TS461, TS462, TS464

Output rail-to-rail operational amplifiers

Features

- High dynamic features
- Large output swing (±2.4 V at V_{CC} = ±2.5 V)
- Low noise level: 4 nV/√Hz
- Low distortion: 0.003 %
- Operating range: 2.7 V to 10 V
- Available in SOT23-5 micropackage

Applications

- Sound cards
- PDAs
- CD players
- Recording equipment
- Multimedia
- Microphone pre-amplifiers

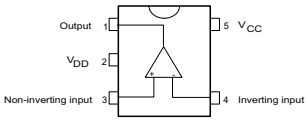
Description

The TS461, TS462 and TS464 family of operational amplifiers can operate with voltages as low as ±1.35 V and reach a minimum of ±2 Vpp of output swing when supplied with ±2.5 V.

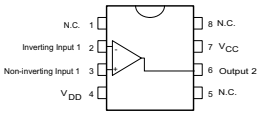
The devices are well-suited to all kinds of portable and battery-supplied equipment, where low noise and low distortion are key requirements.

The TS461, TS462 and TS464 offer excellent output rail-to-rail performances at an attractive cost.

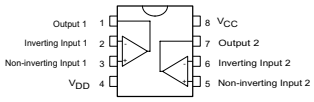
TS461CLT



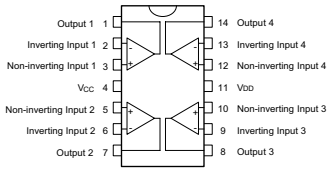
TS461CD



TS462CD-TS462CPT-TS462CST



TS464CD-TS464CPT



1 Absolute maximum ratings and operating conditions

Table 1. Key parameters and their absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage (1)	12	V
V_{id}	Differential Input Voltage (2)	$\pm V_{CC}$	V
V_{in}	Input voltage range	V_{DD} -0.3 to V_{CC}+0.3	V
T_{oper}	Operating free air temperature range	-20 to +70	°C
T_{std}	Storage temperature range	-65 to +150	°C
T_j	Maximum junction temperature	150	°C
R_{thja}	Thermal resistance junction to case (3) SOT23-5 SO8 SO14 TSSOP8 TSSOP14	 250 125 103 120 100	°C/W
ESD	HBM: human body model(4)	2	kV
	MM: machine model(5)	200	V
	CDM: charged device model	1.5	kV
	Lead temperature (soldering, 10 sec)	250	°C

1. All voltages values, except differential voltage are with respect to network group terminal.
2. Differential voltages are non-inverting input terminal with respect to the inverting input terminal.
3. Short-circuits can cause excessive heating and destructive dissipation.
4. Human body model: 100 pF discharged through a 1.5 kΩ resistor into pin of device.
5. Machine model ESD: a 200 pF capacitor is charged to the specified voltage, then discharged directly into the IC with no external series resistor (internal resistor < 5 Ω), into pin-to-pin of device.

Table 2. Operating conditions

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	2.7 to 10	V
Vicm	Common mode input voltage range	V_{DD} +1.15 to V_{CC} - 1.15	V
T_{oper}	Operating free air temperature range	-20 to +70	°C

2 Electrical characteristics

Table 3. V_{CC} = 2.5 V, V_{DD} = -2.5 V, V_{icm} = V_{CC} / 2, R_L connected to V_{CC} / 2, T_{amb} = 25° C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{io}	Input offset voltage $T_{min.} \leq T_{amb} \leq T_{max.}$		1	5 7	mV
ΔV_{io}	Input offset voltage drift		5		µV/°C
I_{io}	Input offset current $T_{min.} \leq T_{amb} \leq T_{max.}$		10	150 200	nA
I_{ib}	Input bias current $T_{min.} \leq T_{amb} \leq T_{max.}$		200 200	750 1000	nA
CMR	Common mode rejection ratio V_{icm} = ±1.35 V	60	85		dB
SVR	Supply voltage rejection ratio V_{CC} = ±2 V to ±3 V	60	70		dB
A_{vd}	Large signal voltage gain R_L = 2 kΩ	70	80		dB
V_{OH}	High level output voltage R_L = 2 kΩ	2	2.4		V
V_{OL}	Low level output voltage R_L = 2 kΩ		-2.4	-2	V
I_{CC}	Supply current, per amplifier Unity gain - no load		2	2.8	mA
GBP	Gain bandwidth product f = 100 kHz, R_L = 2 kΩ, C_L = 100 pF	8.5	12		MHz
SR	Slew rate A_V = 1, V_{in} = ±1 V	2.8	4		V/µs
en	Equivalent input noise voltage f = 100 kHz		4		$\frac{nV}{\sqrt{Hz}}$
THD	Total harmonic distortion f = 1 kHz, A_V = -1, R_L = 10 kΩ		0.003		%

