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.

FAIRCHILD™

March 2015

KA431S / KA431SA / KA431SL
Programmable Shunt Regulator

Features

- Programmable Output Voltage to 36 V
- Low Dynamic Output Impedance 0.2 Ω (Typical)
- Sink Current Capability: 1.0 to 100 mA
- Equivalent Full-Range Temperature Coefficient of 50 ppm/°C (Typical)
- Temperature Compensated for Operation Over Full Rated Operating Temperature Range
- Low Output Noise Voltage
- Fast Turn-on Response

Description

The KA431S / KA431SA / KA431SL are three-terminal adjustable regulator series with a guaranteed thermal stability over the operating temperature range. The output voltage can be set to any value between V_{REF} (approximately 2.5 V) and 36 V with two external resistors. These devices have a typical dynamic output impedance of 0.2 Ω. Active output circuitry provides a sharp turn-on characteristic, making these devices excellent replacement for zener diodes in many applications.

SOT-23F

MF- 1.Cathode 2. Ref 3. Anode
MF2- 1. Ref 2. Cathode 3. Anode

Ordering Information

Part Number	Operating Temperature Range	Output Voltage Tolerance	Top Mark	Package	Packing Method
KA431SMFTF	-25 to +85°C	2%	43A	SOT-23F 3L	Tape and Reel
KA431SMF2TF			43D		
KA431SAMFTF		1%	43B		
KA431SAMF2TF			43E		
KA431SLMFTF		0.5%	43C		
KA431SLMF2TF			43F		

Block Diagram

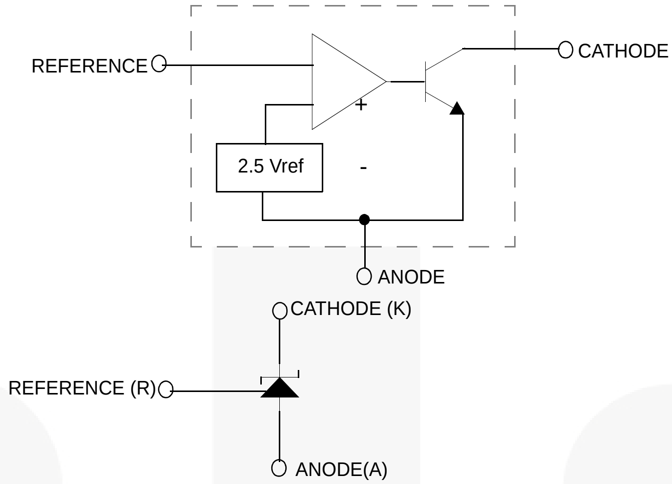


Figure 1. Block Diagram

Marking Information

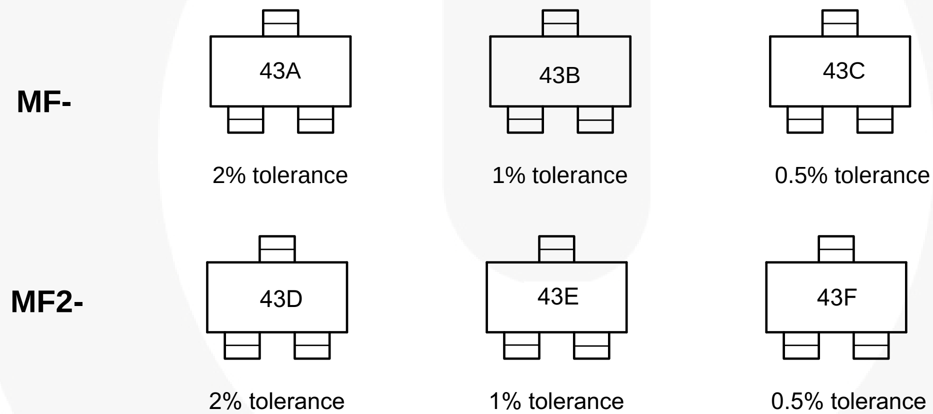


Figure 2. Top Mark (per package)

