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LM111-LM211-LM311

Voltage comparator with strobe

Features

- Maximum input current: 150nA
- Maximum offset current: 20nA
- Differential input voltage range: ±30V
- Power consumption:135mW at ±15V
- Supply voltage: +5V to ±15V
- Output current: 50mA

Description

The LM111, LM211, LM311 are voltage comparators that have low input currents.

They are also designed to operate over a wide range of supply voltages: from standard ±15V operational amplifier supplies down to the single +5V supply used for IC logic.

Their output is compatible with RTL-DTL and TTL as well as MOS circuits and can switch voltages up to +50V at output currents as high as 50mA.

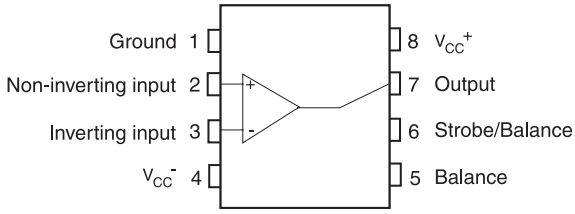


N
DIP8
(Plastic package)



D
SO-8
(Plastic micropackage)

Pin connections (top view)



Order codes

Part number	Temperature range	Package	Packing	Marking
LM211N	-40°C, +105°C	DIP8	Tube	LM211N
LM211D/DT		SO-8	Tube or tape & reel	211
LM311N	0°C, +70°C	DIP8	Tube	LM311
LM311D/DT		SO-8	Tube or Tape & reel	311

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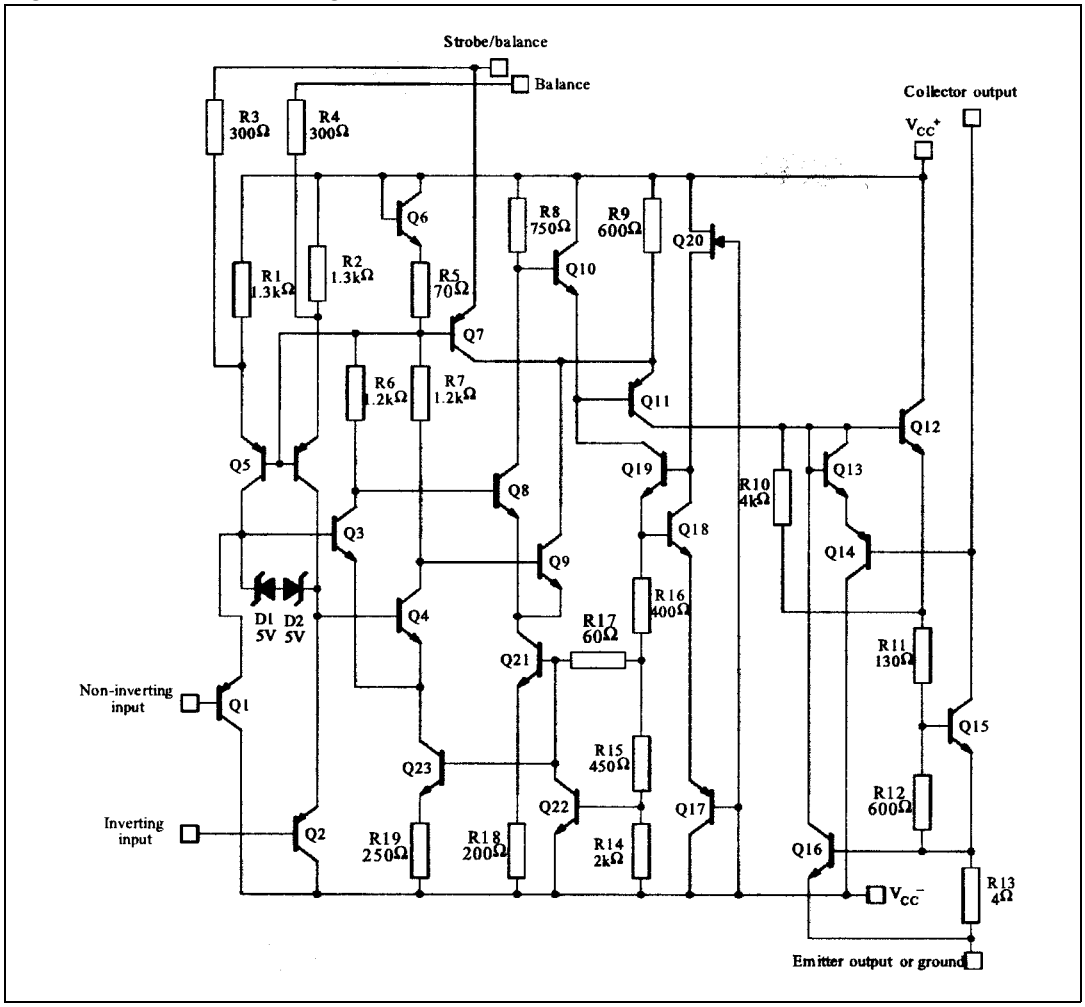
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1 Schematic diagram

