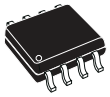
LM211, LM311

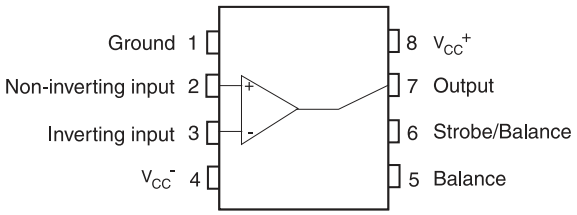
Voltage comparator with strobe

Datasheet - production data



D
SO-8
(Plastic micropackage)

Pin connections (top view)



Description

The 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 ±15 V operational amplifier supplies down to the single +5 V 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 +50 V at output currents as high as 50 mA.

Features

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

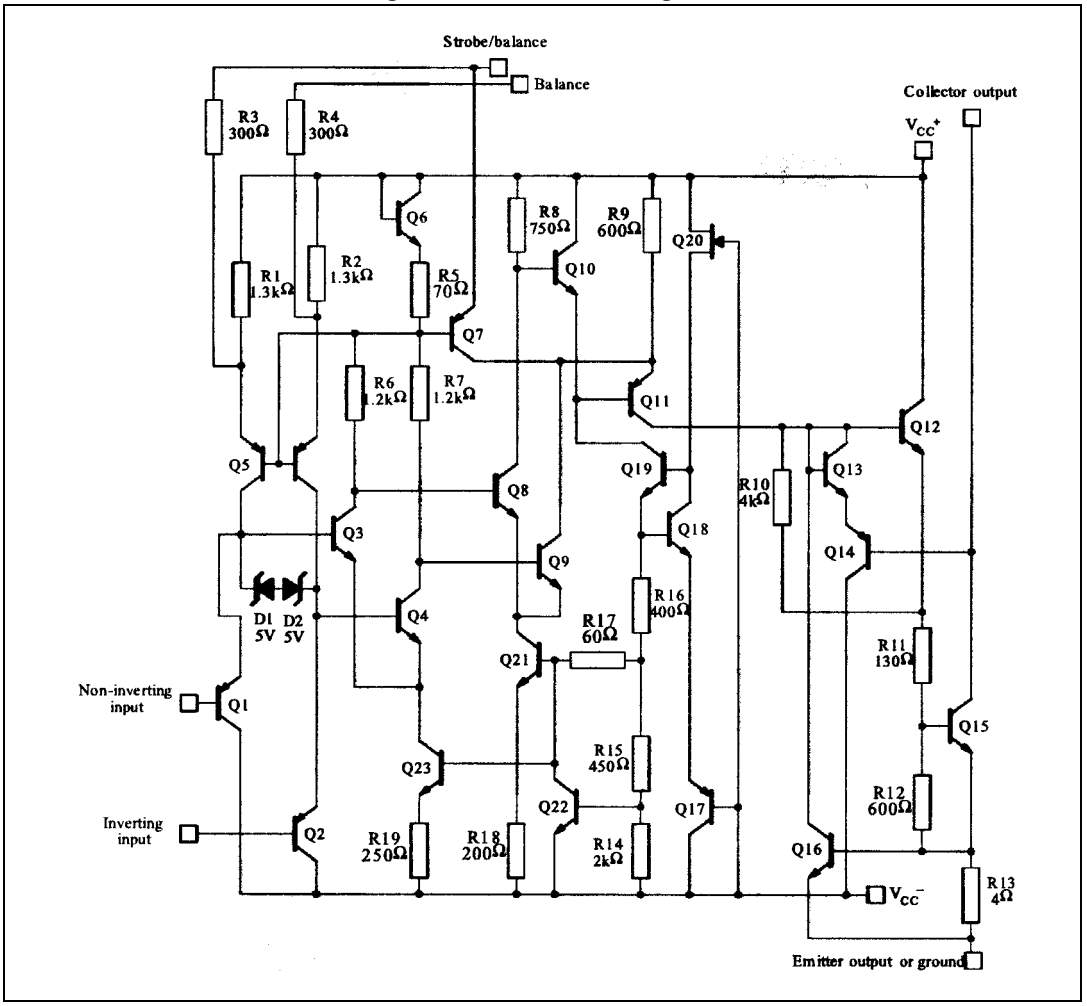
Table 1. Order codes

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

Contents

1 Schematic diagram

Figure 1. Schematic diagram



2 Absolute maximum ratings & operating conditions

Table 2. 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 LM211 LM311	 50 40	V
