

# ZXFV201, ZXFV202, ZXFV203, ZXFV204

## Quad, single, triple and dual video amplifiers

### Device description

The ZXFV201, ZXFV202, ZXFV203 and ZXFV204 are quad, single, triple and dual, respectively, high speed amplifiers designed for video and other high speed applications.

Their low differential gain and phase performance make them ideal for video amplifier buffer applications.

The quad allows one IC to drive RGBS format component video signals, while the triple provides RGB component video buffer/driver. The dual amplifier is a mainstay of the video market providing two channels in the space of 1 single in SO8. The small size of the ZXFV202 in SOT23 allows it to be placed where needed for position/size critical applications.

Together with high output drive and slew rate capability, they bring high performance to video applications.

### Ordering information

Part number	Description	Reel size (inches)	Qty.	Part mark
ZXFV202E5TA	Single	7	3,000	V202
ZXFV202E5TD	Single	7	500	V202
ZXFV202N8TA	Single	7	500	ZXFV202
ZXFV202N8TC	Single	13	2,500	ZXFV202
ZXFV204N8TA	Dual	7	500	ZXFV204
ZXFV204N8TC	Dual	13	2,500	ZXFV204
ZXFV203N14TA	Triple	7	500	ZXFV203
ZXFV203N14TC	Triple	13	2,500	ZXFV203
ZXFV201N14TA	Quad	7	500	ZXFV201
ZXFV201N14TC	Quad	13	2,500	ZXFV201

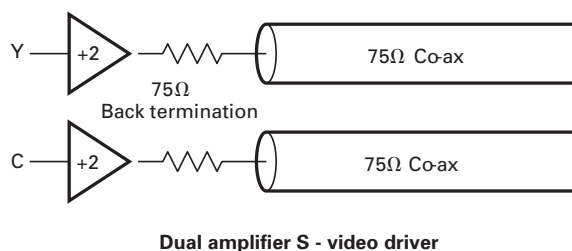
### Features

- High speed
- Gain of 1 - 3dB bandwidth 210MHz
- Slew rate 380V/ $\mu$ s
- Good video
- 25 MHz 0.1dB bandwidth
- Differential gain 0.04%
- Differential phase 0.04°
- 40mA output current @ 3V Output
- Characterized up to 300pF load
- $\pm$ 5 Volt supply operation
- Supply current 7.5mA per amplifier

### Applications

- Industry standard pinouts
- Video gain stages
- CCTV buffer
- Video distribution
- RGB buffering
- Home theater
- High Speed ADC signal input drive
- Cable driving

### Application diagram



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## Absolute maximum ratings over operating free-air temperature (unless otherwise stated <sup>(a)</sup>)

Supply voltage ( $V_{S+}$ to $V_{S-}$ )	-0.5V to +11V
Input voltage ( $V_{IN-}$ , $V_{IN+}$ ) <sup>(b)</sup>	$V_{S-}$ -0.5V to $V_{S+}$ +0.5 V
Differential input voltage ( $V_{ID}$ )	$\pm 3V$
Inverting input current ( $I_{IN-}$ ) <sup>(c)</sup>	$\pm 5mA$
Output current (continuous, $T_J < 110^{\circ}C$ )	$\pm 60mA$
Internal power dissipation	See power dissipation derating table
Storage temperature range	$-65^{\circ}C$ to $+150^{\circ}C$
Operating ambient junction temperature ( $T_{JMAX}$ )	$150^{\circ}C$

### NOTES:

- (a) Stresses above those listed under Absolute maximum ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
- (b) During power-up and power-down, these voltage ratings require that signals be applied only when the power supply is connected.
- (c) At high closed loop gains and low gain setting resistors care must be taken if large input signals are applied to the device which cause the output stage to saturate for extended periods of time.