Figure 1. Schematic diagram



2 Absolute maximum ratings & operating conditions

Table 1. Absolute maximum ratings (AMR)

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	36	V
V_{id}	Differential input voltage	±30	V
V_i	Input voltage (1)	±15	V
$V_{(1-4)}$	Ground to negative supply voltage	30	V
$V_{(7-4)}$	Output to negative supply voltage LM111-LM211 LM311	 50 40	V
	Output short-circuit duration	10	s
	Voltage at strobe pin	V_{CC}^+ -5	V
p_d	Power dissipation (2) DIP8 SO-8	 1250 710	mW
T_j	Junction temperature	+150	°C
T_{stg}	Storage temperature range	-65 to +150	°C

1. This rating applies for ±15V supplies. The positive input voltage limit is 30V above the negative. The negative input voltage is equal to the negative supply voltage or 30V below the positive supply, whichever is less.
2. P_d is calculated with T_{amb} = +25°C, T_j = +150°C and R_{thja} = 100°C/W for the DIP8 package, and R_{thja} = 175°C/W for the SO-8 package.

Table 2. Operating conditions

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	5 to ±15	V
T_{oper}	Operating free-air temperature range LM111 LM211 LM311	 -55 to +125 -40 to +105 0 to +70	°C

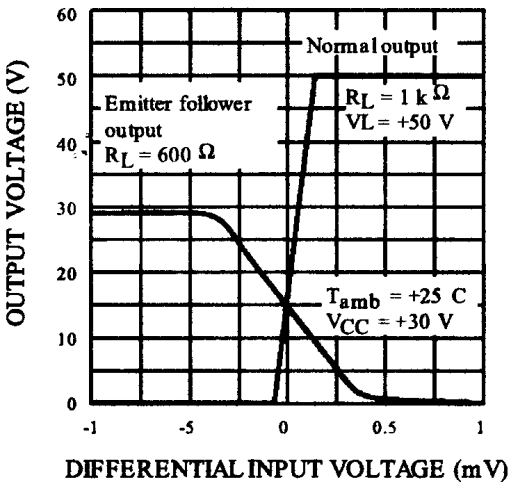
3 Electrical characteristics

Table 3. V_{CC}^+ = ±15V, T_{amb} = +25°C (unless otherwise specified)

