

Hybrid Circuits

HYBRID CIRCUITS NUMERICAL INDEX

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HYBRID CROSS REFERENCE

Title	RTL	DTL	Analog Amplifiers	Analog Switches	Regulators
SH2001 High-Voltage, High-Current Driver		TO - 5 F/P			
SH2002 DT _μ L High Power Driver		TO - 5 F/P			
SH2002-P DT _μ L High Power Driver in plastic Dual-in-Line Pack		DIP			
SH2100 High-Current Driver	TO - 5 F/P				
SH2101 High-Voltage Driver	TO - 5 F/P				
SH3000 High Impedance, Wideband DC Amplifier			TO - 5 F/P		
SH3001 Analog Switch				TO - 5	
SH3002 SPDT Analog Switch				TO - 5	
SH3005 High Impedance Differential Comparator				TO - 5 F/P	
SH3200 Adjustable Positive DC Voltage Regulator					TO - 5
SH3201 Adjustable Negative DC Voltage Regulator					TO - 5

F/P = FLAT PACK

DIP = Dual-In-Line PACKAGE

SH2001

HIGH-VOLTAGE, HIGH-CURRENT DRIVER

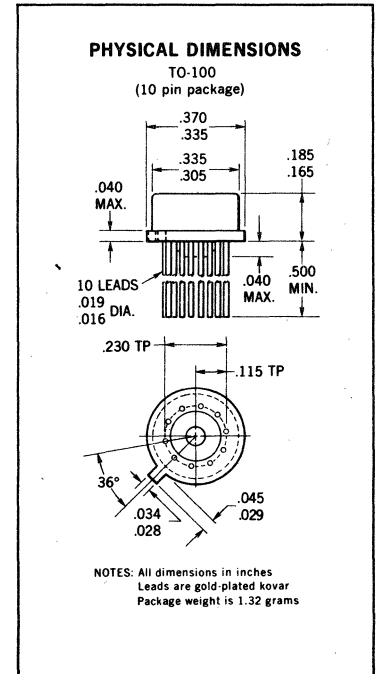
FAIRCHILD HYBRID CIRCUITS

- **INPUTS CCSL COMPATIBLE**
- **USE FOR CORE, CABLE, AND LAMP DRIVER**
- **HIGH CURRENT CAPABILITY . . . 250 mA SINKING CURRENT AT 0.5 VOLT**
- **HIGH VOLTAGE CAPABILITY . . . 40 VOLTS V_{CEO}**
- **LOGIC FLEXIBILITY 4 INPUT NAND WITH INHIBIT (NOR) INPUT**
- **HIGH SPEED $t_{ON} = 70$ ns (TYP) -- $t_{OFF} = 110$ ns (TYP)**

ABSOLUTE MAXIMUM RATINGS (25°C Free Air Temperature unless otherwise noted)

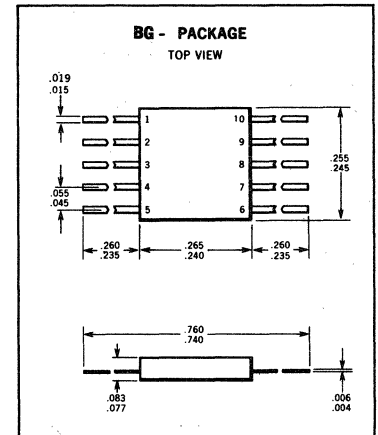
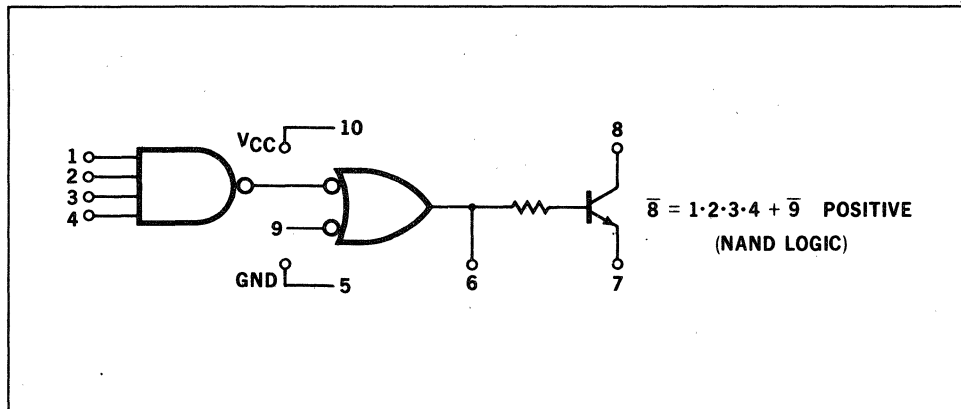
Voltage Applied to Pin 8
 Voltage Applied to Pin 10
 Operating Power
 Operating Temperature
 Storage Temperature
 Input Reverse Current
 Current on Pin 8

+40 Volts
 8 Volts
 800 mW
 (See Part Nos.)
 -65°C to +150°C
 1 mA
 1 Amp



PART NO. -55°C TO +125°C HAG-20011XX
0°C TO +70°C HAG 20019XX

LOGIC SYMBOLS AND FUNCTIONS



PART NO. -55°C TO +125°C HBG-20011XX
0°C TO +70°C HBG 20019XX

FAIRCHILD HYBRID CIRCUITS SH-2001

GUARANTEED TEST SEQUENCE SH-2001

TEST NO.	LTPD GROUP	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9	PIN 10	SENSE	LIMIT	
													MIN.	MAX.
1	A	V _{IH}	V _{IH}	V _{IH}	V _{IH}	GND		GND	I _{OL1}		V _{CCL}	V ₈	V _{OL}	
2	A	V _{IL}	V _{IH}	V _{IH}	V _{IH}	GND		GND	I _{OL1}	V _{IL}	V _{CCL}	V ₈	V _{OL}	
3	A	V _{IL}				GND	I _{OL2}		I _{OL1}		V _{CCL}	V ₆	V _{OL2}	
4	A	V _{IL}	V _{IL}			GND	I _{OL2}				V _{CCL}	V ₆	V _{OL2}	
5	A		V _{IL}			GND	I _{OL2}				V _{CCL}	V ₆	V _{OL2}	
6	A			V _{IL}		GND	I _{OL2}				V _{CCL}	V ₆	V _{OL2}	
7	A				V _{IL}	GND	I _{OL2}			V _{IH}	V _{CCL}	V ₆	V _{OL2}	
8	B	V _R	GND	GND	GND	GND					V _{CCH}	I ₁	I _R	
9	B	GND	V _R	GND	GND	GND					V _{CCH}	I ₂	I _R	
10	B	GND	GND	V _R	GND	GND					V _{CCH}	I ₃	I _R	
11	B	GND	GND	GND	V _R	GND					V _{CCH}	I ₄	I _R	
12	B					GND				V _R	V _{CCH}	I ₉	I _R	
13	C	V _F	V _R	V _R	V _R	GND					V _{CCH}	I ₁	-I _F	
14	C	V _R	V _F	V _R	V _R	GND					V _{CCH}	I ₂	-I _F	
15	C	V _R	V _R	V _F	V _R	GND					V _{CCH}	I ₃	-I _F	
16	C	V _R	V _R	V _R	V _F	GND					V _{CCH}	I ₄	-I _F	
17	C				GND	GND				V _F	V _{CCH}	I ₉	-I _F	
18	D					GND		GND			V _{CCL}	V ₆	V _{OH}	
19	E	GND				GND		GND	V _{OX}		V _{CCL}	I ₈	I _{OX}	
20	F					GND		GND			V _{PD}	I ₁₀	I _{PDH}	
21	F	GND				GND					V _{MAX}	I ₁₀	I _{MAX}	
22*	F					GND					V _{PD}		t _{ON}	
23*	F					GND					V _{PD}		t _{OFF}	

*See Test Conditions and Definitions on Page 3

FORCING FUNCTIONS (Temperature Range -55°C to +125°C)

	UNITS	-55°C	+25°C	+125°C
V _{CCL}	Volts	4.50	4.50	4.50
V _{CCH}	Volts	5.50	5.50	5.50
V _{PD}	Volts		5.00	
V _{MAX}	Volts		8.00	
V _{IL}	Volts	1.40	1.10	0.80
V _{IH}	Volts	2.10	1.90	1.70
V _R	Volts	4.00	4.00	4.00
V _F	Volts	0.00	0.00	0.00
I _{OL1}	Milliamps	250	250	250
I _{OL2}	Milliamps	8.00	8.00	7.50
V _{OX}	Volts	40.0	40.0	40.0

FORCING FUNCTIONS (Temperature Range 0°C to +70°C)

	UNITS	0°C	+25°C	+70°C
V _{CCL}	Volts	5.00	5.00	5.00
V _{CCH}	Volts	5.00	5.00	5.00
V _{PD}	Volts		5.00	
V _{MAX}	Volts		8.00	
V _{IL}	Volts	1.20	1.10	.950
V _{IH}	Volts	2.00	1.90	1.80
V _R	Volts	4.00	4.00	4.00
V _F	Volts	0.45	0.45	0.50
I _{OL1}	Milliamps	250	250	250
I _{OL2}	Milliamps	8.0	8.0	7.5
V _{OX}	Volts	40.0	40.0	40.0

FAIRCHILD HYBRID CIRCUITS SH-2001

TEST LIMITS (Temperature Range -55°C to +125°C)

	UNITS	-55°C		+25°C		+125°C	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
V_{OL1}	Volts		0.45		0.40		0.45
V_{OL2}	Volts		0.45		0.40		0.45
V_{OH}	Volts	2.20		2.00		1.80	
I_R	Microamp				2.0		5.0
$-I_F$	Milliamp		1.60		1.60		1.50
I_{OX}	Microamp				5.0		200
I_{PDH}	Milliamp				30.6		
I_{MAX}	Milliamp				29.6		
t_{ON}	Nanosec.				160		
t_{OFF}	Nanosec.				220		

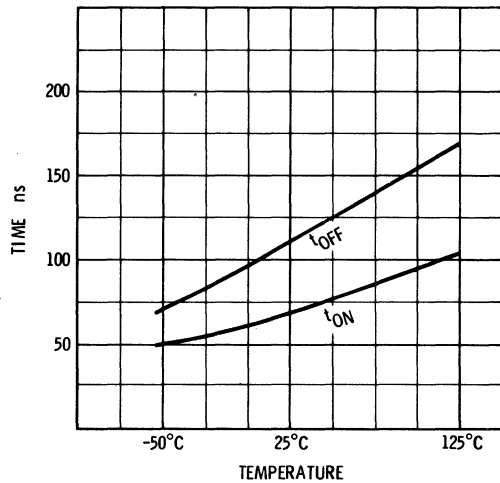
TEST LIMITS (Temperature Range 0°C to +70°C)

	UNITS	0°C		+25°C		+70°C	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
V_{OL1}	Volts		0.45		0.45		0.5
V_{OL2}	Volts		0.45		0.45		0.5
V_{OH}	Volts	2.05		1.95		1.85	
I_R	Microamp				5.0		10.0
$-I_F$	Milliamp		1.40		1.40		1.35
I_{OX}	Microamp				5.0		200
I_{PDH}	Milliamp				30.6		
I_{MAX}	Milliamp				34.0		
t_{ON}	Nanosec.				200		
t_{OFF}	Nanosec.				260		

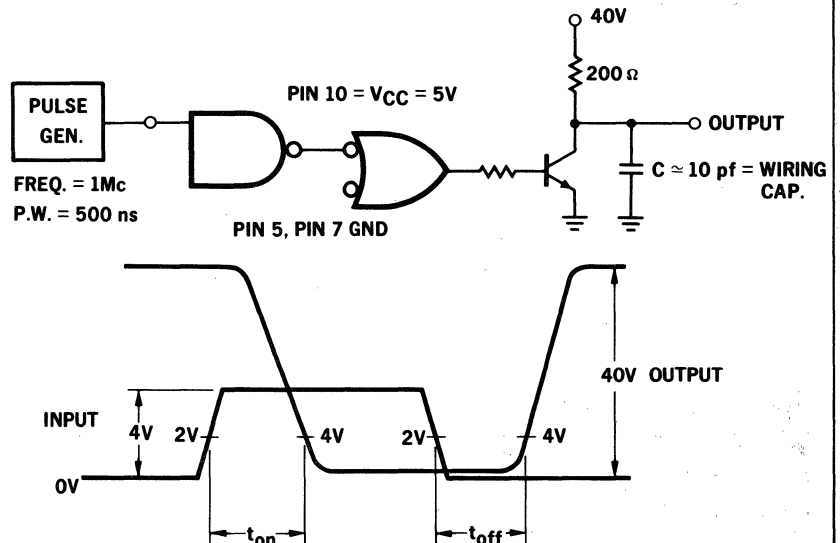
TABLE OF LTPD'S (These apply to test sequence page 2)

GROUP	COLD	25°C	HOT
A	15%	10%	15%
B		10%	15%
C	15%	10%	15%
D	15%	10%	15%
E		10%	15%
F		10%	15%

TYPICAL SWITCHING TIMES



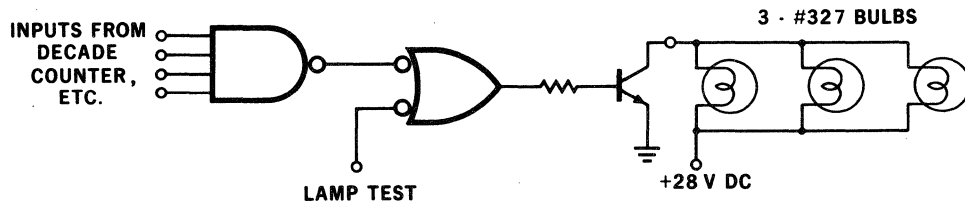
SWITCHING TIME TEST CONDITIONS



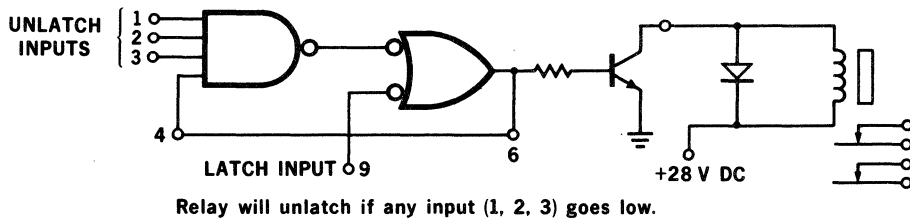
FAIRCHILD HYBRID CIRCUITS SH-2001

APPLICATIONS

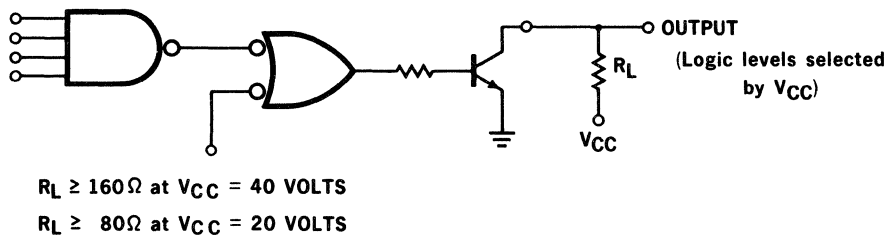
LAMP DRIVER—



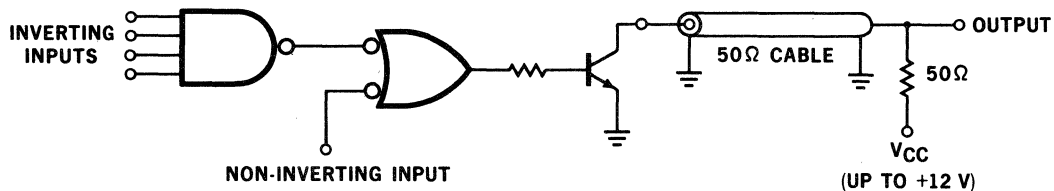
LATCHING RELAY—



DT_μL INTERFACE DRIVER—



HIGH-CURRENT LINE TRANSMITTER—



NOTE: If only non-inverting input is used, one of the inverting inputs must be grounded.