## Power derating table

Package	Theta-ja	Power rating at 25°C
SOT23-5	195°C/W	0.64W
SO8	168°C/W	0.74W
SO14	120°C/W	1.04W

## Recommended operating conditions

Parameter		Min.	Max.	Unit
$V_{S\pm}$	Dual supply voltage range	$\pm 4.75$	$\pm 5.25$	V
$V_{CMR}$	Common mode input voltage range	-3	+3	V
$T_A$	Ambient temperature range	-40	85	°C

## Recommended resistor values

$V_{S\pm} = 5V$ ,  $C_L = 10pF$

$G_{CL}$	$R_F$	$R_G$	Peaking
1	680	n/c	2 dB
	820		0
	1000		-2dB
2	430	430	2dB
	470	470	1.5dB
	560	560	0

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**DC electrical characteristics ( $\pm 5V$  power supplies,  $T_{amb} = 25^{\circ}C$  unless otherwise stated.  $R_f = 1k\Omega$ ,  $R_L = 150\Omega$ ,  $C_L \leq 10pF$ )**

Parameter	Conditions	Test	Min.	Typ.	Max.	Unit
Supply voltage $V_+$ operating range			4.75	5	5.25	V
Supply voltage $V_-$ operating range			-5.25	-5	-4.75	V
Supply current/per channel		P	5.0	7.5	10	mA
Input common mode voltage range		P		$\pm 3$		V
Input offset voltage		P		1	10	mV
Output offset voltage		P		2	20	mV
Input bias current, non-inverting input		P		5	10	$\mu A$
Input resistance		P	1.5	2	6.5	$M\Omega$
Output voltage swing	$I_{OUT} = 40mA$	P		$\pm 3$		V
Output drive current	$V_{IN} = 3V$	P	40			mA
Positive PSRR	$\Delta V_+ = \pm 0.25$	P	49	57		dB
Negative PSRR	$\Delta V_- = \pm 0.25$	P	49	57		dB

Test - P = production tested. C = characterized

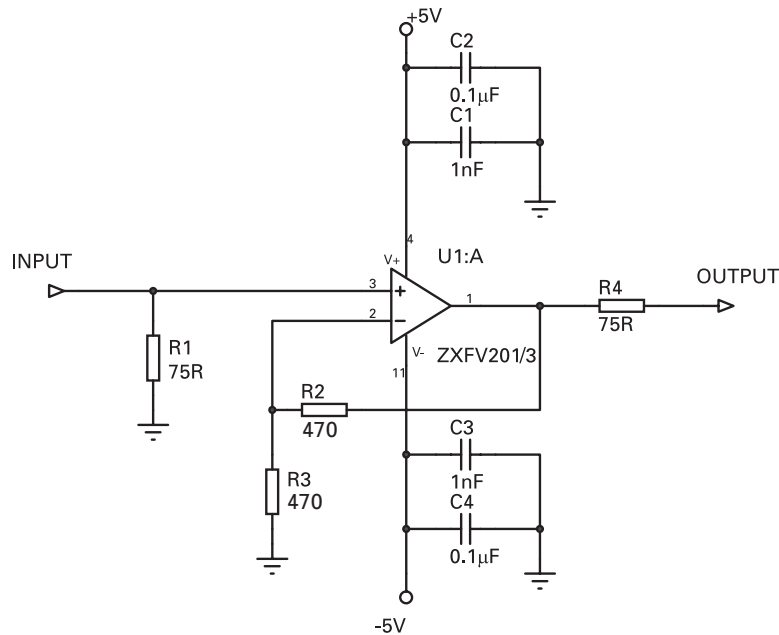
**AC electrical characteristics ( $\pm 5V$ ,  $R_f = 470\Omega$ ,  $G = 2$ ,  $C_L = 10pF$ ,  $T_A = 25^{\circ}C$ , unless otherwise stated)**

Parameter	Conditions	Min	Typ	Max	Unit
BW <sub>-3</sub> Bandwidth, -3dB	$V_{OUT} = 0.2V_{PP}$ $G = +2$ , $R_F = 470\Omega$		210		MHz
	$V_{OUT} = 0.2V_{PP}$ $G = +1$ , $R_F = 820\Omega$		210		
BW <sub>0.1</sub> Bandwidth, $\pm 0.1dB$	$V_{OUT} = 0.2V_{PP}$		30		MHz
SR    Slew Rate	$V_{OUT} = 2V_{PP}$ $G = +2$ , $R_F = 470\Omega$		600		V/ $\mu s$
	$V_{OUT} = 2V_{PP}$ $G = +1$ , $R_F = 820\Omega$		380		
$t_r$ Rise time	$V_{OUT} = \pm 1V$ , 10% - 90%		5.8		ns
$t_f$ Fall time			4.6		
$t_p$ Propagation delay	$V_{OUT} = \pm 2V$ , 10% - 90%		2.6		
dG    Differential phase, NTSC	NTSC/PAL, 280mV <sub>PP</sub>		0.04		%
dP    Differential phase, NTSC	DC = -1.428V to +1.428 V		0.04°		

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## Applications information

A typical circuit application is shown in Figure 1. This is suitable for 75Ω transmission line connections at both the input and the output and is useful for distribution of wide-band signals such as video via cables. The 75Ω reverse terminating resistor R4 gives the correct matching condition to a terminated video cable. The amplifier load is then 150Ω in parallel with the local feedback network.



