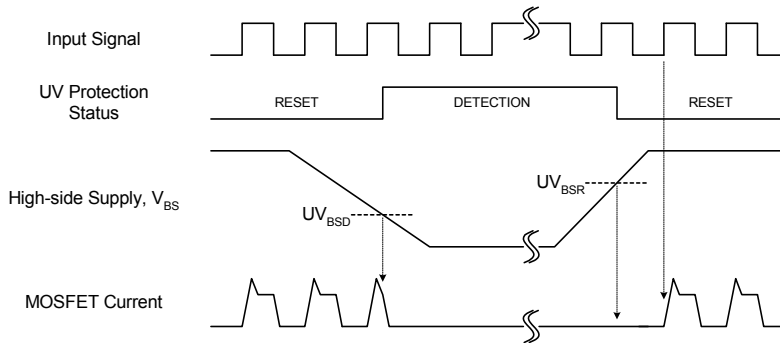


图 9. 欠压保护 (高侧)

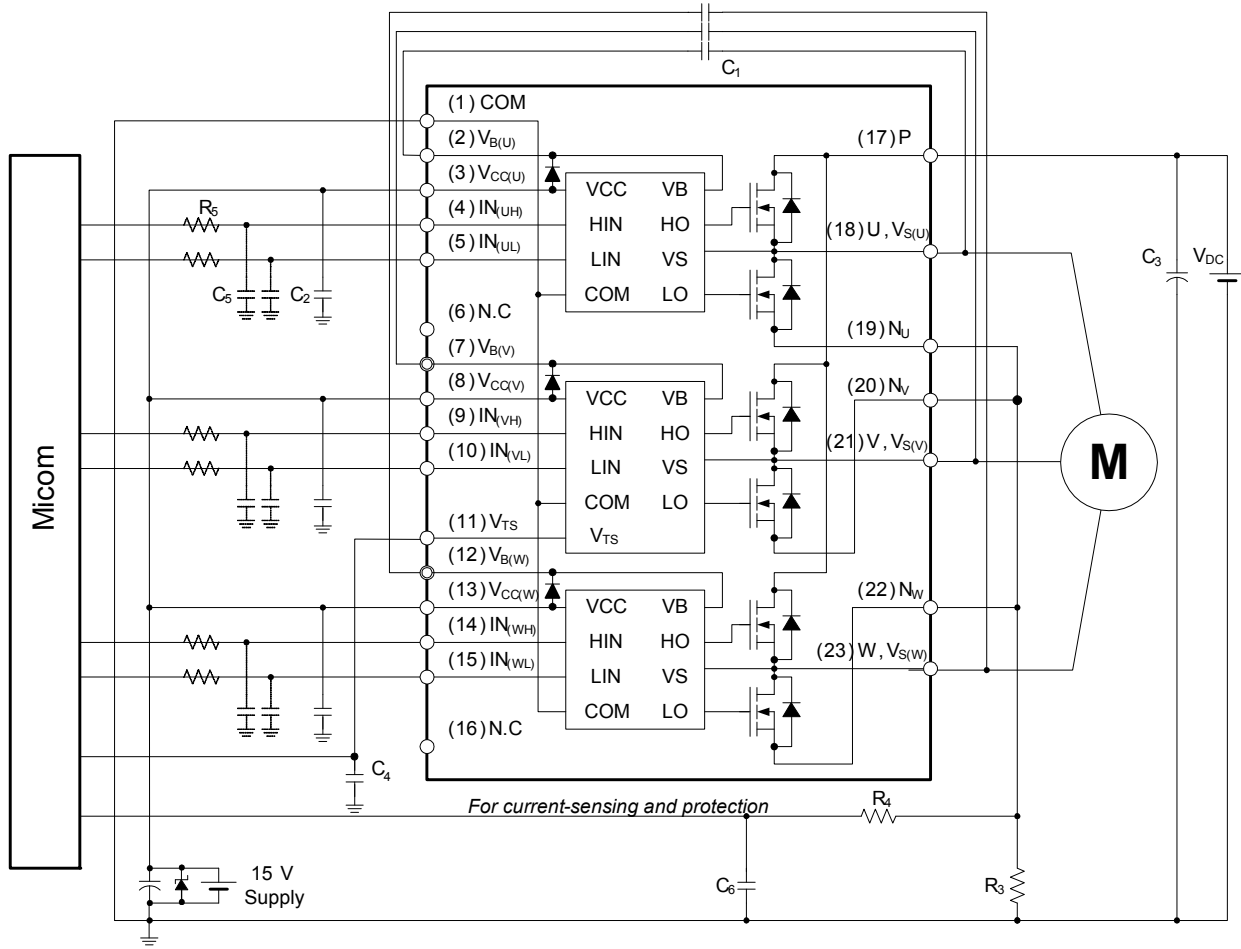
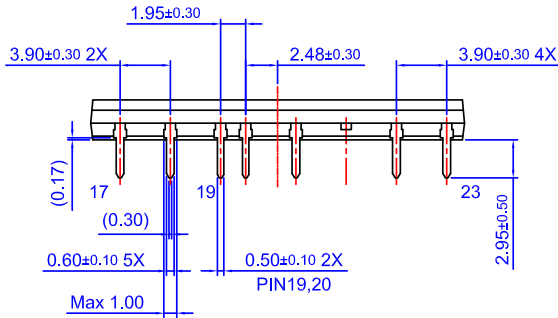
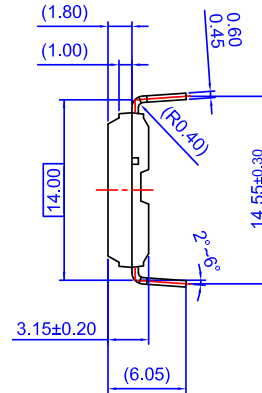
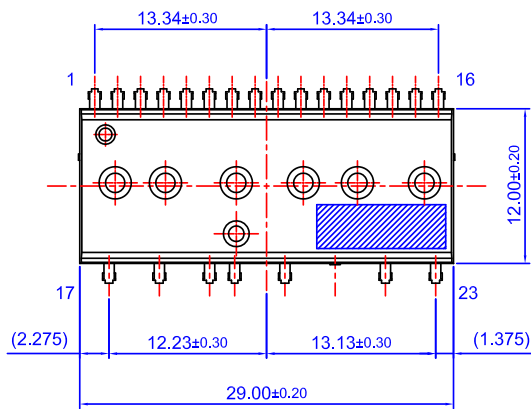
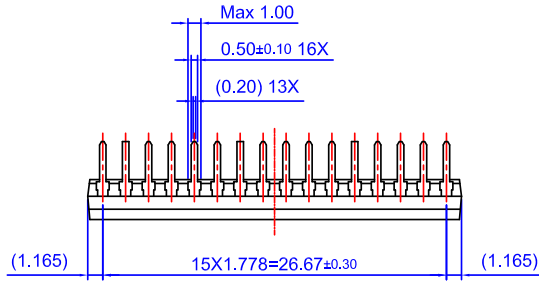


图 10. 应用电路实例

注:

1. 关于引脚的位置, 请参阅图 1。
2. SPM® 5 产品和 MCU 的每个输入端的 RC 耦合 (R_5 和 C_5 、 R_4 和 C_6) 和 C_4 都可用于防止由浪涌噪声产生的错误信号。
3. 由于位于 COM 和低侧 MOSFET 的源极端子之间, R_3 的压降会影响低端的开关性能和自举特性。为此, 稳态情况下 R_3 的压降应小于 1 V。
4. 为避免浪涌电压和 HVIC 故障, 接地线和输出端子之间的接线应短且粗。
5. 所有的滤波电容器应紧密连接到 Motion SPM 5 产品, 它们应当具有能够很好的阻挡高频纹波电流的特性。

轮廓封装详图 (FSB50450A)