SH2002

DT μ L HIGH POWER DRIVER

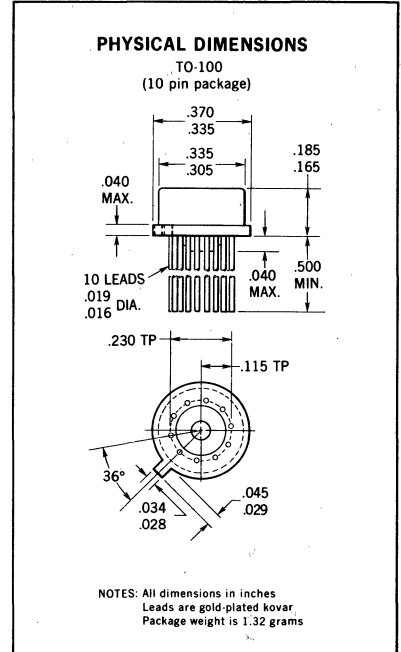
FAIRCHILD HYBRID CIRCUITS

- LOGIC FLEXIBILITY LATCHABLE 4 INPUT NAND WITH INHIBIT (NOR) INPUT
- HIGH CURRENT CAPABILITY . . . UP TO 150 mA
- HIGH VOLTAGE CAPABILITY . . . 40 VOLTS V_{CEO}
- INPUT COMPATIBLE WITH CCSL PRODUCTS
- FULL -55°C TO $+125^{\circ}\text{C}$ TEMPERATURE OPERATION
- APPLICATIONS INCLUDE CABLE AND LAMP DRIVER

ABSOLUTE MAXIMUM RATINGS (25°C Free Air Temperature unless otherwise noted)

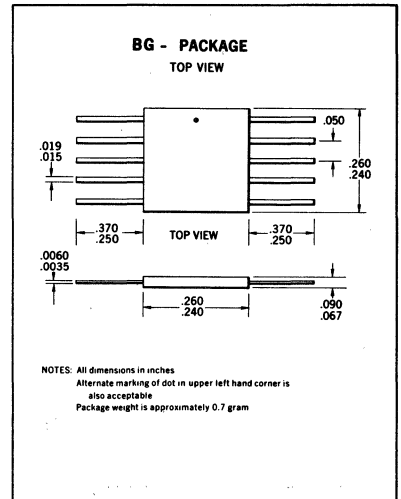
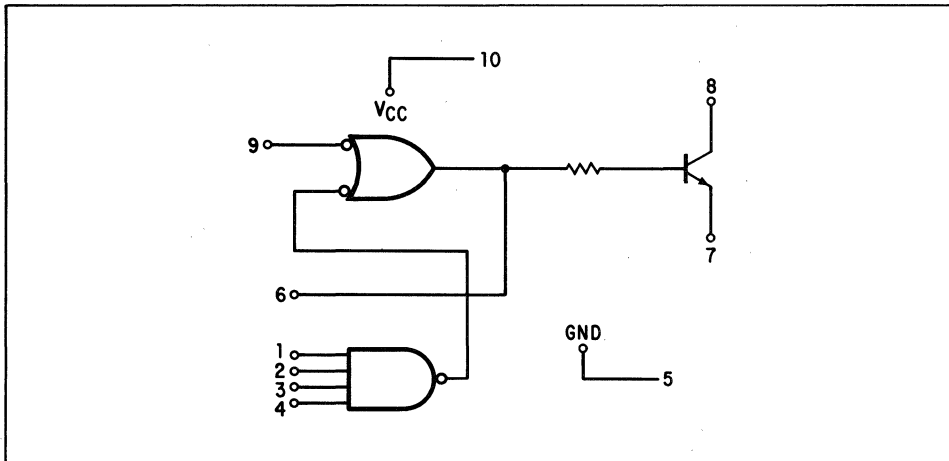
Voltage Applied to Pin 10 (continuous)
 Input Reverse Current
 Voltage Applied to Pin 8 (continuous)
 Voltage Applied to Pin 10 (pulsed ≤ 1 second)
 Storage Temperature
 Operating Temperature
 Power Dissipation (Derate Linearly to $+175^{\circ}\text{C}$)

$+8.0$ Volts
 1.0 mA
 $+40$ Volts
 $+12$ Volts
 -65°C to $+150^{\circ}\text{C}$
 (See Part Nos.)
 800 mW



HAG20021XX (-55°C TO $+125^{\circ}\text{C}$)
HAG20029XX (0°C TO $+70^{\circ}\text{C}$)

LOGIC SYMBOLS AND FUNCTIONS



HBG20021XX (-55°C TO $+125^{\circ}\text{C}$)
HBG20029XX (0°C TO $+70^{\circ}\text{C}$)

FAIRCHILD DIODE TRANSISTOR MICROLOGIC® I.C.

GUARANTEED TEST SEQUENCE SH2002

TEST NO.	LTPD GROUP	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9	PIN 10	SENSE	LIMIT	
													MIN.	MAX.
1	A	V _{IH}	V _{IH}	V _{IH}	V _{IH}	GND		GND	I _{OL1}		V _{CCL}	V ₈	V _{OL}	
2	A	V _{IL}	V _{IH}	V _{IH}	V _{IH}	GND		GND	I _{OL1}	V _{IL}	V _{CCL}	V ₈	V _{OL}	
3	A	V _{IL}				GND	I _{OL2}				V _{CCL}	V ₆	V _{OL2}	
4	A		V _{IL}			GND	I _{OL2}				V _{CCL}	V ₆	V _{OL2}	
5	A			V _{IL}		GND	I _{OL2}				V _{CCL}	V ₆	V _{OL2}	
6	A				V _{IL}	GND	I _{OL2}				V _{CCL}	V ₆	V _{OL2}	
7	A				GND	GND	I _{OL2}			V _{IH}	V _{CCL}	V ₆	V _{OL2}	
8	B	V _R	GND	GND	GND	GND					V _{CCH}	I ₁	I _R	
9	B	GND	V _R	GND	GND	GND					V _{CCH}	I ₂	I _R	
10	B	GND	GND	V _R	GND	GND					V _{CCH}	I ₃	I _R	
11	B	GND	GND	GND	V _R	GND					V _{CCH}	I ₄	I _R	
12	B					GND				V _R	V _{CCH}	I ₉	I _R	
13	C	V _F	V _R	V _R	V _R	GND					V _{CCH}	I ₁	-I _F	
14	C	V _R	V _F	V _R	V _R	GND					V _{CCH}	I ₂	-I _F	
15	C	V _R	V _R	V _F	V _R	GND					V _{CCH}	I ₃	-I _F	
16	C	V _R	V _R	V _R	V _F	GND					V _{CCH}	I ₄	-I _F	
17	C				GND	GND				V _F	V _{CCH}	I ₉	-I _F	
18	D					GND		GND			V _{CCL}	V ₆	V _{OH}	
19	E	GND				GND		GND	V _{OX}		V _{CCL}	I ₈	I _{OX}	
20	F					GND		GND			V _{PD}	I ₁₀	I _{PDH}	
21	F	GND				GND					V _{MAX}	I ₁₀	I _{MAX}	

FORCING FUNCTIONS (Temperature Range -55°C to +125°C)

	UNITS	-55°C	+25°C	+125°C
V _{CCL}	Volts	4.50	4.50	4.50
V _{CCH}	Volts	5.50	5.50	5.50
V _{PD}	Volts		5.00	
V _{MAX}	Volts		8.00	
V _{IL}	Volts	1.40	1.10	0.80
V _{IH}	Volts	2.10	1.90	1.70
V _R	Volts	4.00	4.00	4.00
V _F	Volts	0.00	0.00	0.00
I _{OL1}	Milliamps	150	150	150
I _{OL2}	Milliamps	8.00	8.00	7.50
V _{OX}	Volts	40.0	40.0	40.0

FORCING FUNCTIONS (Temperature Range 0°C to +70°C)

	UNITS	0°C	+25°C	+70°C
V _{CCL}	Volts	5.00	5.00	5.00
V _{CCH}	Volts	5.00	5.00	5.00
V _{PD}	Volts		5.00	
V _{MAX}	Volts		8.00	
V _{IL}	Volts	1.20	1.10	.950
V _{IH}	Volts	2.00	1.90	1.80
V _R	Volts	4.00	4.00	4.00
V _F	Volts	0.45	0.45	0.50
I _{OL1}	Milliamps	250	250	250
I _{OL2}	Milliamps	8.0	8.0	7.5
V _{OX}	Volts	40.0	40.0	40.0

FAIRCHILD DIODE TRANSISTOR MICROLOGIC® I.C.

TEST LIMITS (Temperature Range -55°C to +125°C)

	UNITS	-55°C		+25°C		+125°C	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
V_{OL1}	Volts		0.45		0.40		0.45
V_{OL2}	Volts		0.45		0.40		0.45
V_{OH}	Volts	2.20		2.00		1.80	
I_R	Microamp				2.0		5.0
$-I_F$	Milliamp		1.60		1.60		1.50
I_{OX}	Microamp				5.0		200
I_{PDH}	Milliamp				30.6		
I_{MAX}	Milliamp				29.6		

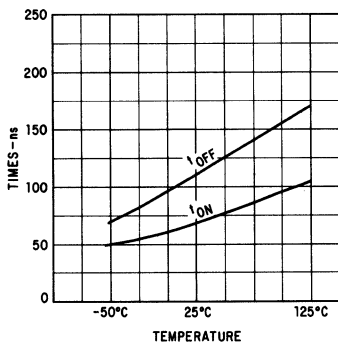
TEST LIMITS (Temperature Range 0°C to +70°C)

	UNITS	0°C		+25°C		+70°C	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
V_{OL1}	Volts		0.45		0.45		0.5
V_{OL2}	Volts		0.45		0.45		0.5
V_{OH}	Volts	2.05		1.95		1.85	
I_R	Microamp				5.0		10.0
$-I_F$	Milliamp		1.40		1.40		1.35
I_{OX}	Microamp				5.0		200
I_{PDH}	Milliamp				30.6		
I_{MAX}	Milliamp				34.0		

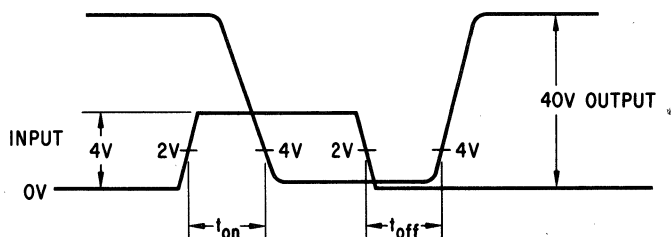
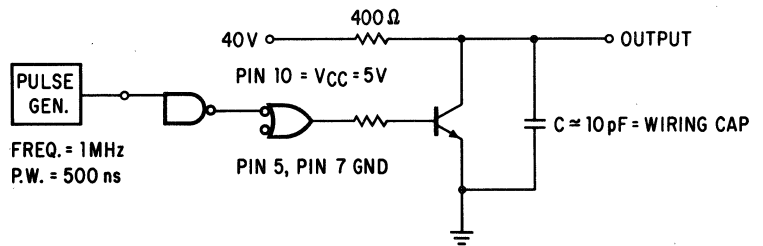
TABLE OF LTPD'S (These apply to test sequence page 2)

GROUP	COLD	+25°C	HOT
A	15%	10%	15%
B		10%	15%
C	15%	10%	15%
D	15%	10%	15%
E		10%	15%
F		10%	15%

TYPICAL SWITCHING TIMES



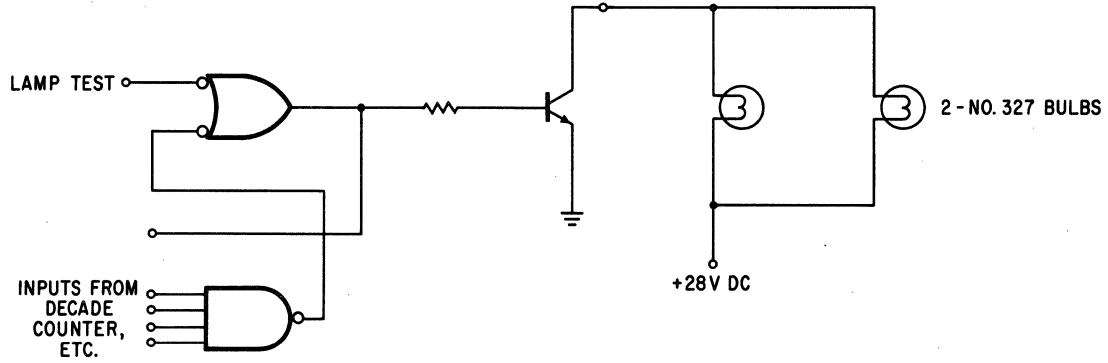
SWITCHING TIME TEST CONDITIONS



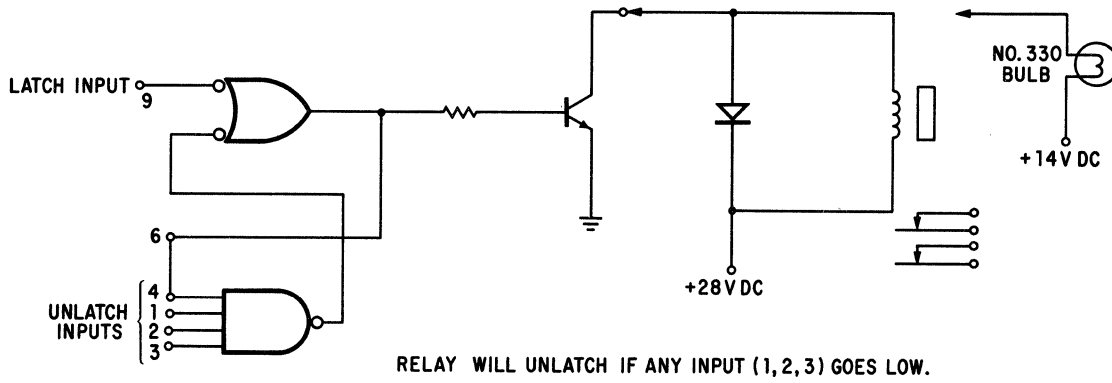
FAIRCHILD DIODE TRANSISTOR MICROLOGIC® I.C.

APPLICATIONS

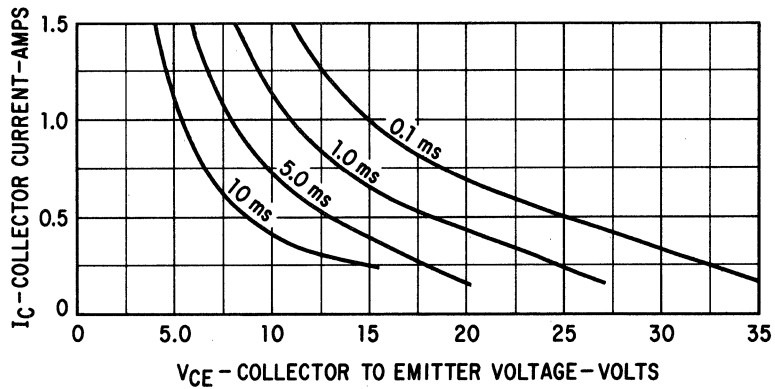
LAMP DRIVER—



LATCHING RELAY—OR FAULT LAMP DRIVER



OUTPUT TRANSFER PULSE SAFE OPERATING AREA



SH2002-P

DT μ L HIGH POWER DRIVER

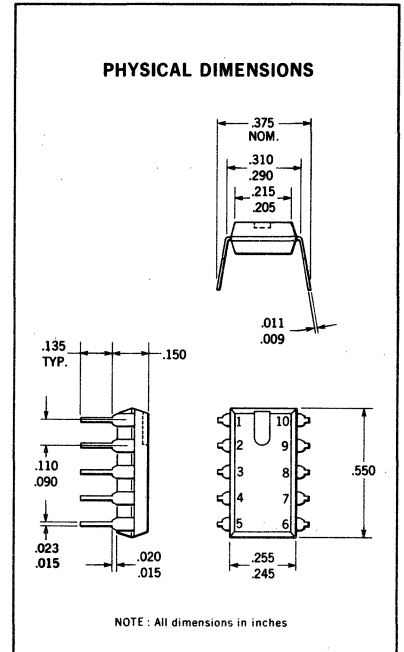
IN PLASTIC DUAL-IN-LINE PACK
FAIRCHILD HYBRID CIRCUITS

- LOGIC FLEXIBILITY LATCHABLE 4 INPUT NAND WITH INHIBIT (NOR) INPUT
- HIGH CURRENT CAPABILITY . . . UP TO 150 mA
- HIGH VOLTAGE CAPABILITY . . . 40 VOLTS V_{CEO}
- INPUT COMPATIBLE WITH CCSL PRODUCTS
- APPLICATIONS INCLUDE CABLE, LAMP, AND RELAY DRIVER

ABSOLUTE MAXIMUM RATINGS (25°C Free Air Temperature unless otherwise noted)

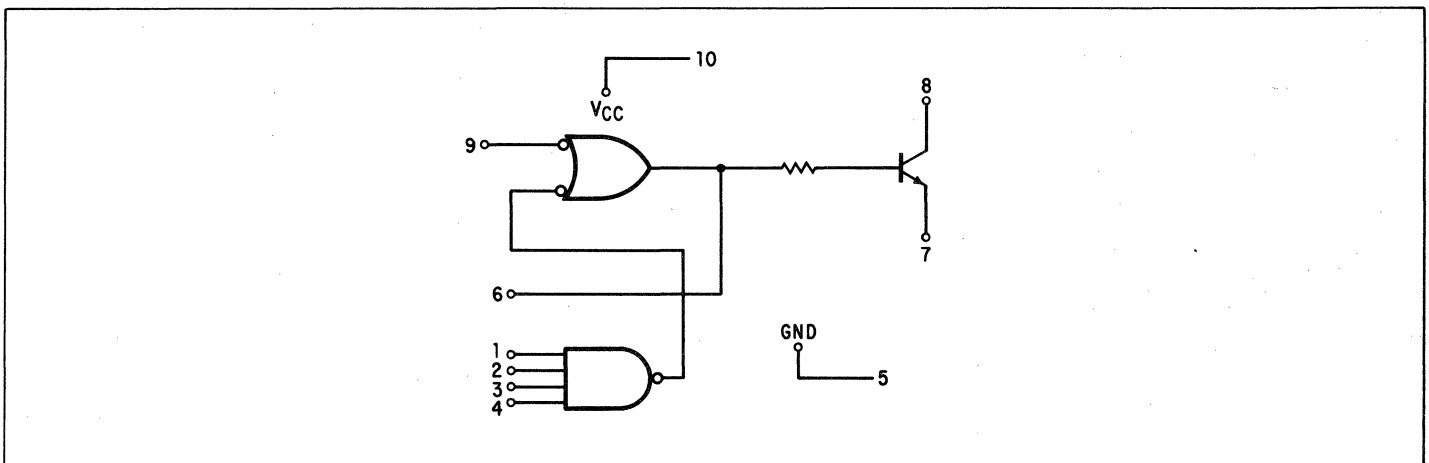
Voltage Applied to Pin 10 (continuous)
Input Reverse Current
Voltage Applied to Pin 8 (continuous)
Voltage Applied to Pin 10 (pulsed ≤ 1 second)
Storage Temperature
Operating Temperature
Power Dissipation (Derate Linearly to +175°C)

+8.0 Volts
1.0 mA
+40 Volts
+12 Volts
-65°C to +150°C
0°C to +70°C
800 mW



H6F20029XX (0°C TO +70°C)

LOGIC SYMBOLS AND FUNCTIONS



FAIRCHILD HYBRID CIRCUIT SH2002-P

GUARANTEED TEST SEQUENCE

TEST NO.	LTPD GROUP	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9	PIN 10	SENSE	LIMIT	
													MIN.	MAX.
1	A	V _{IH}	V _{IH}	V _{IH}	V _{IH}	GND		GND	I _{OL1}		V _{CCL}	V ₈	V _{OL}	
2	A	V _{IL}	V _{IH}	V _{IH}	V _{IH}	GND		GND	I _{OL1}	V _{IL}	V _{CCL}	V ₈	V _{OL}	
3	A	V _{IL}				GND	I _{OL2}				V _{CCL}	V ₆	V _{OL2}	
4	A		V _{IL}			GND	I _{OL2}				V _{CCL}	V ₆	V _{OL2}	
5	A			V _{IL}		GND	I _{OL2}				V _{CCL}	V ₆	V _{OL2}	
6	A				V _{IL}	GND	I _{OL2}				V _{CCL}	V ₆	V _{OL2}	
7	A				GND	GND	I _{OL2}			V _{IH}	V _{CCL}	V ₆	V _{OL2}	
8	B	V _R	GND	GND	GND	GND					V _{CCH}	I ₁	I _R	
9	B	GND	V _R	GND	GND	GND					V _{CCH}	I ₂	I _R	
10	B	GND	GND	V _R	GND	GND					V _{CCH}	I ₃	I _R	
11	B	GND	GND	GND	V _R	GND					V _{CCH}	I ₄	I _R	
12	B					GND				V _R	V _{CCH}	I ₉	I _R	
13	C	V _F	V _R	V _R	V _R	GND					V _{CCH}	I ₁	-I _F	
14	C	V _R	V _F	V _R	V _R	GND					V _{CCH}	I ₂	-I _F	
15	C	V _R	V _R	V _F	V _R	GND					V _{CCH}	I ₃	-I _F	
16	C	V _R	V _R	V _R	V _F	GND					V _{CCH}	I ₄	-I _F	
17	C				GND	GND				V _F	V _{CCH}	I ₉	-I _F	
18	D					GND		GND			V _{CCL}	V ₆	V _{OH}	
19	E	GND				GND		GND	V _{OX}		V _{CCL}	I ₈	I _{OX}	
20	F					GND		GND			V _{PD}	I ₁₀	I _{PDH}	
21	F	GND				GND					V _{MAX}	I ₁₀	I _{MAX}	

FORCING FUNCTIONS (Temperature Range 0°C to +70°C)

	UNITS	0°C	+25°C	+70°C
V _{CCL}	Volts	5.00	5.00	5.00
V _{CCH}	Volts	5.00	5.00	5.00
V _{PD}	Volts		5.00	
V _{MAX}	Volts		8.00	
V _{IL}	Volts	1.20	1.10	.950
V _{IH}	Volts	2.00	1.90	1.80
V _R	Volts	4.00	4.00	4.00
V _F	Volts	0.45	0.45	0.50
I _{OL1}	Milliamps	150	150	150
I _{OL2}	Milliamps	8.0	8.0	7.5
V _{OX}	Volts	40.0	40.0	40.0

FAIRCHILD HYBRID CIRCUIT SH2002-P

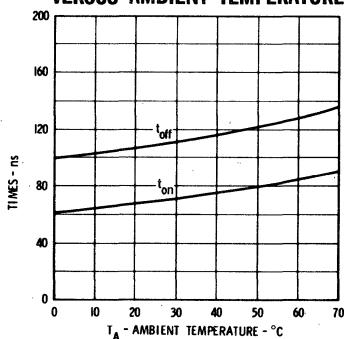
TEST LIMITS (Temperature Range 0°C to +70°C)

	UNITS	0°C		+25°C		+70°C	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
V_{OL1}	Volts		0.45		0.45		0.5
V_{OL2}	Volts		0.45		0.45		0.5
V_{OH}	Volts	2.05		1.95		1.85	
I_R	Microamp				5.0		10.0
$-I_F$	Milliamp		1.40		1.40		1.35
I_{OX}	Microamp				5.0		200
I_{PDH}	Milliamp				30.6		
I_{MAX}	Milliamp				34.0		

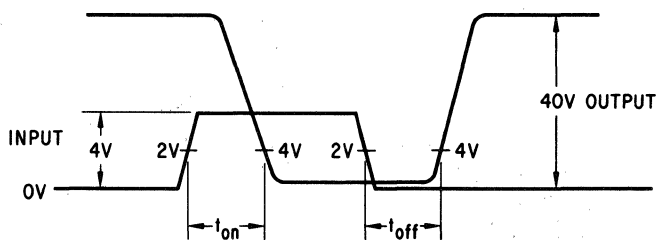
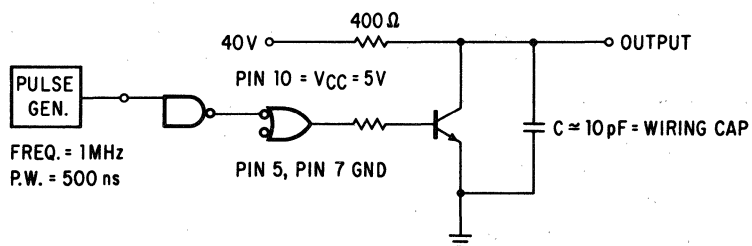
TABLE OF LTPD'S (These apply to test sequence page 2)

GROUP	0°C	+25°C	+70°C
A	15%	10%	15%
B		10%	15%
C	15%	10%	15%
D	15%	10%	15%
E		10%	15%
F		10%	15%

TYPICAL SWITCHING TIME VERSUS AMBIENT TEMPERATURE



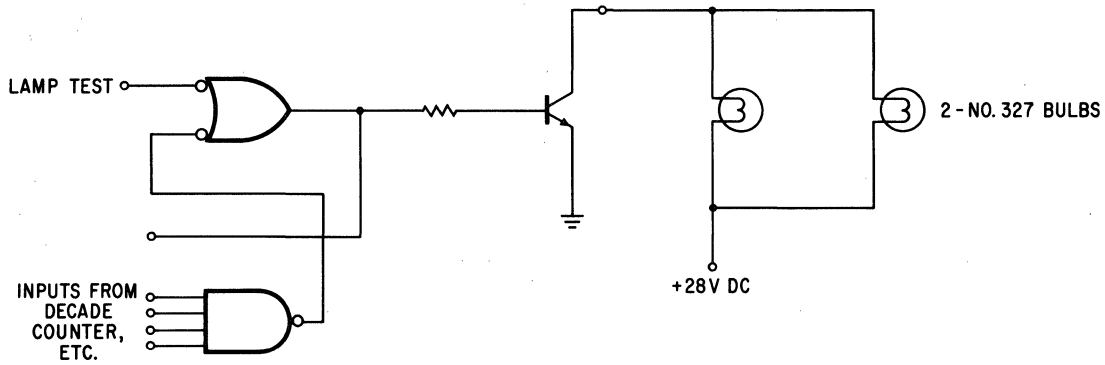
SWITCHING TIME TEST CONDITIONS



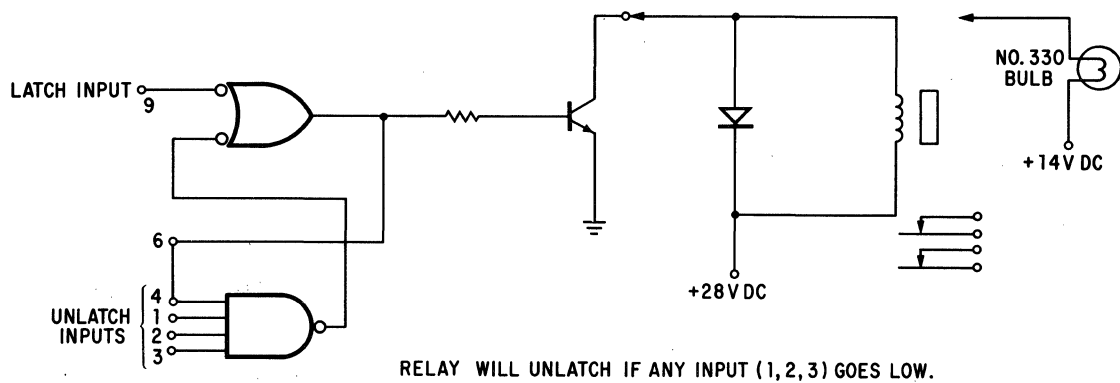
FAIRCHILD HYBRID CIRCUIT SH2002-P

APPLICATIONS

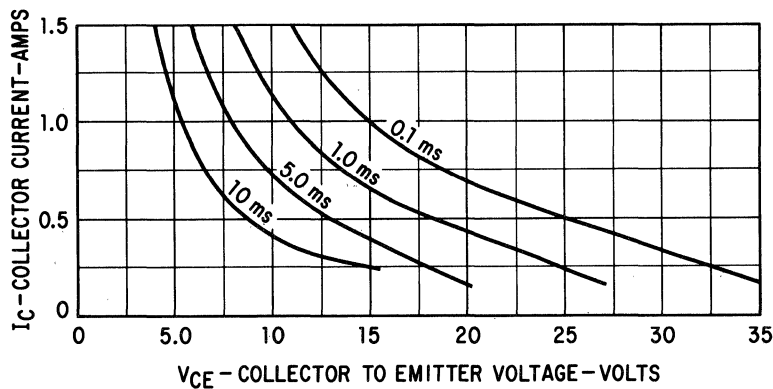
LAMP DRIVER—



LATCHING RELAY—OR FAULT LAMP DRIVER



OUTPUT TRANSFER PULSE SAFE OPERATING AREA



SH2100

HIGH CURRENT DRIVER

HYBRID CIRCUITS

GENERAL DESCRIPTION - The SH2100 Hybrid consists of a Buffer Micrologic® Integrated Circuit driving a high-current NPN Planar* Epitaxial Silicon Transistor.

*Planar is a patented Fairchild process.

- 135 mA CURRENT SINK
- INPUT COMPATIBLE WITH μL , $\text{MW}\mu\text{L}$, $\text{DT}\mu\text{L}$, AND $\text{CT}\mu\text{L}$
- OPERATES AT 12V
- FAN-OUT = 200 μLOGIC LOADS

ABSOLUTE MAXIMUM RATINGS (25°C Free Air Temperature unless otherwise noted)

Maximum Temperatures

Storage Temperature -65°C to +150°C

Operating Temperature -55°C to +125°C

Maximum Voltages

Maximum Voltage Applied to Pin 8 +12 Volts

Maximum Voltage Applied to Pin 3 ± 4 Volts

Maximum Voltage Applied to Pin 5 V_{CBO} +30 Volts

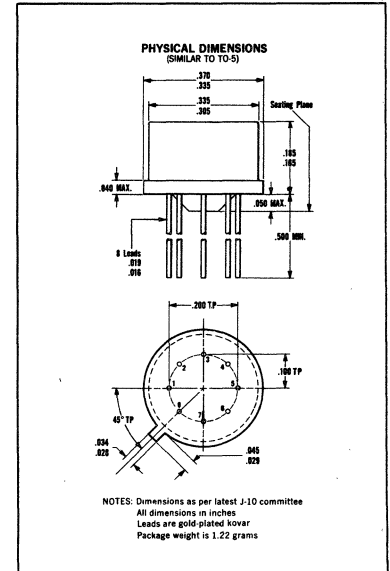
V_{CEO} +12 Volts

Maximum Total Power Dissipation at 25°C Ambient 500 mW

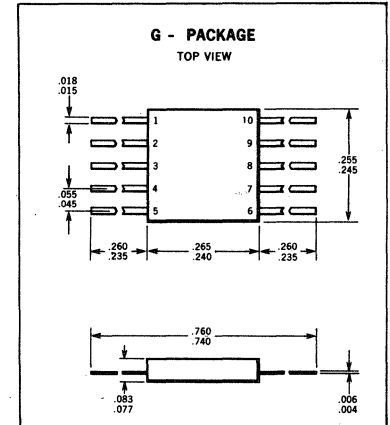
Typical Power Dissipation at 25°C Ambient 65 mW

Maximum Current Applied to Pin 5 500 mA

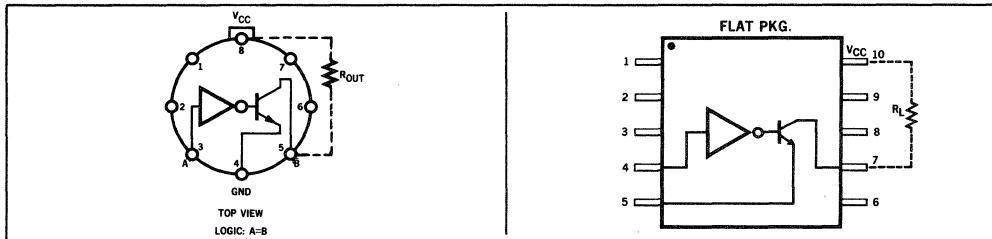
Maximum Fan-out ($R_{out} = 20 \Omega \pm 5\%$) into RTL Micrologic 200



PART NO. HXK21001XX -55°C TO +125°C
HXK21009XX 0°C TO +70°C



PART NO. HBG21001XX -55°C TO +125°C
HBG21009XX 0°C TO +70°C



DC ACCEPTANCE TEST CONDITIONS

Test No.	Test Title	Units	Test Conditions								Test Limits				
			Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Min.	Typ.	Max.		
1	I_3	mA			V_{IN}	GND						V_{CC}		$2I_{IN}$	
2	V_5	V			V_{OFF}	GND	V_{R_2}					V_{CC}		V_{out}	
3	I_5	mA			V_{ON}	GND	V_{max}					V_{max}		I_{CEX}	
4	t_{3+5+}				See Switching Time Test Circuit										80 nsec
5	t_{3-5-}				See Switching Time Test Circuit										70 nsec

FAIRCHILD HYBRID CIRCUITS SH2100

DC ACCEPTANCE TEST LIMITS

Symbol*	Test Tolerance	-55°C ± 2°C	25°C ± 2°C	+125°C ± 2°C
V _{CC}	± 0.010 V	3.00 V	3.00 V	3.00 V
V _{IN}	± 0.002 V	1.014 V	0.844 V	0.674 V
V _{ON}	± 0.002 V	1.014 V	0.815 V	0.674 V
V _{OFF}	± 0.002 V	0.710 V	0.565 V	0.320 V
V _{R2}	± 0.01 Ω	20 Ω	20 Ω	20 Ω
V _{out}		0.710 V	0.300 V	0.320 V
V _{max}	± 0.01 V	12.0 V	12.0 V	12.0 V
2I _{IN}		0.990 mA	0.870 mA	0.940 mA
I _{CEX}		0.100 mA	0.218 mA	0.235 mA

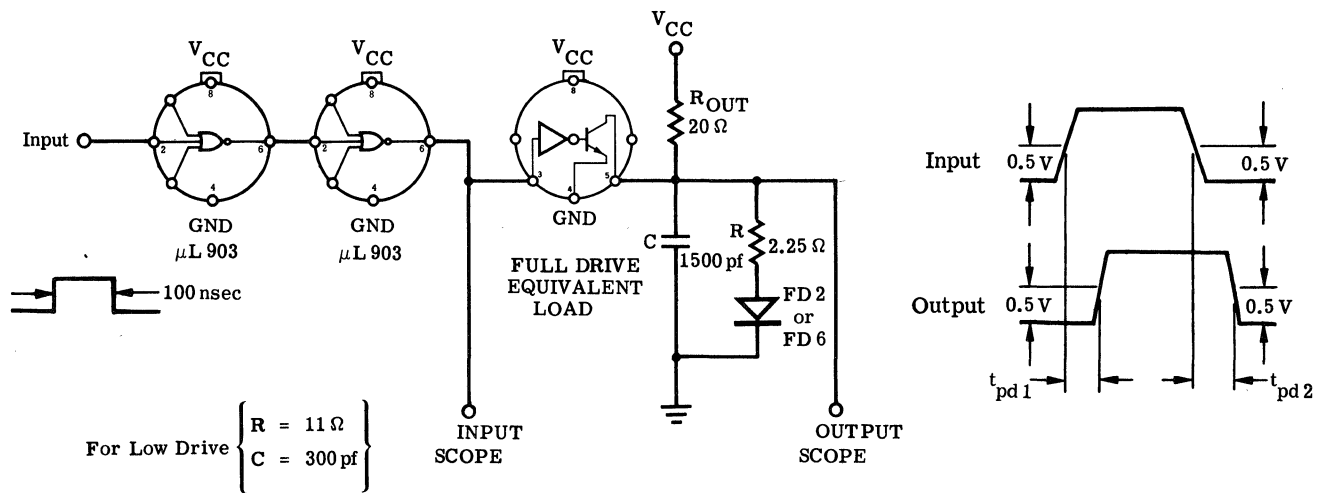
*For definition of the symbols refer to standard Fairchild Micrologic specification.

