QUAD PRECISION MICROPOWER CMOS VOLTAGE COMPARATOR WITH DRIVER

GENERAL DESCRIPTION

The ALD4303A/ALD4303 is a precision monolithic high performance quad voltage comparator with open drain output built with advanced silicon gate CMOS technology. It features very high typical input impedance of $10^{12}\Omega$; low input bias current of 10pA; very low power dissipation of 7.5μA per comparator; micropower operation; high output drive and single (+5V) or dual (±5V) power supply operation.

The input voltage range includes ground, making this comparator ideal for single supply low level signal detection with high source impedance. The ALD4303A/ALD4303 can be used in connection with other voltage comparator circuits such as the ALD2301/ALD2302/ALD4302 voltage comparators. The outputs can be connected to a higher external voltage than V+ and used in a wired-OR connection with other open drain circuits such as ALD2301/ALD2303. They can also be used with push-pull output types such as ALD2302/ALD4302 voltage comparators simultaneously with open drain comparators using a common V+. The ALD4303A/ALD4303 is ideal for a great variety of voltage comparator applications, especially micropower detection circuits requiring very low input currents, high output currents and low standby power.

APPLICATIONS

- Sensor detection circuits
- PCMCIA instruments
- MOSFET driver
- High source impedance voltage comparison circuits
- Multiple limit window comparator
- Power supply voltage monitor
- Photodetector sensor circuit
- High speed LED driver
- Oscillators
- Battery operated instruments
- Remote signal detection
- Multiple relay drivers

BENEFITS

- Extremely low power and high precision combination
- Built-in high input impedance buffer
- Built-in output driver with up to 60mA sink current

ORDERING INFORMATION

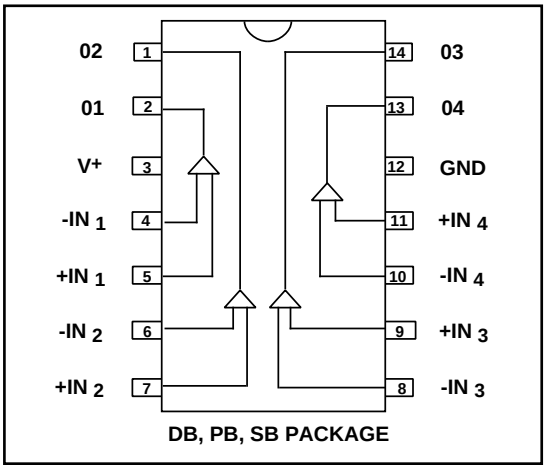
Operating Temperature Range *		
-55°C to +125°C	0°C to +70°C	0°C to +70°C
14-Pin CERDIP Package	14-Pin Small Outline Package (SOIC)	14-Pin Plastic Dip Package
ALD4303ADB ALD4303DB	ALD4303ASB ALD4303SB	ALD4303APB ALD4303PB

* Contact factory for industrial temperature range

FEATURES

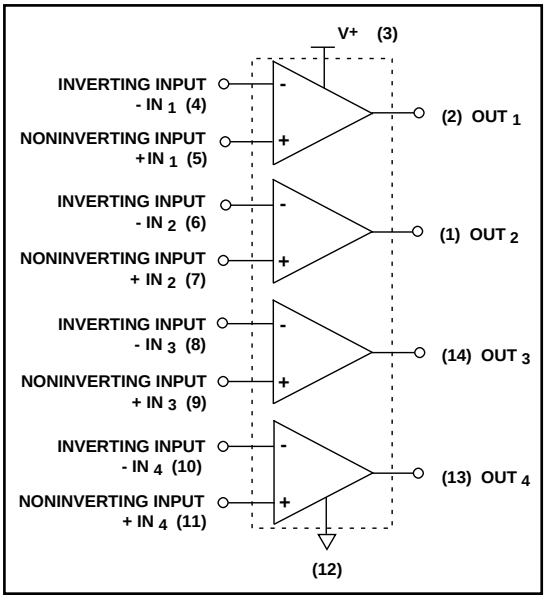
- 3V, 5V and 12V supply
- Guaranteed to drive 200Ω loads
- Fanout of 30LS TTL loads
- Guaranteed maximum supply current of 22μA per comparator
- Industry standard pinout of LM393 type
- Extremely low input bias currents -- 10pA
- Virtually eliminates source impedance effects
- Single (+5V) and dual supply (±5V) operation
- CMOS, NMOS and TTL compatible
- Open drain wired-OR outputs
- Compatible with push-pull outputs
- High output sinking current -- 60mA
- Low supply current spikes
- High gain -- 100V/mV