- NOTES: UNLESS OTHERWISE SPECIFIED
 A) THIS PACKAGE DOES NOT COMPLY TO ANY CURRENT PACKAGING STANDARD
 B) ALL DIMENSIONS ARE IN MILLIMETERS
 C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS
 D) () IS REFERENCE
 E) [] IS ASS'Y QUALITY
 F) DRAWING FILENAME: MOD23DCREV4.0
 G) FAIRCHILD SEMICONDUCTOR

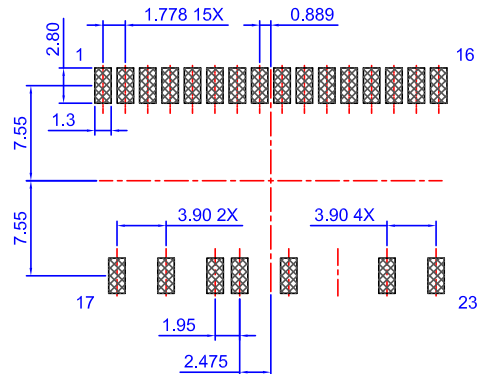
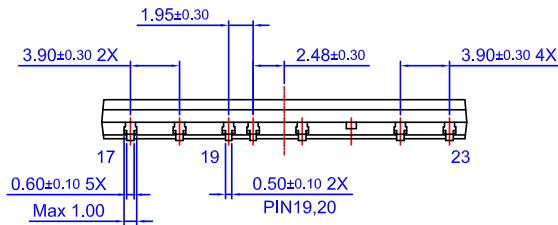
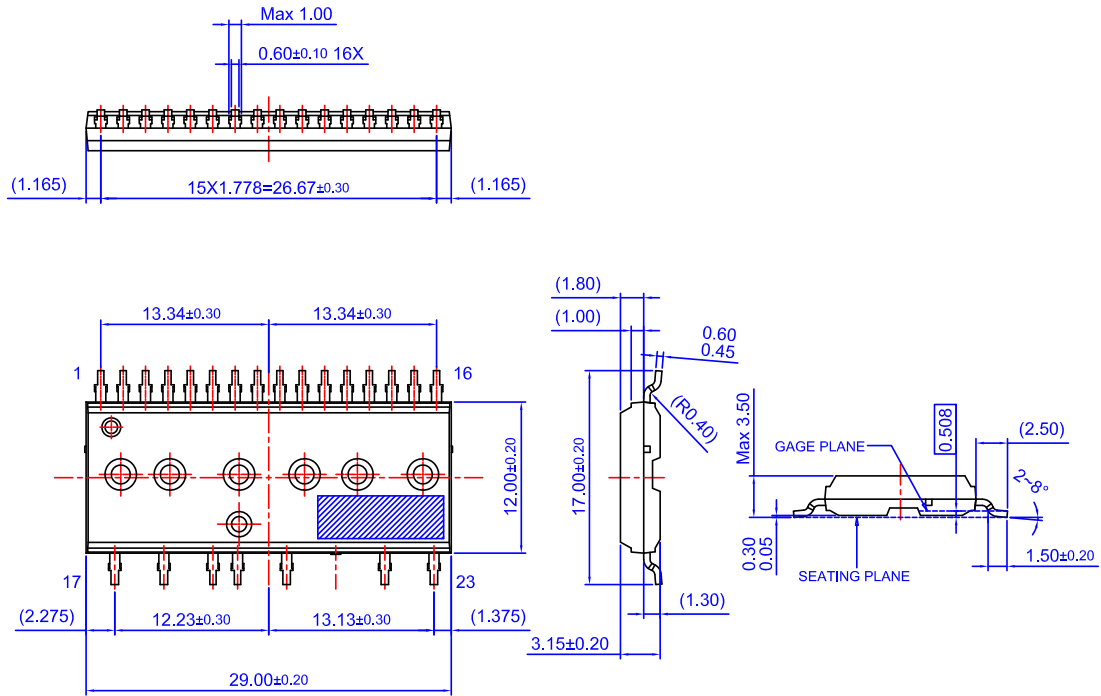