TESTS FOR END POINTS GROUP B 1, 2, 3

LTPD'S	Test 1	10% 25°C	15% -55° & +125°C
Group A	Test 2	10% 25°C	15% -55 & +125°C
	Test 3	10% 25°C	15% -55° & +125°C

NOTE: Fairchild Assured Customer Test Programs are identical to latest issue Epitaxial μLogic Tentative Specifications.

SWITCHING TIME TEST CIRCUIT



NOTE: FULL DRIVE IS EQUIVALENT TO FAN-OUT OF 200 MICROLOGIC GATES.
 LOW DRIVE IS EQUIVALENT TO FAN-OUT OF 40 MICROLOGIC GATES.

RULES FOR SELECTING VALUES OF R_{OUT}

(Applicable over -55°C to +125°C temperature range.)

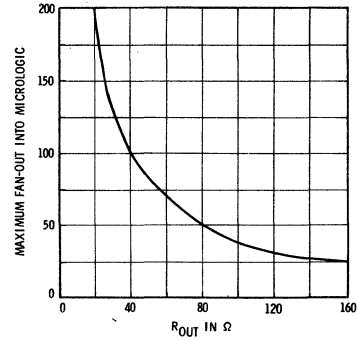
Primary consideration is to minimize overdrive to driven elements and reduce power drain.

A. MICROLOGIC Elements

$$R_{out}(\text{min}) = 20 \Omega \pm 5\%$$

$$R_{out} = \frac{4,000}{\text{Max Fan-out Used}} \Omega$$

FANOUT MAXIMUM VS. R_{OUT}

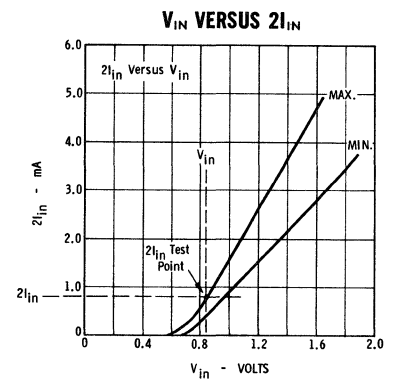
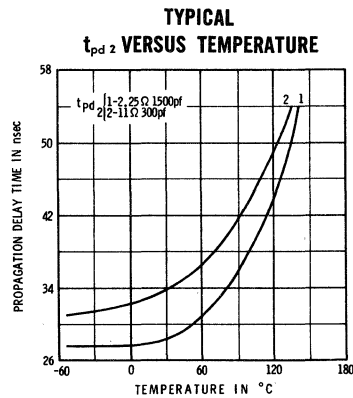
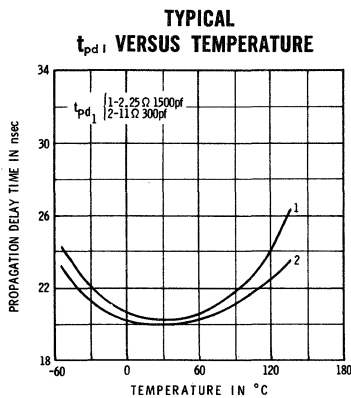
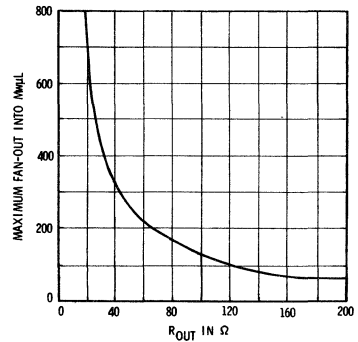


B. MWμL Elements

$$R_{out}(\text{min}) = 20 \Omega \pm 5\%$$

$$R_{out} = \frac{13,000}{\text{Max. Fan-out Used}} \Omega$$

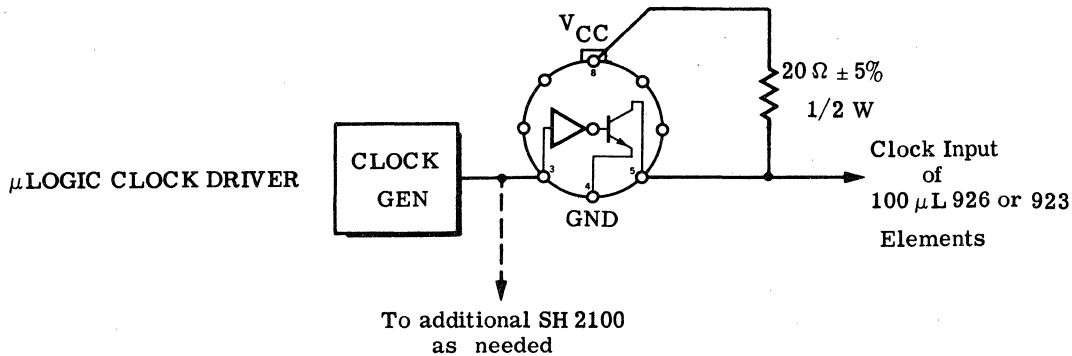
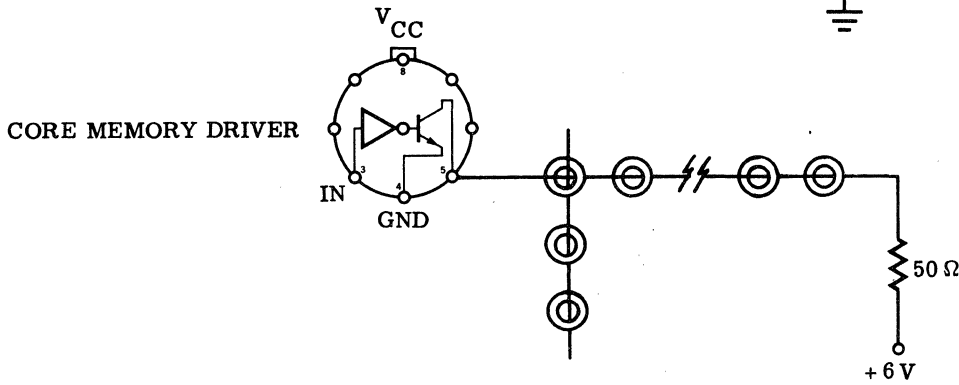
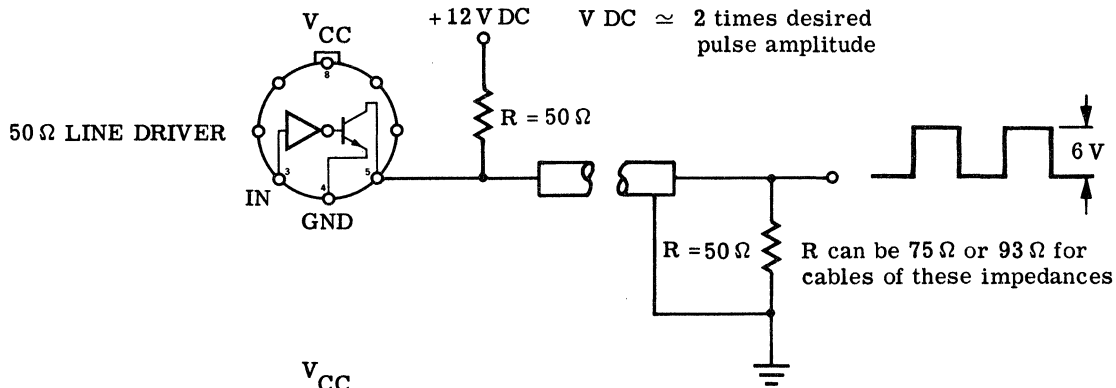
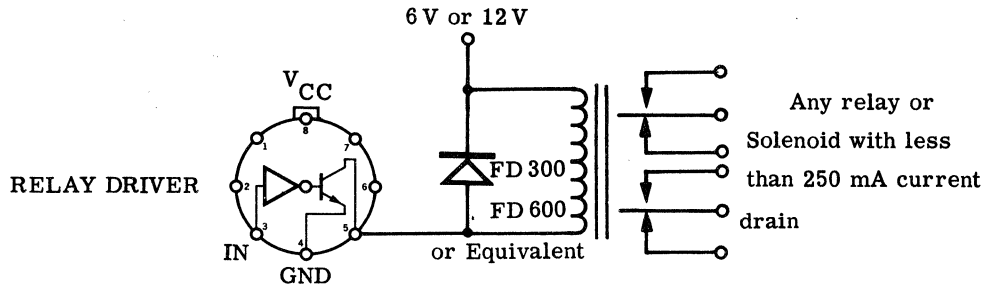
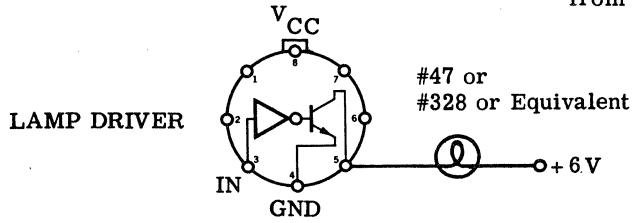
FANOUT MAXIMUM VS. R_{OUT}



FAIRCHILD HYBRID CIRCUITS SH2100

APPLICATIONS-When driven from standard MICROLOGIC

Input Loading = 2 when driven
Factor from Micrologic
= 6.0 when driven
from MW μ L



SH2101

HIGH VOLTAGE DRIVER

HYBRID CIRCUITS

GENERAL DESCRIPTION - The Fairchild SH2101 Hybrid High-Voltage Driver consists of an Integrated 4-input Milliwatt RT μ L Gate driving a High-Voltage Transistor.

- 100 VOLT OUTPUT-CAN SINK TO 10 mA
- INPUT COMPATIBLE WITH μ L, MILLIWATT RT μ L, DT μ L, AND CT μ L
- FULL -55°C TO +125°C TEMPERATURE OPERATION
- APPLICATIONS INCLUDE NEON BULB AND GAS READOUT TUBE DRIVER AND HIGH VOLTAGE INTERFACING

ABSOLUTE MAXIMUM RATINGS (25°C Free Air Temperature)

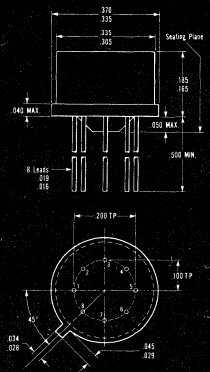
Maximum Voltage Applied to Pin 8 (continuous)	+8.0 Volts
Maximum Voltage Applied to any Input Pin (continuous)	± 4.0 Volts
Maximum Voltage Applied to Pin 6 (continuous)	+100 Volts
Maximum Voltage Applied to Pin 8 (pulsed \leq 1 second)	+12 Volts
Maximum Storage Temperature	-65°C to +150°C
Maximum Operating Temperature	-55°C to +125°C
Maximum Power Dissipation	250 mW

OPERATING VOLTAGE RANGE

V_{CC} (Pin 8) = +3.0 \pm 10% to +4.0 \pm 10% Volts

V_H (Pin 6) < +100 Volts

PHYSICAL DIMENSIONS
(SIMILAR TO T-5)

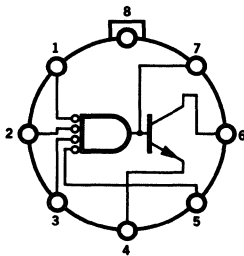


NOTES: Dimensions as per latest JS-10 committee.
All dimensions in inches.
Leads are gold-plated kovar.
Package weight is 1.12 grams.

PART NO. HXK2101TXX

T=1 FOR -55°C TO +125°C TEMP. RANGE
T=9 FOR 0°C TO +70°C TEMP. RANGE

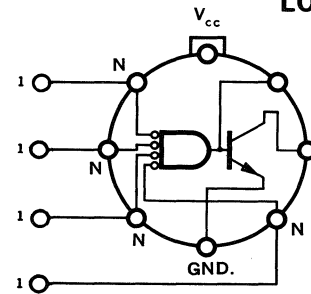
LOGIC SYMBOL



NEGATIVE LOGIC: 6 = 1 · 2 · 3 · 5
POSITIVE LOGIC: 6 = 1 + 2 + 3 + 5

PIN 7 IS AN EXPANDER INPUT. ADDITIONAL PAIRS OF INPUTS MAY BE ADDED USING THE MILLIWATT RT μ L EXPANDER, FOLLOWING THE LOADING RULES SHOWN ON THE MILLIWATT RT μ L 921 DATA SHEET.

LOAD CHART



DRIVEN BY
MILLIWATT RT μ L
 μ L
CT μ L

DRIVEN BY
DT μ L GATE
BUFFER

N (EQUIV. INPUT LOAD)
1
1/3
1/3

NO. OF SH-2101 ALLOWED
3 MAX WITH NO DT μ L FANOUT
10 MAX WITH NO DT μ L FANOUT
1 MAX WITH SPECIFIED DT μ L FANOUT

FAIRCHILD HYBRID CIRCUIT SH2101

Test No.	Test Title	Units	TEST CONDITIONS								TEST LIMITS		
			Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Min.	Typ.	Max.
1	I_1	mA	V_{IN}	V_{BOT}	V_{BOT}	GND	V_{BOT}				V_{CC}		I_{IN}
2	I_2	mA	V_{BOT}	V_{IN}	V_{BOT}	GND	V_{BOT}				V_{CC}		I_{IN}
3	I_3	mA	V_{BOT}	V_{BOT}	V_{IN}	GND	V_{BOT}				V_{CC}		I_{IN}
4	I_5	mA	V_{BOT}	V_{BOT}	V_{BOT}	GND	V_{IN}				V_{CC}		I_{IN}
5	V_6	mV	V_{OFF}	V_{OFF}	V_{OFF}	GND	V_{OFF}	I_{OL}			V_{CC}		V_{OL}
6	I_6	μA	V_{ON}	GND	GND	GND	GND	V_H			V_{CC}		I_{OX}
7	I_6	μA	GND	V_{ON}	GND	GND	GND	V_H			V_{CC}		I_{OX}
8	I_6	μA	GND	GND	V_{ON}	GND	GND	V_H			V_{CC}		I_{OX}
9	I_6	μA	GND	GND	GND	GND	V_{ON}	V_H			V_{CC}		I_{OX}
10	t_{1-6-}	nsec	Pulse in	GND	GND	GND	GND		Pulse out		V_{CC}		200
11	t_{1+6+}	nsec	Pulse in	GND	GND	GND	GND		Pulse out		V_{CC}		160