PIN CONFIGURATION



DB, PB, SB PACKAGE

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Supply voltage, V^+		13.2V
Differential input voltage range		-0.3V to V^+ +0.3V
Power dissipation		600 mW
Operating temperature range	PB, SB package	0°C to +70°C
	DB package	-55°C to +125°C
Storage temperature range		-65°C to +150°C
Lead temperature, 10 seconds		+260°C

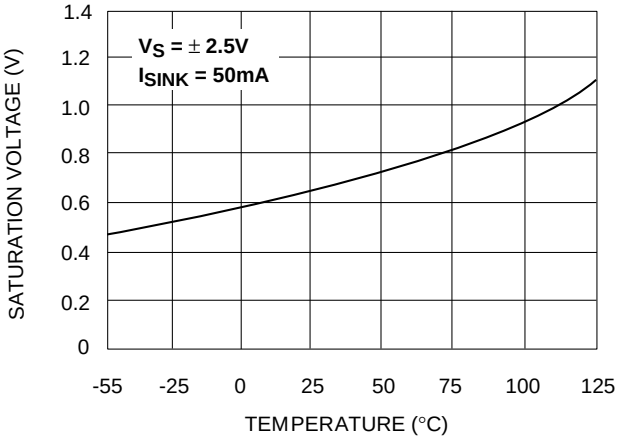
OPERATING ELECTRICAL CHARACTERISTICS
T_A = 25°C V^+= +5V unless otherwise specified

		4303A			4303				Test
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**	**Conditions**
Voltage Supply	V_S V^+	±1.5 3		±6 12	±1.5 3		±6 12	V V	Dual Supplies Single Supply
Supply Current	I_S		50	90		50	90	µA	R_{LOAD} = ∞ 4 comparators
Voltage Gain	A_{VD}	10	100		10	100		V/mV	R_{LOAD} ≥15KΩ
Input Offset Voltage	V_{OS}		2	5.0 7.0		4	10.0 12.0	mV	R_{LOAD} =1.5KΩ 0°C ≤ T_A ≤ 70°C
Input Offset Current [1]	I_{OS}		0.1	30 800		0.1	30 800	pA	 0°C ≤ T_A ≤ 70°C
Input Bias Current [1]	I_B		0.1	30 1000		0.1	30 1000	pA	 0°C ≤ T_A ≤ 70°C
Common Mode Input Voltage Range [2]	V_{ICR}	-0.3		V^+-1.5	-0.3		V^+ -1.5	V	
Low Level Output Voltage	V_{OL}		0.18	0.4		0.18	0.4	V	I_{SINK} =12mA V_{INPUT} =1V Differential
Low Level Output Current	I_{OL}	24	60		24	60		mA	V_{OL} =1.0V
High Level Leakage Current	I_{LH}		0.1	20		0.1	20	nA	V_{OH} = 5.0V
Response Time [2]	t_{RP}		6.5			6.5		µs	R_L =50KΩ C_L = 15pF 10mV Input Step/10mV Overdrive
			5			5		µs	RL = 50KΩ C_L = 15pF TTL- Level Input Step

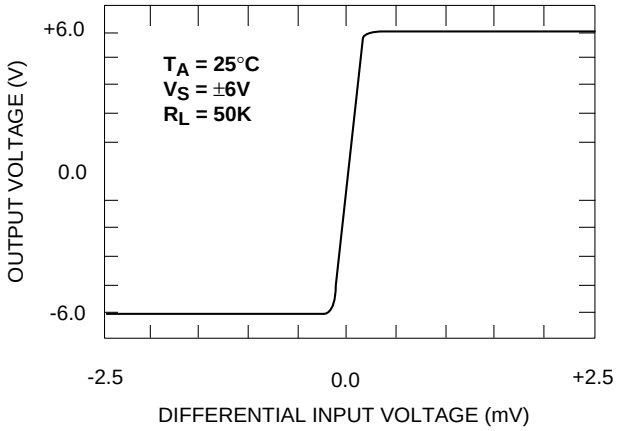
Notes: [1] Consists of junction leakage currents
[2] Sample tested parameters