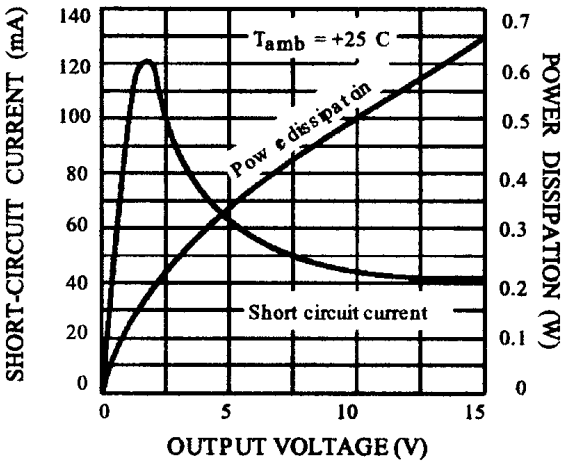
Symbol	Parameter	Conditions	LM111 - LM211			LM311			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input offset voltage (1)	$R_S \leq 50k\Omega$ T_{amb} = +25°C $T_{min} \leq T_{amb} \leq T_{max}$		0.7	3 4		2	7.5 10	mV
I_{io}	Input offset current (1)	T_{amb} = +25°C $T_{min} \leq T_{amb} \leq T_{max}$		4	10 20		6	50 70	nA
I_{ib}	Input bias current (1)	T_{amb} = +25°C $T_{min} \leq T_{amb} \leq T_{max}$		60	100 150		100	250 300	nA
A_{vd}	Large signal voltage gain		40	200		40	200		V/mV
I_{CC}^+ I_{CC}^-	Supply currents	Positive Negative		5.1 4.1	6 5		5.1 4.1	7.5 5	mA
V_{icm}	Input common mode voltage range	$T_{min} \leq T_{amb} \leq T_{max}$	-14.5	+13.8 -14.7	+13	-14.5	+13.8 -14.7	+13	V
V_{OL}	Low level output voltage	T_{amb} = +25°C, I_O = 50mA, $V_i \leq$-5mV		0.75	1.5				V
		T_{amb} = +25°C, I_O = 50mA, $V_i \leq$-10mV					0.75	1.5	
		$T_{min} \leq T_{amb} \leq T_{max}$ $V_{CC}^+ \geq$ +4.5V, V_{CC}^- = 0 I_O = 8mA, $V_i \leq$-6m		0.23	0.4				
		$T_{min} \leq T_{amb} \leq T_{max}$ $V_{CC}^+ \geq$ +4.5V, V_{CC}^- = 0 I_O = 8mA, $V_i \leq$ -10mV					0.23	0.4	
I_{OH}	High level output current	T_{amb} = +25°C Vi ≥ +5mV, V_O = +35V		0.2	10				nA
		T_{amb} = +25°C Vi ≥ +10mV, V_O = +35V					0.2	50	nA
		$T_{min} \leq T_{amb} \leq T_{max}$ Vi ≥ +5mV, V_O = +35V		0.1	0.5				µA
I_{strobe}	Strobe current			3			3		mA
t_{re}	Response time (2)			200			200		ns

1. The offset voltage, offset current and bias current specifications apply for any supply voltage from a single +5V supply up to ±15V supplies. The offset voltages and offset currents given are the maximum values required to drive the output down to +1V or up to +14V with a 1mA load current. Thus, these parameters define an error band and take into account the worst-case of voltage gain and input impedance.
2. The response time specified is for a 100mV input step with 5mV overdrive.