3 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

3.1 SOT23-5 package information

Figure 1. SOT23-5 package mechanical drawing

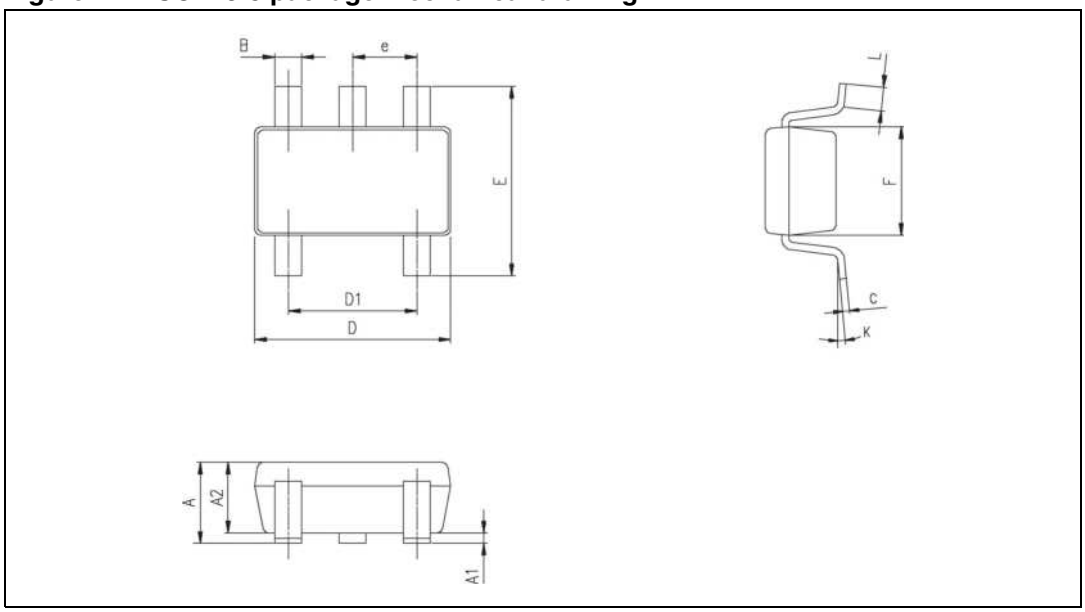


Table 4. SOT23-5 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.90	1.20	1.45	0.035	0.047	0.057
A1			0.15			0.006
A2	0.90	1.05	1.30	0.035	0.041	0.051
B	0.35	0.40	0.50	0.013	0.015	0.019
C	0.09	0.15	0.20	0.003	0.006	0.008
D	2.80	2.90	3.00	0.110	0.114	0.118
D1		1.90			0.075	
e		0.95			0.037	
E	2.60	2.80	3.00	0.102	0.110	0.118
F	1.50	1.60	1.75	0.059	0.063	0.069
L	0.10	0.35	0.60	0.004	0.013	0.023
K	0 degrees		10 degrees			