TYPICAL PERFORMANCE CHARACTERISTICS

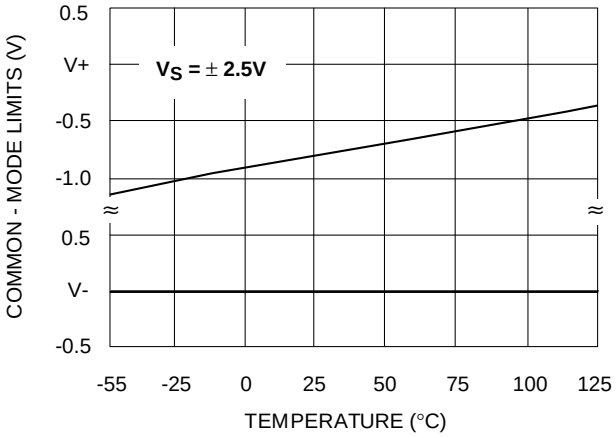
SATURATION VOLTAGE vs. TEMPERATURE



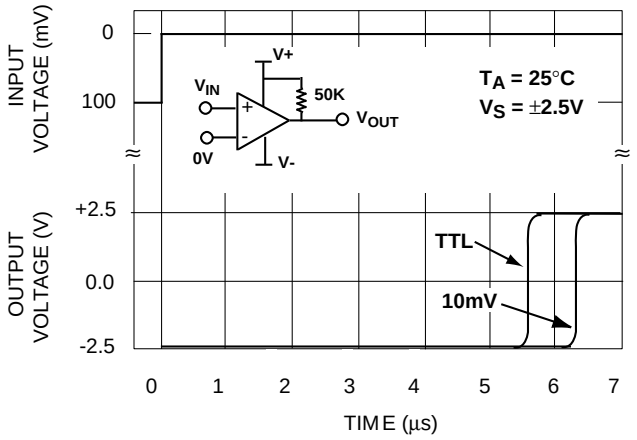
TRANSFER FUNCTION



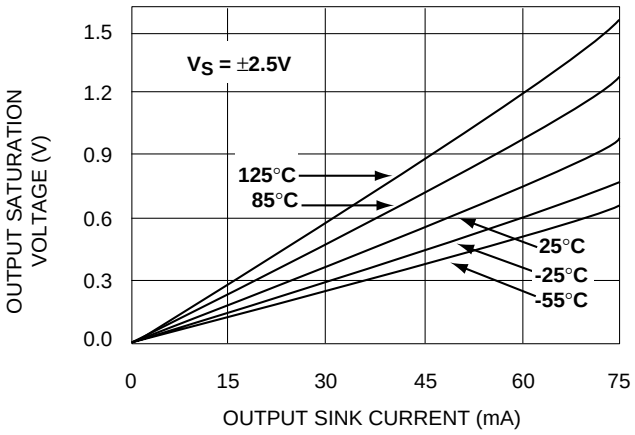
COMMON - MODE VOLTAGE REFERRED TO SUPPLY VOLTAGE



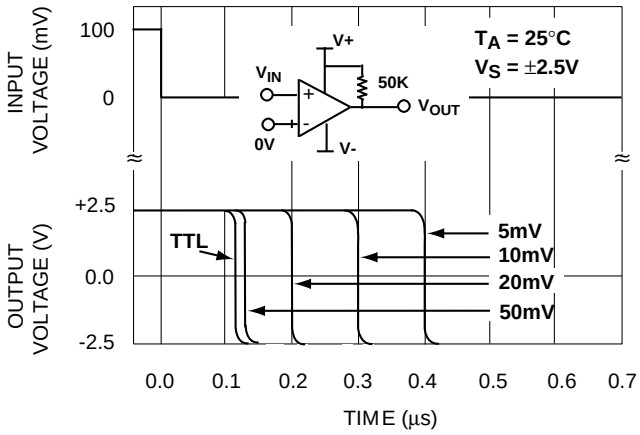
RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES



SATURATION VOLTAGE vs. SINK CURRENT

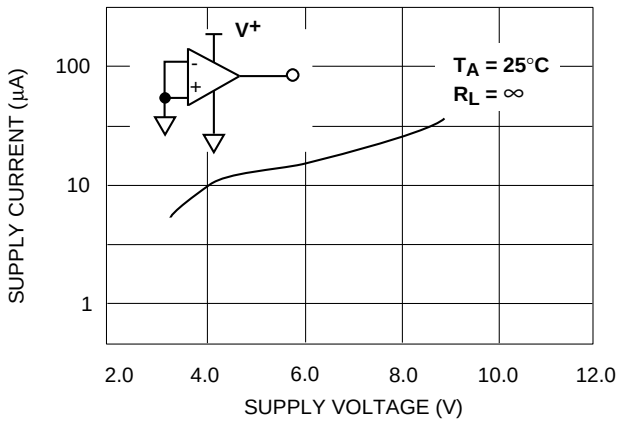


RESPONSE TIME FOR VARIOUS INPUT OVERDRIVES

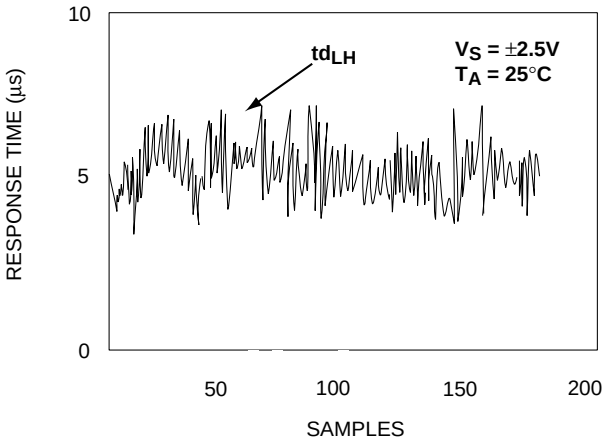


TYPICAL PERFORMANCE CHARACTERISTICS

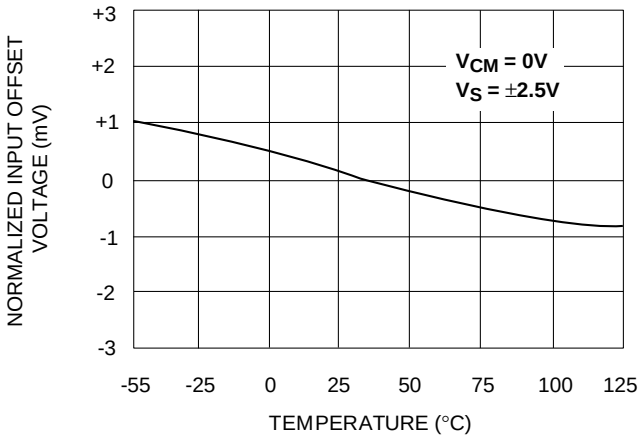
TOTAL SUPPLY CURRENT vs. TOTAL SUPPLY VOLTAGE



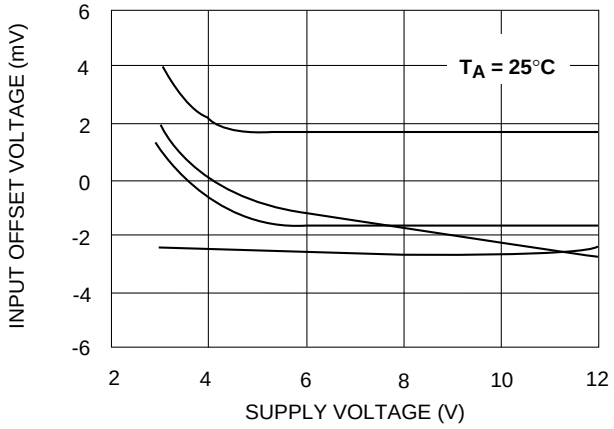
RESPONSE TIME FOR REPRESENTATIVE SAMPLES



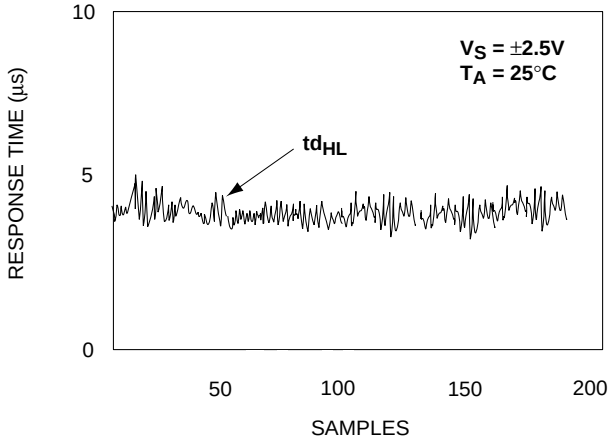
NORMALIZED INPUT OFFSET VOLTAGE vs. TEMPERATURE