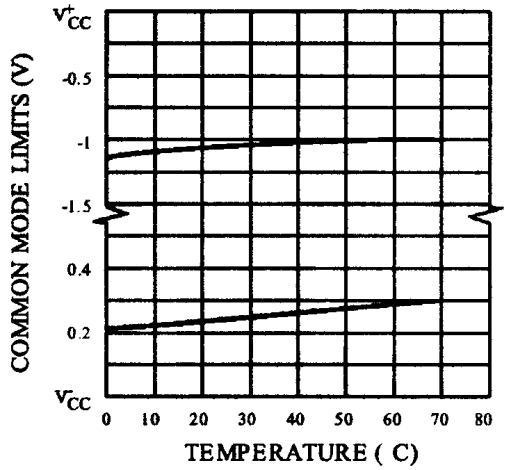
TRANSFERT CHARACTERISTICS



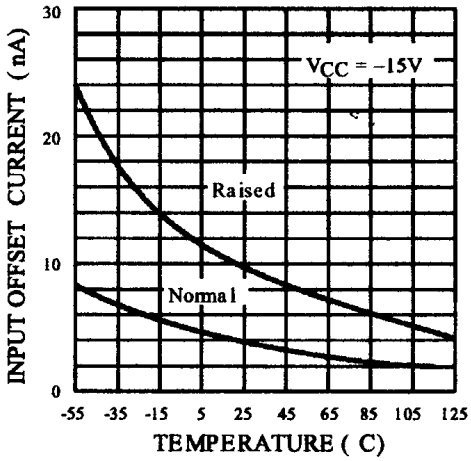
OUTPUT LIMITING CHARACTERISTICS



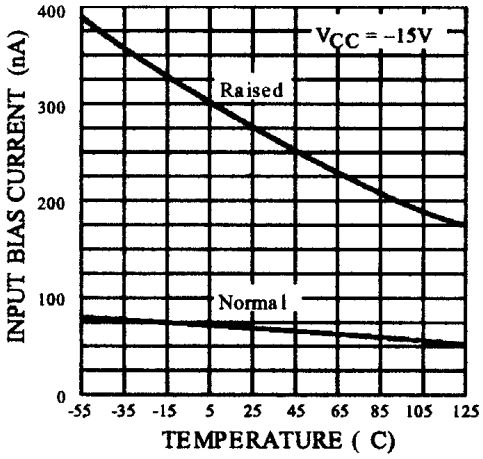
COMMON MODE LIMITS



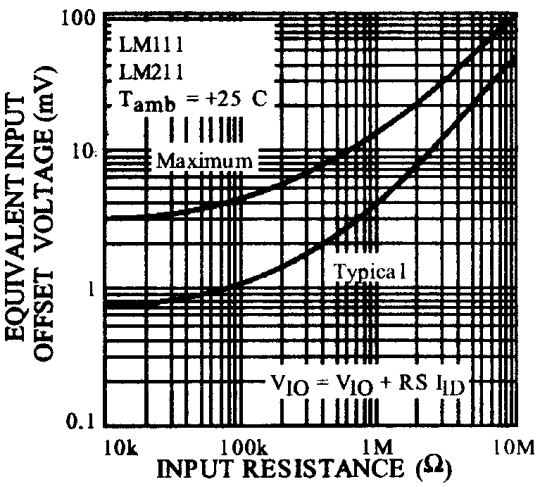
INPUT OFFSET CURRENT



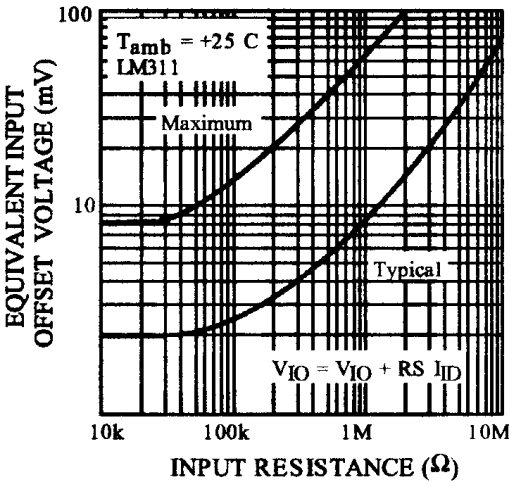
INPUT BIAS CURRENT



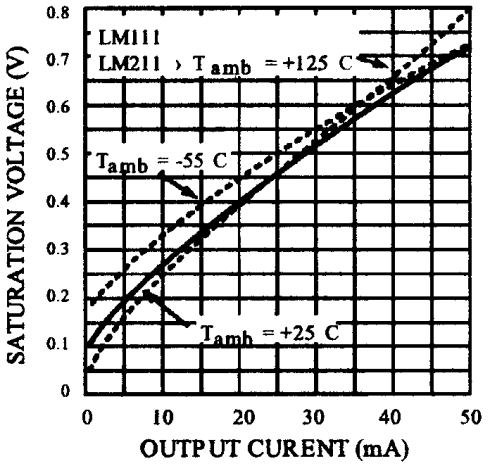
EQUIVALENT INPUT OFFSET ERROR



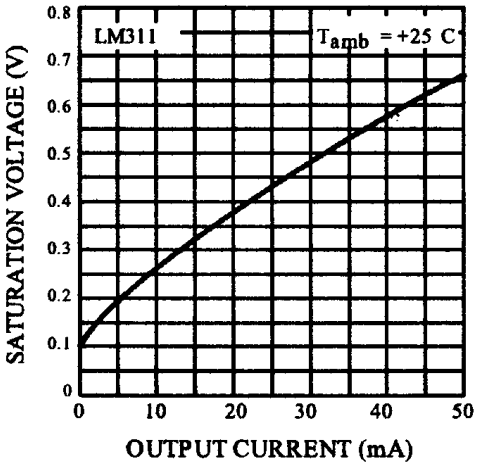
EQUIVALENT INPUT OFFSET ERROR