	Output short-circuit duration	10	s
	Voltage at strobe pin	V_{CC}^+ -5	V
p_d	Power dissipation (2) SO-8	 710	mW
T_j	Junction temperature	+150	°C
T_{stg}	Storage temperature range	-65 to +150	°C
ESD	Human Body Model (HBM) Charged Device Model (CDM) Machine Model (MM)	800 1500 200	V

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} = 175°C/W for the SO-8 package.

Table 3. Operating conditions

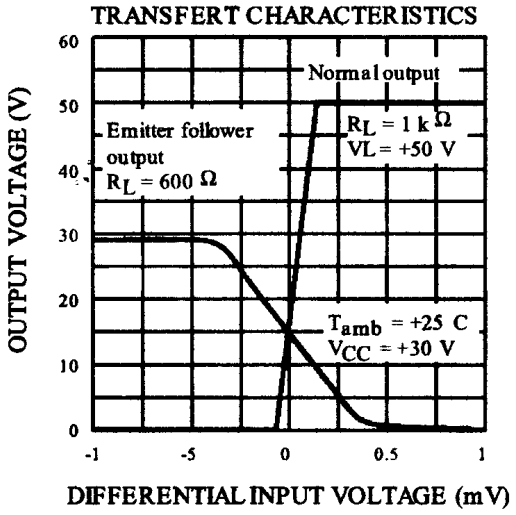
Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	5 to ±15	V
T_{oper}	Operating free-air temperature range LM211 LM311	 -40 to +105 0 to +70	°C

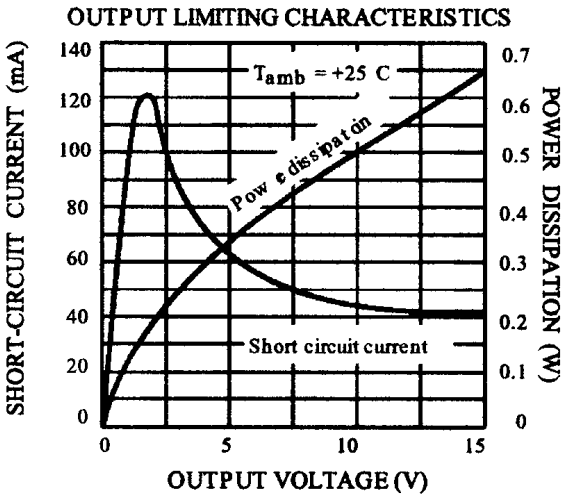
3 Electrical characteristics

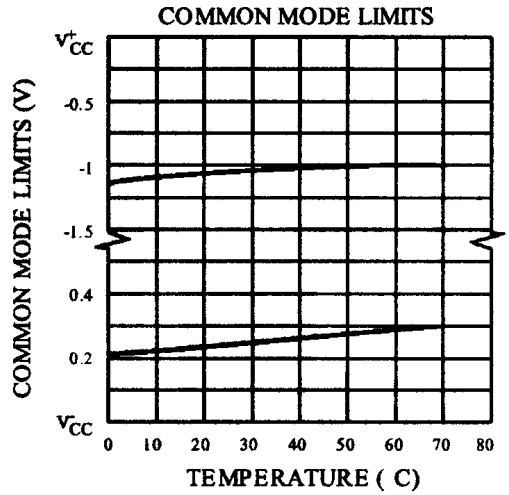
Table 4. V_{CC+} = ±15 V, T_{amb} = +25 °C (unless otherwise specified)

