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ECL Products	

10104 Gate

Quad 2-Input AND Gate

FEATURES

- Typical propagation delay: 2.7ns
- Typical supply current ($-I_{EE}$): 20mA

DESCRIPTION

The 10104 is a high-speed logic, low power, AND function.

All unused inputs can be left open due to integrated pull-down resistors which avoid the need for a supply voltage.

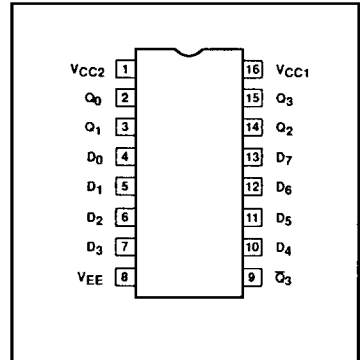
ORDERING INFORMATION

DESCRIPTION	ORDER CODE
16-Pin Plastic DIP	10104N
16-Pin Ceramic DIP	10104F
16-Pin SO	10104D

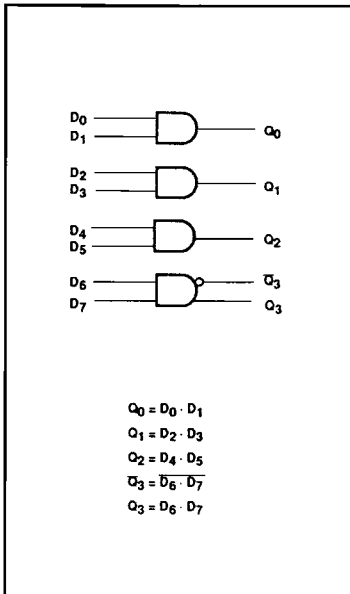
PIN DESCRIPTION

PINS	DESCRIPTION
$D_0 - D_7$	Data Inputs
$Q_0 - Q_3$	Data Outputs (AND)
\bar{Q}_3	Data Output (NAND)

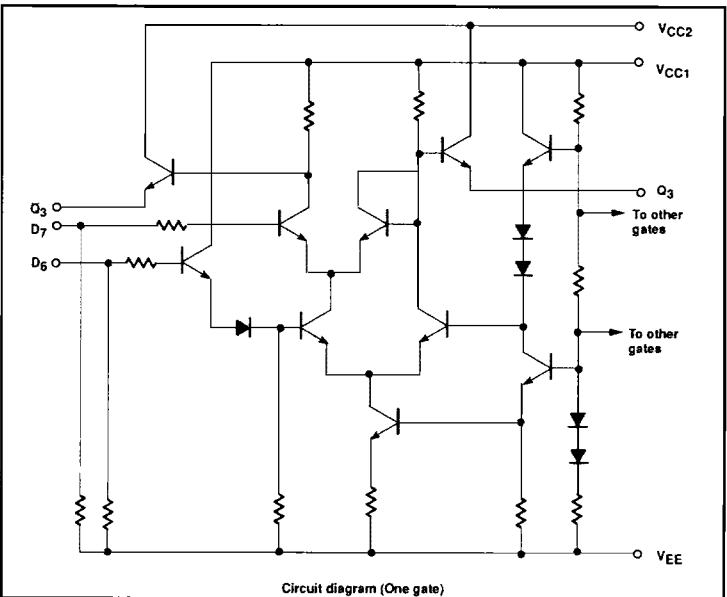
PIN CONFIGURATION



LOGIC DIAGRAM



SIMPLIFIED SCHEMATIC



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ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	LIMITS	UNIT	
V_{EE}	Supply voltage	-8.0	V	
V_{IN}	Input voltage (V_{IN} should never be more negative than V_{EE})	0 to V_{EE}	V	
I_O	Output source current (continuous)	-50	mA	
T_S	Storage temperature range	-55 to +150	°C	
T_J	Maximum junction temperature	Ceramic Package	+165	°C
		Plastic Package	+150	°C

NOTE:

Operation beyond the limits set forth in this table may impair the useful life of the device. Unless otherwise noted, these limits are specified over the operating ambient temperature range.

DC OPERATING CONDITIONS

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			MIN.	NOM.	MAX.	
V_{CC1}, V_{CC2}	Circuit ground		0	0	0	V
V_{EE}	Supply voltage (negative)			-5.2		V
V_{IH}	High level input voltage	$T_A = -30^\circ\text{C}$			-890	mV
		$T_A = +25^\circ\text{C}$			-810	mV
		$T_A = +85^\circ\text{C}$			-700	mV
V_{IHT}	High level input threshold voltage	$T_A = -30^\circ\text{C}$	-1205			mV
		$T_A = +25^\circ\text{C}$	-1105			mV
		$T_A = +85^\circ\text{C}$	-1035			mV
V_{ILT}	Low level input threshold voltage	$T_A = -30^\circ\text{C}$			-1500	mV
		$T_A = +25^\circ\text{C}$			-1475	mV
		$T_A = +85^\circ\text{C}$			-1440	mV
V_{IL}	Low level input voltage	$T_A = -30^\circ\text{C}$	-1890			mV
		$T_A = +25^\circ\text{C}$	-1850			mV
		$T_A = +85^\circ\text{C}$	-1825			mV
T_A	Operating ambient temperature range		-30	+25	+85	°C

NOTE:

When operating at other than the specified V_{EE} voltage (-5.2V), the DC and AC Electrical Characteristics will vary slightly from specified values.

