

RELIABILITY REPORT
FOR
MAX4550xxl
PLASTIC ENCAPSULATED DEVICES

March 4, 2002

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by



Jim Pedicord
Quality Assurance
Reliability Lab Manager

Reviewed by



Bryan J. Preeshl
Quality Assurance
Executive Director

Conclusion

The MAX4550 successfully meets the quality and reliability standards required of all Maxim products. In addition, Maxim's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim's quality and reliability standards.

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I. Device Description

A. General

The MAX4550 serial-interface, programmable, dual 4x2 audio/video crosspoint switch is ideal for multimedia applications. The device contains two identical crosspoint switch arrays, each with four inputs and two outputs. To improve off-isolation, use the additional crosspoint inputs SA and SB as shunts. Each output is selectively programmable for clickless or regular mode operation. A set of internal resistive voltage-dividers supplies DC bias for each output when using AC-coupled inputs. Additionally, four auxiliary outputs control additional circuitry via the MAX4550's 2-wire or 3-wire interface.

The MAX4550 features 80 Ω on-resistance, 10 Ω on-resistance matching between channels, 5 Ω on-resistance flatness, and 0.014% total harmonic distortion. Additionally, it features off-isolation of at least -110dB in the audio frequency range and -78dB at 4MHz, with -95dB crosstalk in the audio frequency range and -54dB at 4MHz. The MAX4550 uses a 2-wire I²C-compatible serial interface. This part is available in 28-pin SSOP and wide SO packages and is tested over either the commercial (0°C to +70°C) or extended (-40°C to +85°C) operating temperature range.

B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
V+ to GND	-0.3V to +6V
V+ to V-	-0.3V to +13.2V
V- to GND	+0.3V to -6V
NO_ , S_ , BIAS_ , COM_ , Q_ , A1, DOUT to GND (Note 1)	(V- - 0.3V) to (V+ + 0.3V)
CS, SCLK, DIN, SCL, SDA, A0 to GND	-0.3V to +6V
Continuous Current into Any Terminal	±10mA
Peak Current, NO_ , S_ , COM_ (pulsed at 1ms, 10% duty cycle max)	±40mA
Operating Temperature Ranges	
MAX4550C_I	-0°C to +70°C
MAX4550E_I	-40°C to +85°C
Storage Temperature Range	-65°C to +160°C
Lead Temperature (soldering, 10sec)	+300°
Continuous Power Dissipation (T _A = +70°C)	
28-Lead SSOP	762mW
28-Lead Wide SO	1000mW
Derates above +70°C	
28-Lead SSOP	9.52mW/°C
28-Lead Wide SO	12.5mW/°C

Note 1: Signals on NO_ , S_ , or COM_ exceeding V+ or V- are clamped by internal diodes. Limit forward-diode current to maximum current rating

II. Manufacturing Information

A. Description/Function:	Serially Controlled, Dual 4x2, Clickless Audio/Video Analog Crosspoint Switch
B. Process:	S3 (SG3) Standard 3 micron silicon gate CMOS
C. Number of Device Transistors:	5200
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Malaysia or Philippines
F. Date of Initial Production:	October, 1999

III. Packaging Information

A. Package Type:	28-Lead WSO	28-Lead SSOP
B. Lead Frame:	Copper	Copper
C. Lead Finish:	Solder Plate	Solder Plate
D. Die Attach:	Silver-filled Epoxy	Silver-filled Epoxy
E. Bondwire:	Gold (1.3 mil dia.)	Gold (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler	Epoxy with silica filler
G. Assembly Diagram:	# 05-1201-0051	# 05-1201-0050
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1	Level 1

IV. Die Information

A. Dimensions:	140 x 157 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
D. Backside Metallization:	None
E. Minimum Metal Width:	3 microns (as drawn)
F. Minimum Metal Spacing:	3 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:

Jim Pedicord (Reliability Lab Manager)
Bryan Preeshl (Executive Director of QA)
Kenneth Huening (Vice President)

B. Outgoing Inspection Level: 0.1% for all electrical parameters guaranteed by the Datasheet.
0.1% For all Visual Defects.