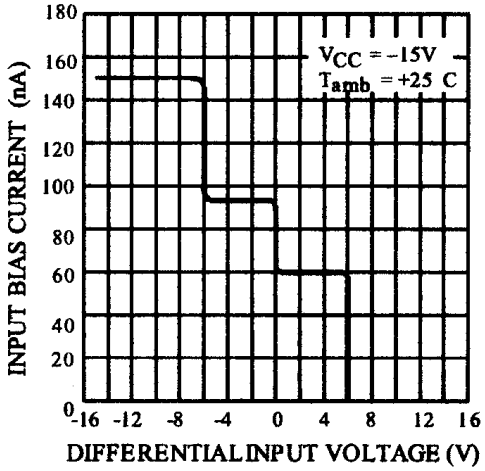
LOW LEVEL OUTPUT SATURATION VOLTAGE



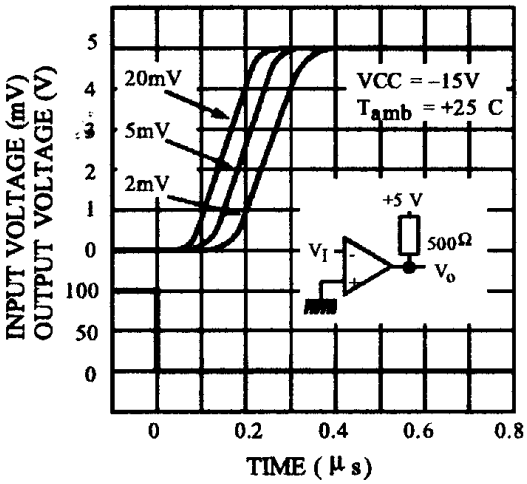
LOW LEVEL OUTPUT SATURATION VOLTAGE



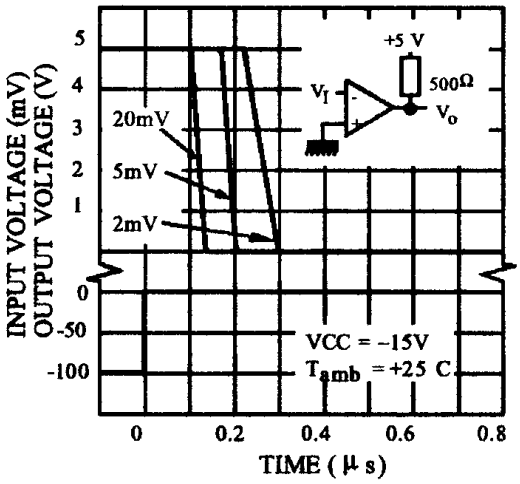
INPUT CHARACTERISTICS



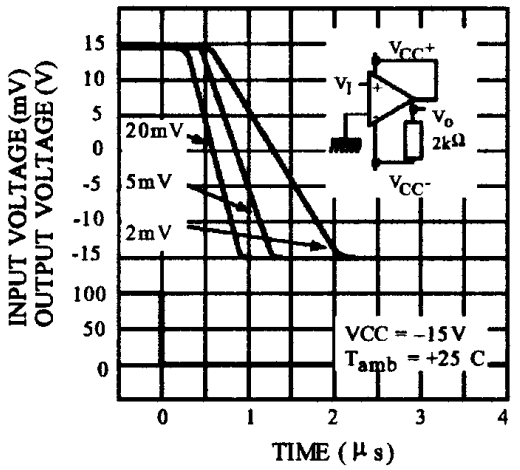
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



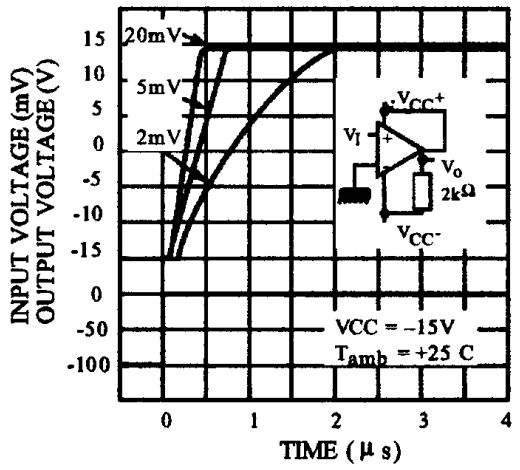
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



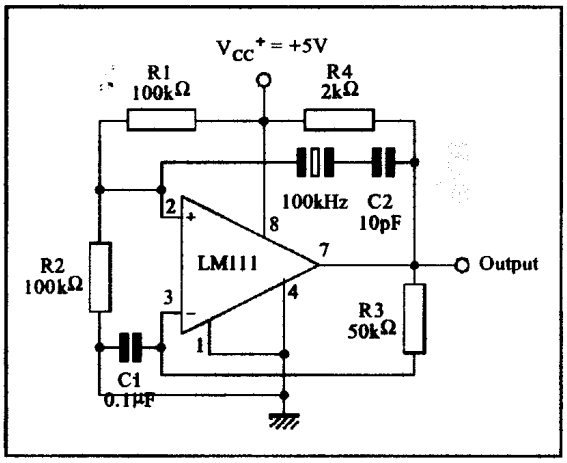
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



