

STANDARD  
LINEAR  
AND LOGIC  
PRODUCTS



## COMPANY OVERVIEW

Diodes Incorporated is a leading global provider of Discrete and Analog semiconductors.

Its global footprint includes sales offices in 5 countries and manufacturing locations in China, Europe and the USA.

A focus on product innovation, cost reduction, acquisitions and customer service has made Diodes Incorporated an industry leader.

Combining leading silicon and packaging technologies, Diodes provides a broad portfolio of discrete semiconductors comprising Bipolar Transistors, MOSFETs, Schottky diodes, SBR, switching diodes and functional specific arrays to enable our customers' next generation designs.

The Diodes' Analog IC portfolio consists of 6 main areas: Power Management ICs, Standard Linear, Lighting, Sensors, Direct Broadcast by Satellite and Applications Specific Standard Products.



## DIODES MEANS STANDARD LINEAR

**Diodes' acquisition of Zetex semiconductors expanded both companies' Analog product lines.**

The best Analog ICs provide circuit designers with the most advantageous combination of efficiency, functionality, and package size.

Diodes Incorporated offers a portfolio of devices that meet the requirements of a wide range of electronic applications by addressing these competing design criteria to produce elegant and practical solutions.

The breadth of Diodes' standard linear portfolio provides designers with cost-effective industry standard replacements to high performance devices for the most demanding industrial and automotive applications.

The Diodes' portfolio is well suited to meeting the circuit requirements of:

- Performance consumer
- Portable consumer
- Communications
- Computer
- Automotive

Diodes' Standard Linear product line extends the performance of many industry standard parts. Offered in a choice of space-saving packages, they provide the opportunity to reduce power consumption and increase operating temperature.

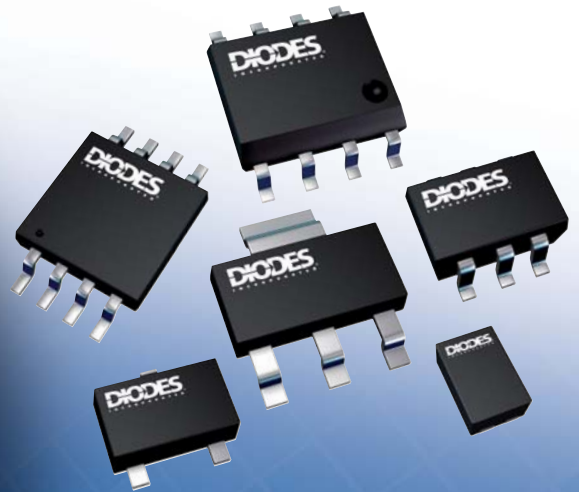
With its knowledge, packaging, and technology leadership, Diodes has created the range of competitive Standard Linear ICs presented here.

## DIODES INTRODUCES FOCUSED STANDARD LOGIC PRODUCT FAMILIES

**Combining industry-leading packaging expertise with high-performance wafer processing, Diodes has recently released a family of focused, cost-effective Single-Gate Logic products.**

The Low Voltage CMOS (LVC) product offering is an upgrade to industry standard product lines, providing outstanding

electrical performance for more versatile system implementations. The Diodes' portfolio offers the industry's most requested LVC logic functions in two standard packaging options. The new Diodes' LVC logic family is suitable for use in a wide variety of computing, networking, consumer, and communications systems.



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### Standard Logic

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# STANDARD LINEAR Operational Amplifiers