C. Observed Outgoing Defect Rate: < 50 ppm

D. Sampling Plan: Mil-Std-105D

VI. Reliability Evaluation

A. Accelerated Life Test

The results of the 135°C biased (static) life test are shown in **Table 1**. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{4.04}{192 \times 4389 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

└─ Thermal acceleration factor assuming a 0.8eV activation energy

$$\lambda = 29.97 \times 10^{-9} \quad \lambda = 29.97 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

This low failure rate represents data collected from Maxim's reliability qualification and monitor programs. Maxim also performs weekly Burn-In on samples from production to assure the reliability of its processes. The reliability required for lots which receive a burn-in qualification is 59 F.I.T. at a 60% confidence level, which equates to 3 failures in an 80 piece sample. Maxim performs failure analysis on lots exceeding this level. The following Burn-In Schematic (Spec. # 06-5378) shows the static circuit used for this test. Maxim also performs 1000 hour life test monitors quarterly for each process. This data is published in the Product Reliability Report (**RR-1M**).

B. Moisture Resistance Tests

Maxim evaluates pressure pot stress from every assembly process during qualification of each new design. Pressure Pot testing must pass a 20% LTPD for acceptance. Additionally, industry standard 85°C/85%RH or HAST tests are performed quarterly per device/package family.

C. E.S.D. and Latch-Up Testing

The AH07 die type has been found to have all pins able to withstand a transient pulse of $\pm 1500\text{V}$, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of $\pm 50\text{mA}$.

Table 1
Reliability Evaluation Test Results

MAX4550xxI

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	PACKAGE	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality		80	1
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	WSO	77	0
			SSOP	77	0
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality		77	0
Mechanical Stress (Note 2)					
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality		77	0

Note 1: Life Test Data may represent plastic DIP qualification lots.

Note 2: Generic Package/Process data

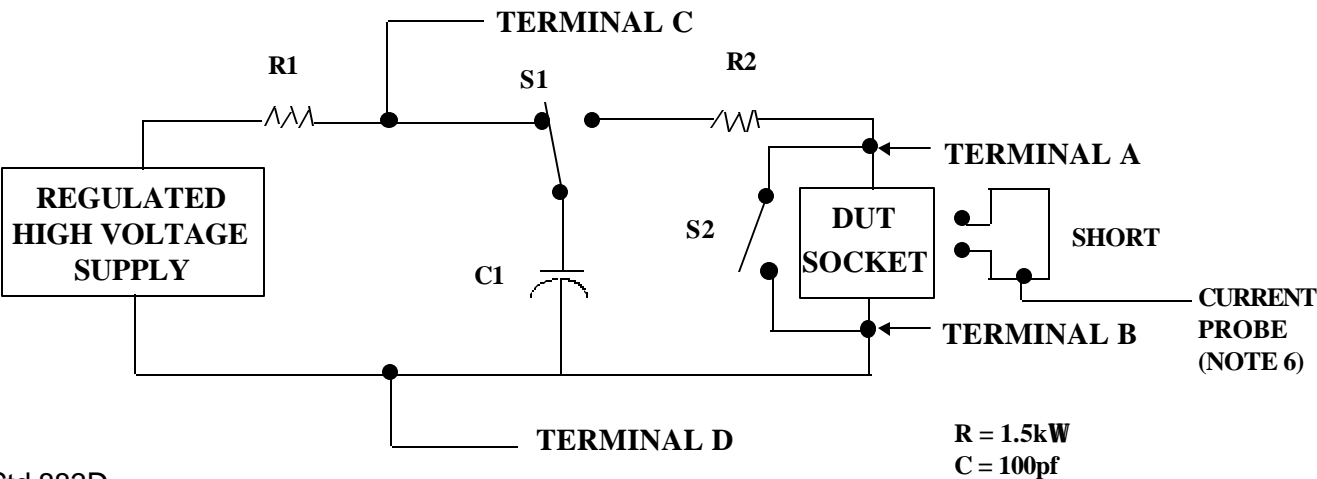
TABLE II. Pin combination to be tested. 1/ 2/