**Figure 1 Typical video signal application circuit, gain = 2 (overall gain = 1 for 75Ω load)**

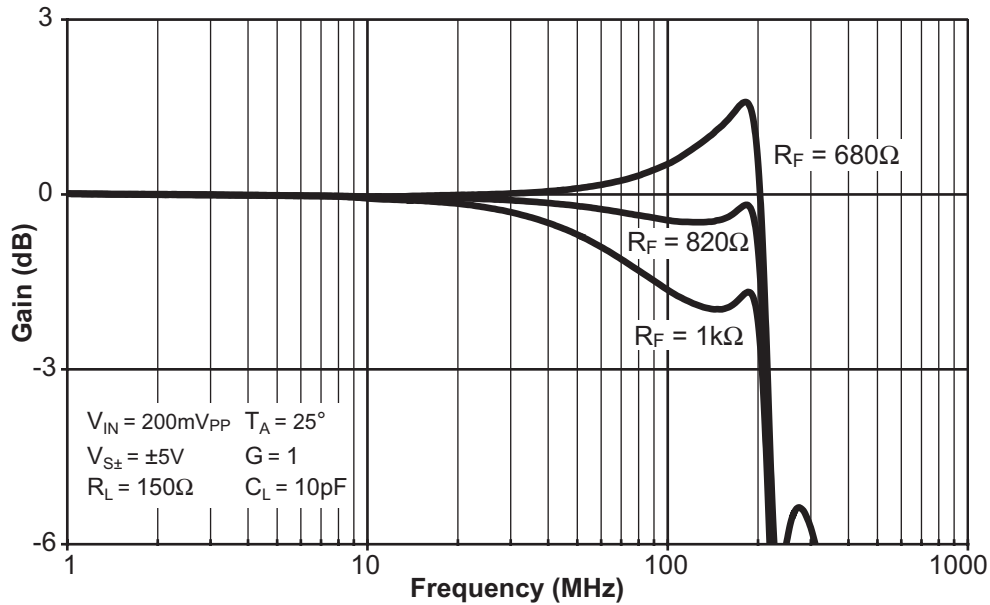
The wide bandwidth of this device necessitates some care in the layout of the printed circuit. A continuous ground plane is required under the device and its signal connection paths, to provide the shortest possible ground return paths for signals and power supply filtering. A double-sided or multi-layer PCB construction is required, with plated-through via holes providing closely spaced low-inductance connections from some components to the continuous ground plane.

For the power supply filtering, low inductance surface mount capacitors are normally required. It has been found that very good RF decoupling is provided on each supply using a 1000pF NPO size 0805 or smaller ceramic surface mount capacitor, closest to the device pin, with an adjacent 0.1μF X7R capacitor. Other configurations are possible and it may be found that a single 0.01μF X7R capacitor on each supply gives good results. However this should be supported by larger decoupling capacitors elsewhere on the printed circuit board. Values of 1 to 10μF are recommended, particularly where the voltage regulators are located more than a few inches from the device. These larger capacitors are recommended to be solid tantalum electrolytic or ceramic types.