| Part Number | Minimum Supply Voltage | Maximum Supply Voltage | Supply Current @5V | Input Offset Voltage | Input Bias Current | Minimum Common Mode Input Voltage | Maximum Common Mode Input Voltage | Rail-rail Input | Rail-rail Output | Open Loop Gain | CMRR | PSRR | Gain Bandwidth | Slew Rate  | Number of Channels | Operating Ambient Temp Range | Available Packages |
|-------------|------------------------|------------------------|--------------------|----------------------|--------------------|-----------------------------------|-----------------------------------|-----------------|------------------|----------------|------|------|----------------|------------|--------------------|------------------------------|--------------------|
|             | V                      | V                      | mA                 | mV                   | nA                 | V                                 | V                                 |                 |                  | V/mV           | dB   | dB   | MHz            | V/ $\mu$ s |                    | $^{\circ}$ C                 |                    |
| AP358       | 3                      | 32                     | 0.5                | 2                    | 45                 | 0                                 | $V_{+} - 1.5$                     | -               | -                | 100            | 85   | 100  | 1              | 0.6        | 2                  | 0 to +70                     | SO-8<br>PDIP-8     |
| APX321      | 2.5                    | 5.5                    | 0.11               | 1.7                  | 15                 | $V_{-} + 0.2$                     | $V_{+} - 0.2$                     | X               | X                | 100            | 65   | 60   | 1              | 1          | 1                  | -40 to +85                   | SOT353<br>SOT25    |
| APX358      | 2.5                    | 5.5                    | 0.19               | 1.7                  | 15                 | $V_{-} + 0.2$                     | $V_{+} - 0.2$                     | X               | X                | 100            | 65   | 60   | 1              | 1          | 2                  | -40 to +85                   | MSOP-8<br>SO-8     |
| APX324      | 2.5                    | 5.5                    | 0.34               | 1.7                  | 15                 | $V_{-} + 0.2$                     | $V_{+} - 0.2$                     | X               | X                | 100            | 65   | 60   | 1              | 1          | 4                  | -40 to +85                   | TSSOP-14           |
| LMV321      | 2.5                    | 5.5                    | 0.11               | 1.7                  | 15                 | $V_{-}$                           | $V_{+} - 1$                       | -               | X                | 100            | 65   | 60   | 1              | 1          | 1                  | -40 to +85                   | SOT353<br>SOT25    |
| LMV358      | 2.5                    | 5.5                    | 0.19               | 1.7                  | 15                 | $V_{-}$                           | $V_{+} - 1$                       | -               | X                | 100            | 65   | 60   | 1              | 1          | 2                  | -40 to +85                   | MSOP-8<br>SO-8     |
| LMV324      | 2.5                    | 5.5                    | 0.34               | 1.7                  | 15                 | $V_{-}$                           | $V_{+} - 1$                       | -               | X                | 100            | 65   | 60   | 1              | 1          | 4                  | -40 to +85                   | TSSOP-14           |
| TL072       | 10                     | 30                     | 2.8                | 3                    | 0.065              | $V_{-} + 4$                       | $V_{+} - 4$                       | -               | -                | 200            | 100  | 100  | 3              | 10         | 2                  | -40 to +85                   | SO-8               |
| TL082       | 10                     | 30                     | 2.8                | 3                    | 0.08               | $V_{-} + 4$                       | $V_{+} - 4$                       | -               | -                | 200            | 86   | 86   | 3              | 10         | 2                  | -40 to +85                   | SO-8               |

## THE DIODES ADVANTAGE

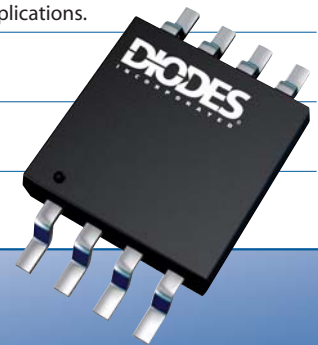
Diodes' LMV321/LMV358/ LMV324 has been designed to effectively reduce cost and save space at low voltage levels.



### Product benefits

Industry standard op amps for general purpose amplifier applications.

- **Pin-pin compatible with LMV321/358/324**  
Offers a lower cost solution versus other standard LMV321/358/324 devices.
- **-40 to 85 $^{\circ}$ C temperature range**  
Suitable for consumer and industrial applications.
- **Rail-rail output swing**  
Maximizes available dynamic range.
- **Wide range of packages**  
Industry standard drop-in devices.



# Comparators

| Part Number | Minimum Supply Voltage | Maximum Supply Voltage | Supply Current @5V | Input Offset Voltage | Input Offset Current | Input Bias Current | Minimum Common Mode Input Voltage | Maximum Common Mode Input Voltage | Rail-rail Input | Output Type    | Voltage Gain | Output Current Sink | Number of Channels | Operating Ambient Temp Range | Available Packages |
|-------------|------------------------|------------------------|--------------------|----------------------|----------------------|--------------------|-----------------------------------|-----------------------------------|-----------------|----------------|--------------|---------------------|--------------------|------------------------------|--------------------|
|             | V                      | V                      | mA                 | mV                   | nA                   | nA                 | V                                 | V                                 |                 |                | V/mV         | mA                  |                    | °C                           |                    |
| AP311       | 2                      | 36                     | 0.4                | 4                    | 70                   | 150                | 0                                 | V <sup>+</sup> -1.5               | -               | Open Collector | 200 @ 15kΩ   | 16                  | 1                  | 0 to +70                     | SOT25              |
| AP331A      | 2                      | 36                     | 0.4                | 4                    | 70                   | 150                | 0                                 | V <sup>+</sup> -1.5               | -               | Open Collector | 200 @ 15kΩ   | 16                  | 1                  | 0 to +70                     | SOT25              |
| AP393       | 2                      | 36                     | 0.4                | 1                    | 5                    | 25                 | 0                                 | V <sup>+</sup> -2                 | -               | Open Collector | 200 @ 15kΩ   | 16                  | 2                  | 0 to +70                     | SO-8<br>PDIP-8     |
| AP393A      | 2                      | 36                     | 0.4                | 4                    | 70                   | 150                | 0                                 | V <sup>+</sup> -1.5               | -               | Open Collector | 200 @ 15kΩ   | 16                  | 2                  | 0 to +70                     | MSOP-8             |
| APX393      | 2.5                    | 5.5                    | 0.15               | 1.7                  | 2                    | 25                 | 0.2                               | V <sup>+</sup> -0.2               | X               | Open Drain     | 50 @ 5.1kΩ   | 60                  | 2                  | -40 to +85                   | MSOP-8<br>SO-8     |
| APX339      | 2.5                    | 5.5                    | 0.24               | 1.7                  | 2                    | 25                 | 0.2                               | V <sup>+</sup> -0.2               | X               | Open Drain     | 50 @ 5.1kΩ   | 60                  | 4                  | -40 to +85                   | TSSOP-14           |