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter	Value	Unit
V_{KA}	Cathode Voltage	37	V
I_{KA}	Cathode Current Range (Continuous)	-100 ~ +150	mA
I_{REF}	Reference Input Current Range	-0.05 ~ +10	mA
$R_{\theta JA}$	Thermal Resistance Junction-Air[1,2] MF Suffix Package	350	°C/W
P_D	Power Dissipation[3,4] MF Suffix Package	350	mW
T_J	Junction Temperature	150	°C
T_{OPR}	Operating Temperature Range	-25 ~ +85	°C
T_{STG}	Storage Temperature Range	-65 ~ +150	°C

Notes:

1. Thermal resistance test board
   Size: 1.6mm x 76.2mm x 114.3mm (1S0P)
   JEDEC Standard: JESD51-3, JESD51-7.
2. Assume no ambient airflow.
3. T_{JMAX} = 150°C; Ratings apply to ambient temperature at 25°C.
4. Power dissipation calculation: $P_D = (T_J - T_A) / R_{\theta JA}$.

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Min.	Max.	Unit
V_{KA}	Cathode Voltage	V_{REF}	36	V
I_{KA}	Cathode Current	1	100	mA

Electrical Characteristics(5)

Values are at T_A = 25°C unless otherwise noted.

<table>
<tr><th rowspan="2">Symbol</th><th rowspan="2">Parameter</th><th rowspan="2" colspan="2">Conditions</th><th colspan="3">KA431S</th><th colspan="3">KA431SA</th><th colspan="3">KA431SL</th><th rowspan="2">Unit</th></tr>
<tr><th>Min.</th><th>Typ.</th><th>Max.</th><th>Min.</th><th>Typ.</th><th>Max.</th><th>Min.</th><th>Typ.</th><th>Max.</th></tr>
<tr><td>V_{REF}</td><td>Reference Input Voltage</td><td colspan="2">$V_{KA} = V_{REF}$, I_{KA} = 10 mA</td><td>2.450</td><td>2.500</td><td>2.550</td><td>2.470</td><td>2.495</td><td>2.520</td><td>2.482</td><td>2.495</td><td>2.508</td><td>V</td></tr>
<tr><td>$\Delta V_{REF}/\Delta T$</td><td>Deviation of Reference Input Voltage Over-Temperature</td><td colspan="2">$V_{KA} = V_{REF}$, I_{KA} = 10 mA, $T_{MIN} \leq T_A \leq T_{MAX}$</td><td></td><td>4.5</td><td>17.0</td><td></td><td>4.5</td><td>17.0</td><td></td><td>4.5</td><td>17.0</td><td>mV</td></tr>
<tr><td rowspan="2">$\Delta V_{REF}/\Delta V_{KA}$</td><td rowspan="2">Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage</td><td rowspan="2">I_{KA} = 10 mA</td><td>ΔV_{KA} = 10 V - V_{REF}</td><td></td><td>-1.0</td><td>-2.7</td><td></td><td>-1.0</td><td>-2.7</td><td></td><td>-1.0</td><td>-2.7</td><td rowspan="2">mV/V</td></tr>
<tr><td>ΔV_{KA} = 36 V - 10 V</td><td></td><td>-0.5</td><td>-2.0</td><td></td><td>-0.5</td><td>-2.0</td><td></td><td>-0.5</td><td>-2.0</td></tr>
<tr><td>I_{REF}</td><td>Reference Input Current</td><td colspan="2">I_{KA} = 10 mA, R1 = 10 kΩ, R2 = ∞</td><td></td><td>1.5</td><td>4.0</td><td></td><td>1.5</td><td>4.0</td><td></td><td>1.5</td><td>4.0</td><td>µA</td></tr>
<tr><td>$\Delta I_{REF}/\Delta T$</td><td>Deviation of Reference Input Current Over Full Temperature Range</td><td colspan="2">I_{KA} = 10 mA, R1 = 10 kΩ, R2 = ∞ T_A = Full Range</td><td></td><td>0.4</td><td>1.2</td><td></td><td>0.4</td><td>1.2</td><td></td><td>0.4</td><td>1.2</td><td>µA</td></tr>
<tr><td>$I_{KA(MIN)}$</td><td>Minimum Cathode Current for Regulation</td><td colspan="2">$V_{KA} = V_{REF}$</td><td></td><td>0.45</td><td>1.00</td><td></td><td>0.45</td><td>1.00</td><td></td><td>0.45</td><td>1.00</td><td>mA</td></tr>
<tr><td>$I_{KA(OFF)}$</td><td>Off - Stage Cathode Current</td><td colspan="2">V_{KA} = 36 V, V_{REF} = 0</td><td></td><td>0.05</td><td>1.00</td><td></td><td>0.05</td><td>1.00</td><td></td><td>0.05</td><td>1.00</td><td>µA</td></tr>
<tr><td>Z_{KA}</td><td>Dynamic Impedance</td><td colspan="2">$V_{KA} = V_{REF}$, I_{KA} = 1 to 100 mA, f ≥ 1.0 kHz</td><td></td><td>0.15</td><td>0.50</td><td></td><td>0.15</td><td>0.50</td><td></td><td>0.15</td><td>0.50</td><td>Ω</td></tr>
</table>