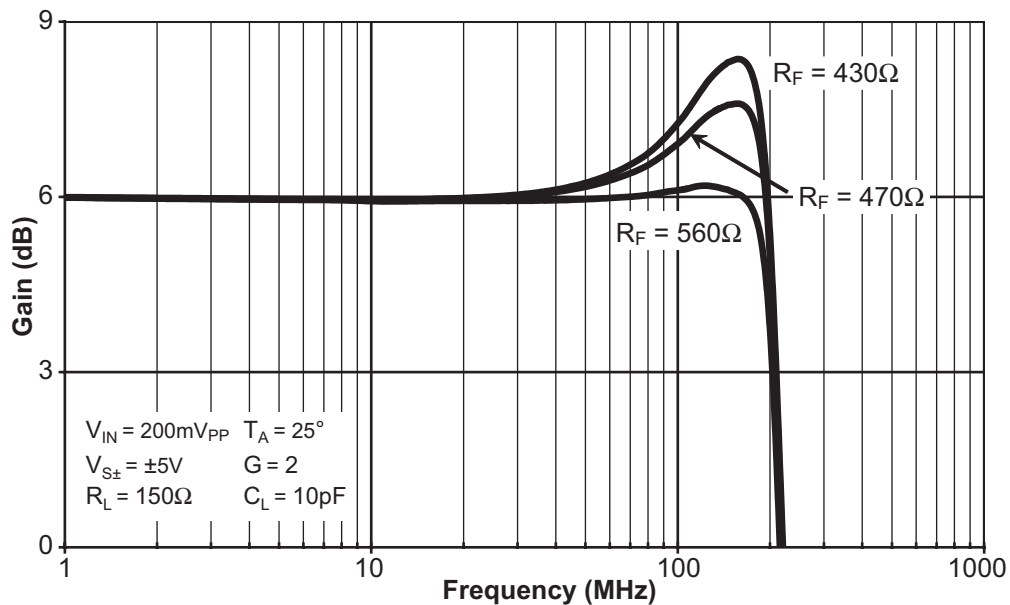
Note particularly that the inverting input of this current feedback type of amplifier is sensitive to small amounts of capacitance to ground which occur as part of the practical circuit board layout. This capacitance affects bandwidth, frequency response peaking and pulse overshoot. Therefore to minimize this capacitance, the feedback components R2 and R3 of Figure 1 should be positioned as close as possible to the inverting input connection.

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The frequency response and pulse response will vary according to particular values of resistors and layout capacitance. The response can be tailored for the application to some extent by choice of the value of feedback resistor. Figures 2 and 3 show the small signal unity gain and gain of 2 frequency responses.



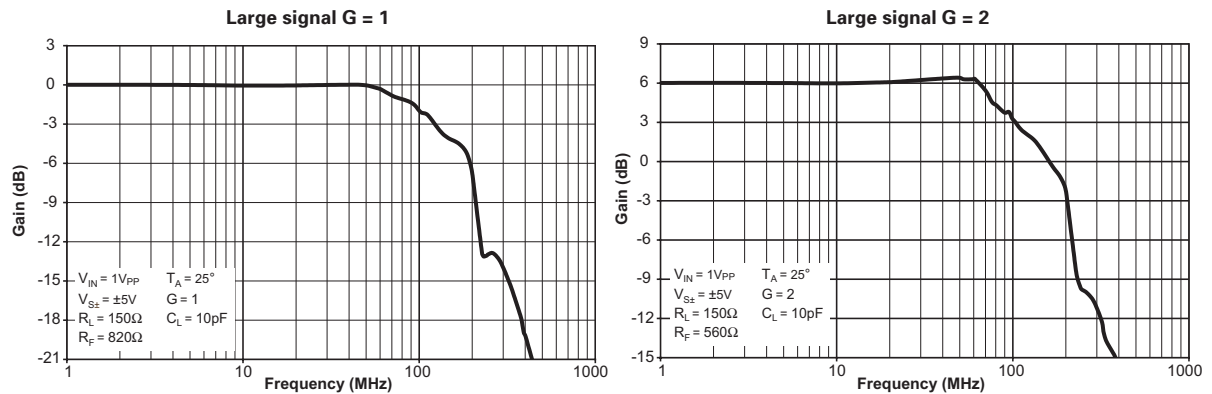
**Figure 2** Unity gain small signal bandwidth



**Figure 3** Gain of 2 small signal bandwidth

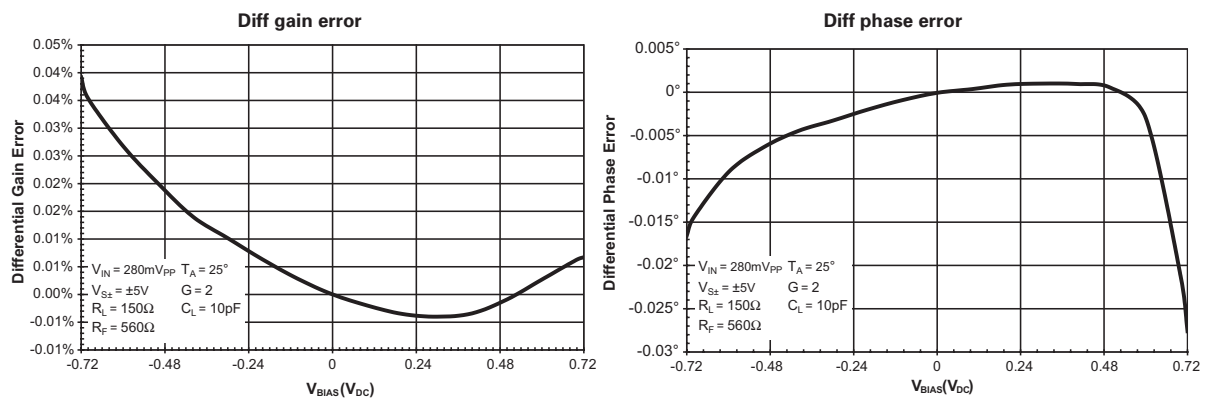
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Figures 4 and 5 show the large signal unity gain of 2 frequency responses.