THE DIODES ADVANTAGE

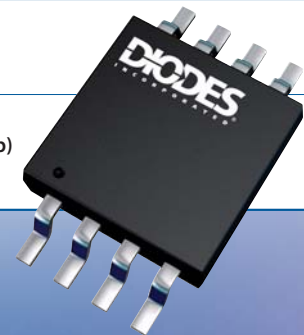
Diodes' cost-effective comparators for cost-sensitive applications.



## Product benefits

Industry standard comparators for everyday applications.

- **Pin-pin compatible with LMV393/339**  
Provides a low cost solution for 3V and 5V systems.
- **Pin-pin compatible with TL331/LM393**  
Offers customers a lower cost solution to other manufacturers.
- **Open drain/collector outputs**  
Enables simple level shifting and wire-ORing of multiple comparators.
- **Wide range of packages in green molding compound (No Br/Sb)**  
Environmentally friendly packaging.



# Current Monitors – Programmable Voltage gain

| Part Number | Description   | Min Supply Voltage | Max Supply Voltage | Min S+ Common-mode Sense Voltage | Max S+ Common-mode Sense Voltage | Max Output Voltage | Max Sense Voltage | Output Impedance | Accuracy @ $V_{sense} = 100mV$ | Quiescent Current | Gain | Bandwidth | Ambient Temp Range | AEC-Q100 | Available Packages |
|-------------|---|--------------------|--------------------|----------------------------------|----------------------------------|--------------------|-------------------|------------------|--------------------------------|-------------------|------|-----------|--------------------|----------|--------------------|
|             |   | V                  | V                  | V                                | V                                | V                  | V                 | $\Omega$         | %                              | $\mu A$           | mA/V | MHz       | $^{\circ}C$        |          |                    |
| ZXCT1008    | AEC-Q100 High-Side Current Monitors                                   | -                  | -                  | 2.5                              | 20                               | $V_S - 1$          | 0.5               | -                | 2.5                            | 4                 | 10   | 2         | -40 to +125        | X        | SOT23              |
| ZXCT1009    | Micro-Power High Side Current Monitor for portable equipment          | -                  | -                  | 2.5                              | 20                               | $V_S - 1$          | 2.5               | -                | 2.5                            | 4                 | 10   | 2         | -40 to +85         | -        | SM8 SOT23          |
| ZXCT1010    | Micro-Power High-side Current Monitor with improved offset            | -                  | -                  | 2.5                              | 20                               | $V_S - 1$          | 2.5               | -                | 2.5                            | 3.5               | 10   | 2         | -40 to +85         | -        | SOT25              |
| ZXCT1011    | Micro-Power High-side Current Monitor with improved Temperature drift | 2.5                | 20                 | $V_B$                            | $V_B$                            | $V_S - 1$          | 2.5               | -                | 2.5                            | 4                 | 10   | 1.5       | -40 to +125        | -        | SOT25              |
| ZXCT1012    | ZXCT1010 with low profile package                                     | -                  | -                  | 2.5                              | 20                               | $V_S - 1$          | 2.5               | -                | 2.5                            | 3.5               | 10   | 2         | -40 to +85         | -        | TSOT25             |
| ZXCT1020    | Low offset Current Monitor  | 2.7                | 20                 | $V_B$                            | $V_B$                            | $V_S - 1$          | 1.5               | -                | 2                              | 25                | Prog | 3         | -40 to +125        | -        | SOT25              |
| ZXCT1050    | Input range includes 0V with separate $V_{CC}$ pin                    | 2.7                | 20                 | 0                                | $V_{CC} - 2$                     | $V_{CC} - 2$       | 0.5               | -                | 3                              | 50                | Prog | 0.8       | -40 to +125        | -        | SOT25              |
| ZXCT1082    | Precision 60V wide common mode range Current Monitor                  | 2.7                | 60                 | 2.7                              | 60                               | $V_S - 1$          | 0.5               | -                | 2                              | 25                | Prog | 0.5       | -40 to +125        | X        | SOT25              |
| ZXCT1083    | Precision 40V wide common mode range Current Monitor                  | 2.7                | 40                 | 2.7                              | 40                               | $V_S - 1$          | 0.5               | -                | 2                              | 25                | Prog | 0.5       | -40 to +125        | X        | SOT25              |

THE DIODES ADVANTAGE

ZXCT current monitors convert a high-side current measurement to a ground referenced output signal, greatly simplifying high-sided current measurement.



## Product benefits

The devices enable gain to be set by a single external resistor, for increased versatility while minimizing component count.