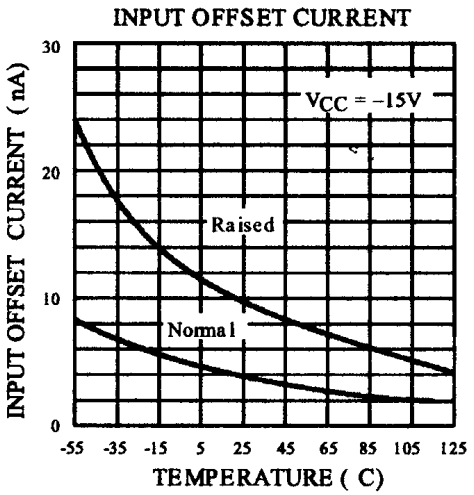
Symbol	Parameter	Conditions	LM211			LM311			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input offset voltage (1)	$R_S \leq 50k\Omega$ T_{amb} = +25°C $T_{min} \leq T_{amb} \leq T_{max}$		0.7	3 4		2	7.5 10	mV
I_{io}	Input offset current (1)	T_{amb} = +25°C $T_{min} \leq T_{amb} \leq T_{max}$		4	10 20		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

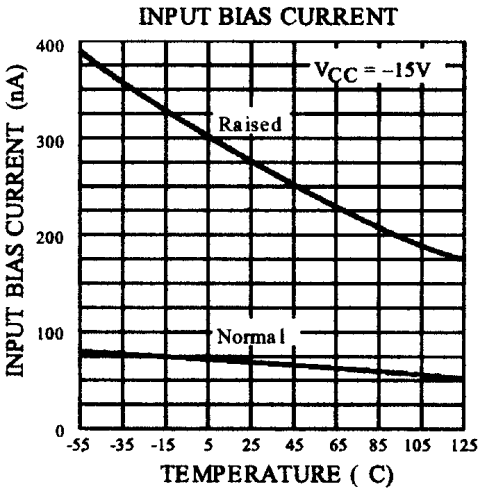
1. The offset voltage, offset current and bias current specifications apply for any supply voltage from a single +5 V supply up to ±15 V supplies. The offset voltages and offset currents given are the maximum values required to drive the output down to +1 V or up to +14 V with a 1 mA load current. Thus, 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 100 mV input step with 5 mV overdrive.


TRANSFERT CHARACTERISTICS
OUTPUT VOLTAGE (V)
DIFFERENTIAL INPUT VOLTAGE (mV)
Normal output
Emitter follower output
RL = 600 Ω
RL = 1 kΩ
VL = +50 V
Tamb = +25 C
VCC = +30 V

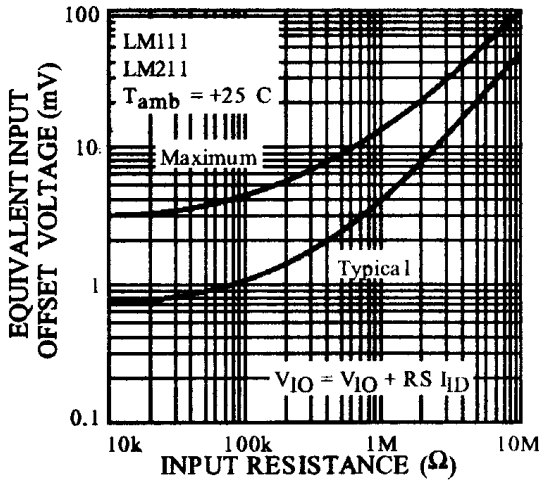

OUTPUT LIMITING CHARACTERISTICS
SHORT-CIRCUIT CURRENT (mA)
POWER DISSIPATION (W)
OUTPUT VOLTAGE (V)
Tamb = +25 C
Pow e dissipat on
Short circuit current


COMMON MODE LIMITS
COMMON MODE LIMITS (V)
TEMPERATURE (C)

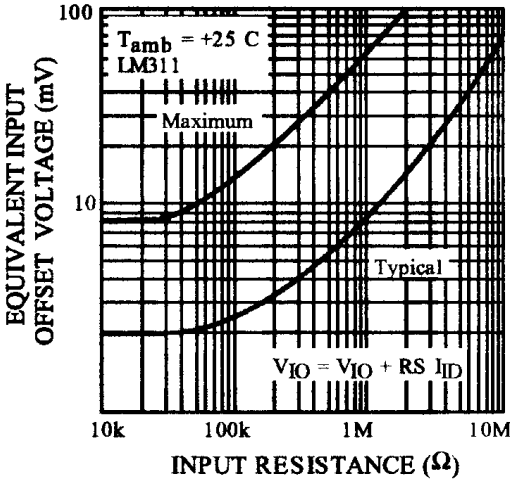

INPUT OFFSET CURRENT
INPUT OFFSET CURRENT (nA)
TEMPERATURE (C)
VCC = –15V
Raised
Normal


INPUT BIAS CURRENT
INPUT BIAS CURRENT (nA)
TEMPERATURE (C)
VCC = –15V
Raised
Normal

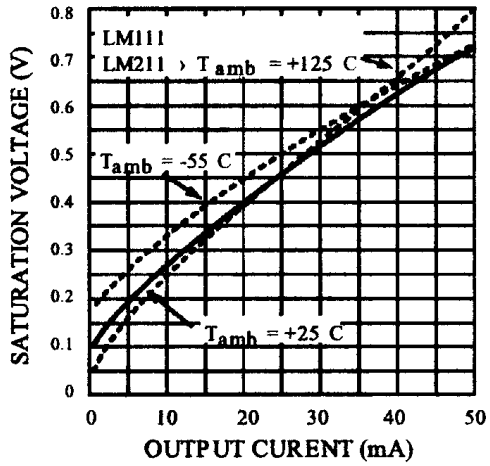
EQUIVALENT INPUT OFFSET ERROR



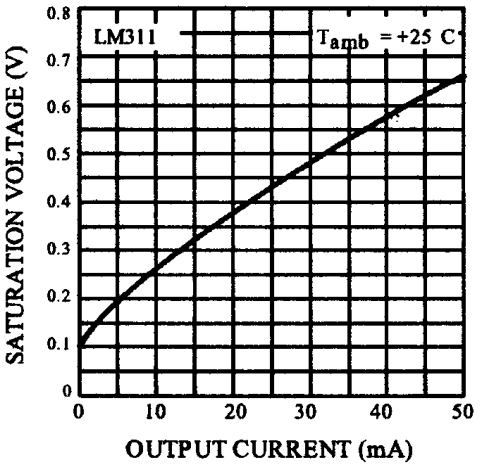
EQUIVALENT INPUT OFFSET ERROR



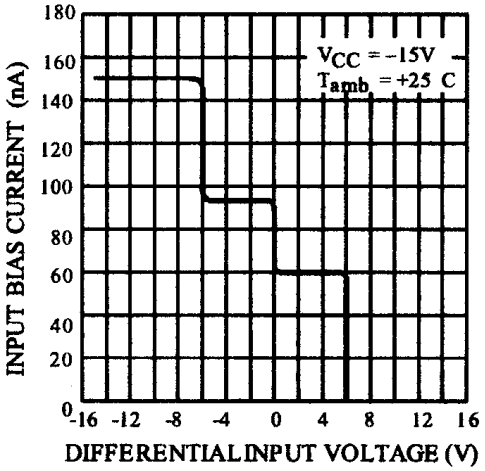
LOW LEVEL OUTPUT SATURATION VOLTAGE