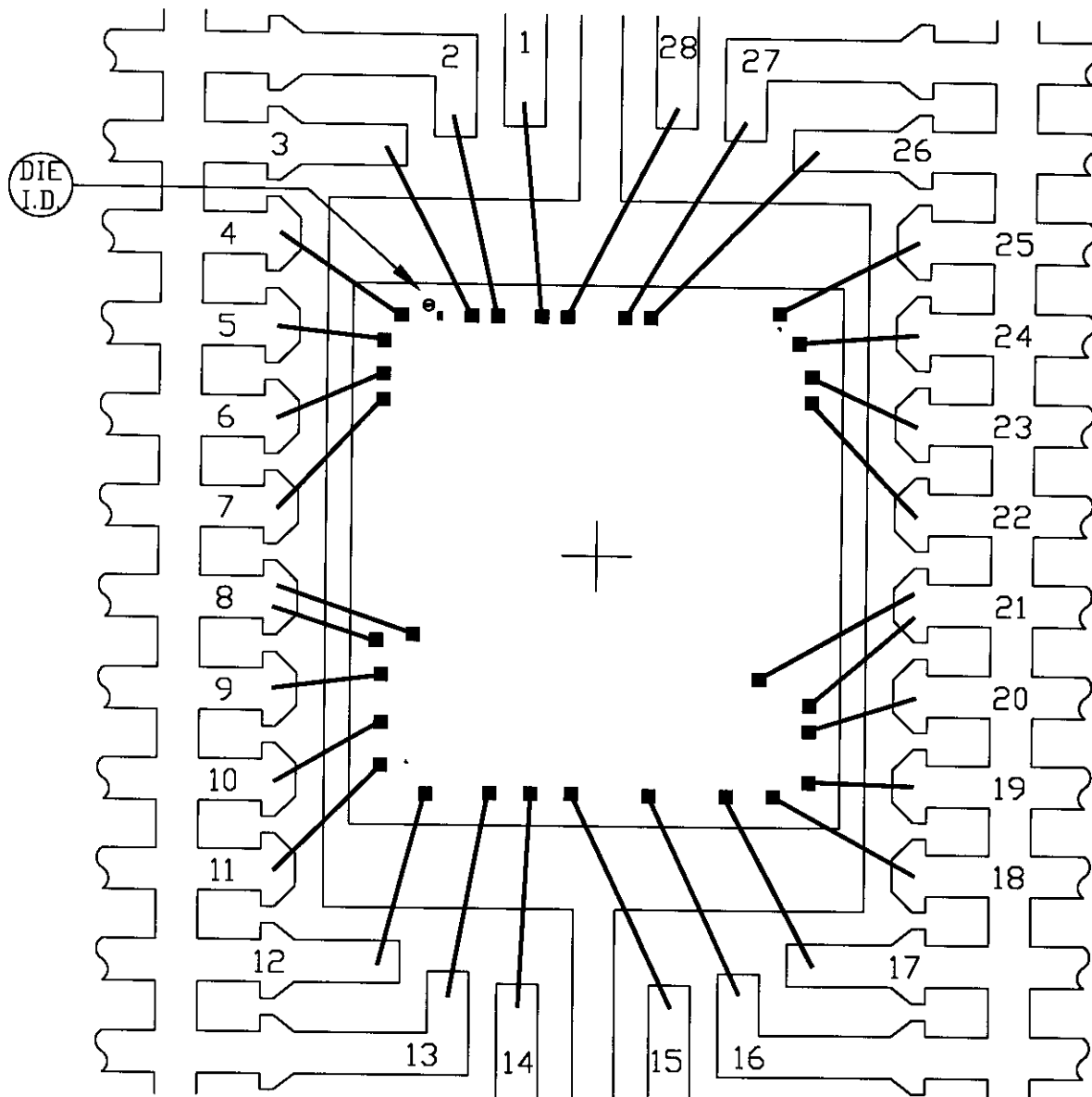
	Terminal A (Each pin individually connected to terminal A with the other floating)	Terminal B (The common combination of all like-named pins connected to terminal B)
1.	All pins except V_{PS1} 3/	All V_{PS1} pins
2.	All input and output pins	All other input-output pins

- 1/ Table II is restated in narrative form in 3.4 below.
2/ No connects are not to be tested.
3/ Repeat pin combination I for each named Power supply and for ground
(e.g., where V_{PS1} is V_{DD} , V_{CC} , V_{SS} , V_{BB} , GND, $+V_S$, $-V_S$, V_{REF} , etc).

3.4 Pin combinations to be tested.

- a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.
- b. Each pin individually connected to terminal A with respect to each different set of a combination of all named power supply pins (e.g., V_{SS1} , or V_{SS2} or V_{SS3} or V_{CC1} , or V_{CC2}) connected to terminal B. All pins except the one being tested and the power supply pin or set of pins shall be open.
- c. Each input and each output individually connected to terminal A with respect to a combination of all the other input and output pins connected to terminal B. All pins except the input or output pin being tested and the combination of all the other input and output pins shall be open.