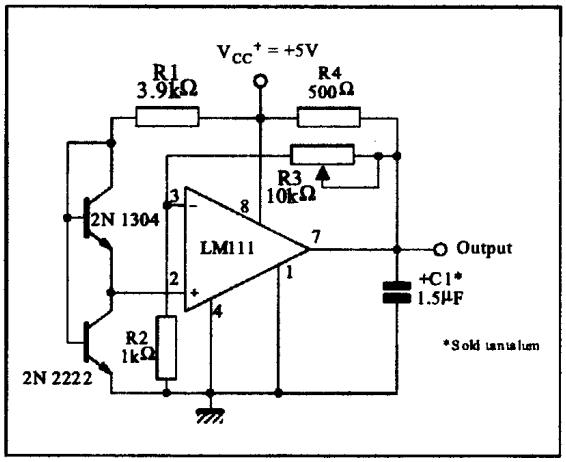
4 Typical application schematics

TYPICAL APPLICATIONS

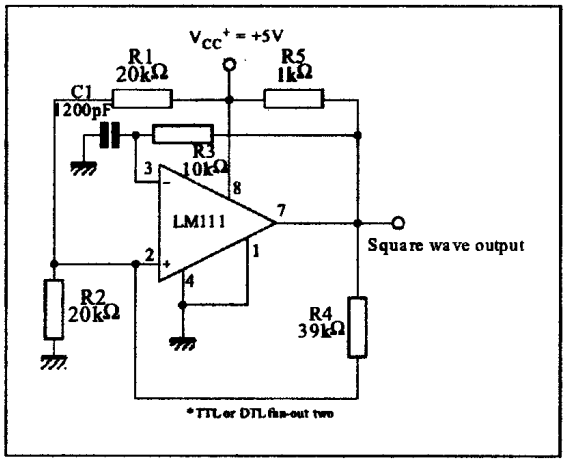
CRYSTAL OSCILLATOR



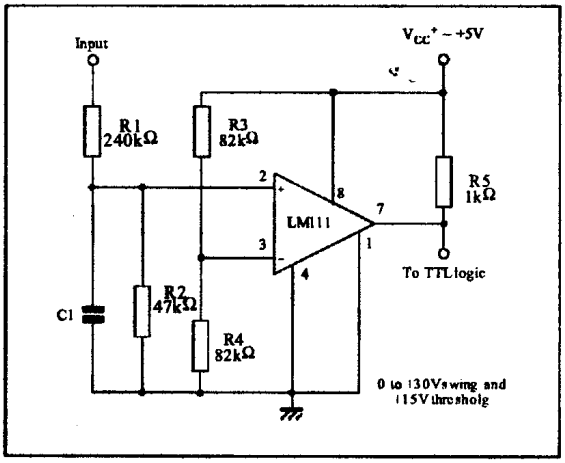
LOW VOLTAGE ADJUSTABLE REFERENCE SUPPLY



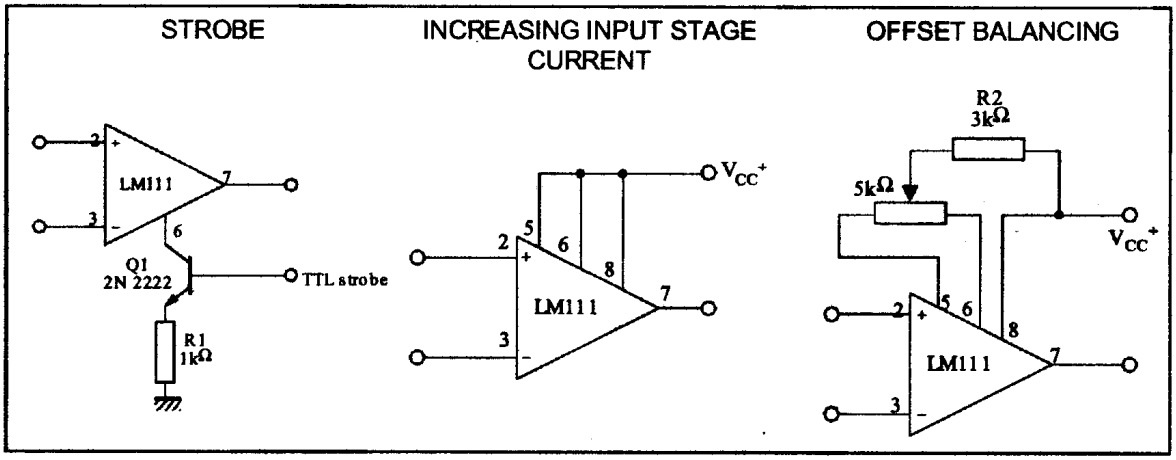
100KHz FREE RUNNING MULTIVIBRATOR



TTL INTERFACE WITH HIGH LEVEL LOGIC



AUXILIARY CIRCUITS

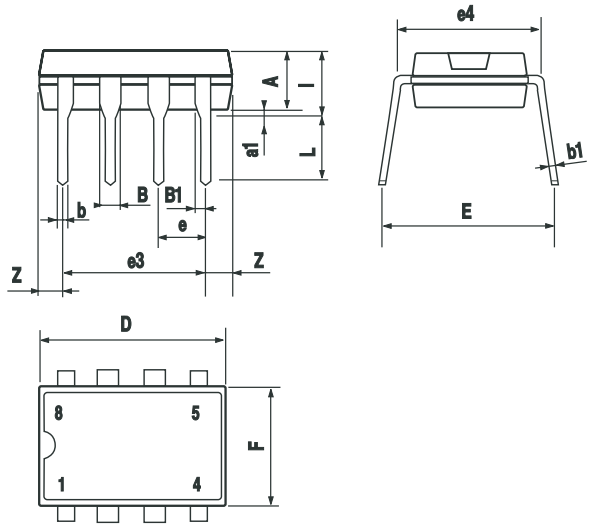


5 Package mechanical data

In order to meet environmental requirements, STMicroelectronics offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an STMicroelectronics trademark. ECOPACK specifications are available at: www.st.com.

5.1 DIP8 package

Plastic DIP-8 MECHANICAL DATA						
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A		3.3			0.130	
a1	0.7			0.028		
B	1.39		1.65	0.055		0.065
B1	0.91		1.04	0.036		0.041
b		0.5			0.020	
b1	0.38		0.5	0.015		0.020
D			9.8			0.386