Note:

5. T_{MIN} = -25°C, T_{MAX} = +85°C

Test Circuits

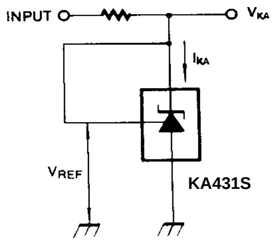


Figure 3. Test Circuit for $V_{KA} = V_{REF}$

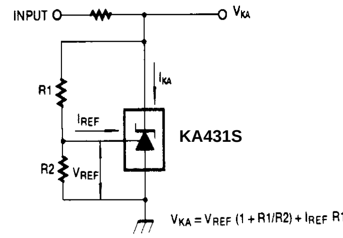


Figure 4. Test Circuit for $V_{KA} \geq V_{REF}$

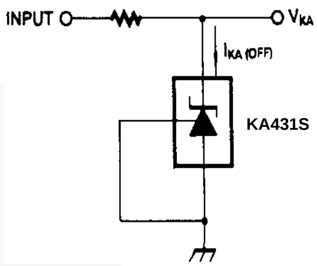


Figure 5. Test Circuit for $I_{KA(OFF)}$

Typical Applications

$$V_O = \left(1 + \frac{R_1}{R_2}\right)V_{ref}$$

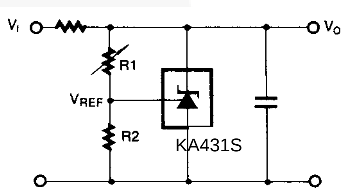


Figure 6. Shunt Regulator

$$V_O = V_{ref}\left(1 + \frac{R_1}{R_2}\right)$$

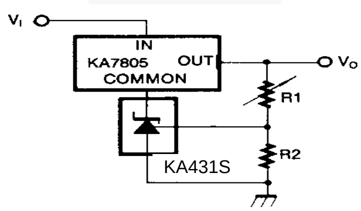


Figure 7. Output Control for Three-Terminal Fixed Regulator

$$V_O = \left(1 + \frac{R_1}{R_2}\right)V_{ref}$$

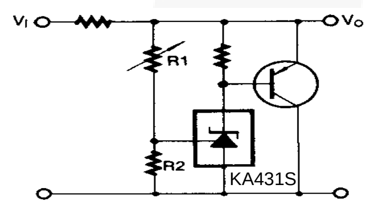
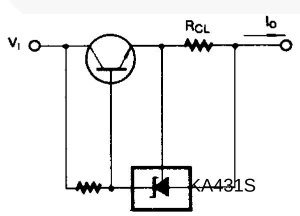
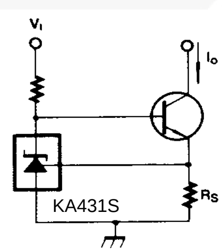


Figure 8. High Current Shunt Regulator



$$I_O = \frac{V_{REF}}{R_{CL}}$$

Figure 9. Current Limit or Current Source



$$I_O = \frac{V_{REF}}{R_S}$$

Figure 10. Constant-Current Sink

Typical Performance Characteristics

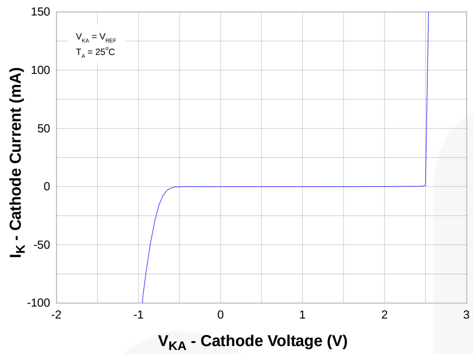


Figure 11. Cathode Current vs. Cathode Voltage

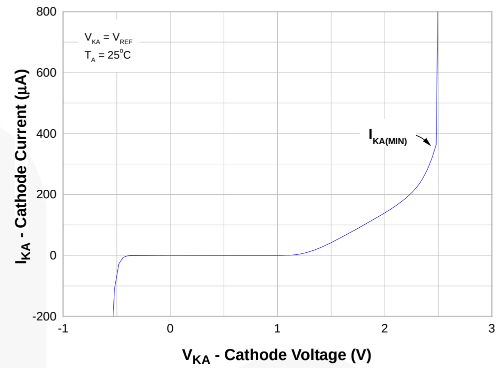


Figure 12. Cathode Current vs. Cathode Voltage

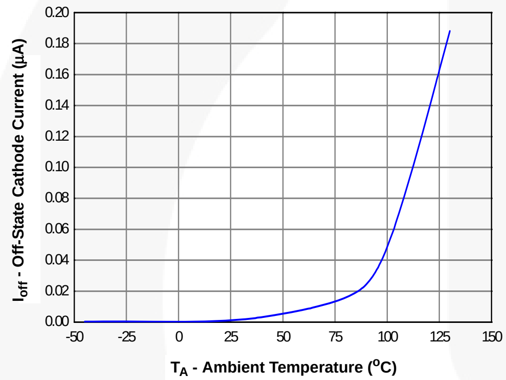


Figure 13. OFF-State Cathode Current vs. Ambient Temperature

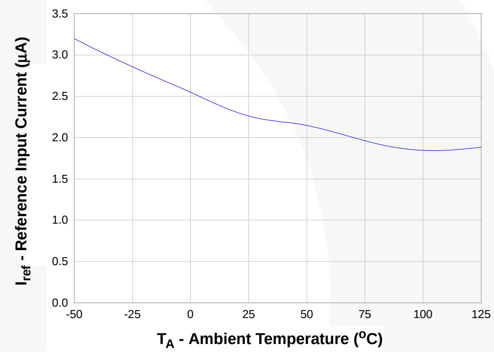


Figure 14. Reference Input Current vs. Ambient Temperature

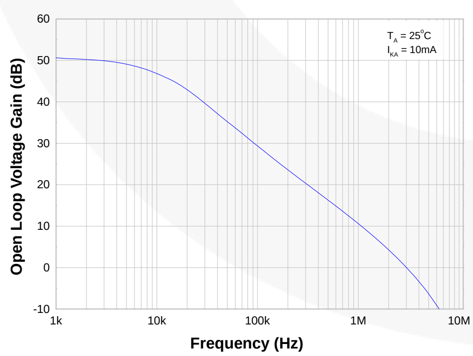


Figure 15. Frequency vs. Small Signal Voltage Amplification

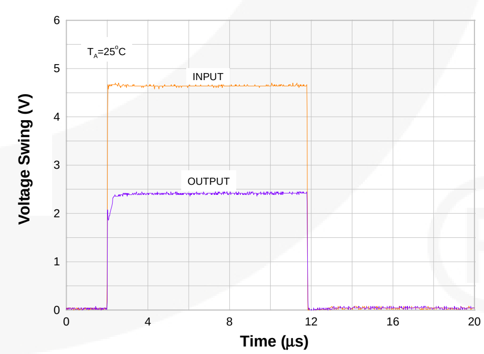


Figure 16. Pulse Response

Typical Performance Characteristics (Continued)