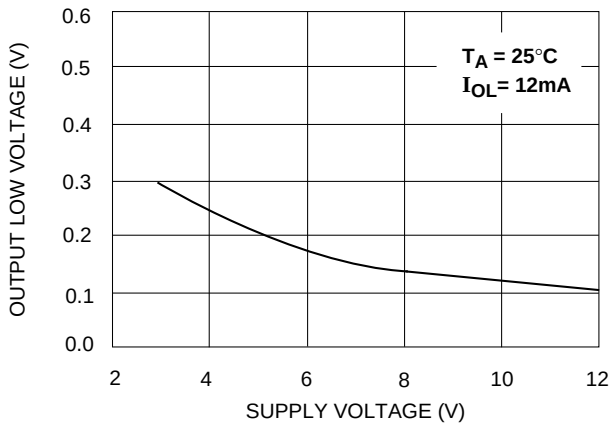
INPUT OFFSET VOLTAGE vs. SUPPLY VOLTAGE REPRESENTATIVE SAMPLES



RESPONSE TIME FOR REPRESENTATIVE SAMPLES

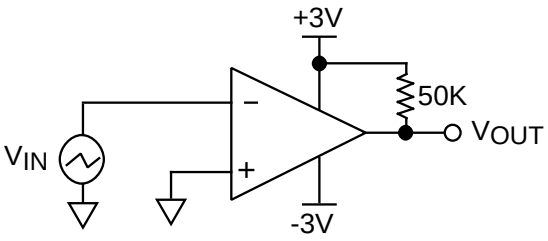


OUTPUT LOW VOLTAGE vs. SUPPLY VOLTAGE



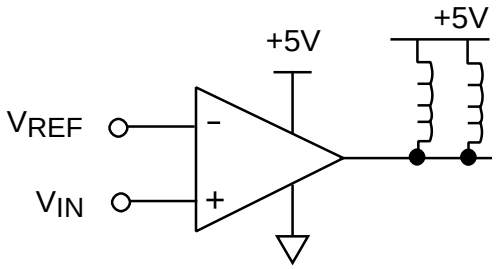
TYPICAL APPLICATIONS

ZERO CROSSING DETECTOR



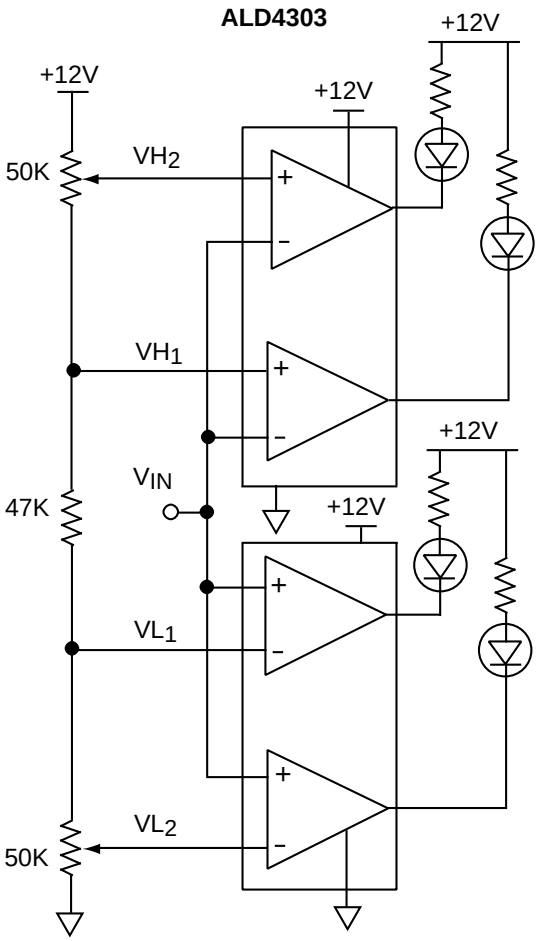
1/4 ALD4303

MULTIPLE RELAY DRIVE



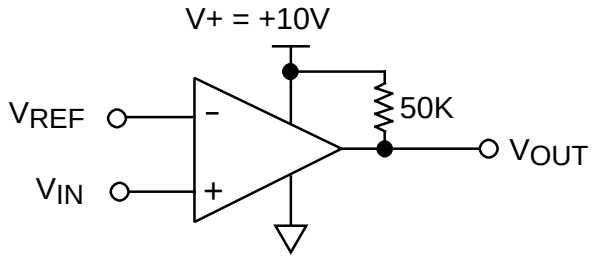
1/4 ALD4303

DOUBLE QUAD LIMIT WINDOW COMPARATOR



VL_1 and VH_1 first limit window send warning
VL_2 and VH_2 second limit window execute system cutoff