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DC ELECTRICAL CHARACTERISTICS $V_{CC1} = V_{CC2} = \text{ground}$, $V_{EE} = -5.2V \pm 0.010V$, $T_A = -30^\circ\text{C}$ to $+85^\circ\text{C}$ output loading 50Ω to $-2.0V \pm 0.010V$ unless otherwise specified^{1,3}

SYMBOL	PARAMETER	TEST CONDITIONS ²		LIMITS			UNIT	
				MIN.	TYP.	MAX.		
V_{OH}	High level output voltage	$T_A = -30^\circ\text{C}$	For Q_n outputs, apply V_{IHMAX} to	-1060		-890	mV	
		$T_A = +25^\circ\text{C}$	all inputs. For \bar{Q}_3 output, apply	-960		-810	mV	
		$T_A = +85^\circ\text{C}$	V_{ILMIN} to all inputs.	-890		-700	mV	
V_{OHT}	High level output threshold voltage	$T_A = -30^\circ\text{C}$	For Q_n outputs, apply V_{IHT} to one gate input	-1080			mV	
		$T_A = +25^\circ\text{C}$	with V_{IHMAX} applied to the other gate input. For \bar{Q}_3 output, apply V_{ILT} to one gate input	-980			mV	
		$T_A = +85^\circ\text{C}$	with V_{IHMAX} applied to the other gate input.	-910			mV	
V_{OLT}	Low level output threshold voltage	$T_A = -30^\circ\text{C}$	For Q_n outputs, apply V_{ILT} to one gate input			-1655	mV	
		$T_A = +25^\circ\text{C}$	with V_{IHMAX} applied to the other gate input. For \bar{Q}_3 output, apply V_{IHT} to one gate input			-1630	mV	
		$T_A = +85^\circ\text{C}$	with V_{IHMAX} applied to the other gate input.			-1595	mV	
V_{OL}	Low level output voltage	$T_A = -30^\circ\text{C}$	For Q_n outputs, apply V_{ILMIN} to	-1890		-1675	mV	
		$T_A = +25^\circ\text{C}$	all inputs. For \bar{Q}_3 output, apply	-1850		-1650	mV	
		$T_A = +85^\circ\text{C}$	V_{IHMAX} to all inputs.	-1825		-1615	mV	
I_{IH}	High level input current	D ₀ , D ₃ D ₄ , D ₇ inputs	$T_A = -30^\circ\text{C}$	Apply V_{IHMAX} to each input under test,			425	μA
			$T_A = +25^\circ\text{C}$	one at a time, with V_{ILMIN} applied			265	μA
			$T_A = +85^\circ\text{C}$	to all other inputs.			265	μA
		D ₁ , D ₂ D ₅ , D ₆ inputs	$T_A = -30^\circ\text{C}$	Apply V_{IHMAX} to each input under test,			350	μA
			$T_A = +25^\circ\text{C}$	one at a time, with V_{ILMIN} applied			220	μA
			$T_A = +85^\circ\text{C}$	to all other inputs.			220	μA
I_{IL}	Low level input current	$T_A = -30^\circ\text{C}$	Apply V_{ILMIN} to each input under test,	0.5			μA	
		$T_A = +25^\circ\text{C}$	one at a time, with V_{IHMAX} applied	0.5			μA	
		$T_A = +85^\circ\text{C}$	to all other inputs.	0.3			μA	
$-I_{EE}$	V_{EE} supply current	$T_A = -30^\circ\text{C}$				39	mA	
		$T_A = +25^\circ\text{C}$			20	35	mA	
		$T_A = +85^\circ\text{C}$				39	mA	
$\frac{\Delta V_{OH}}{\Delta V_{EE}}$	High level output voltage compensation				0.016		V/V	
$\frac{\Delta V_{OL}}{\Delta V_{EE}}$	Low level output voltage compensation		$T_A = +25^\circ\text{C}$		0.250		V/V	
$\frac{\Delta V_{BB}}{\Delta V_{EE}}$	Reference bias voltage compensation				0.148		V/V	

NOTES:

- The specified limits represent the worst case values for the parameter. Since these worst case values normally occur at the supply voltage and temperature extremes, additional noise immunity can be achieved by decreasing the allowable operating condition ranges.
- