

Voltage Comparator

The FT111 are voltage comparators that have input currents nearly a thousand times lower than devices like the LM106 or LM710. They are also designed to operate over a wider range of supply voltages: from standard $\pm 15V$ op amp 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. Further, they can drive lamps or relays, switching voltages up to 50V at currents as high as 50 mA.

Both the inputs and the outputs of the FT111 can be isolated from system ground, and the output can drive loads referred to ground, the positive supply or the negative supply. Offset balancing and strobe capability are provided and outputs can be wire OR'ed. Although slower than the LM106 and LM710 (200 ns response time vs 40 ns) the devices are also much less prone to spurious oscillations.

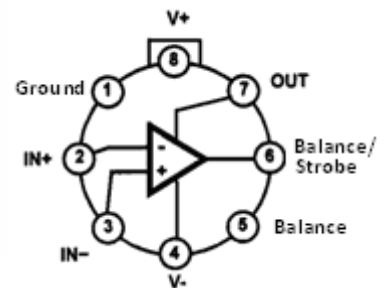
The FT111 has the same pin configuration as the LM106 and LM710.

Features

- Operates from single 5V supply
- Input current: 150 nA max. over temperature
- Offset current: 20 nA max. over temperature
- Differential input voltage range: $\pm 30V$
- Power consumption: 135 mW at $\pm 15V$

Pinout

8-lead metal can
Top View



Package pinout

Absolute Maximum Ratings

Total Supply Voltage	36V
Output to Negative Supply Voltage	50V
Ground to Negative Supply Voltage	30V
Differential Input Voltage	±30V
Input Voltage	±15V
Output Short Circuit Duration	10 sec

Operation Condition

Operating Ambient Temp. Range	-60°C<Ta<+125°C
Voltage at Strobe Pin V ⁺	5V

Thermal Information

Thermal Resistance (typical)	$\theta_{JA} = 170 \text{ }^\circ\text{C/W}$ (note 1)
	$\theta_{JC} = 85 \text{ }^\circ\text{C/W}$ (note 2)
Maximum Junction Temperature	150°C
Lead Temperature (Soldering, 10 seconds)	300°C

Notes:

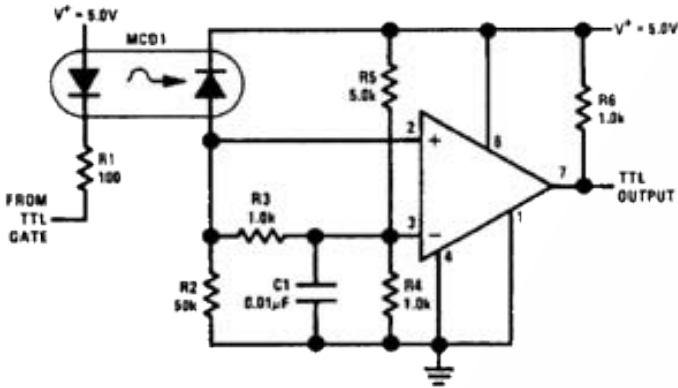
- θ_{JA} is measured with component on an evaluation PC board in free air
- For θ_{JC} "case temp" location is the center of metal can

Electrical Specifications

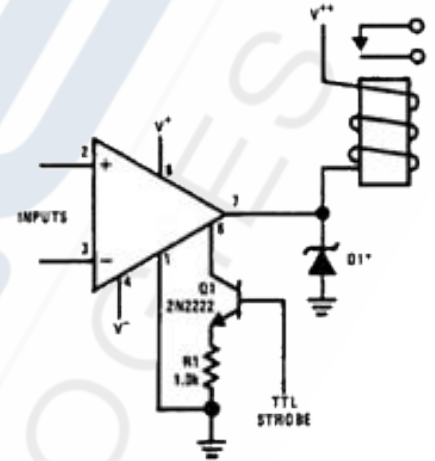
V_{SUPPLY} = ± 15 V

Parameter	Temp., °C	Min	Typ	Max	Units
Input Offset Voltage	25	-3	0.2	3	mV
	125	-4	0.8	4	
	-60	-4	-0.3	4	
Offset Voltage Drift	25 125	-20	5	20	μV/°C
	-60 25	-25	-3	25	
Input Bias Current	25	-	45	75	nA
	125	-	25	75	
	-60	-	60	100	
Input Offset Current	25	-10	-0.2	10	nA
	125	-6	0.2	6	
	-60	-20	1.2	20	
Offset Current Drift	-60 to 25	-0.02	0.05	0.2	nA/°C
	25 to 125	0.003	0.07	0.1	
Voltage Gain	25	150	200	-	kV/V
	125	100	150	-	
	-60	100	180	-	
Response Time	25		200	300	ns
Saturation Voltage, V _{IN} ≤ -5 mV, I _{OUT} = 50 mA	25	-	0.6	1.0	V
	125	-	0.9	1.2	
	-60	-	0.7	1.2	
Strobe ON Current	25	-	2	5	mA
Output Leakage Current	25	-	0.2	10	nA
	125	-	100	500	
	-60	-	-	-	
Input Voltage Range, V ⁺ =15V, V ⁻ =-15V, Pin 7 Pull-Up May Go To 5V	25	-14.5	13.8,-14.7	13	V
Saturation Voltage, V ⁺ ≥4.5V, V ⁻ =0 V _{IN} ≤ -6 mV, I _{OUT} ≤ 8 mA	25	-	0.23	0.4	V
	125	-	0.28	0.4	
	-60	-	0.30	0.5	
Output Leakage Current, V _{IN} ≥ 5 mV, V _{OUT} = 35V	25	-	0.1	0.5	μA

Digital Transmission Isolator



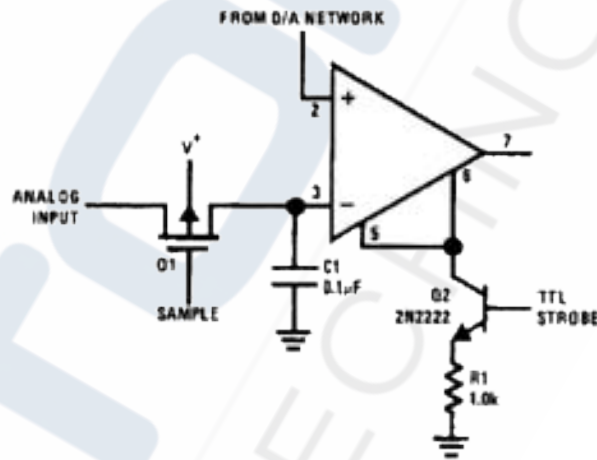
Relay Driver with Strobe



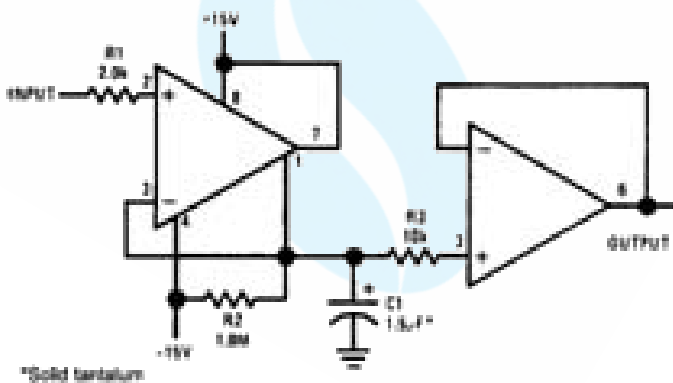
Strobing off Both Input and Output Stages

Typical input current is 50 pA with inputs strobed off.

*Absorbs inductive kickback of relay and protects IC from severe voltage transients on V+ line. Do Not Ground Strobe Pin.

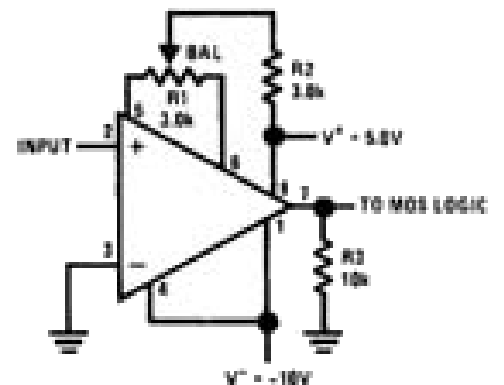


Positive Peak Detector

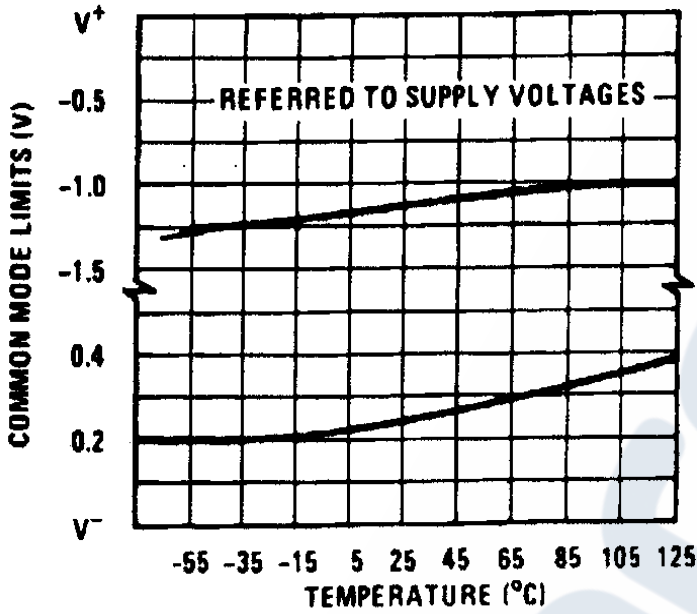


*Solid tantalum

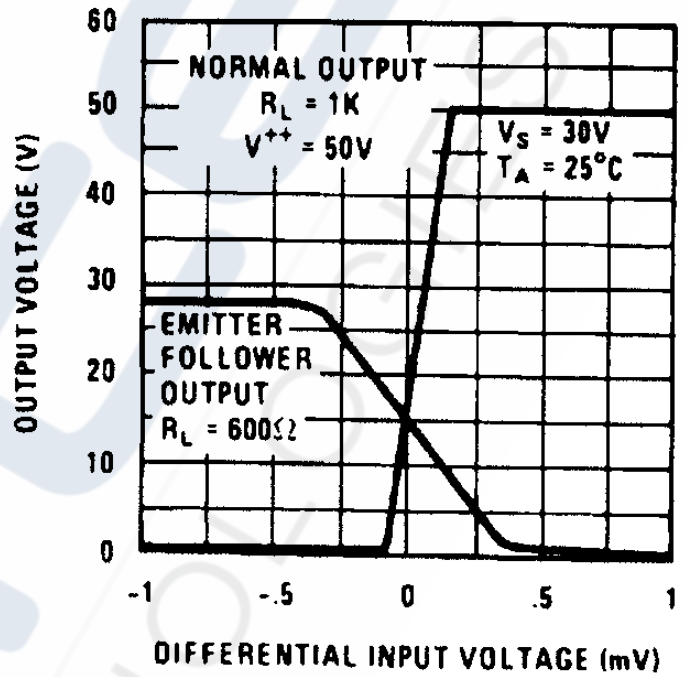
Zero Crossing Detector Driving MOS Logic



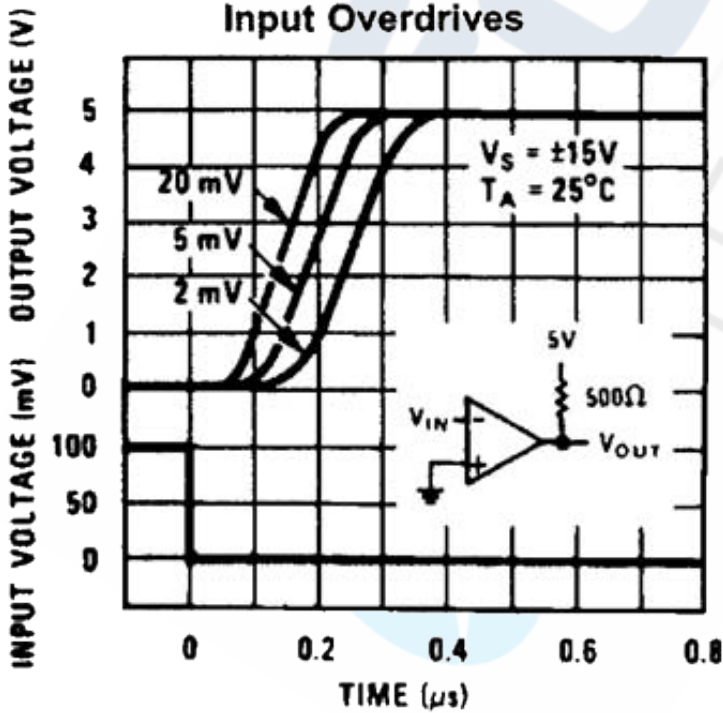
Input Bias Current



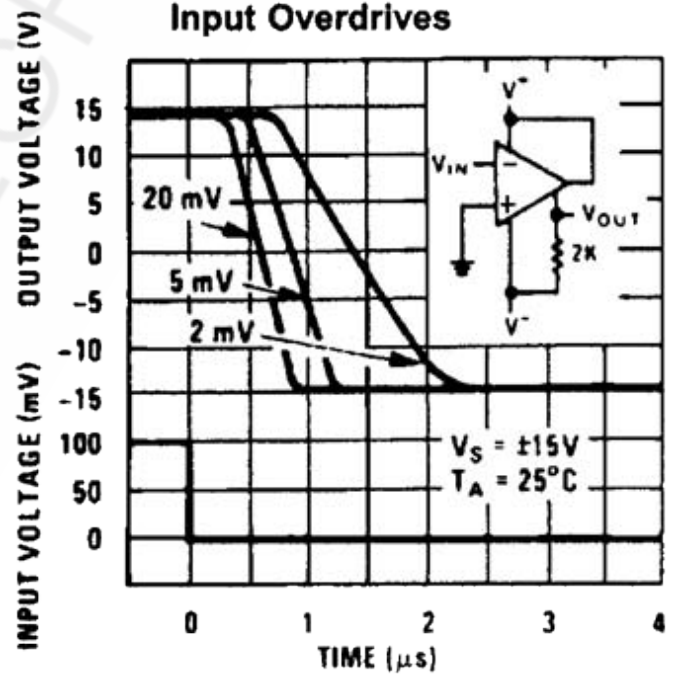
Input Bias Current



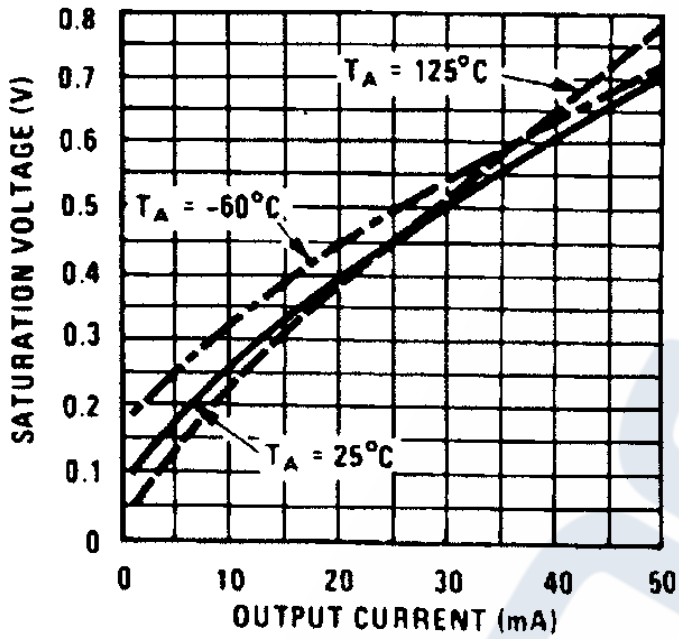
Input Bias Current
Input Overdrives



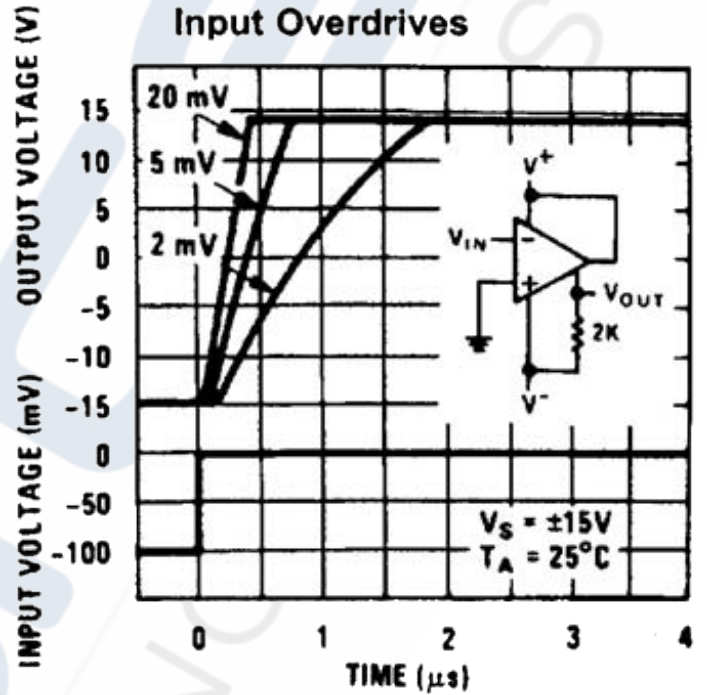
Response Time for Various
Input Overdrives



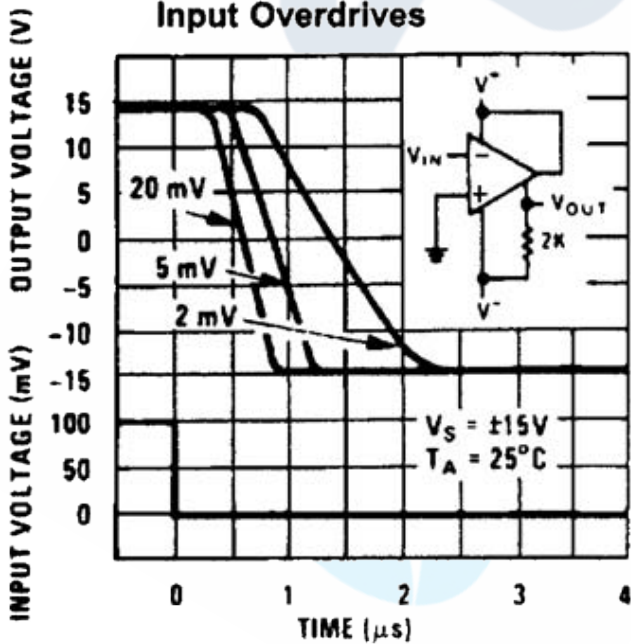
Input Bias Current



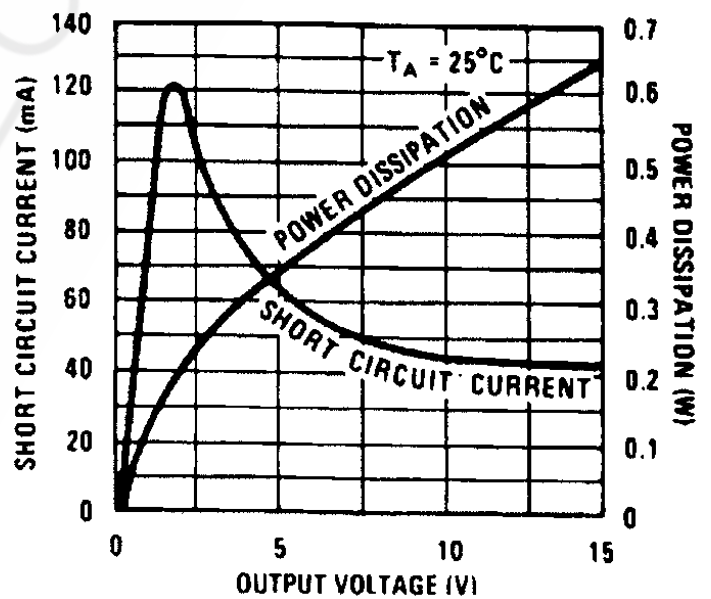
Response Time for Various Input Overdrives



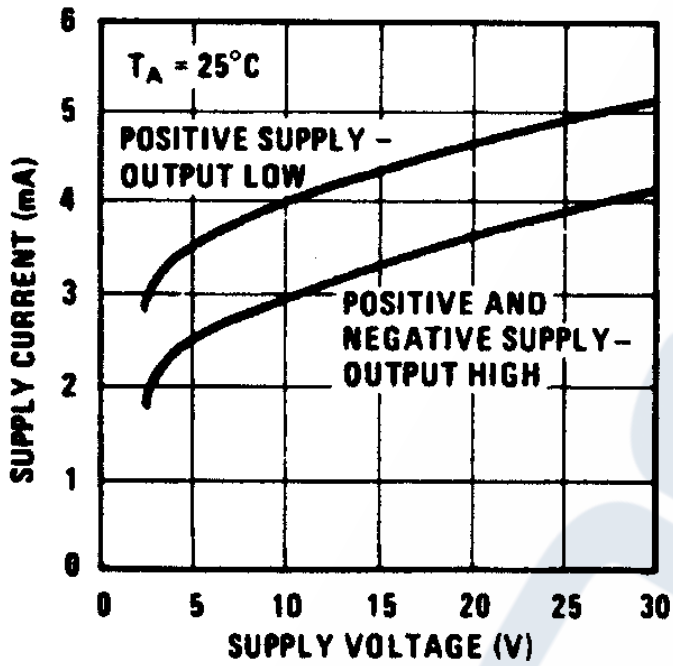
Response Time for Various Input Overdrives



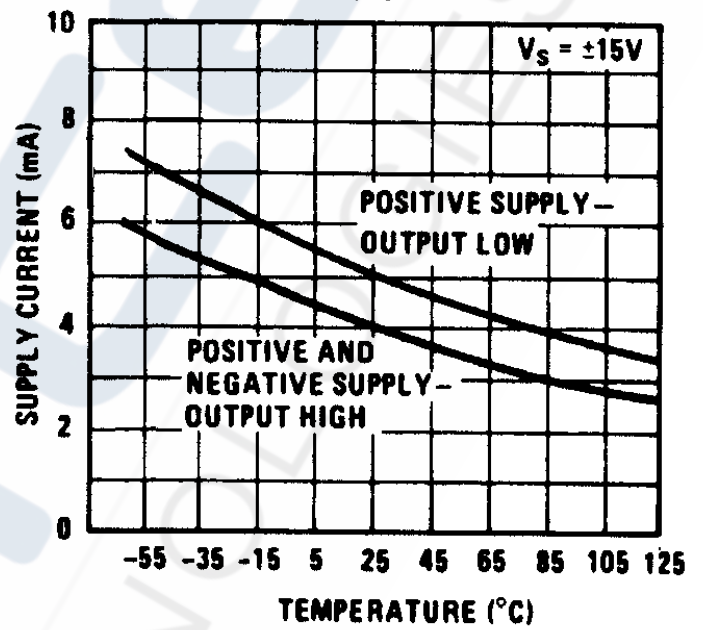
Output Limiting Characteristics



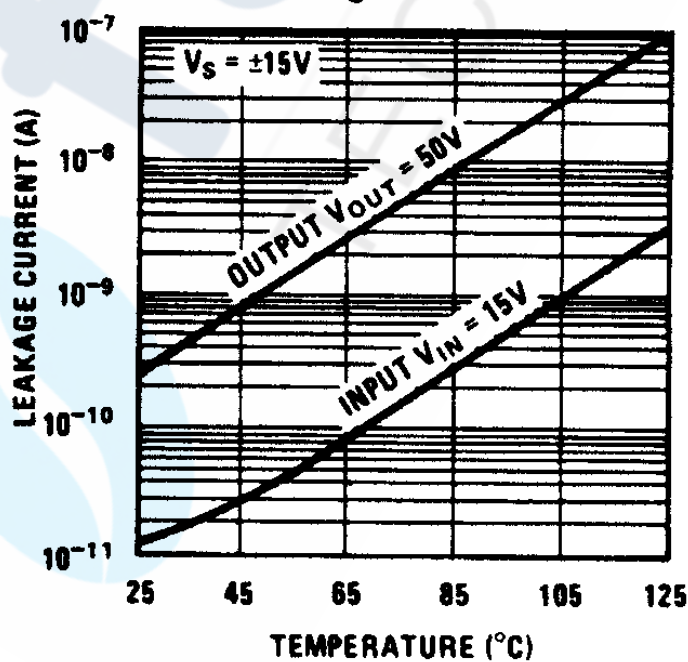
Supply Current



Supply Current



Leakage Currents



Die Characteristics

Die dimensions:

1.4x1.5± 0.1 mm,

55x59 ± 4 mils.

Wafer thickness 0.46± 0.02 mm,

18 ± 1 mils.

Metallisation:

type: Al, 1% Si, thickness: 1.4 ± 0.1 µm

Glassivation:

type: Phosphosilicate glass (PSG)

PSG thickness 1.2 ± 0.2µm.

Worst case current density:

8·10⁴ A/cm².

Substrate potential(Powered Up):

Unbiased.

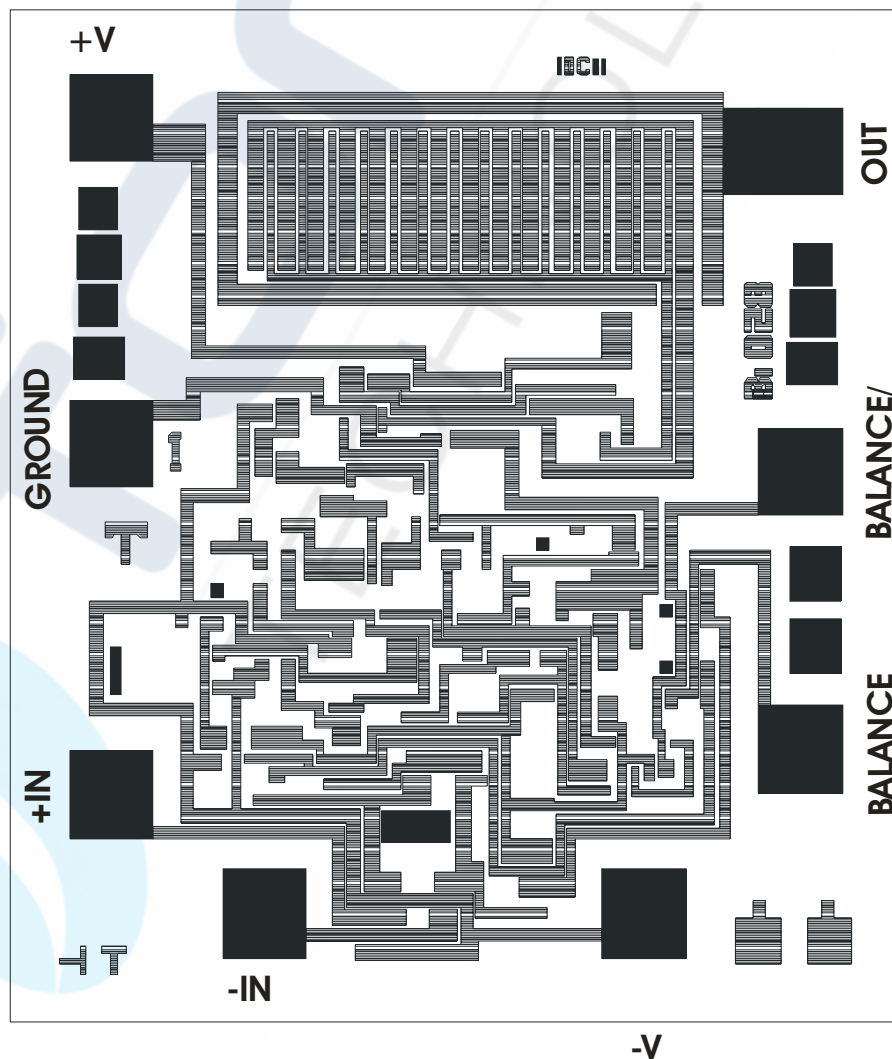
Transistor count:

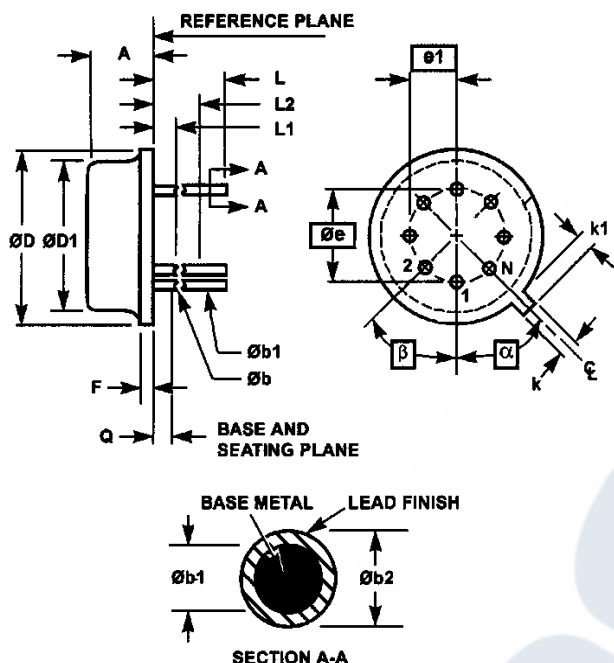
27.

Process:

Bipolar epitaxial.

Metallisation Mask



Metal Can Package

Notes:

- (All leads) $\varnothing b$ applies between L1 and L2. $\varnothing b1$ applies between L2 and 0.500 from the reference plane. Diameter is uncontrolled in L1 and beyond 0.500 from the reference plane.
- Measured from maximum diameter of the product.
- α is the basic spacing from the centerline of the tab to terminal 1 and β is the basic spacing of each lead or lead position (N -1 places) from a, looking at the bottom of the package.
- N is the maximum number of terminal positions.
- Controlling dimension: millimeter.

SH-8
8-lead metal can package

Symbol	Millimeters		Inches		Note
	MIN	MAX	MIN	MAX	
A	6.00	6.22	0.236	0.244	-
$\varnothing b$	0.41	0.48	0.016	0.019	13
$\varnothing b1$	0.41	0.53	0.016	0.021	13
$\varnothing b2$	0.41	0.61	0.016	0.024	-
$\varnothing D$	9.09	9.19	0.335	0.375	-
$\varnothing D1$	8.23	8.43	0.305	0.335	-
$\varnothing e$	0.200		5.08		-
e1	0.100		2.54		-
F	0.33	0.43	0.013	0.017	-
k	0.69	0.86	0.027	0.034	-
k1	0.69	1.14	0.027	0.045	14
L	13.0	14.0	0.512	0.552	13
L1	-	1.27	-	0.05	13
L2	6.35	6.85	0.250	0.270	13
Q	0.5	-	0.02	-	-
α	45°		45°		15
β	45°		45°		15
N	8		8		16

Ordering Information

Part	Mark.	Temp., °C	Package	Package Drawing
FT111SH5U	1115U	-60 to +125	8-lead metal can	SH-8

Notes:

1. This Pb free hermetic packaged product employs 100% Au plate, which is RoHS.
2. Military Screening available on request



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