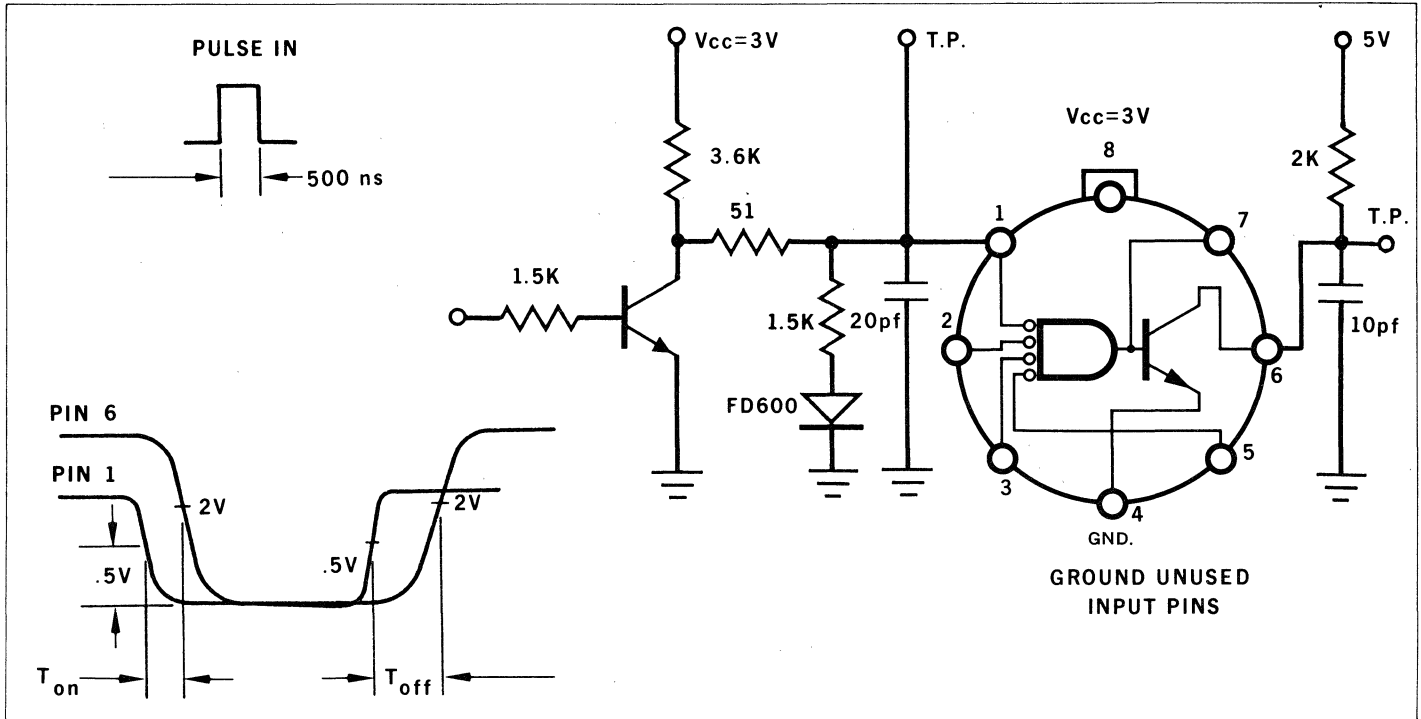
DC TEST LIMITS		-55°C	+25°C	+125°C
V_{CC}	V	3.00 ± 0.01	3.00 ± 0.01	3.00 ± 0.01
V_{BOT}	V	1.80 ± 0.01	1.80 ± 0.01	1.80 ± 0.01
V_{IN}	mV	970 ± 2	805 ± 2	590 ± 2
V_{ON}	mV	935 ± 2	750 ± 2	555 ± 2
V_{OFF}	mV	650 ± 2	450 ± 2	260 ± 2
I_{IN}	μA	125	130	110
V_H	V	100 ± 1	100 ± 1	100 ± 1
V_{OL}	mV	220	220	320
I_{OX}	μA	5	5	40
I_{OL}	mA	10 ± 0.1	10 ± 0.1	10 ± 0.1

SYMBOLS AND DEFINITIONS

- V_{CC} Supply Voltage
- V_{ON} Minimum threshold voltage which will insure an off output transistor.
- V_{IN} Input voltage used to measure maximum I_{IN} required to define fan-in.
- V_{BOT} Voltage level sufficient to insure full saturation of remaining input transistors for measurement of worst case input loading.
- V_{OFF} The maximum voltage which may be applied to an input terminal without turning on the transistor.
- I_{IN} The current drawn from the V_{IN} supply by one input of a gate with a fan-in of two or more.
- V_{OL} Maximum saturated output voltage when V_{OFF} voltage is applied at all inputs and I_{OL} is supplied to output collector.
- I_{OX} Collector leakage current when V_{ON} is applied to one input and V_H is applied to output collector.
- I_{OL} Output transistor collector current.
- V_H Voltage applied to output collector to measure I_{OX} .

FAIRCHILD HYBRID CIRCUIT SH2101

SWITCHING TIME TEST CIRCUIT



TYPICAL ELECTRICAL CHARACTERISTICS

FIG. 1
TYPICAL SWITCHING TIMES

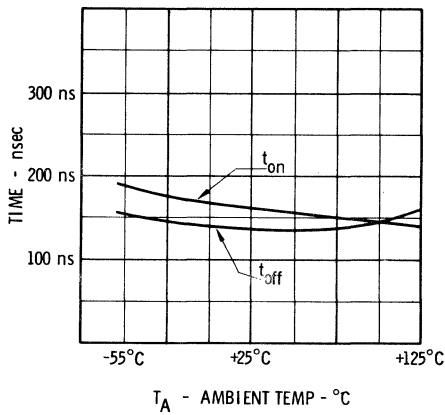
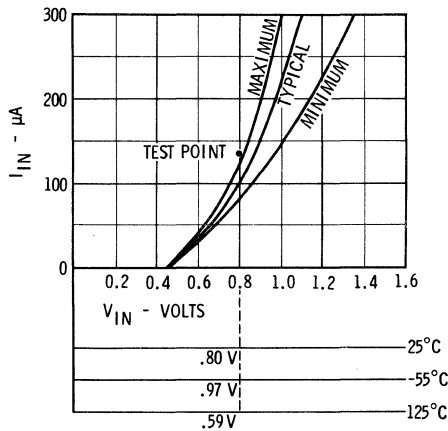
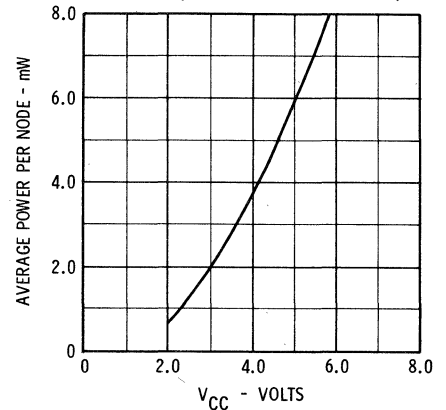


FIG. 2
TYPICAL INPUT CHARACTERISTICS



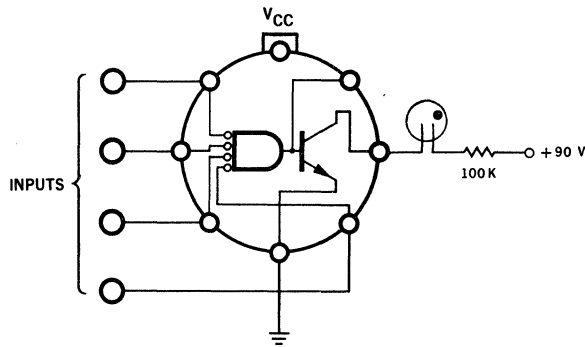
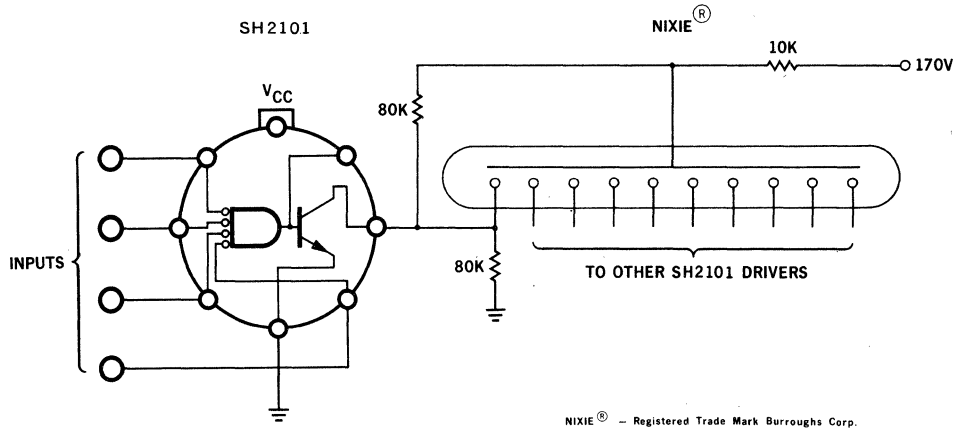
NOTE: This curve will apply as V_{CC} is increased from 3V to 5V with small decrease in I_{IN} for same V_{IN} .

FIG. 3
TYPICAL POWER DISSIPATION VS. V_{CC} (FOR OPEN OUTPUT)



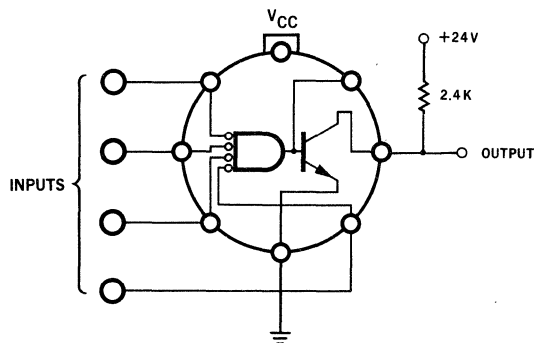
FAIRCHILD HYBRID CIRCUIT SH2101

TYPICAL APPLICATION



NEON GLOW LAMP DRIVER

**NOTE: LAMP LIGHTS ONLY
WHEN ALL INPUTS ARE LOW**



INTERFACE GATE — MICROLOGIC TO 24 VOLT LOGIC

**NOTE: FOR 12 VOLT CIRCUITS —
USE 1.2K RESISTOR AND +12 VOLT SUPPLY
FOR DT_μL AND TT_μL CIRCUITS
USE 2K RESISTOR AND +5 VOLT SUPPLY**

SH3000

HIGH IMPEDANCE, WIDEBAND DC AMPLIFIER

FAIRCHILD HYBRID CIRCUITS

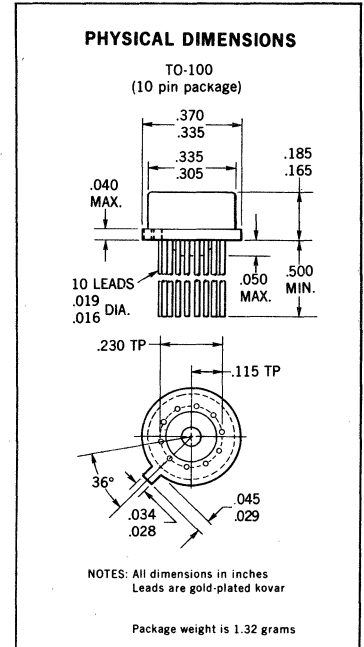
GENERAL DESCRIPTION - The SH 3000 Hybrid consists of a pair of high-gain, matched transistors connected as emitter-followers at the inputs of a μ A 702A operational amplifier.

FEATURES

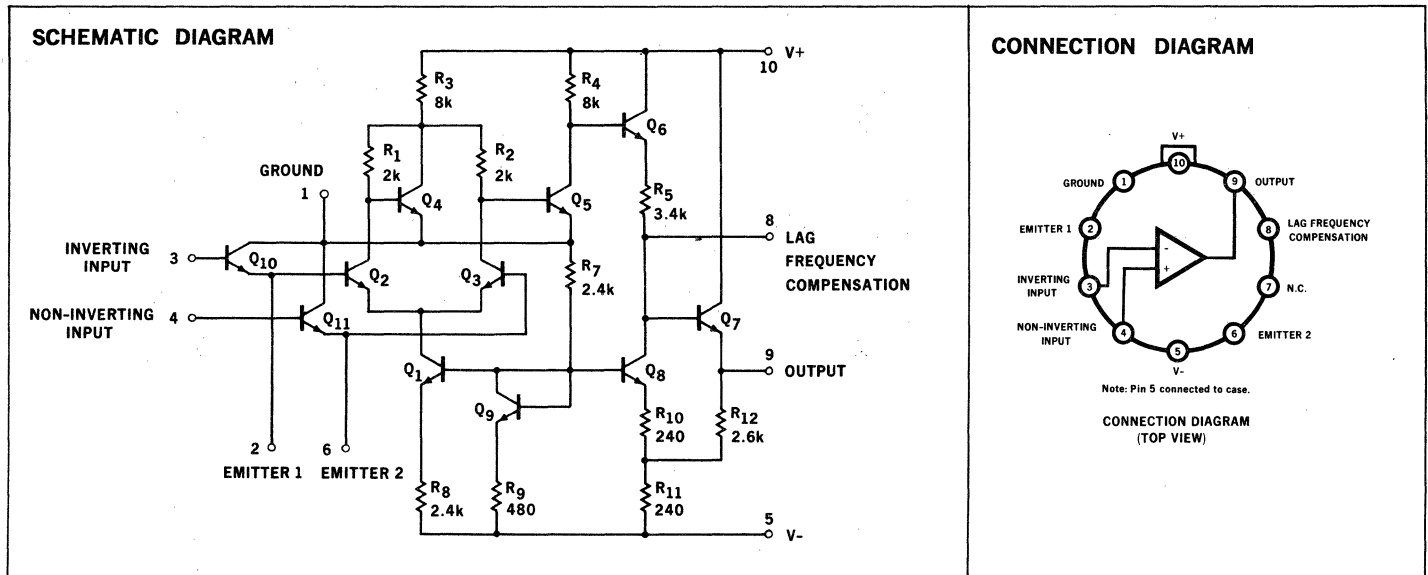
- 5 M Ω TYPICAL INPUT IMPEDANCE
- 0.3 μ A TYPICAL INPUT BIAS CURRENT
- DC TO 30 MHz USEFUL BANDWIDTH
- LATCH-UP PROTECTED
- -55°C TO +125°C TEMPERATURE RANGE

ABSOLUTE MAXIMUM RATINGS (Note 1)

Total Supply Voltage Between V ⁺ and V ⁻ Terminals	21 Volts
Peak Load Current	50 mA
Input Voltage	+0.5 V to -6.0 V
Differential Input Voltage	± 5 Volts
Internal Power Dissipation (Note 1)	300 mW
Operating Temperature Range	-55°C to +125°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 60 seconds)	300°C



PART NO. HAG30001XX:
-55°C TO +125°C



NOTE 1: Rating applies for case temperatures to +125°C; derate linearity at 5.6 mW/°C for ambient temperatures above +125°C.



FAIRCHILD LINEAR INTEGRATED CIRCUITS SH3000

ELECTRICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, $V^+ = 12\text{V}$, $V^- = -6.0\text{V}$, $R_{E1} = R_{E2} = 200\text{k}$ unless otherwise noted)

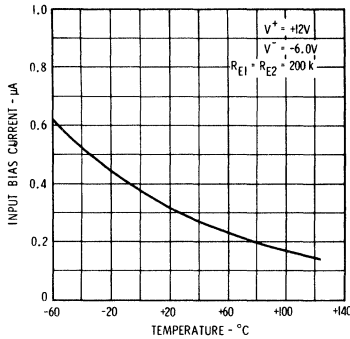
Parameter	Conditions	Min.	Typ.	Max.	Units
Input Offset Voltage	$R_S \leq 20\text{k}$		2.0	6.0	mV
Input Offset Current			35	100	nA
Input Bias Current			300	750	nA
Input Resistance		1.0	5.0		m Ω
Input Voltage Range		-3.5		0	V
Common Mode Rejection Ratio	$R_S \leq 20\text{k}$, $f \leq 1\text{kHz}$	70	80		dB
Voltage Gain		1400	2600		
Output Voltage Swing	$R_L \geq 100\text{k}$	± 5.0	± 5.3		V
Supply Voltage Rejection Ratio			75		$\mu\text{V/V}$
Power Consumption			70	120	mW

The following Specifications apply for $-55^\circ\text{C} \leq +125^\circ\text{C}$:

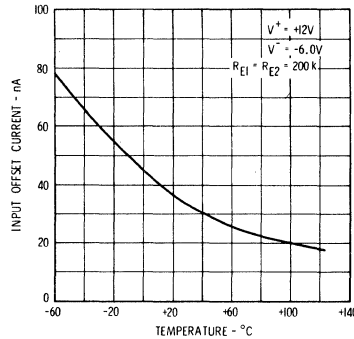
Input Offset Voltage	$R_S \leq 20\text{k}$			7.5	mV
Voltage Gain		1000			
Input Offset Current	$T_A = +125^\circ\text{C}$			100	nA
Input Offset Current	$T_A = -55^\circ\text{C}$			200	nA
Input Bias Current	$T_A = -55^\circ\text{C}$			1.0	μA
Average Temperature Coefficient of Input Offset Voltage			7.5		$\mu\text{V}/^\circ\text{C}$

TYPICAL PERFORMANCE CURVES

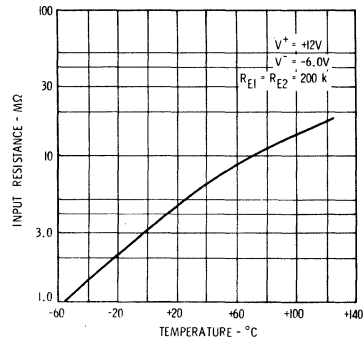
INPUT BIAS CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