PKG.CODE: A28-1

CAV./PAD SIZE:
154X200

APPROVALS

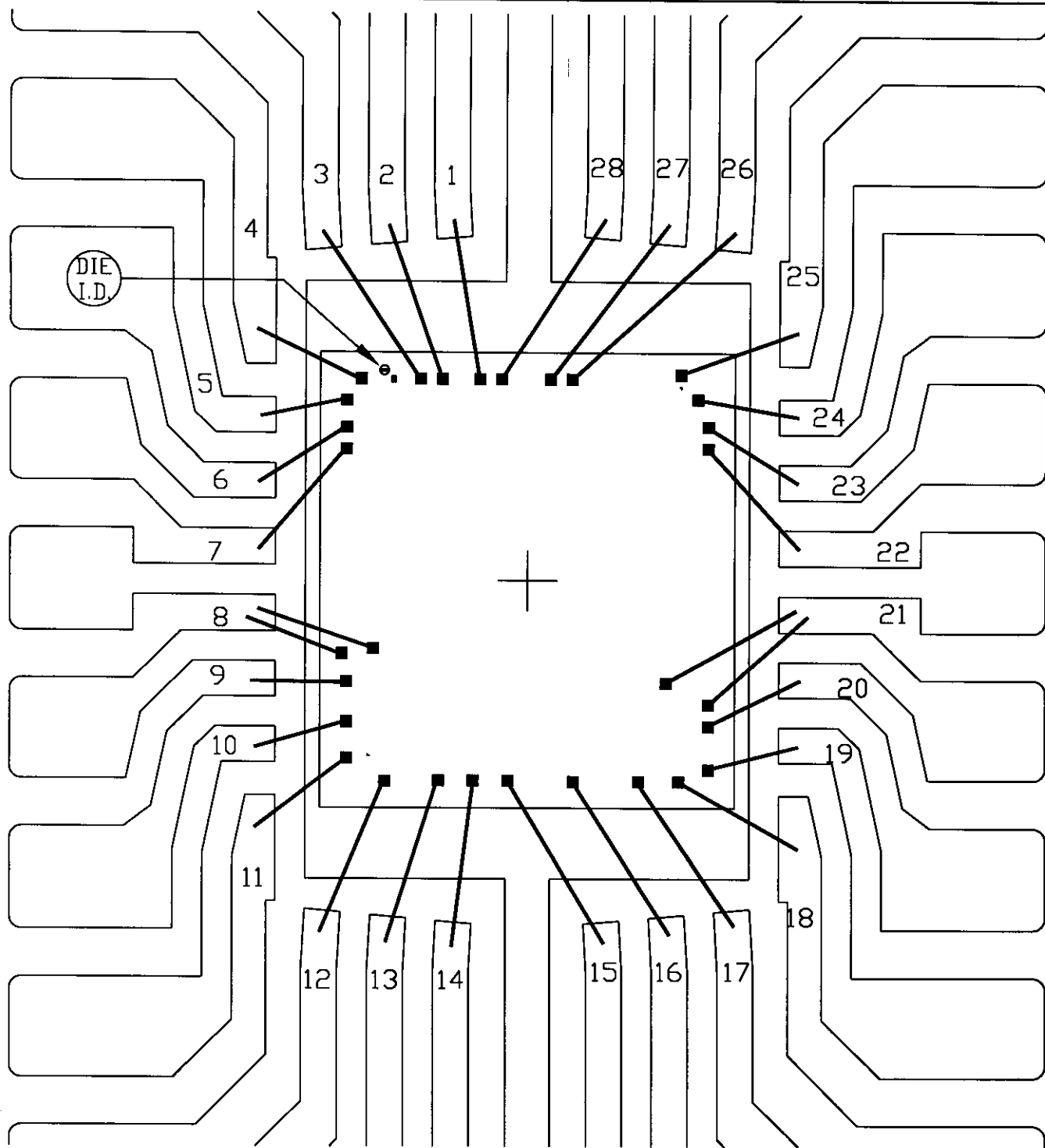
DATE

MAXIM

BUILDSHEET NUMBER:
05-1201-0050

REV:
A

PKG.
DESIGN



PKG.CODE: W28-6

CAV./PAD SIZE:
150X200

APPROVALS

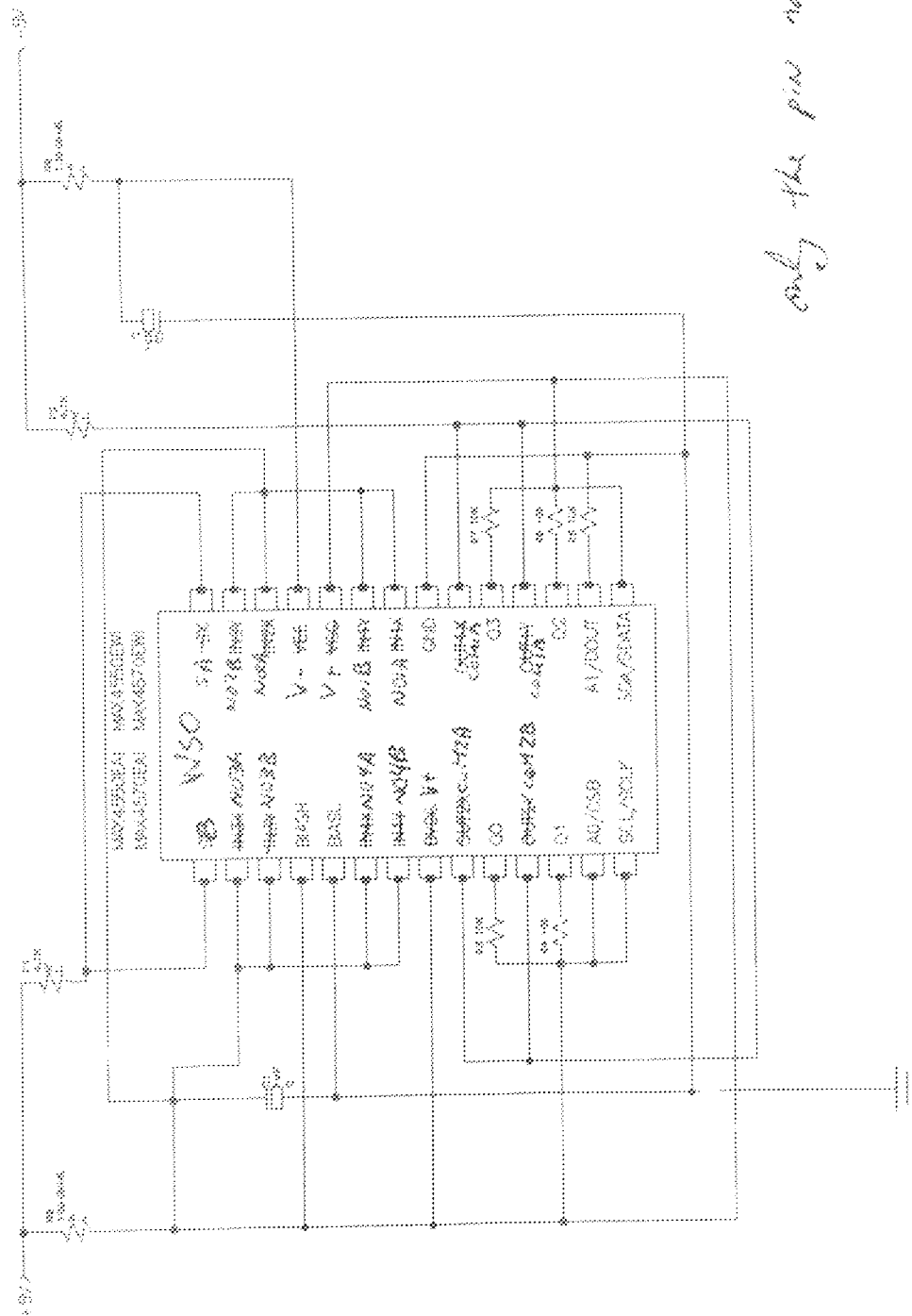
DATE

MAXIM

BUILDSHEET NUMBER:
05-1201-0051

REV:
A

PKG.
DESIGN

[illegible]

only the pin names have changed

MAX CURRENT PER DEVICE IS 4mA FROM +5V AND 15mA FROM -5V.
ORDER WIDE SO BOARDS.

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