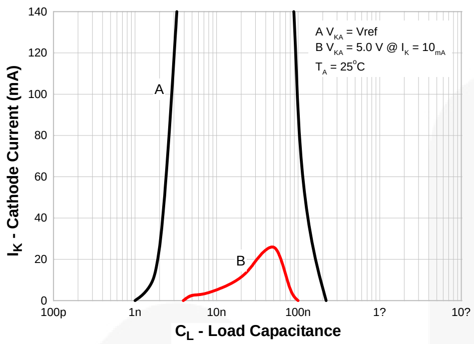


Figure 17. Stability Boundary Conditions

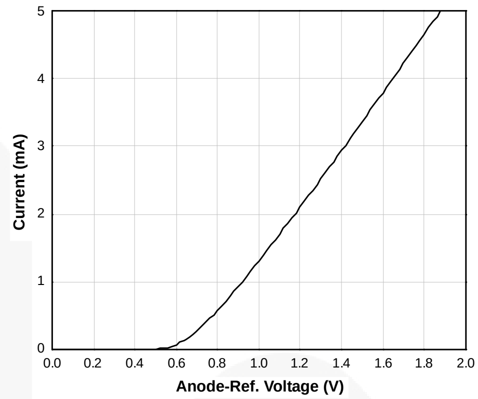


Figure 18. Anode-Reference Diode Curve

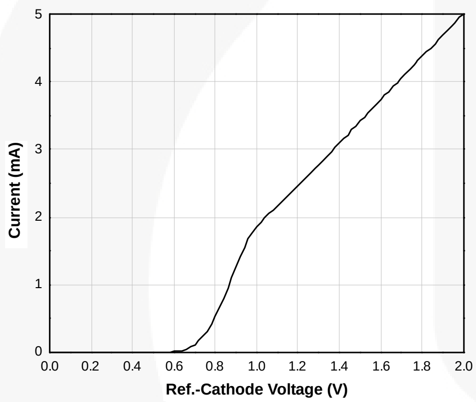


Figure 19. Reference-Cathode Diode Curve

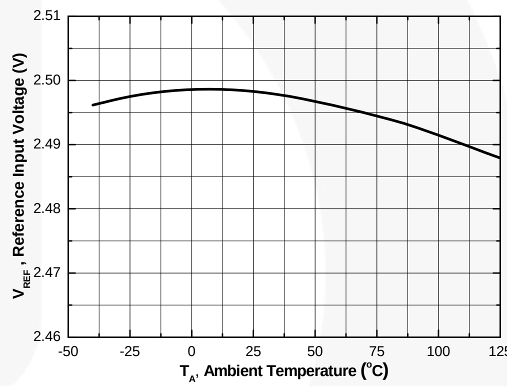
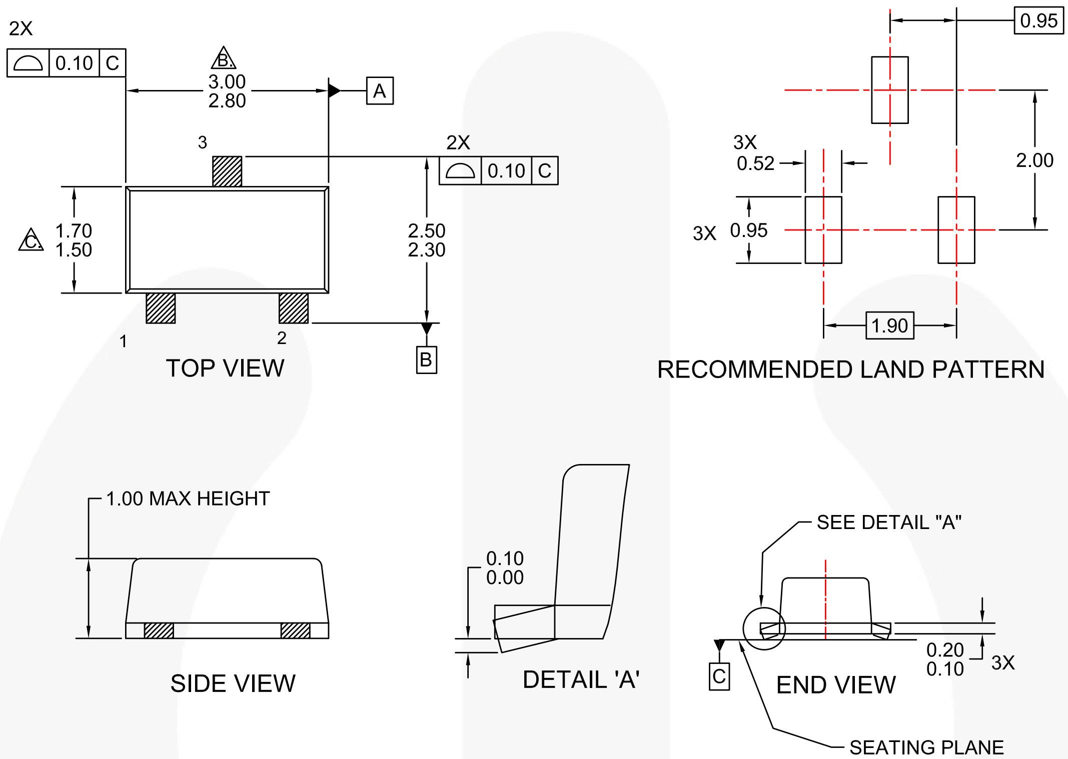


Figure 20. Reference Input Voltage vs. Ambient Temperature

Physical Dimensions



NOTES:

A. ALL DIMENSIONS ARE IN MILLIMETERS.

B. DIMENSION DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15mm PER END.

C. DIMENSION DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.15mm PER SIDE.

D. DIMENSIONS B AND C ARE DETERMINED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH. BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.

E. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.

F. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08mm AND 0.15mm FROM THE LEAD TIP.

G. LANDPATTERN RECOMMENDATION PER IPC SOTFL95P240X100-4N (ADAPTED TO 3LD)

H. DRAWING FILE NUMBER AND REVISION: MKT-MA03EREV1.DWG

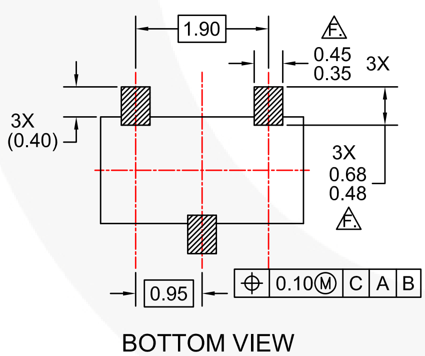


Figure 21. 3-LEAD, SOT23, FLAT LEAD, LOW PROFILE

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

* 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. 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 surgical 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. I73

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

Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.

Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)
Факс: 8 (812) 320-02-42
Электронная почта: org@eplast1.ru
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.