- High-side current sensing**  
 Does not disturb ground plane.
- Current output format allows externally set gain**  
 Versatility allows 1 device used at different gains.
- Up to 2.5V sense voltage**  
 Measures larger transient currents while keeping accuracy at lower currents.
- <1% typical accuracy**  
 Meets accuracy requirements of demanding applications.



## Current Mirror

Current monitor using a two PNP and two NPN transistor combination that enables simple current measurement

| Part Number | $V_{IN}$ | Maximum collector currents | Maximum $V_{E1} - V_{E2}$ | Maximum zero offset voltage ( $R1=R3=R4=100\Omega$ ) | $P_D$ | Package |
|-------------|----------|----------------------------|---------------------------|--|-------|---------|
|             | V        | A                          | V                         | mV   | W     |         |
| ZDS1009     | 2.5 - 30 | 1                          | 10                        | 4  | 2     | SM8     |

# Current Monitors – Fixed gain

| Part Number | Description   | Min Supply Voltage | Max Supply Voltage | Min S+ Common-mode Sense Voltage | Max S+ Common-mode Sense Voltage | Max Output Voltage | Max Sense Voltage | R <sub>OUT</sub> Output impedance | Accuracy @ V <sub>sense</sub> = 100mV | Quiescent Current | Gain | Bandwidth | Ambient Temp Range | AEC-Q100 | Available Packages |
|-------------|---|--------------------|--------------------|----------------------------------|----------------------------------|--------------------|-------------------|-----------------------------------|---------------------------------------|-------------------|------|-----------|--------------------|----------|--------------------|
|             |   | V                  | V                  | V                                | V                                | V                  | V                 | Ω                                 | %                                     | μA                | V/V  | MHz       | °C                 |          |                    |
| ZXCT1021    | 20V improved accuracy                                     | -                  | -                  | 2.5                              | 20                               | V <sub>S</sub> -1  | 1.5               | 15k                               | 2                                     | 25                | 10   | 1         | -40 to +85         | -        | SOT25              |
| ZXCT1022    | 20V improved accuracy                                     | -                  | -                  | 2.5                              | 20                               | V <sub>S</sub> -1  | 0.18              | 15k                               | 3                                     | 25                | 100  | 1         | -40 to +85         | -        | SOT25              |
| ZXCT1023    | Voltage Output  | -                  | -                  | 2.5                              | 20                               | V <sub>S</sub> -1  | 0.38              | 15k                               | 3                                     | 3.5               | 25   | 1         | -40 to +85         | -        | TDFN1218-4         |
| ZXCT1030    | Voltage Output with Internal reference and comparator     | 2.2                | 20                 | 2.2                              | V <sub>CC</sub>                  | V <sub>S</sub> -1  | 0.5               | 1.5k                              | 3                                     | 270               | 10   | 6         | -40 to +85         | -        | SO-8               |
| ZXCT1032    | High-side inrush current limit controller                 | -                  | -                  | 9.5                              | 21                               | V <sub>S</sub> -1  | 0.25              | -                                 | -                                     | 1600              | 10   | -         | -40 to +85         | -        | SO-8               |
| ZXCT1041    | Bi-directional voltage output with flag                   | -                  | -                  | 2.7                              | 20                               | V <sub>S</sub> -1  | ±0.8              | 15k                               | 3                                     | 35                | 10   | 0.3       | -40 to +85         | -        | SOT25              |
| ZXCT1051    | Input range includes 0V with separate V <sub>CC</sub> pin | 2.5                | 20                 | 0                                | V <sub>CC</sub> -2               | V <sub>CC</sub> -2 | 0.3               | 3.75k                             | 3                                     | 50                | 10   | 2         | -40 to +125        | -        | SOT25              |
| ZXCT1080    | AEC-Q100 High Voltage Current Monitor                     | 4.5                | 12                 | 3                                | 60                               | 1.5                | 0.15              | -                                 | 3                                     | 30                | 10   | 0.5       | -40 to +125        | X        | SOT25              |
| ZXCT1081    | High Voltage Current Monitor                              | 4.5                | 12                 | 3                                | 40                               | 1.5                | 0.15              | -                                 | 3                                     | 30                | 10   | 0.5       | -40 to +125        | -        | SOT25              |
| ZXCT1084    | Precision 60V wide common mode range Current Monitor      | 2.7                | 60                 | 2.7                              | 60                               | V <sub>S</sub> -1  | 0.5               | 125                               | 2                                     | 0.6               | 25   | 0.5       | -40 to +125        | X        | SOT25              |
| ZXCT1085    | Precision 40V wide common mode range Current Monitor      | 2.7                | 40                 | 2.7                              | 40                               | V <sub>S</sub> -1  | 0.5               | 125                               | 2                                     | 0.6               | 25   | 0.5       | -40 to +125        | X        | SOT25              |
| ZXCT1086    | Precision 60V wide common mode range Current Monitor      | 2.7                | 60                 | 2.7                              | 60                               | V <sub>S</sub> -1  | 0.5               | 125                               | 2                                     | 0.6               | 50   | 0.2       | -40 to +125        | X        | SOT25              |
| ZXCT1087    | Precision 40V wide common mode range Current Monitor      | 2.7                | 40                 | 2.7                              | 40                               | V <sub>S</sub> -1  | 0.5               | 125                               | 2                                     | 0.6               | 50   | 0.2       | -40 to +125        | X        | SOT25              |