3.2 SO-8 package information

Figure 2. SO-8 package mechanical drawing

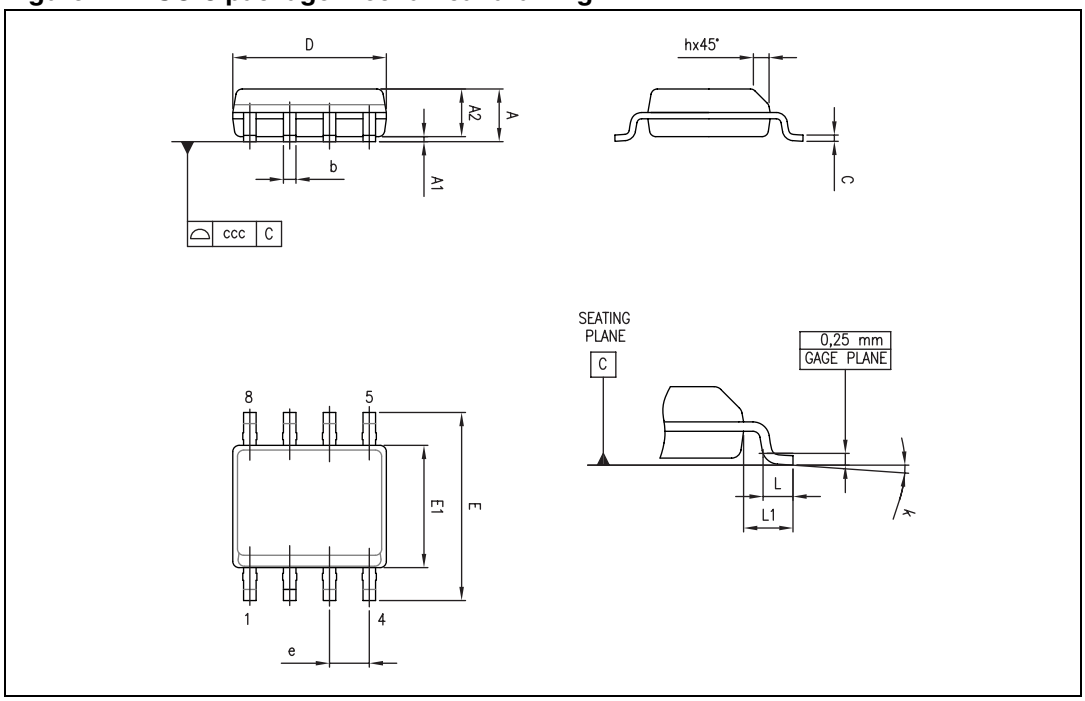


Table 5. SO-8 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
A1	0.10		0.25	0.004		0.010
A2	1.25			0.049		
b	0.28		0.48	0.011		0.019
c	0.17		0.23	0.007		0.010
D	4.80	4.90	5.00	0.189	0.193	0.197
E	5.80	6.00	6.20	0.228	0.236	0.244
E1	3.80	3.90	4.00	0.150	0.154	0.157
e		1.27			0.050	
h	0.25		0.50	0.010		0.020
L	0.40		1.27	0.016		0.050
L1		1.04			0.040	
k	1°		8°	1°		8°
ccc			0.10			0.004