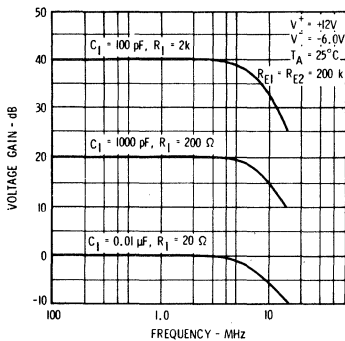
INPUT OFFSET CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



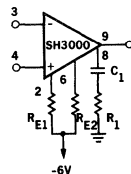
INPUT RESISTANCE AS A FUNCTION OF AMBIENT TEMPERATURE



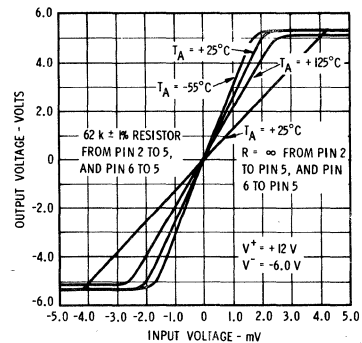
FREQUENCY RESPONSE FOR VARIOUS CLOSED-LOOP GAINS



FREQUENCY COMPENSATION CIRCUIT



VOLTAGE TRANSFER CHARACTERISTIC



SH 3001

ANALOG SWITCH

FAIRCHILD HYBRID CIRCUITS

- INPUTS CCSL COMPATIBLE
- mW MICROLOGIC AND MICROLOGIC COMPATIBLE INPUTS
- LOW FEED THROUGH SPIKES ON THE OUTPUT
- TYPICAL t_{on} -- 145 ns LOADED
- APPLICATIONS -- SCANNING, MULTIPLEXING, A/D CONVERSION, 4-POLE ST NORMALLY OPEN RELAY OR CHOPPER

ABSOLUTE MAXIMUM RATINGS

Maximum Temperatures

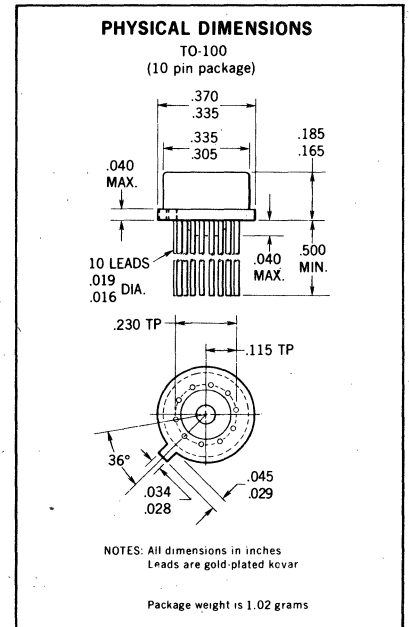
Storage Temperature	-65°C to +150°C
Operating Temperature	-55°C to +125°C

Maximum Power Dissipation

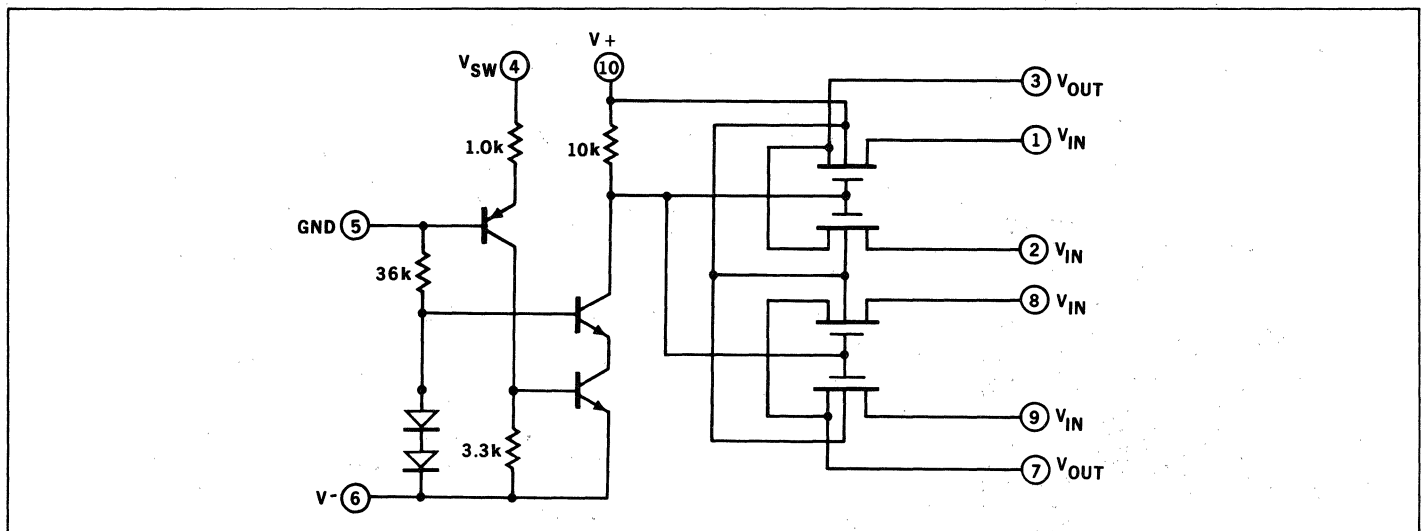
at 25°C Case	500 mW
at 25°C Ambient	350 mW

Maximum Voltages and Current

V_{in} (Pins 1, 2, 8 & 9)	± 10 V
V_{out} (Pins 3 & 7)	± 10 V
V^+ (Pin 10)	+11 V
V^- (Pin 6)	-22 V
I_{in}, I_{out}	100 mA
V_{switch} (Pin 4)	± 6 V



PART NO. HAG 30011XX



Electrical Characteristics on page 2

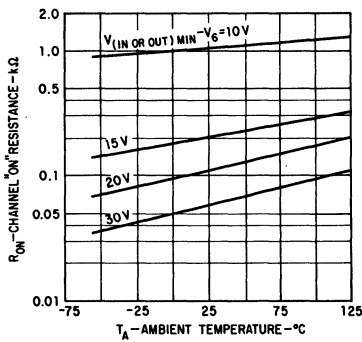
FAIRCHILD HYBRID CIRCUITS SH 3001

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, $V^+ = 10\text{ V}$, $V^- = -20\text{ V}$ Unless Otherwise Specified)

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Conditions
I_{SWH}	High Switch Drive Current (On)		0.4		mA	$T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$
V_{SWL}	Low Switch Drive Voltage (Off)		0.6		V	$T_A = 25^\circ\text{C}$
V_{SWL}	Low Switch Drive Voltage (Off)		0.5		V	$T_A = -55^\circ\text{C}$, $+125^\circ\text{C}$
$R_{ON}/\text{channel}$	Channel On Resistance	120	200		Ω	$I_{SW} = 0.4\text{ mA}$, $I_{in} = 1.0\text{ mA}$ $V_{out} = 0.0\text{ V}$
I_{OFF}	Channel Off Leakage Current		1.0		nA	$V_{SW} = 0.6\text{ V}$
I_{OFF}	Channel Off Leakage Current		1.0		μA	$V_{SW} = 0.5\text{ V}$, $T_A = +125^\circ\text{C}$
V_{IN}	Analog Peak Signal Input		± 10		V	$I_{IN} = 0$, $T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$
$-I_6$	Negative Supply Current	4.4	6.0		mA	$I_{SW} = 0.4\text{ mA}$, $T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$
$C_{IN}/\text{channel}$	Channel Input Capacitance	3.5			pF	$V_{SW} = 0.0\text{ V}$, $V_{IN} = 0.0\text{ V}$
C_{OUT}	Channel Output Capacitance	5.0			pF	$V_{SW} = 0.0\text{ V}$, $V_{OUT} = 0.0\text{ V}$
t_{on}^+	Switch Turn-On Time	145	180		ns	See Figures 1 & 2
t_{on}^-	Switch Turn-On Time	230	280		ns	See Figures 1 & 3
t_{off}^+	Switch Turn-Off Time	580	600		ns	See Figures 1 & 2
t_{off}^-	Switch Turn-Off Time	270	300		ns	See Figures 1 & 3

TYPICAL ELECTRICAL CHARACTERISTICS

CHANNEL "ON" RESISTANCE VERSUS TEMPERATURE



CHANNEL "ON" RESISTANCE VERSUS $V_{(IN OR OUT) MIN} - V_6$

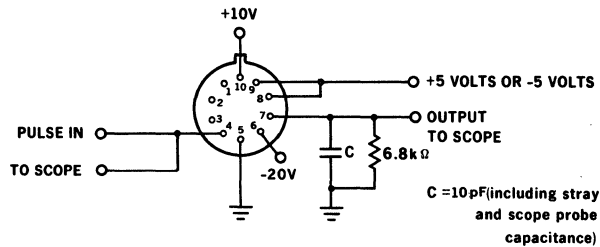
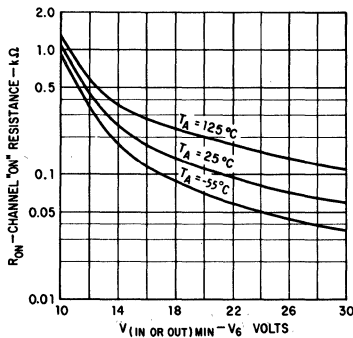


FIGURE 1

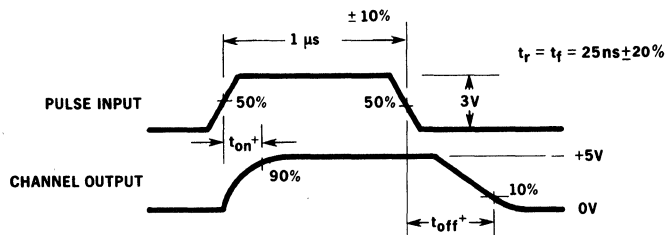


FIGURE 2

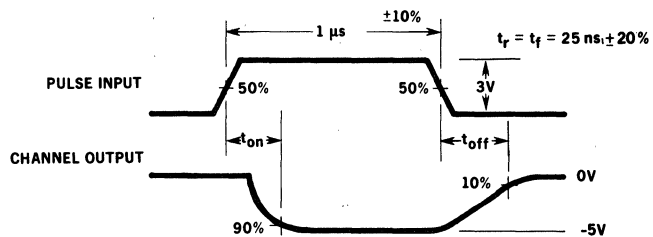


FIGURE 3

SH3002

SPDT ANALOG SWITCH

FAIRCHILD HYBRID CIRCUITS

- INPUTS CCSL COMPATIBLE
- MW MICROLOGIC® AND MICROLOGIC® COMPATIBLE INPUTS
- LOW FEED THROUGH SPIKES ON THE OUTPUT
- TYPICAL t_{on} — 120 ns
- APPLICATIONS: SERIES SHUNT CHOPPERS, A/D CONVERSION SINGLE POLE DT RELAYS, MULTIPLEXING OR SCANNING

ABSOLUTE MAXIMUM RATINGS

Maximum Temperatures

Storage Temperature
Operating Temperature

-65°C to +150°C
-55°C to +125°C

Maximum Power Dissipation

at 25°C Case
at 25°C Ambient

500 mW
350 mW

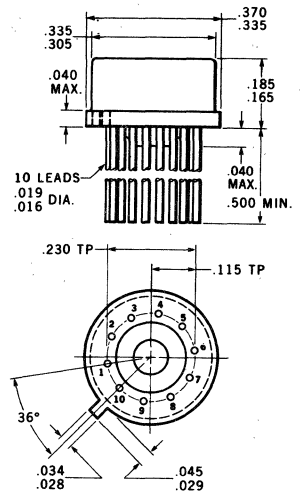
Maximum Voltages and Current

V_{in} (Pins 1, 2, 8 & 9)
 V_{out} (Pins 3 & 7)
 V^+ (Pin 10)
 V^- (Pin 6)
 I_{in}, I_{out}
 V_{switch} (Pin 4)

±10 V
±10 V
+11 V
-22 V
100 mA
±6 V

PHYSICAL DIMENSIONS

(in accordance with JEDEC TO-100)



NOTES:
All dimensions in inches
Leads are gold-plated Kovar
Package weight is 1.02 grams

PART NO. HAG30021XX

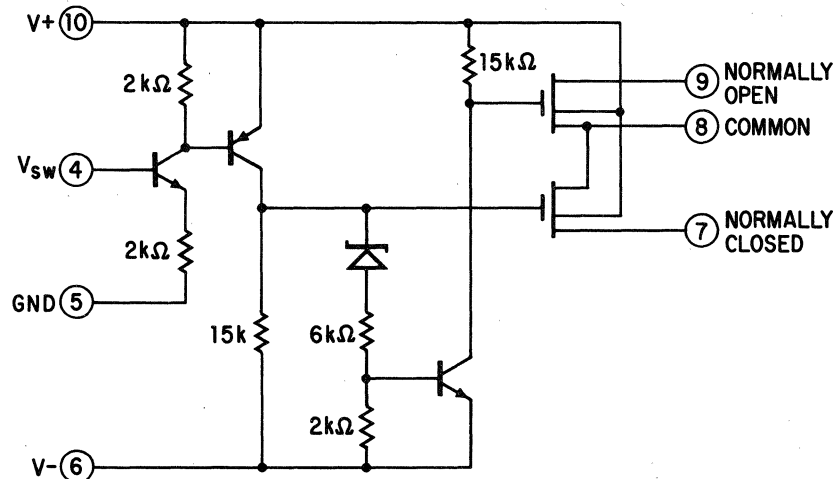


FIG. 1.

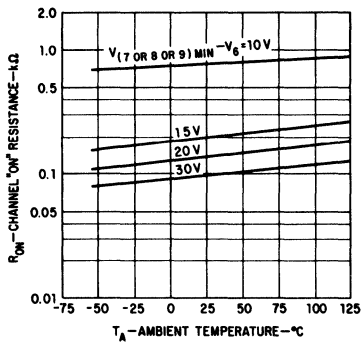
FAIRCHILD HYBRID CIRCUITS SH3002

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, $V^+ = 10\text{V}$, $V^- = -20\text{V}$ unless otherwise specified)

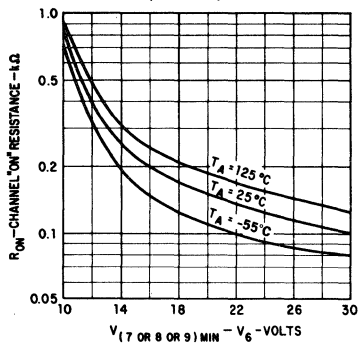
SYMBOL	CHARACTERISTICS	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
V_{SWH}	High Switch Drive Voltage	2.5			V	$T_A = 25^\circ\text{C}$, $T_A = 125^\circ\text{C}$
V_{SWH}	High Switch Drive Voltage	2.6			V	$T_A = -55^\circ\text{C}$
V_{SWL}	Low Switch Drive Voltage			0.8	V	$T_A = 125^\circ\text{C}$
V_{SWL}	Low Switch Drive Voltage			1.1	V	$T_A = -55^\circ\text{C}$, $T_A = 25^\circ\text{C}$
$R_{ON}/\text{channel}$	Channel "ON" Resistance		140	200	Ω	$I_{\text{common}} = 1.0\text{mA}$ V_7 or $V_9 = 0.0\text{V}$
I_{OFF}	Channel "OFF" Leakage Current			1.0	nA	$T_A = 25^\circ\text{C}$
I_{OFF}	Channel "OFF" Leakage Current			1.0	μA	$T_A = 125^\circ\text{C}$
V_{IN}	Analog Peak Signal Input			± 10	V	$I_{\text{CHNL}} = 0$, $T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$
I_{10}	Positive Supply Current			8.0	mA	$V_{SWH} = 4.0\text{V}$, $T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$
$C_{\text{IN}}/C_{\text{HWL}}$	Channel Input Capacitance		3.5		pF	Channel Off, V_7 or $V_9 = 0.0\text{V}$
C_{OUT}	Channel Output Capacitance		5.0		pF	Channel Off, V_7 or $V_9 = 0.0\text{V}$
$t_{\text{on}+}$	Switch Turn-on Time (Pin 9)		120	150	ns	See Figures 2 and 3
$t_{\text{off}+}$	Switch Turn-off Time (Pin 7)		430	500	ns	See Figures 2 and 3
$t_{\text{on}-}$	Switch Turn-on Time (Pin 9)		130	160	ns	See Figures 2 and 4
$t_{\text{off}-}$	Switch Turn-off Time (Pin 7)		300	340	ns	See Figures 2 and 4
$t_{\text{on}+}$	Switch Turn-on Time (Pin 9)		1.6	1.9	μs	See Figures 2 and 3
$t_{\text{off}+}$	Switch Turn-off Time (Pin 7)		1.35	2.0	μs	See Figures 2 and 3
$t_{\text{on}-}$	Switch Turn-on Time (Pin 9)		1.5	1.7	μs	See Figures 2 and 4
$t_{\text{off}-}$	Switch Turn-off Time (Pin 7)		1.6	2.5	μs	See Figures 2 and 4

TYPICAL ELECTRICAL CHARACTERISTICS

CHANNEL "ON" RESISTANCE VERSUS TEMPERATURE



CHANNEL "ON" RESISTANCE VERSUS $V_{(7 \text{ or } 8 \text{ or } 9) \text{ MIN}} - V_6$



SWITCHING TEST CIRCUIT

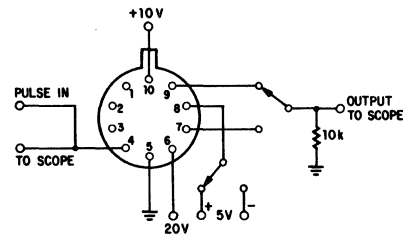


Fig. 2.