THE DIODES ADVANTAGE

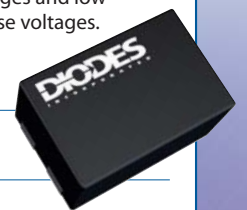
ZXCT current monitors with voltage output convert a high-side current measurement to a ground referenced voltage output, greatly simplifying high-sided current measurements.



## Product benefits

The devices offer an internally set gain with low offset voltages and low temperature drift, which optimizes performance at low sense voltages.

- High-side current sensing**  
 Does not disturb ground plane.
- Output voltage scaling**  
 One external component - reduces PCB area.
- Up to 0.8V sense voltage**  
 Measures larger transient currents while keeping accuracy at lower currents.
- 2.5V - 60V supply range**  
 ZXCT108x works directly off power rails saving cost and PCB area.
- <1% typical accuracy**  
 Meets accuracy requirements of demanding applications.



| Part Number | Reference Voltage | Accuracy  | Max Input Voltage | Sink Current | Minimum Cathode Current for Regulation | Typical Temperature Coefficient | Maximum Slope Resistance | Operating Ambient Temp Range | AEC-Q100 | Available Packages               |
|-------------|-------------------|-----------|-------------------|--------------|--|---------------------------------|--------------------------|------------------------------|----------|----------------------------------|
|             | V                 | %         | V                 | mA           | $\mu$ A                                | ppm/ $^{\circ}$ C               | $\Omega$                 | $^{\circ}$ C                 |          |                                  |
| ZXRE060     | 0.6               | 0.5, 1    | 18                | 10           | -                                      | -                               | -                        | -40 to +85                   | -        | SOT23/SOT363                     |
| AP432       | 1.24              | 0.5, 1    | 20                | 250          | 150                                    | 30                              | 0.5                      | -20 to +85                   | -        | TO92/SO-8/SOT23/SOT89/SC59/SOT25 |
| TLV431      | 1.24              | 0.5, 1    | 18                | 15           | 100                                    | 50                              | 0.4                      | -40 to +125                  | X        | SOT23/SOT363/SOT25               |
| ZR431L      | 1.24              | 1, 2.5    | 10                | -            | 100                                    | 55                              | 2                        | -40 to +85                   | -        | SOT23                            |
| AP431       | 2.495             | 0.5, 1    | 36                | 250          | 190                                    | 30                              | 0.5                      | -20 to +85                   | -        | TO92/SO-8/SOT23/SOT89/SC59/SOT25 |
| TL431       | 2.495             | 0.5, 1    | 36                | 100          | 400                                    | 50                              | 0.5                      | -40 to +125                  | -        | TO92/SOT23/SOT25                 |
| ZHT431      | 2.5               | 1, 2      | 20                | 150          | 50                                     | 55                              | 0.75                     | -55 to +125                  | -        | SOT23                            |
| ZR431       | 2.5               | 0.5, 1, 2 | 20                | 100          | 50                                     | 55                              | 0.75                     | -40 to +85                   | -        | SOT223/SOT23                     |
| ZTL431      | 2.5               | 0.5, 1    | 20                | 100          | 400                                    | 50                              | 0.5                      | -40 to +125                  | X        | SOT23/SOT363/SOT25               |
| ZTL432      | 2.5               | 0.5, 1    | 20                | 100          | 400                                    | 50                              | 0.5                      | -40 to +125                  | X        | SOT23                            |

## THE DIODES ADVANTAGE

The ZXRE060 simplifies the design of isolated low voltage DC-DC regulators. Its low 0.6V reference voltage makes it ideal for state of the art  $\mu$ P/DSP/PLD core voltage POL converters.



### Product benefits

Diodes' shunt regulators provide cost-effective solutions to a variety of consumer, power supply, industrial, and automotive applications.

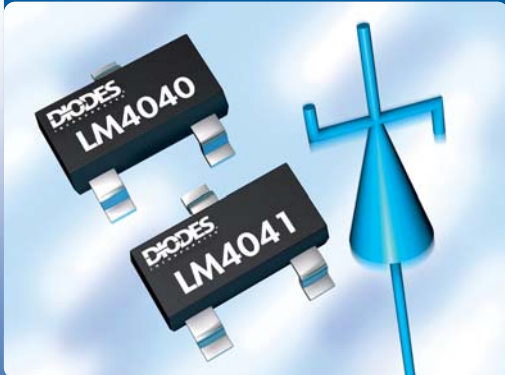
- **Wide temperature ranges, some to -40 to 125 $^{\circ}$ C**  
Best cost fit to application need.
- **Very low minimum operating current: ZR/ZHT431 only 55 $\mu$ A**  
Suitable for current sensitive applications.
- **AP431/2 cost-effective shunt regulators in industry standard packages**  
Simplifies and reduces BOM cost.
- **ZTL431/2 and TLV431 qualified to AEC-Q100**  
Suitable for automotive applications.
- **0.5% and 1% variants in all package options**  
Provides a large range of package size/power dissipation options to address a wide variety of system needs.

# Shunt References

| Part Number | Reference Voltage | Accuracy    | Max Input Voltage | Sink Current | Minimum Cathode Current for Regulation | Typical Temperature Coefficient | Maximum Slope Resistance | Noise Voltage                  | Operating Ambient Temp Range | AEC-Q100 | Available Packages |
|-------------|-------------------|-------------|-------------------|--------------|--|---------------------------------|--------------------------|--------------------------------|------------------------------|----------|--------------------|
|             | V                 | %           | V                 | mA           | $\mu\text{A}$                          | ppm/ $^{\circ}\text{C}$         | $\Omega$                 | $\mu\text{V}/^{\circ}\text{C}$ | $^{\circ}\text{C}$           |          |                    |
| ZXRE1004    | 1.22              | 1           | -                 | 20           | 8                                      | 20                              | 0.6                      | 60                             | -40 to +85                   | -        | SOT23              |
| ZXRE125     | 1.22              | 0.5, 1, 2   | -                 | 20           | 8                                      | 20                              | 0.6                      | 60                             | -40 to +85                   | -        | SOT23              |
| LM4041      | 1.225             | 0.5, 1      | -                 | 12           | 30                                     | 15                              | 0.6                      | 20                             | -40 to +125                  | X        | SOT23/SOT353       |
| ZXRE4041    | 1.225             | 0.5, 1, 2   | -                 | 12           | 30                                     | 20                              | -                        | 60                             | -40 to +85                   | -        | SOT23              |
| LM4041-ADJ  | 1.233             | 1           | 10                | 12           | 30                                     | 15                              | 0.6                      | 20                             | -40 to +125                  | X        | SOT23/SOT353       |
| LM4040-2.5  | 2.5               | 0.2, 0.5, 1 | -                 | 15           | 60                                     | 15                              | 0.9                      | 35                             | -40 to +125                  | X        | SOT23/SOT353       |
| ZR4040-2.5  | 2.5               | 0.5, 1, 2   | -                 | 20           | 50                                     | 30                              | 2                        | 45                             | -40 to +85                   | -        | SOT23              |
| ZRC250      | 2.5               | 1, 2        | -                 | 5            | 20                                     | 30                              | 1                        | 60                             | -40 to +85                   | -        | SOT23              |
| LM4040-3.0  | 3                 | 0.2, 0.5, 1 | -                 | 15           | 62                                     | 15                              | 0.9                      | 35                             | -40 to +85                   | X        | SOT23/SOT353       |
| ZRC330      | 3.3               | 1, 2        | -                 | 5            | 20                                     | 15                              | 2                        | 75                             | -40 to +85                   | -        | SOT23              |
| ZR4040-4.1  | 4.096             | 1           | -                 | 20           | 50                                     | 20                              | 2                        | 90                             | -40 to +85                   | -        | SOT23              |
| ZRC400      | 4.096             | 1           | -                 | 5            | 23                                     | 30                              | 2                        | 90                             | -40 to +85                   | -        | SOT23              |
| LM4040-5.0  | 5                 | 0.2, 0.5, 1 | -                 | 15           | 60                                     | 15                              | 1.1                      | 80                             | -40 to +125                  | X        | SOT23/SOT353       |
| ZR4040-5    | 5                 | 1           | -                 | 20           | 50                                     | 20                              | 1.5                      | 105                            | -40 to +85                   | -        | SOT23              |
| ZRB500      | 5                 | 1, 2        | -                 | 15           | 50                                     | 15                              | 1.5                      | 105                            | -40 to +85                   | -        | SOT23              |
| ZRC500      | 5                 | 1           | -                 | 5            | 25                                     | 30                              | 2                        | 105                            | -40 to +85                   | -        | SOT23              |

## THE DIODES ADVANTAGE

Diodes' voltage references are cost-effective form, fit and function industry-standard shunt references.



### Product benefits

Diodes voltage references are cost effective industry standard pin out shunt references providing excellent temperature stability.

- **Wide temperature ranges, some to -40 to 125°C**  
Simplifies component choice and stocking.
- **0.2%, 0.5% and 1% tolerance references**  
Matches needs of a wide range of applications.
- **ZRx references provide very low minimum operating currents**  
Suitable for portable/battery powered applications.
- **LM4040/1 qualified to AEC-Q100**  
Suitable for automotive applications.
- **Available in SOT23 and SOT353**  
Small, cost-effective surface mount options.