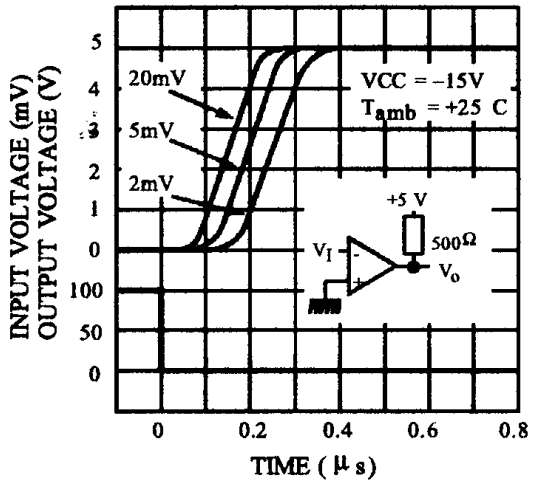
LOW LEVEL OUTPUT SATURATION VOLTAGE



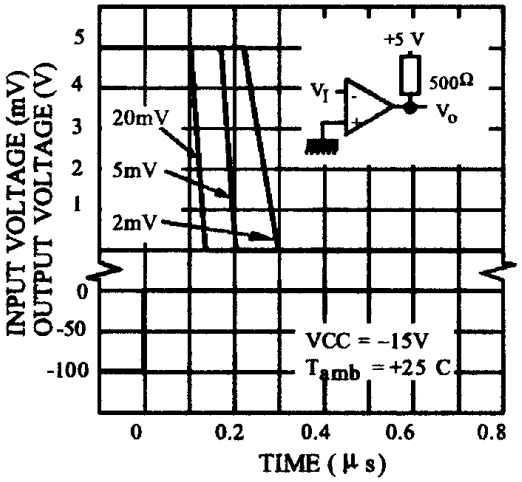
INPUT CHARACTERISTICS



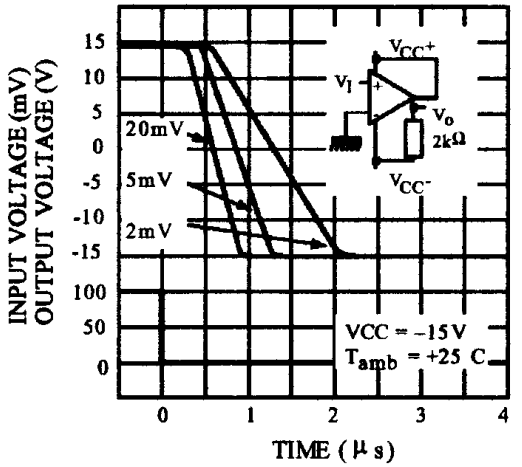
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



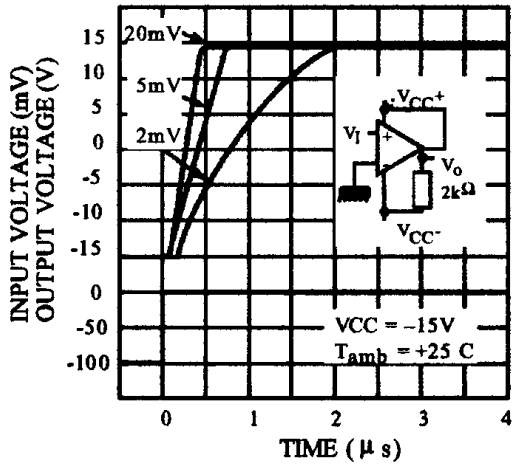
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



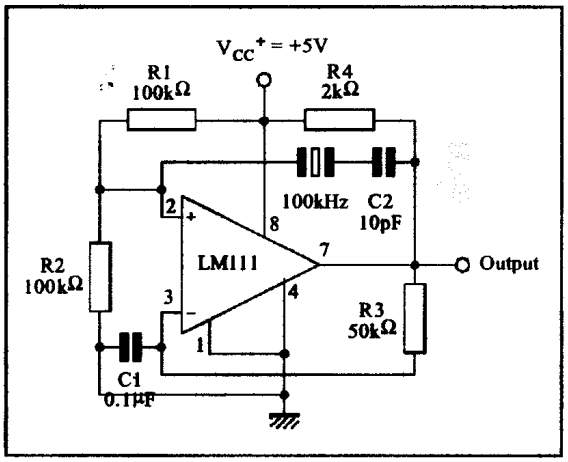
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