**Figures 4 and 5 Large signal unity gain of 2 frequency response**

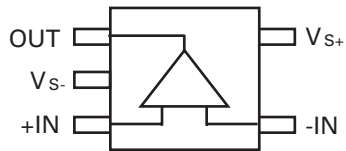
The ZXFBV20x family are primarily video amplifiers; Figures 6 and 7 show the NTSC/PAL differential gain and phase errors at a gain of 2.



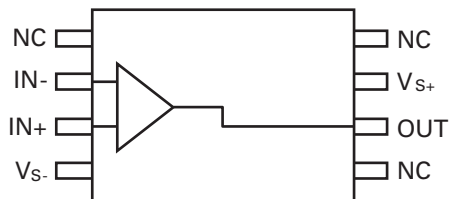
**Figures 6 and 7 NTSC/PAL differential gain and phase errors at a gain of 2**

# ZXFB201, ZXFB202, ZXFB203, ZXFB204

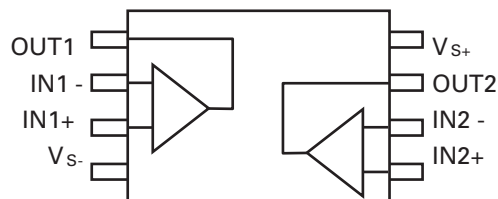
## Pinout details



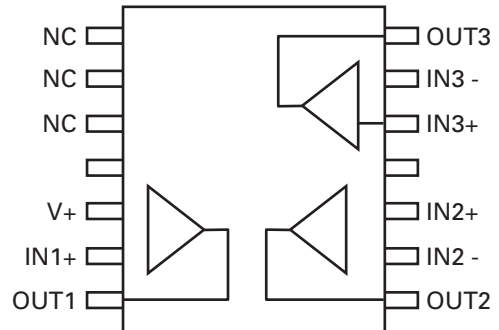
**ZXFB202E5**  
Single



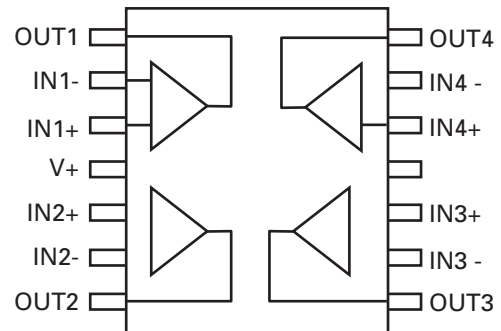
**ZXFB202N8**  
Single



**ZXFB204**  
Dual



**ZXFB203**  
Triple



**ZXFB201**  
Quad

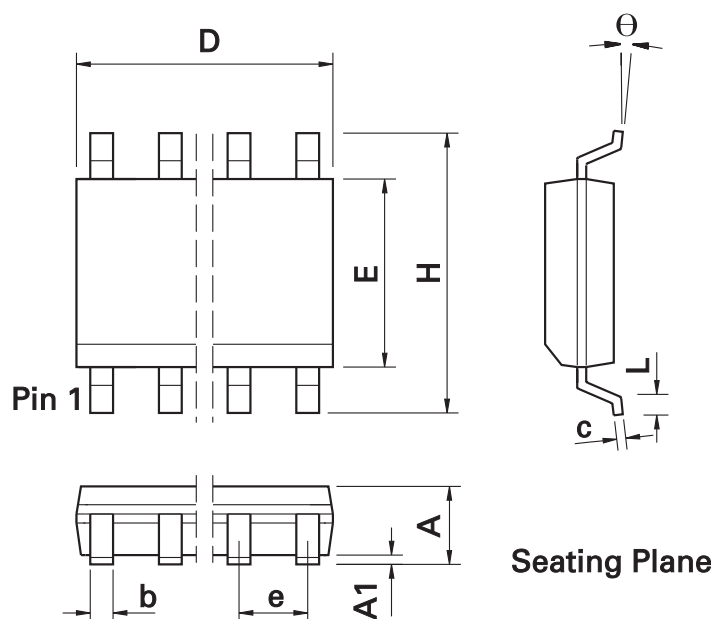
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# ZXFV201, ZXFV202, ZXFV203, ZXFV204