# Reset Generators

| Part Number | Detect Voltages                                      | Minimum Input Voltage | Maximum Input Voltage | Quiescent Current | Typical Time Delay | Watchdog Timeout Period | Active-High Reset Output | Active-Low Reset Output | Manual Reset Input | Watchdog Input | Watchdog Output | PFI (Power Fail Input) | PFO (Power Fail Output) | Reset Output Topology* | Ambient Temperature Range | Available Packages |
|-------------|--|-----------------------|-----------------------|-------------------|--------------------|-------------------------|--------------------------|-------------------------|--------------------|----------------|-----------------|------------------------|-------------------------|------------------------|---------------------------|--------------------|
|             | V  | V                     | V                     | µA                | ms                 | s                       |                          |                         |                    |                |                 |                        |                         |                        | °C                        |                    |
| APX803      | 2.25<br>2.63<br>2.93<br>3.08<br>4.00<br>4.38<br>4.63 | 1                     | 5.5                   | 20                | 200                | -                       | -                        | Y                       | -                  | -              | -               | -                      | -                       | OD                     | -40 to +85                | SOT23              |
| APX809      |  | 1                     | 5.5                   | 20                | 200                | -                       | -                        | Y                       | -                  | -              | -               | -                      | -                       | PP                     | -40 to +85                | SOT23              |
| APX810      |  | 1                     | 5.5                   | 20                | 200                | 200                     | -                        | Y                       | -                  | -              | -               | -                      | -                       | PP                     | -40 to +85                | SOT23              |
| APX811      |  | 1                     | 5.5                   | 20                | 200                | 200                     | -                        | -                       | Y                  | Y              | -               | -                      | -                       | PP                     | -40 to +85                | SOT143             |
| APX812      |  | 1                     | 5.5                   | 20                | 200                | 200                     | -                        | Y                       | -                  | Y              | -               | -                      | -                       | PP                     | -40 to +85                | SOT143             |
| APX823      |  | 1                     | 5.5                   | 25                | 200                | 1.6                     | -                        | Y                       | Y                  | Y              | -               | -                      | -                       | PP                     | -40 to +85                | SOT25              |
| APX824      |  | 1                     | 5.5                   | 25                | 200                | 1.6                     | Y                        | Y                       | -                  | Y              | -               | -                      | -                       | PP                     | -40 to +85                | SOT25              |
| APX825A     |  | 1                     | 5.5                   | 25                | 200                | 1.6                     | Y                        | Y                       | Y                  | Y              | -               | -                      | -                       | PP                     | -40 to +85                | SOT26              |
| AP1701      |  | 1                     | 5.5                   | 20                | 200                | 200                     | -                        | -                       | Y                  | -              | -               | -                      | -                       | PP                     | -40 to +85                | SC59               |
| AP1702      |  | 1                     | 5.5                   | 20                | 200                | 200                     | -                        | Y                       | -                  | -              | -               | -                      | -                       | PP                     | -40 to +85                | SC59               |
| AP1703      |  | 1                     | 5.5                   | 20                | 200                | 200                     | -                        | -                       | Y                  | -              | -               | -                      | -                       | PP                     | -40 to +85                | SC59               |
| AP1704      |  | 1                     | 5.5                   | 20                | 200                | 200                     | -                        | Y                       | -                  | -              | -               | -                      | -                       | PP                     | -40 to +85                | SC59               |
| ZM33164-3   | 2.68   | 1                     | 10                    | 190               | 0                  | -                       | -                        | Y                       | -                  | -              | -               | -                      | -                       | OC                     | -40 to +85                | SOT223             |
| ZSM560      | 4.6  | 1                     | 6.5                   | 200               | 0                  | -                       | -                        | Y                       | -                  | -              | -               | -                      | -                       | OC                     | -40 to +85                | SOT223             |

\*OD stands for Open Drain, PP stands for Push Pull, OC stands for Open Collector

## THE DIODES ADVANTAGE

APX8xx µC/µP supervisors provide a simple cost-effective solution for µP/µC power supply supervision.



### Product benefits

- **µP supervisor monitors 2.5V, 3.0V, 3.3V and 5V power supplies**  
Improves circuit reliability at low cost.
- **Wide range of thresholds to meet the needs of 2.5V, 3.0V, 3.3V and 5V power supplies**  
The right threshold can be chosen to meet the needs of the system.
- **Small footprint SOT23/143 green packages**  
Small PCB area and halogen free.
- **Watchdog function**  
Hardware watchdog prevents µP software lock-up, improving reliability.
- **Manual reset (MR) input**  
Hardwire reset function to create manual reset or simple way of coupling multiple supervisors together.
- **No external components required**  
Reduces PCB area and cost.