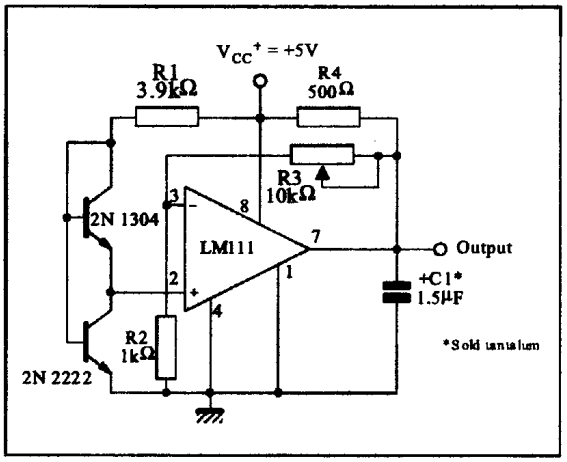
4 Typical application schematics

TYPICAL APPLICATIONS

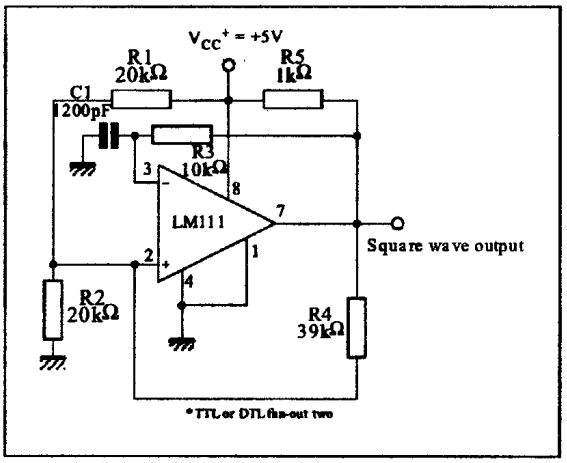
CRYSTAL OSCILLATOR



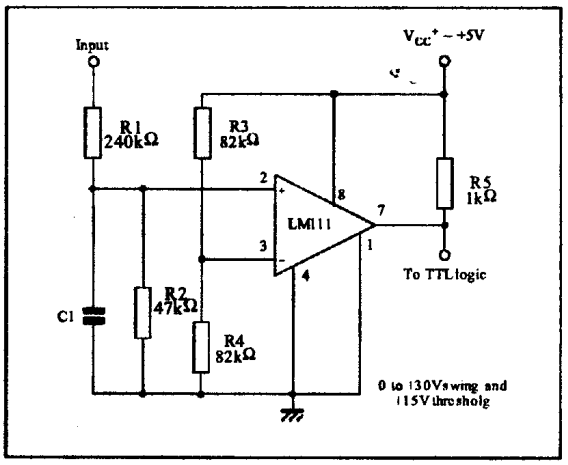
LOW VOLTAGE ADJUSTABLE REFERENCE SUPPLY



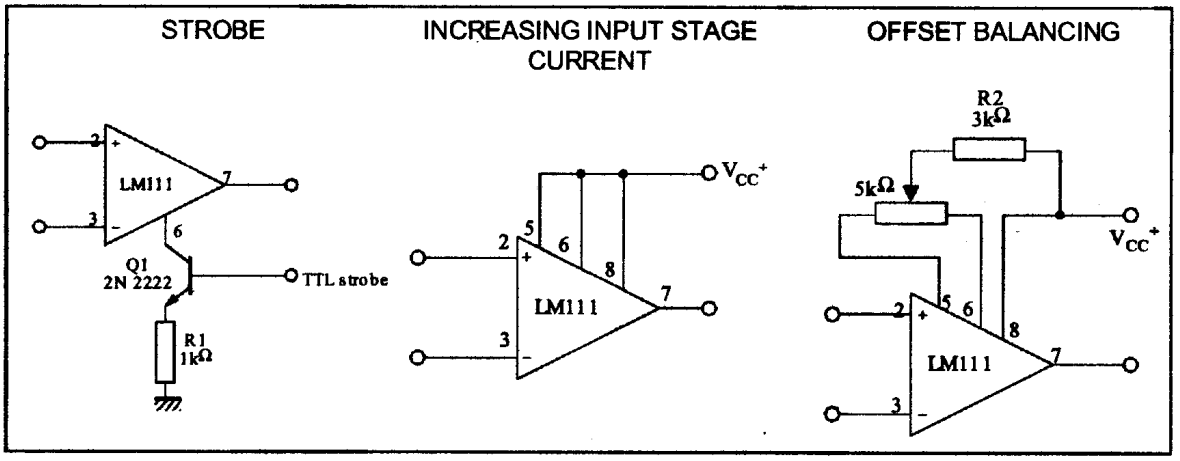
100KHz FREE RUNNING MULTIVIBRATOR



TTL INTERFACE WITH HIGH LEVEL LOGIC



AUXILIARY CIRCUITS



5 Package mechanical data

In order to meet environmental requirements, 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.