3.3 MiniSO-8 package information

Figure 3. MiniSO-8 package mechanical drawing

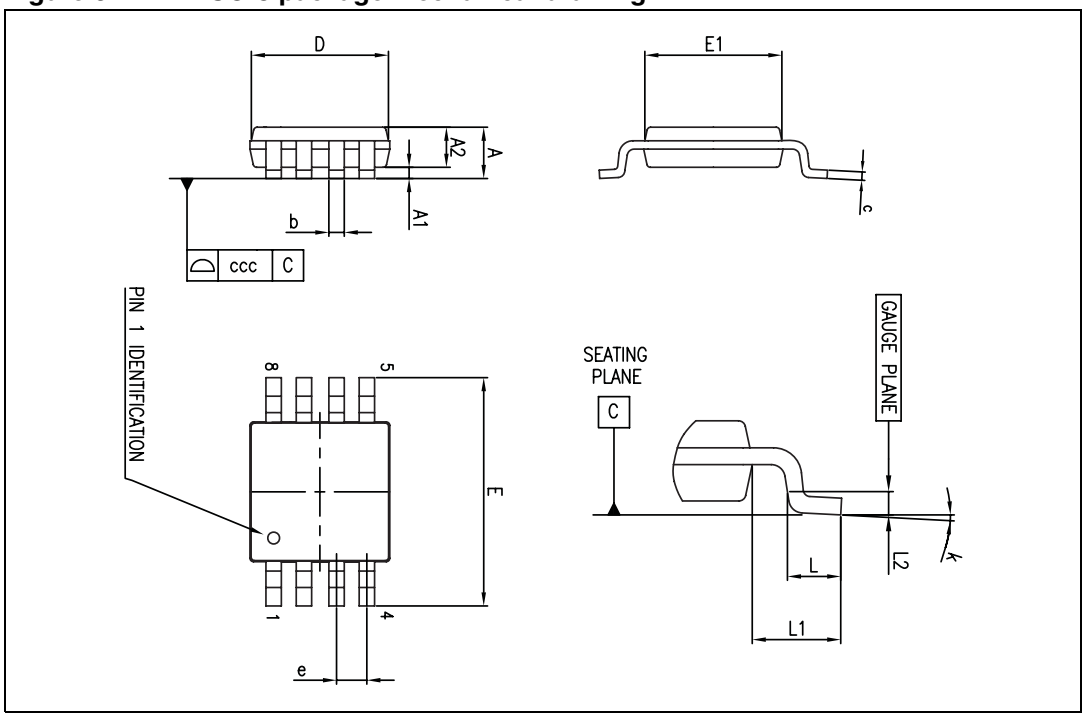


Table 6. MiniSO-8 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.1			0.043
A1	0		0.15	0		0.006
A2	0.75	0.85	0.95	0.030	0.033	0.037
b	0.22		0.40	0.009		0.016
c	0.08		0.23	0.003		0.009
D	2.80	3.00	3.20	0.11	0.118	0.126
E	4.65	4.90	5.15	0.183	0.193	0.203
E1	2.80	3.00	3.10	0.11	0.118	0.122
e		0.65			0.026	
L	0.40	0.60	0.80	0.016	0.024	0.031
L1		0.95			0.037	
L2		0.25			0.010	
k	0°		8°	0°		8°
ccc			0.10			0.004

3.4 TSSOP8 package information

Figure 4. TSSOP8 package mechanical drawing

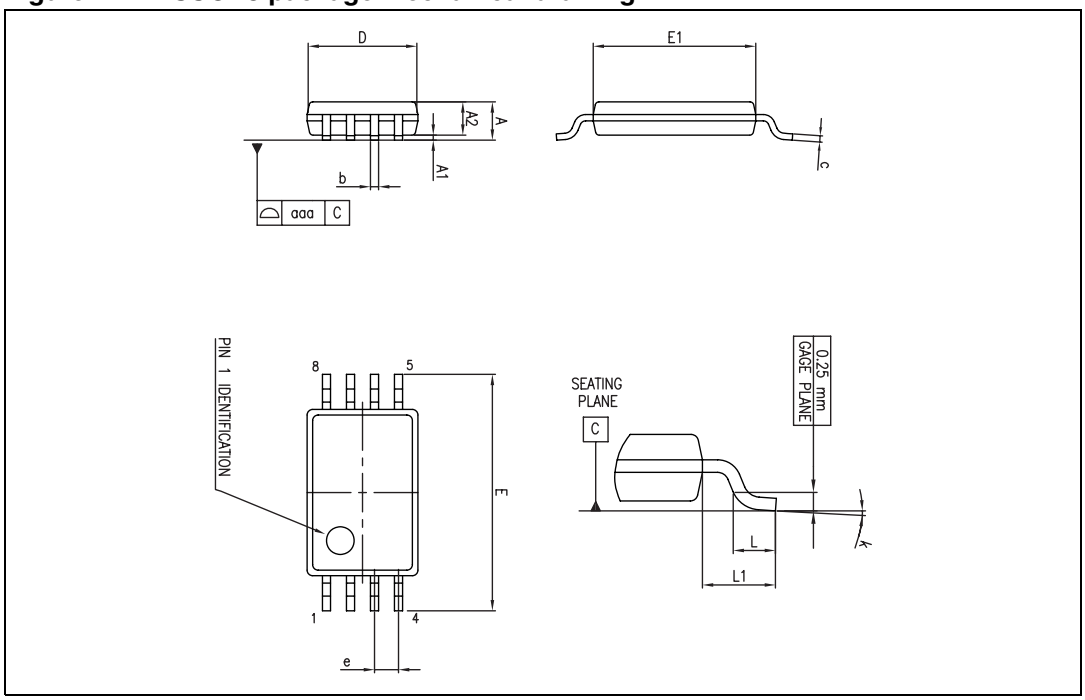


Table 7. TSSOP8 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.20			0.047
A1	0.05		0.15	0.002		0.006
A2	0.80	1.00	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.008
D	2.90	3.00	3.10	0.114	0.118	0.122
E	6.20	6.40	6.60	0.244	0.252	0.260
E1	4.30	4.40	4.50	0.169	0.173	0.177
e		0.65			0.0256	
k	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030
L1		1			0.039	
aaa			0.10			0.004

3.5 TSSOP14 package information

Figure 5. TSSOP14 package mechanical drawing

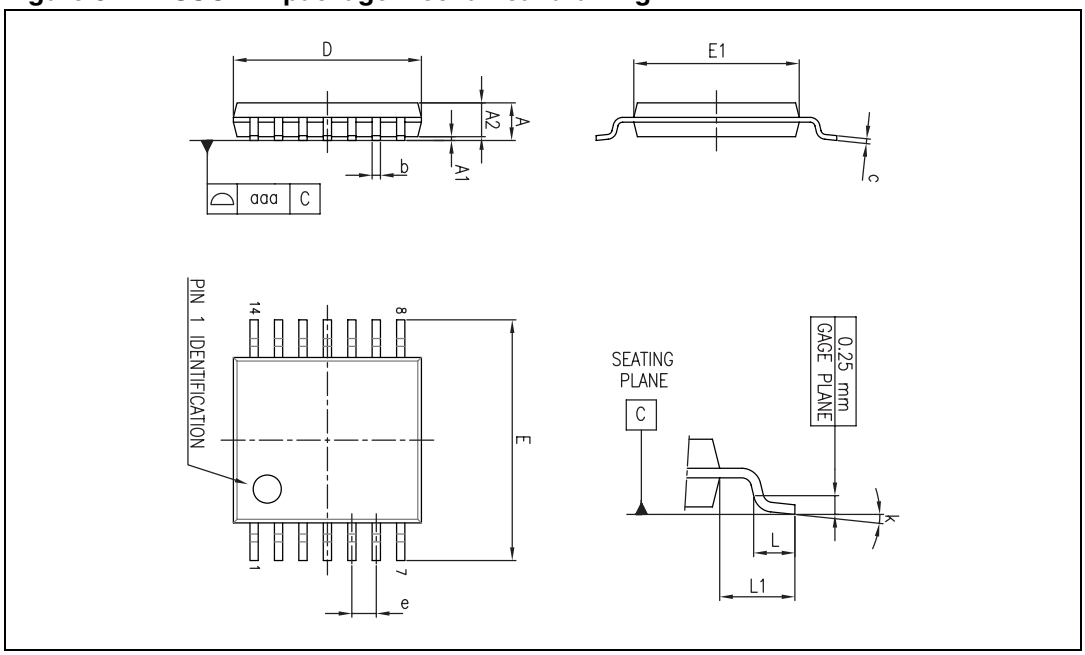


Table 8. TSSOP14 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.20			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.80	1.00	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0089
D	4.90	5.00	5.10	0.193	0.197	0.201
E	6.20	6.40	6.60	0.244	0.252	0.260
E1	4.30	4.40	4.50	0.169	0.173	0.176
e		0.65			0.0256	
L	0.45	0.60	0.75	0.018	0.024	0.030
L1		1.00			0.039	
k	0°		8°	0°		8°
aaa			0.10			0.004