# STANDARD LOGIC

## Single Gate Low Voltage CMOS Logic

| Part Number | Family | $V_{CC}(\text{min})$ | $V_{CC}(\text{max})$ | $t_{pd} \text{ max at } 1.5\text{V}$ | $t_{pd} \text{ max at } 1.8\text{V}$ | $t_{pd} \text{ max at } 2.5\text{V}$ | $t_{pd} \text{ max at } 3.3\text{V}$ | $t_{pd} \text{ max at } 5.0\text{V}$ | Output Current | Description             | Available Packages |
|-------------|--------|----------------------|----------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|----------------|-------------------------|--------------------|
|             |        | V                    | V                    | ns                                   | ns                                   | ns                                   | ns                                   | ns                                   |                |                         |                    |
| 74LVC1G00   | LVC    | 1.65                 | 5.5                  | -                                    | 9                                    | 5.5                                  | 4.7                                  | 4                                    | 32             | 2 Input NAND Gate       | SOT25/SOT353       |
| 74LVC1G02   | LVC    | 1.65                 | 5.5                  | -                                    | 8                                    | 5.5                                  | 4.5                                  | 4                                    | 32             | 2 Input NOR Gate        | SOT25/SOT353       |
| 74LVC1G04   | LVC    | 1.65                 | 5.5                  | -                                    | 7.5                                  | 5.2                                  | 4.2                                  | 3.7                                  | 32             | 1 Input Single Inverter | SOT25/SOT353       |
| 74LVC1G08   | LVC    | 1.65                 | 5.5                  | -                                    | 8                                    | 5.5                                  | 4.5                                  | 4                                    | 32             | 2 Input AND Gate        | SOT25/SOT353       |
| 74LVC1G32   | LVC    | 1.65                 | 5.5                  | -                                    | 8                                    | 5.5                                  | 4.5                                  | 4                                    | 32             | 2 Input OR Gate         | SOT25/SOT353       |
| 74LVC1G86   | LVC    | 1.65                 | 5.5                  | -                                    | 9.9                                  | 5.5                                  | 5                                    | 4                                    | 32             | 2 Input XOR Gate        | SOT25/SOT353       |
| 74LVC1G125  | LVC    | 1.65                 | 5.5                  | -                                    | 9                                    | 5.5                                  | 4.5                                  | 4                                    | 32             | 3-State Buffer OE LOW   | SOT25/SOT353       |
| 74LVC1G126  | LVC    | 1.65                 | 5.5                  | -                                    | 8                                    | 5.5                                  | 4.5                                  | 4                                    | 32             | 3-State Buffer OE HIGH  | SOT25/SOT353       |
| 74LVCE1G00  | LVCE   | 1.35                 | 5.5                  | 12.5                                 | 6.8                                  | 4.5                                  | 4                                    | 3.6                                  | 32             | 2 Input NAND Gate       | SOT25/SOT353       |
| 74LVCE1G02  | LVCE   | 1.35                 | 5.5                  | 12.5                                 | 6                                    | 4.5                                  | 4                                    | 3.6                                  | 32             | 2 Input NOR Gate        | SOT25/SOT353       |
| 74LVCE1G04  | LVCE   | 1.35                 | 5.5                  | 11                                   | 5.7                                  | 4.2                                  | 3.8                                  | 3.4                                  | 32             | 1 Input Single Inverter | SOT25/SOT353       |
| 74LVCE1G08  | LVCE   | 1.35                 | 5.5                  | 12.5                                 | 6                                    | 4.5                                  | 4                                    | 3.6                                  | 32             | 2 Input AND Gate        | SOT25/SOT353       |
| 74LVCE1G32  | LVCE   | 1.35                 | 5.5                  | 12.5                                 | 6                                    | 4.5                                  | 4                                    | 3.6                                  | 32             | 2 Input OR Gate         | SOT25/SOT353       |
| 74LVCE1G86  | LVCE   | 1.35                 | 5.5                  | 14                                   | 7.5                                  | 4.6                                  | 4.4                                  | 4                                    | 32             | 2 Input XOR Gate        | SOT25/SOT353       |
| 74LVCE1G125 | LVCE   | 1.65                 | 5.5                  | 12.5                                 | 6.8                                  | 4.6                                  | 4                                    | 3.6                                  | 32             | 3-State Buffer OE LOW   | SOT25/SOT353       |
| 74LVCE1G126 | LVCE   | 1.65                 | 5.5                  | 12.5                                 | 6.8                                  | 4.6                                  | 4                                    | 3.6                                  | 32             | 3-State Buffer OE HIGH  | SOT25/SOT353       |

### THE DIODES ADVANTAGE

Diodes' low voltage single-gate CMOS products are offered with both standard and extended electrical performance.



### Product benefits

- **LVC and LVCE product families**
  - LVC offers industry standard performance for cost-sensitive applications.
  - LVCE offers enhanced electrical performance for high performance systems.
- **Lower voltage operation**
  - LVCE product suitable for use in 1.5V systems.
- **Faster switching speeds**
  - LVCE product is 20% faster at 1.8V operation.
- **Excellent product reliability**
  - Guaranteed to withstand 2kV ESD.
- **Environmentally-friendly packaging**
  - Offered in green SOT25 and SOT353 package options.

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