封装图纸作为一项服务，提供给考虑 Fairchild 元件的客户。具体参数可进行改动，且无需做出相应通知。请注意图纸上的版本和 / 或日期，并联系飞兆半导体代表核实或获得最新版本。封装规格并不扩大飞兆公司全球范围内的条款与条件，尤其是其中涉及飞兆公司产品保修的部分。

随时访问 Fairchild 在线封装网页，可以获取最新的封装图纸：

<https://www.fairchildsemi.com/package-drawings/MO/MOD23DC.pdf>

轮廓封装详图 (FSB50450AS)



- NOTES: UNLESS OTHERWISE SPECIFIED
- A) THIS PACKAGE DOES NOT COMPLY TO ANY CURRENT PACKAGING STANDARD
 - B) ALL DIMENSIONS ARE IN MILLIMETERS
 - C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS
 - D) () IS REFERENCE
 - E) DRAWING FILENAME: MOD23DGREV6.0
 - F) FAIRCHILD SEMICONDUCTOR

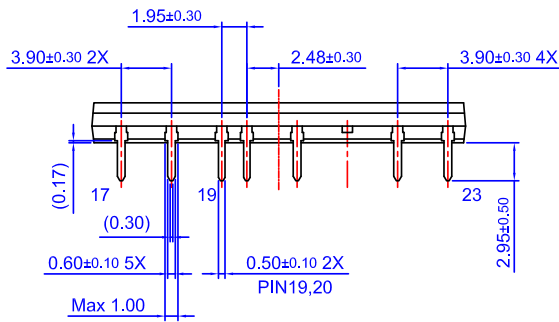
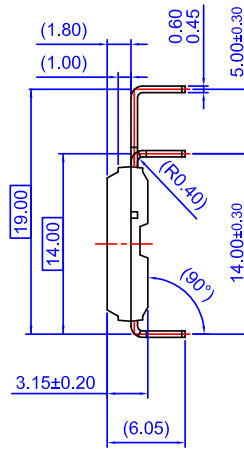
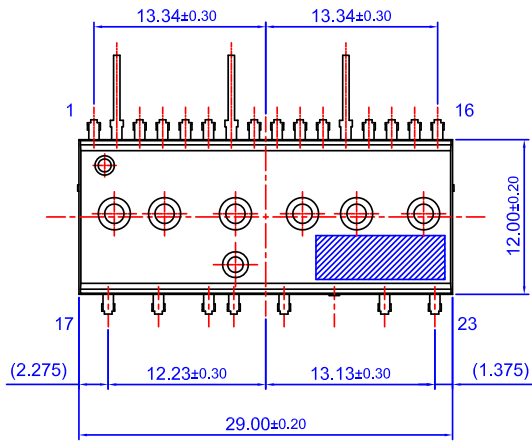
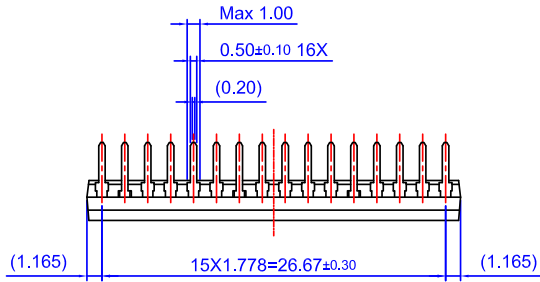


封装图纸作为一项服务，提供给考虑 Fairchild 元件的客户。具体参数可进行改动，且无需做出相应通知。请注意图纸上的版本和/或日期，并联系飞兆半导体代表核实或获得最新版本。封装规格并不扩大飞兆公司全球范围内的条款与条件，尤其是其中涉及飞兆公司产品保修的部分。

随时访问 Fairchild 在线封装网页，可以获取最新的封装图纸：

<https://www.fairchildsemi.com/package-drawings/MO/MOD23DG.pdf>

轮廓封装详图 (FSB50450AT)