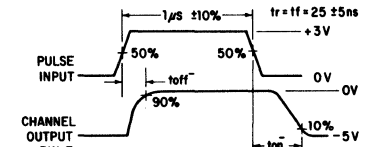
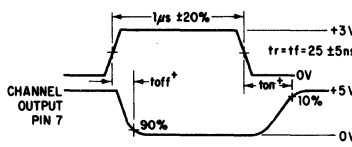
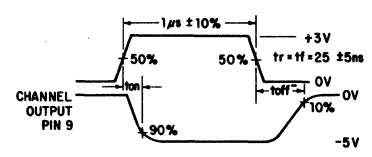
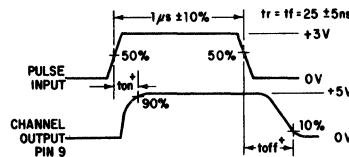


Fig. 3.

Fig. 4.

SH3005 HIGH IMPEDANCE DIFFERENTIAL COMPARATOR

FAIRCHILD HYBRID CIRCUITS

GENERAL DESCRIPTION - The SH 3005 consists of a pair of high current gain, matched transistors connected as emitter followers at the inputs of a $\mu A 710$ comparator.

FEATURES

- 2 M Ω INPUT IMPEDANCE
- 0.8 μA INPUT BIAS CURRENT
- -55°C TO +125°C TEMPERATURE RANGE

APPLICATIONS

- Variable Threshold Schmitt Trigger
- Pulse Height Discriminator
- High Noise Immunity Line Receiver
- Memory Sense Amplifier

ABSOLUTE MAXIMUM RATINGS (Note 1)

Positive Supply Voltage

+14.0 Volts

Negative Supply Voltage

-7.0 Volts

Peak Output Current

10 mA

Differential Input Voltage

± 5.0 Volts

Input Voltage

± 7.0 Volts

Internal Power Dissipation

300 mW

TO-5 (Note 1)

Flat Package (Note 2)

200 mW

Operating Temperature Range

-55°C to +125°C

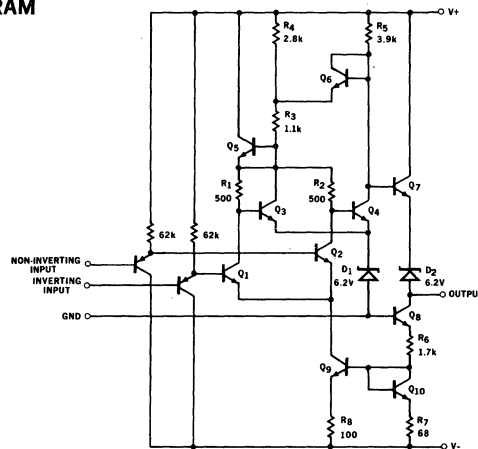
Storage Temperature Range

-65°C to +150°C

Lead Temperature (Soldering, 60 seconds)

300°C

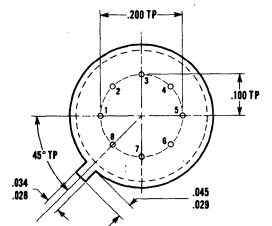
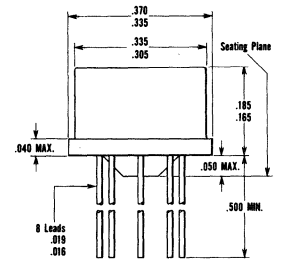
SCHEMATIC DIAGRAM



Notes on page 2
Electrical Characteristics on page 2

PHYSICAL DIMENSIONS

(TO-99)



NOTES: Dimensions as per latest J-10 committee
All dimensions in inches
Leads are gold-plated kovar
Package weight is 1.22 grams

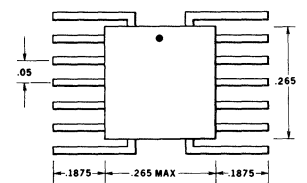
PART NO. HXK30051XX: -55°C TO +125°C

PART NO. HXK30059XX: 0°C TO +70°C

PHYSICAL DIMENSIONS

TYPICAL FLAT PACKAGE

TOP VIEW



PART NO. HBG30051XX: -55°C TO +125°C

PART NO. HBG30059XX: 0°C TO +70°C

FAIRCHILD
SEMICONDUCTOR
A DIVISION OF FAIRCHILD CAMERA AND INSTRUMENT CORPORATION

FAIRCHILD HYBRID CIRCUIT SH3005

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, $V^+ = 12.0\text{ V}$, $V^- = -6.0\text{ V}$ Unless Otherwise Specified)

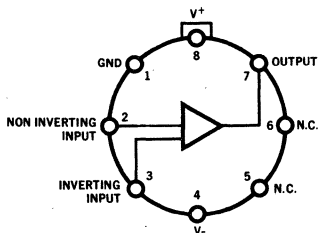
Parameter (see definitions)	Conditions	Min.	Typ.	Max.	Units
Input Offset Voltage	$V_{out} = +1.4\text{ V}$, $R_S \leq 20\text{ k}$			7.0	mV
Input Offset Current	$V_{out} = +1.4\text{ V}$		0.3	0.4	μA
Input Bias Current			0.8	2.0	μA
Voltage Gain		750	1500		
Output Resistance			200		
Input Voltage Range	$V^- = -7.0\text{ V}$	± 5.0			V
Differential Input Voltage Range		± 5.0			V
Positive Output Level	$V_{in} \geq 15\text{ mV}$, $0 \leq I_O \leq 0.5\text{ mA}$	+2.5	+3.2	+4.0	V
Negative Output Level	$V_{in} \geq 15\text{ mV}$	-1.0	-0.5	0	V
Output Sink Current	$V_{in} \geq 15\text{ mV}$, $V_{out} \geq 0$	1.6	2.5		mA
Positive Supply Current	$V_{out} \leq 0$		6.4		mA
Negative Supply Current			5.5		mA
Power Consumption					
TO-5 Package			110	175	mW
The following specifications apply for $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$:					
Input Offset Voltage (Note 4)	$R_S \leq 20\text{ k}$			8.5	mV
Input Offset Current (Note 4)				1.0	μA
Input Bias Current				5.0	μA
Temperature Coefficient of Input Offset Voltage (Note 4)			7.0		$\mu\text{V}/^\circ\text{C}$
Voltage Gain		500			

NOTES:

- (1) Rating applies for case temperatures to $+125^\circ\text{C}$; derate linearly at $5.6\text{ mW}/^\circ\text{C}$ for ambient temperature above $+105^\circ\text{C}$.
- (2) Derate linearly at $4.4\text{ mW}/^\circ\text{C}$ for case temperatures above $+115^\circ\text{C}$; derate linearly at $3.3\text{ mW}/^\circ\text{C}$ for ambient temperatures above $+100^\circ\text{C}$.
- (3) The response time specified (see definitions) is for a 100-mV input step with 5-mV overdrive.
- (4) The input offset voltage (see definitions) is specified for a logic threshold voltage of 1.8 V at -55°C , 1.4 V at $+25^\circ\text{C}$ and 1.0 V at $+125^\circ\text{C}$.

TO-5 CONNECTION DIAGRAM

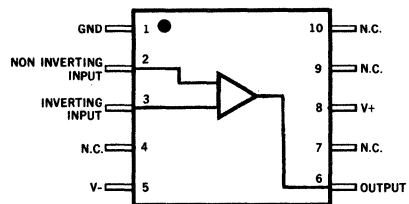
(TOP VIEW)



Note: Pin 4 connected to case

FLAT PACKAGE CONNECTION DIAGRAM

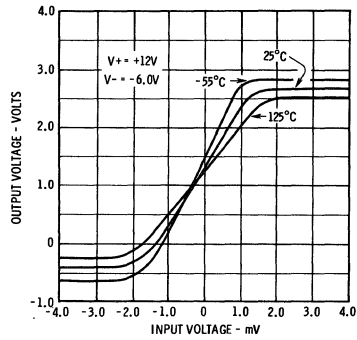
(TOP VIEW)



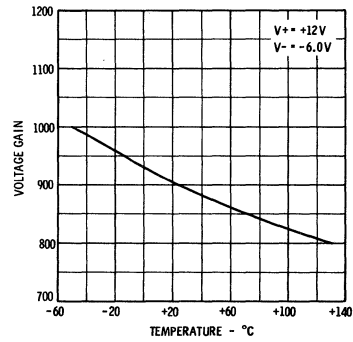
FAIRCHILD HYBRID CIRCUIT SH3005

TYPICAL PERFORMANCE CURVES

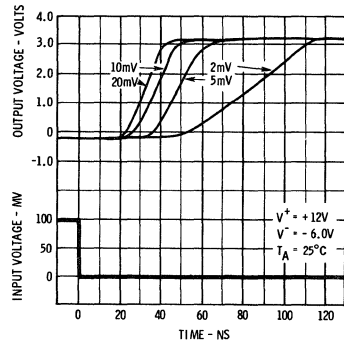
VOLTAGE TRANSFER CHARACTERISTIC



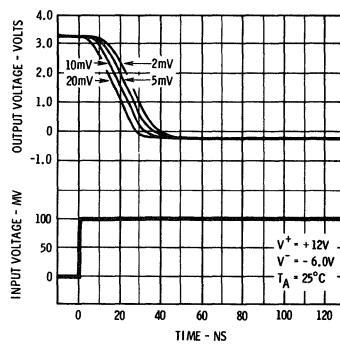
VOLTAGE GAIN AS A FUNCTION OF AMBIENT TEMPERATURE



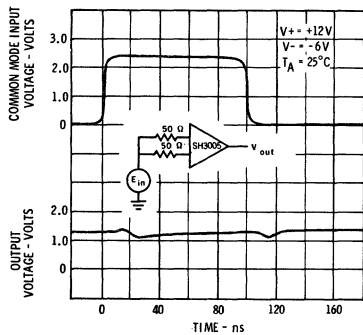
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



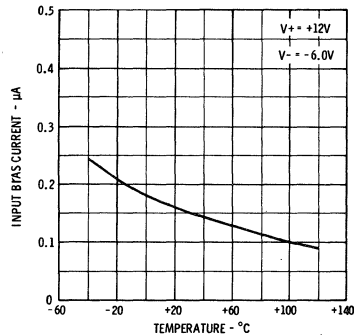
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



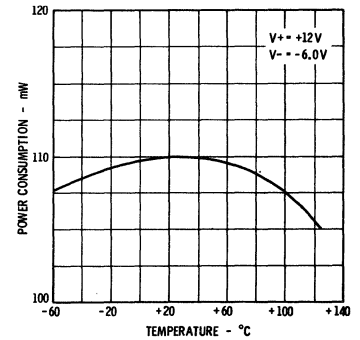
COMMON MODE PULSE RESPONSE



INPUT BIAS CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



POWER CONSUMPTION AS A FUNCTION OF AMBIENT TEMPERATURE



FAIRCHILD HYBRID CIRCUIT SH3005

DEFINITIONS

LOGIC THRESHOLD VOLTAGE - The approximate voltage at the output of the comparator at which the loading logic circuitry changes its digital state.

INPUT OFFSET VOLTAGE* - The voltage between the input terminals when the output is at the logic threshold voltage. The input offset voltage may also be defined for the case where two equal resistances are inserted in series with the input leads.

INPUT OFFSET CURRENT* - The difference in the currents into the two input terminals with the output at the logic threshold voltage.

INPUT BIAS CURRENT* - The average of the two input currents.

INPUT VOLTAGE RANGE* - The range of voltage on the input terminals for which the comparator will operate within specifications.

DIFFERENTIAL INPUT VOLTAGE RANGE* - The range of voltage between the input terminals for which operation within specifications is assured.

VOLTAGE GAIN* - The ratio of the change in output voltage to the change in voltage between the input terminals producing it with the DC output level in the vicinity of the logic threshold voltage.

RESPONSE TIME* - The interval between the application of an input step function and the time when the output crosses the logic threshold voltage. The input step drives the comparator from some initial, saturated input voltage to an input level just barely in excess of that required to bring the output from saturation to the logic threshold voltage. This excess is referred to as the voltage overdrive.

POSITIVE OUTPUT LEVEL* - The DC output voltage in the positive direction with the input voltage equal to or greater than a minimum specified amount.

NEGATIVE OUTPUT LEVEL* - The DC output voltage in the negative direction with the input voltage equal to or greater than a minimum specified amount.

OUTPUT SINK CURRENT - The maximum negative current that can be delivered by the comparator.

PEAK OUTPUT CURRENT - The maximum current that may flow into the output load without causing damage to the comparator.

OUTPUT RESISTANCE* - The resistance seen looking into the output terminal with the DC output level at the logic threshold voltage.

POWER CONSUMPTION - The DC power into the amplifier with no output load. The DC power will vary with signal level, but is specified as a maximum for the entire range of input-signal conditions.

SH3200

ADJUSTABLE POSITIVE DC VOLTAGE REGULATOR

FAIRCHILD HYBRID CIRCUIT

- SHORT CIRCUIT PROTECTED
- BROAD RANGE OF OUTPUT VOLTAGES . . . 8.5 V TO 30 V
- LOAD CURRENTS 0 TO 50 mA AND 5.0 AMPS USING AN EXTERNAL PASS TRANSISTOR
- EXCELLENT REGULATION: LINE REGULATION . . . 0.005%/V MAX.
LOAD REGULATION . . . 0.05% MAX.
- APPLICATIONS: SERIES REGULATOR FOR POSITIVE DC POWER SUPPLIES, DIGITAL AND ANALOG INTEGRATED CIRCUITS
- A COMPLEMENT SH3201 OF THIS REGULATOR IS ALSO AVAILABLE FOR NEGATIVE VOLTAGE REGULATION

ABSOLUTE MAXIMUM RATINGS

Maximum Temperatures

Storage Temperature
Operating Temperature

-65°C to +150°C
-55°C to +125°C

Maximum Power Dissipation

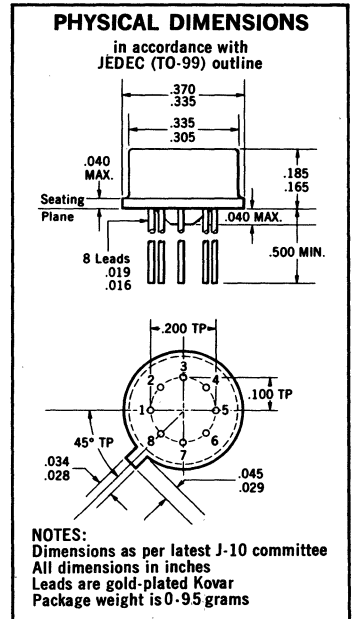
at 25°C Ambient Temperature (Note 1)
at -55°C to +125°C Case Temperature