E		8.8			0.346	
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			7.1			0.280
I			4.8			0.189
L		3.3			0.130	
Z	0.44		1.6	0.017		0.063

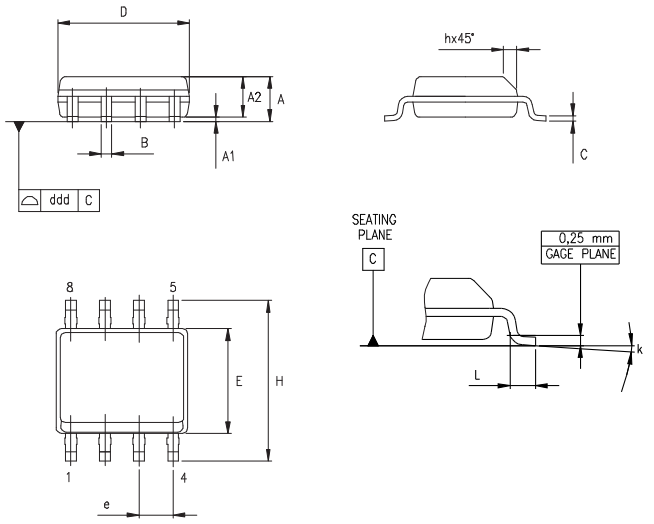


P001F

5.2 SO-8 package

SO-8 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	1.35		1.75	0.053		0.069
A1	0.10		0.25	0.04		0.010
A2	1.10		1.65	0.043		0.065
B	0.33		0.51	0.013		0.020
C	0.19		0.25	0.007		0.010
D	4.80		5.00	0.189		0.197
E	3.80		4.00	0.150		0.157
e		1.27			0.050	
H	5.80		6.20	0.228		0.244
h	0.25		0.50	0.010		0.020
L	0.40		1.27	0.016		0.050
k	8° (max.)					
ddd			0.1			0.04



0016023/C

6 Revision history

Date	Revision	Changes
1-Jun-02	1	Initial release.
2-Jan-06	2	*Table 3. on page 5* updated. Formatting changes throughout.
1-Mar-06	3	Pin connections updated on page 1.
26-Sep-06	4	Corrected description under title on cover page.

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