- NOTES: UNLESS OTHERWISE SPECIFIED
 A) THIS PACKAGE DOES NOT COMPLY TO ANY CURRENT PACKAGING STANDARD
 B) ALL DIMENSIONS ARE IN MILLIMETERS
 C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS
 D) () IS REFERENCE
 E) DRAWING FILENAME: MOD23DFREV4.0
 F) FAIRCHILD SEMICONDUCTOR



封装图纸作为一项服务，提供给考虑 Fairchild 元件的客户。具体参数可进行改动，且无需做出相应通知。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保修的部分。

随时访问 Fairchild 在线封装网页，可以获取最新的封装图纸：
<https://www.fairchildsemi.com/package-drawings/MO/MOD23DF.pdf>



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.

- | | | | |
|--------------------------|--|---------------------------------------|------------------|
| AccuPower™ | F-PFS™ | OPTOPLANAR® | |
| AttitudeEngine™ | FRFET® | | TinyBoost® |
| Awinda® | Global Power Resource™ | | TinyBuck® |
| AX-CAP® | GreenBridge™ | | TinyCalc™ |
| BitSiC™ | Green FPS™ | Power Supply WebDesigner™ | TinyLogic® |
| Build it Now™ | Green FPS™ e-Series™ | PowerTrench® | TINYOPTO™ |
| CorePLUS™ | Gmax™ | PowerXS™ | TinyPower™ |
| CorePOWER™ | GTO™ | Programmable Active Droop™ | TinyPWM™ |
| CROSSVOLT™ | IntelliMAX™ | QFET® | TinyWire™ |
| CTL™ | ISOPLANAR™ | QS™ | TranSiC™ |
| Current Transfer Logic™ | ISOPLANAR™ | Quiet Series™ | TriFault Detect™ |
| DEUXPEED® | Making Small Speakers Sound Louder and Better™ | RapidConfigure™ | TRUECURRENT®* |
| Dual Cool™ | MegaBuck™ | | µSerDes™ |
| EcoSPARK® | MICROCOUPLER™ | Saving our world, 1mW/W/kW at a time™ | |
| EfficientMax™ | MicroFET™ | SignalWise™ | UHC® |
| ESBC™ | MicroPak™ | SmartMax™ | Ultra FRFET™ |
| | MicroPak2™ | SMART START™ | UniFET™ |
| Fairchild® | MillerDrive™ | Solutions for Your Success™ | VCX™ |
| Fairchild Semiconductor® | MotionMax™ | SPM® | VisualMax™ |
| FACT Quiet Series™ | MotionGrid® | STEALTH™ | VoltagePlus™ |
| FACT® | MTI® | SuperFET® | XS™ |
| FastvCore™ | MTx® | SuperSOT™-3 | Xsens™ |
| FETBench™ | MVN® | SuperSOT™-6 | 仙童® |
| FPS™ | mWSaver® | SuperSOT™-8 | |
| | OptoHiT™ | SupreMOS® | |
| | OPTOLOGIC® | SyncFET™ | |
| | | Sync-Lock™ | |

* 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. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT [HTTP://WWW.FAIRCHILDSEMI.COM](http://www.fairchildsemi.com). 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.

AUTHORIZED USE

Unless otherwise specified in this data sheet, this product is a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability. This product may not be used in the following applications, unless specifically approved in writing by a Fairchild officer: (1) automotive or other transportation, (2) military/aerospace, (3) any safety critical application – including life critical medical equipment – where the failure of the Fairchild product reasonably would be expected to result in personal injury, death or property damage. Customer's use of this product is subject to agreement of this Authorized Use policy. In the event of an unauthorized use of Fairchild's product, Fairchild accepts no liability in the event of product failure. In other respects, this product shall be subject to Fairchild's Worldwide Terms and Conditions of Sale, unless a separate agreement has been signed by both Parties.

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 Terms of Use

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. 177

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