VOLTAGE LEVEL TRANSLATOR



1/4 ALD4303

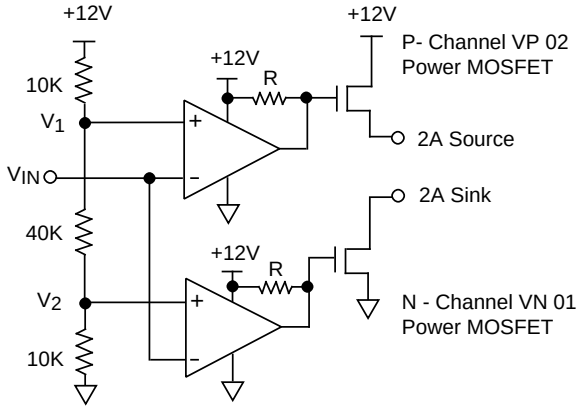
V_{REF} = 1.4V for TTL input

$V_{REF} = \frac{V^+}{2}$ for CMOS input

Output V_{OUT} swings from rail-to-rail

TYPICAL APPLICATIONS

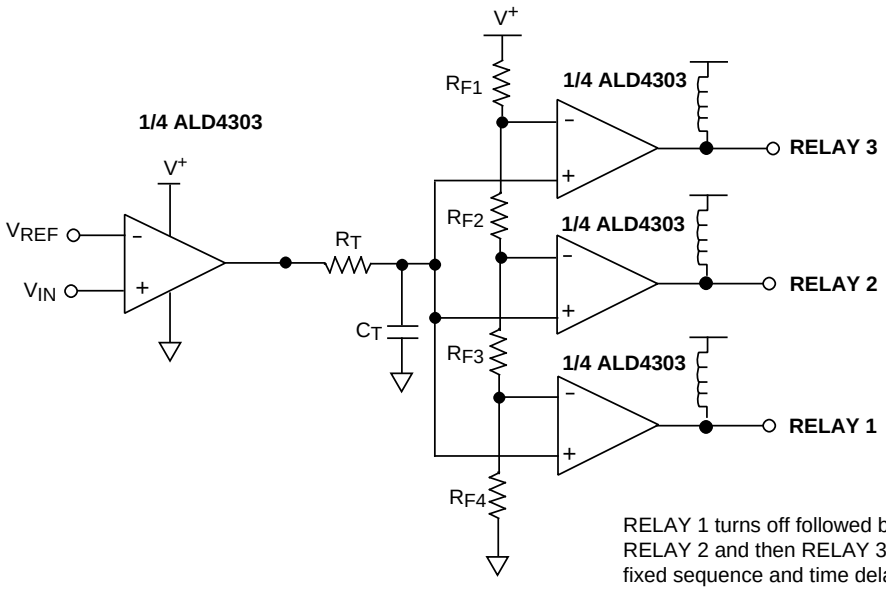
PUSH-PULL COMPLEMENTARY POWER MOSFET DRIVER



$R \geq 50\ K\Omega$

This circuit eliminates crossover current in the complementary power transistors. The outputs can be used to source and sink different loads or tied together to provide push-pull drive of the same load.

TIME DELAY GENERATOR



RELAY 1 turns off followed by RELAY 2 and then RELAY 3 with fixed sequence and time delays selectrd by ratios R_{F1}, R_{F2} , R_{F3} and R_{F4}.

Design & Operating Notes:

1. In order to minimize stray oscillation, all unused inputs must be tied to ground.
2. The input bias and offset currents are essentially input protection diode reverse bias leakage currents, and are typically less than 1 pA at room temperature. These currents are a function of ambient temperature, and would have to be considered in applications where very high source impedance or high accuracy are involved.
3. The high output sinking current of 60mA for each output offers flexibility in many applications, as a separate buffer or driver would not be necessary to drive the intended load. However, as the circuit normally operates close to ambient temperature due to its very low power consumption, thermal effects caused by large output current transients must be considered in certain applications.