## Package details - SO8, SO14

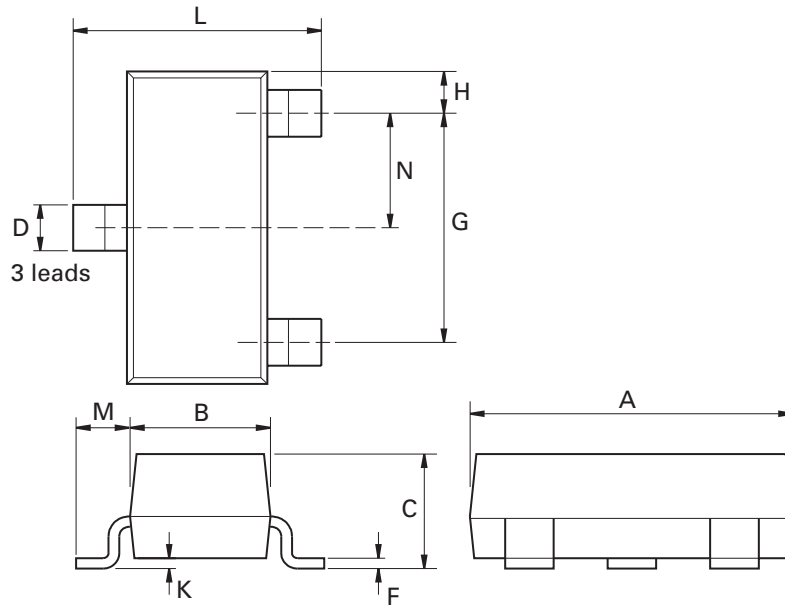


DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.053	0.069	1.35	1.75	L	0.016	0.050	0.40	1.27
A1	0.004	0.010	0.10	0.25	e	0.050 BSC		1.27 BSC	
D (8 pin)	0.189	0.197	4.80	5.00	b	0.013	0.020	0.33	0.51
D (14 pin)	0.337	0.344	8.55	8.75	c	0.008	0.010	0.19	0.25
H	0.228	0.244	5.80	6.20	θ	0°	8°	0°	8°
E	0.150	0.157	3.80	4.00	h	0.010	0.020	0.25	0.50

**Note:** Controlling dimensions are in inches. Approximate dimensions are provided in millimeters

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## Package details - SOT23



Dim.	Millimeters		Inches		Dim.	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Max.	Max.
A	2.67	3.05	0.105	0.120	H	0.33	0.51	0.013	0.020
B	1.20	1.40	0.047	0.055	K	0.01	0.10	0.0004	0.004
C	-	1.10	-	0.043	L	2.10	2.50	0.083	0.0985
D	0.37	0.53	0.015	0.021	M	0.45	0.64	0.018	0.025
F	0.085	0.15	0.0034	0.0059	N	0.95 NOM		0.0375 NOM	
G	1.90 NOM		0.075 NOM		-	-	-	-	-

**Note:** Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

Europe	Americas	Asia Pacific	Corporate Headquarters
Zetex GmbH Streitfeldstraße 19 D-81673 München Germany	Zetex Inc 700 Veterans Memorial Highway Hauppauge, NY 11788 USA	Zetex (Asia Ltd) 3701-04 Metroplaza Tower 1 Hing Fong Road, Kwai Fong Hong Kong	Zetex Semiconductors plc Zetex Technology Park, Chadderton Oldham, OL9 9LL United Kingdom
Telefon: (49) 89 45 49 49 0 Fax: (49) 89 45 49 49 49 europe.sales@zetex.com	Telephone: (1) 631 360 2222 Fax: (1) 631 360 8222 usa.sales@zetex.com	Telephone: (852) 26100 611 Fax: (852) 24250 494 asia.sales@zetex.com	Telephone (44) 161 622 4444 Fax: (44) 161 622 4446 hq@zetex.com

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