5.1 SO-8 package information

Figure 2. SO-8 package outline

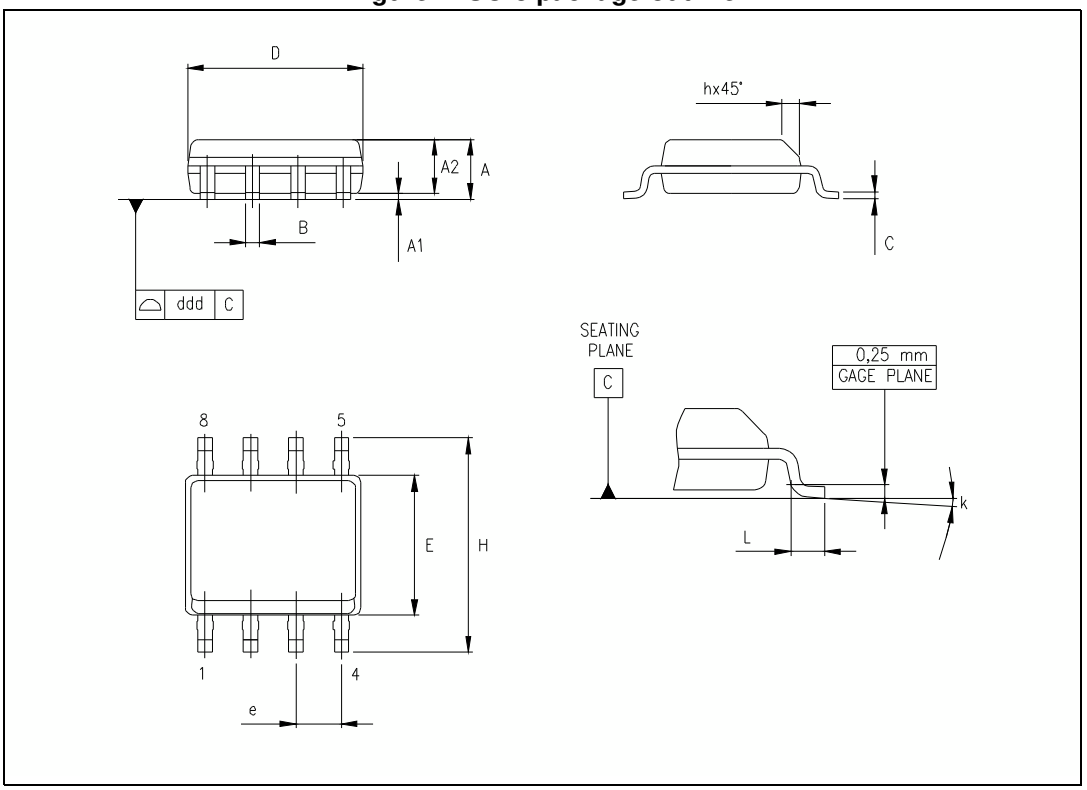


Table 5. SO-8 package mechanical data

Symbol	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	1.35	-	1.75	0.053	-	0.069
A1	0.10	-	0.25	0.004	-	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.)			8° (max.)		
ddd	-	-	0.10	-	-	0.004

6 Revision history

Table 6. Document revision history

Date	Revision	Changes
01-Jun-2002	1	Initial release.
02-Jan-2006	2	Table 3. on page 5 updated. Formatting changes throughout.
01-Mar-2006	3	Pin connections updated on page 1.
26-Sep-2006	4	Corrected description under title on cover page.
08-Jun-2022	5	Added ESD parameter in *Table 2*.