780 mW
1.0 W

Maximum Voltages and Current

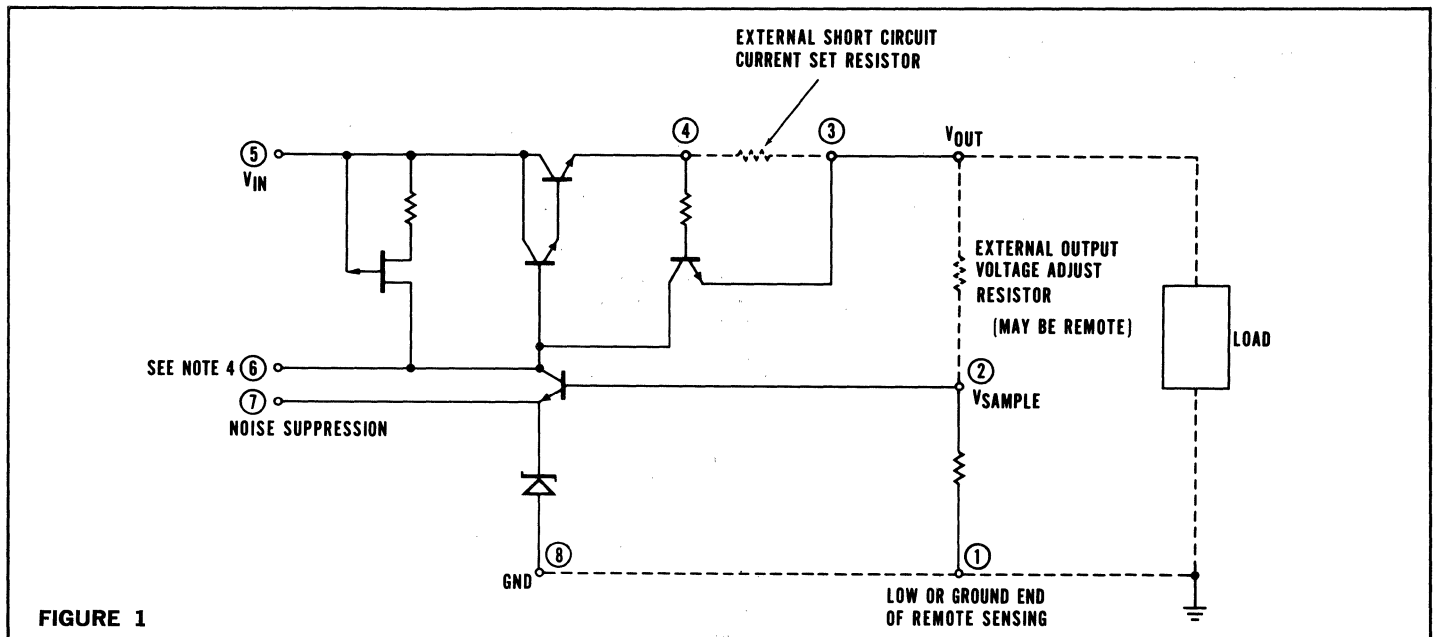
Input Voltage
Output Voltage (Note 2)
Input-Output Voltage Differential
Output Current (Note 3)

+35 V
+28 V
+28 V
50 mA



PART NO. HXK32001XX

SCHEMATIC DIAGRAM



FAIRCHILD HYBRID CIRCUIT SH3200

ELECTRICAL CHARACTERISTICS (25°C Free Air Temperature unless otherwise noted)

SYMBOL	CHARACTERISTICS	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
V_{IN}	Input Voltage Range	12.5		35	Volts	
V_{OUT}	Output Voltage Range (Note 2)	8.5		30	Volts	$35V > V_{IN} > V_{OUT} + 4.0V$
$ V_{IN} - V_{OUT} $	Input-Output Voltage Differential	4.0		28	Volts	
I_L	Load Current (Note 3)	0		50	mA	
$V_{(NOISE)}$	Uncompensated Output Noise Voltage		30	150	mVp.p.	$8.5V \leq V_{OUT} \leq 30V$ $0 \leq I_L \leq 50mA$
$V_{(NOISE)}$	Compensated Output Noise Voltage		3.0	5.0	mVp.p.	$C \geq 0.4 \mu F$, Pin 7 to Pin 8 $8.5V \leq V_{OUT} \leq 30V$ $0 \leq I_L \leq 50mA$
$\frac{(\Delta V_{OUT}/V_{OUT})\%}{\Delta V_{IN}}$	Line Regulation		.002	.005	%/V	$35V > V_{IN} > V_{OUT} + 4.0V$
$\frac{(\Delta V_{OUT}/V_{OUT})\%}{I_L}$	Load Regulation ($I_L = 0$ to 50 mA)		.02	.05	%	$ V_{IN} > V_{OUT} + 4.0V$
$\frac{(\Delta V_{OUT}/V_{OUT})\%}{\Delta T}$	Temperature Stability $T_A = -55^\circ C$ to $+125^\circ C$.01	%/ $^\circ C$	At Package Dissipation $\leq 780mW$
$\frac{(\Delta V_{OUT}/V_{OUT})\%}{P_D}$	Power Dissipation Stability			.002	%/mW	$4.0V \leq V_{IN} - V_{OUT} \leq 28V$ $0 \leq I_L \leq 50mA$

TYPICAL REGULATED OUTPUT VOLTAGE ADJUSTMENT

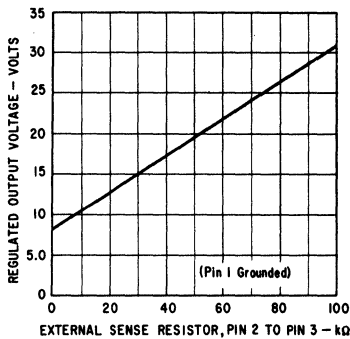


FIGURE 2

TYPICAL SHORT CIRCUIT PROTECTION SETTING CURRENT

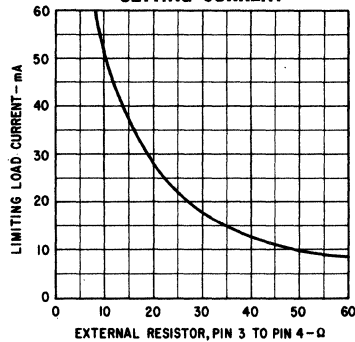


FIGURE 3

MAXIMUM POWER DISSIPATION VERSUS AMBIENT TEMPERATURE

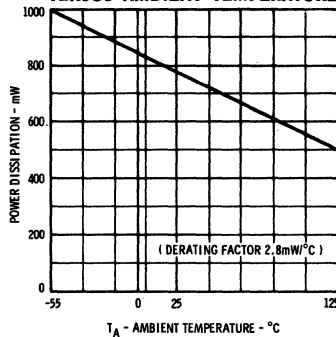


FIGURE 4

NOTES:

- Derating factor as shown in Fig. 4 is 2.8 mW/°C.
- Selection of Output Voltages: By externally connecting a preselected sense resistor (see figure 2) between pin 2 and pin 3 any desired output voltage in the range of 8.5 V to 30 V is achieved.
- Selection of Short Circuit Current: The maximum limit on the internal short circuit protection at any current from 1 to 50 mA can be set by externally connecting a preselected resistor (see figure 3) between pin 3 and pin 4.
- This pin is made available for connections to compensating networks which can be used to alter the dynamic response of the regulator to meet unusual load requirements. No connection is necessary for normal operation.

SH3201

ADJUSTABLE NEGATIVE DC VOLTAGE REGULATOR

FAIRCHILD HYBRID CIRCUIT

- SHORT CIRCUIT PROTECTED
- BROAD RANGE OF OUTPUT VOLTAGES . . . -8.5 V TO -30 V
- LOAD CURRENTS 0 TO 50 mA AND 5.0 AMPS USING AN EXTERNAL PASS TRANSISTOR
- EXCELLENT REGULATION: LINE REGULATION . . . $0.005\%/V$ MAX.
LOAD REGULATION . . . 0.05% MAX.
- APPLICATIONS: SERIES REGULATOR FOR NEGATIVE DC POWER SUPPLIES, DIGITAL AND ANALOG INTEGRATED CIRCUITS
- A COMPLEMENT SH3200 OF THIS REGULATOR IS ALSO AVAILABLE FOR POSITIVE VOLTAGE REGULATION

ABSOLUTE MAXIMUM RATINGS

Maximum Temperatures

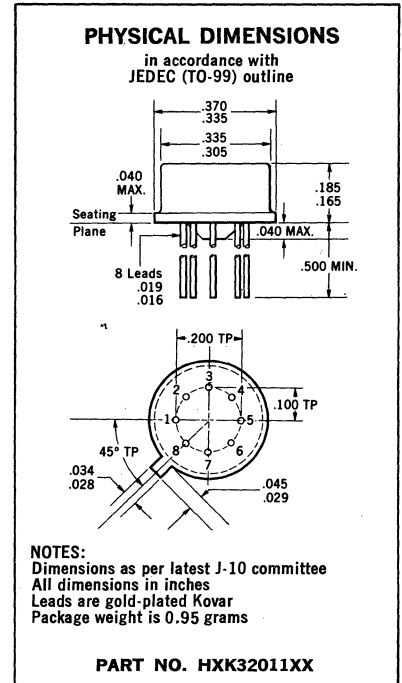
Storage Temperature	-65°C to $+150^\circ\text{C}$
Operating Temperature	-55°C to $+125^\circ\text{C}$

Maximum Power Dissipation

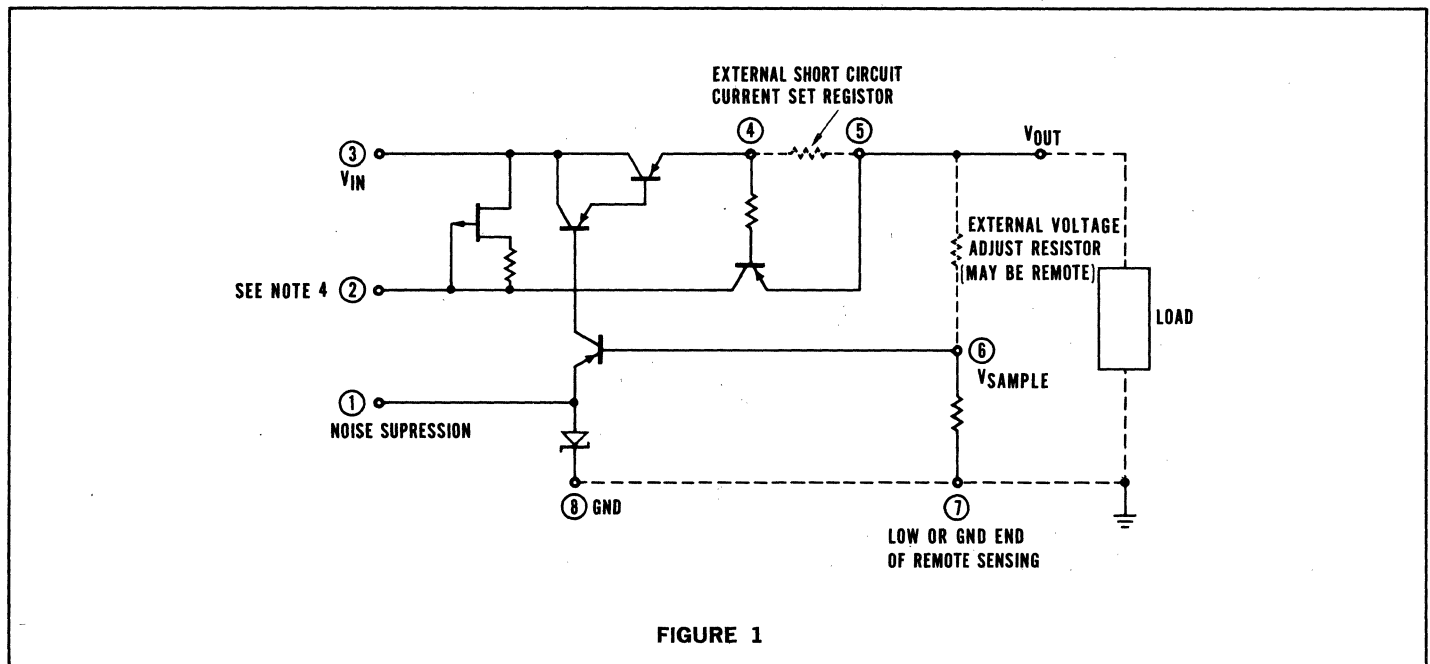
at 25°C Free Air Temperature (Note 1)	780 mW
at -55°C to $+125^\circ\text{C}$ Case Temperature	1.0 W

Maximum Voltages and Current

Input Voltage	-35 V
Output Voltage (Note 2)	-28 V
Input-Output Voltage Differential	28 V
Output Current (Note 3)	50 mA



SCHEMATIC DIAGRAM



FAIRCHILD HYBRID CIRCUIT SH3201

ELECTRICAL CHARACTERISTICS (25°C Free Air Temperature unless otherwise noted)

SYMBOL	CHARACTERISTICS	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
V_{IN}	Input Voltage Range	-12.5		-35	Volts	
V_{OUT}	Output Voltage Range (Note 2)	-8.5		-30	Volts	$35V > V_{IN} > V_{OUT} + 4.0V$
$ V_{IN} - V_{OUT} $	Input-Output Voltage Differential	4.0		28	Volts	
I_L	Load Current (Note 3)	0		50	mA	
$V_{(NOISE)}$	Uncompensated Output Noise Voltage		30	150	mVp.p.	$8.5V \leq V_{OUT} \leq 30V$ $0 \leq I_L \leq 50mA$
$V_{(NOISE)}$	Compensated Output Noise Voltage		3.0	5.0	mVp.p.	$C \geq 0.4 \mu F$, Pin 1 to Pin 8 $8.5V \leq V_{OUT} \leq 30V$ $0 \leq I_L \leq 50mA$
$\frac{(\Delta V_{OUT}/V_{OUT})\%}{\Delta V_{IN}}$	Line Regulation		.002	.005	%/V	$35V > V_{IN} > V_{OUT} + 4.0V$
$\frac{(\Delta V_{OUT}/V_{OUT})\%}{I_L}$	Load Regulation ($I_L = 0$ to 50 mA)		.02	.05	%	$ V_{IN} > V_{OUT} + 4.0V$
$\frac{(\Delta V_{OUT}/V_{OUT})\%}{\Delta T}$	Temperature Stability $T_A = -55^\circ C$ to $+125^\circ C$.01	%/°C	At Package Power Dissipation $\leq 780mW$
$\frac{(\Delta V_{OUT}/V_{OUT})\%}{P_D}$	Power Dissipation Stability			.002	%/mW	$4.0V \leq V_{IN} - V_{OUT} \leq 28V$ $0 \leq I_L \leq 50mA$

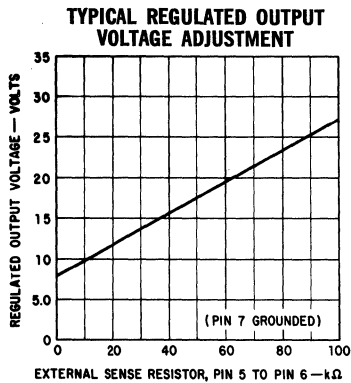


FIGURE 2

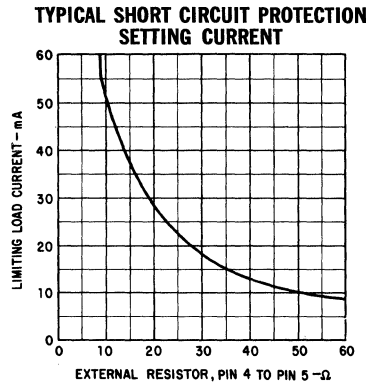


FIGURE 3

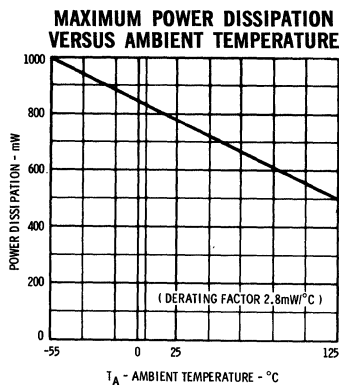


FIGURE 4

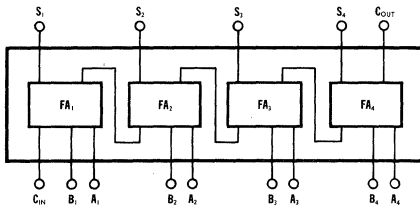
NOTES:

- (1) Derating factor as shown in Fig. 4 is 2.8 mW/°C.
- (2) Selection of Output Voltages: By externally connecting a preselected sense resistor (see figure 2) between pin 5 and pin 6 any desired output voltage in the range of 8.5 V to 30 V is achieved.
- (3) Selection of Short Circuit Current: The maximum limit on the internal short circuit protection at any current from 1 to 50 mA can be set by externally connecting a preselected resistor (see figure 3) between pin 4 and pin 5.
- (4) This pin is made available for connections to compensating networks which can be used to alter the dynamic response of the regulator to meet unusual load requirements. No connection is necessary for normal operation.

HYBRID CIRCUITS COMING SOON

QUAD FULL ADDER

Incorporates four high speed, binary full-adders (2 each 9304 MSI circuits). The adders are useful as ripple-carry parallel addition (or subtraction) function blocks. The device incorporates T μ L circuitry for high speed, high fan-out operation and is compatible with all members of the CCSL groups of digital integrated circuits.

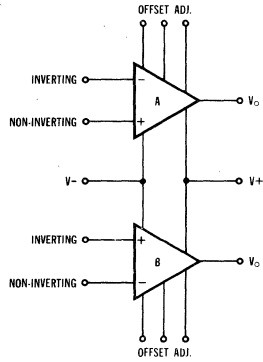


DUAL HIGH GAIN OPERATIONAL AMPLIFIER

Incorporates two linear amplifiers in one package. Features internal frequency compensation, low power of 100mW; output voltage swings of ± 13 volts, and zero offset adjustment.

KEY SPECS: (Typical each side)

Open loop gain	100,000
Offset voltage	3mV
Input impedance	800K
Output voltage swing	$\pm 13V$
Power	50mW



BYTE PARITY GENERATOR OR CHECKER

Incorporates four high speed binary full-adders connected as a parity generator or checker. The design uses two 9304 MSI circuits to generate parity for an 8 bit byte or check parity over 9 bits. Delay from input to add parity is typically 35 nano-seconds.