3.6 SO-14 package information

Figure 6. SO-14 package mechanical drawing

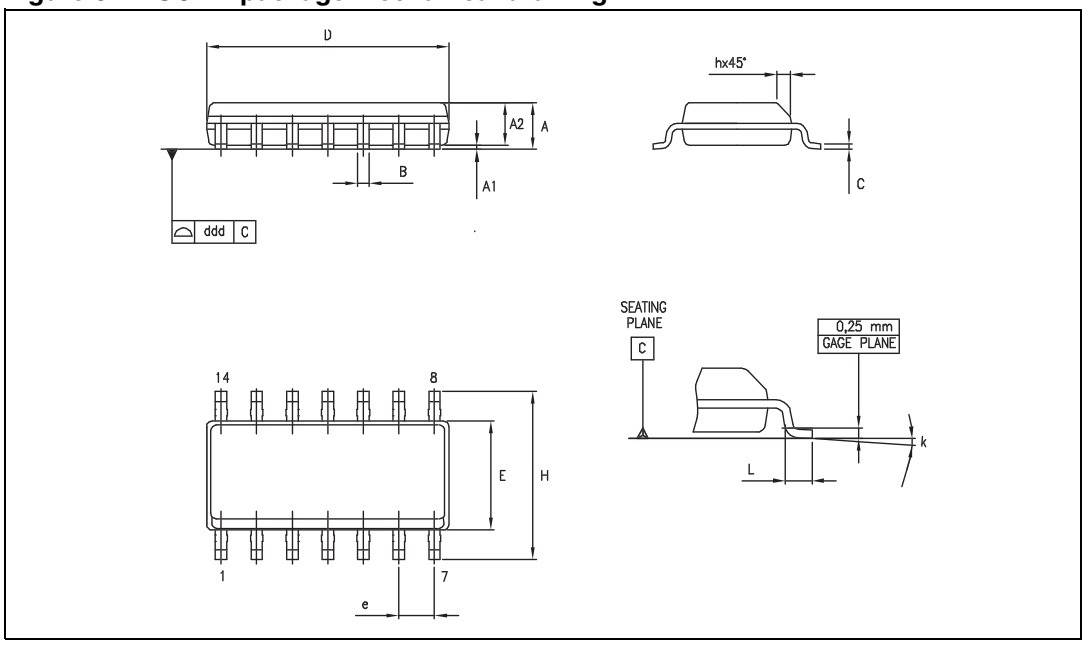


Table 9. SO-14 package mechanical data

Dimensions						
Ref.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	1.35		1.75	0.05		0.068
A1	0.10		0.25	0.004		0.009
A2	1.10		1.65	0.04		0.06
B	0.33		0.51	0.01		0.02
C	0.19		0.25	0.007		0.009
D	8.55		8.75	0.33		0.34
E	3.80		4.0	0.15		0.15
e		1.27			0.05	
H	5.80		6.20	0.22		0.24
h	0.25		0.50	0.009		0.02
L	0.40		1.27	0.015		0.05
k	8° (max.)					
ddd			0.10			0.004

4 Ordering information

Table 10. Order codes

Order code	Temperature range	Package	Packing	Marking
TS461CLT	-20° C, +70° C	SOT23-5L	Tape & reel	K105
TS461CD TS461CDT		SO-8	Tube Tape & reel	461C
TS462CST		Mini SO-8	Tape & reel	K105
TS462CPT		TSSOP-8 (Thin shrink small outline package)	Tape & reel	462C
TS462CD TS462CDT		SO-8	Tube Tape & reel	462C
TS464CPT		TSSOP-14 (Thin shrink small outline package)	Tape & reel	464C
TS464CD TS464CDT		SO-14	Tube Tape & reel	464C

5 Revision history

Table 11. Document revision history

Date	Revision	Changes
01-Jan-2002	1	Initial release.
01-Mar-2005	2	Modified *Table 1: Key parameters and their absolute maximum ratings on page 2* (explanation of Vid and Vi limits).
02-Apr-2009	3	Document reformatted. Removed order codes in DIP package.

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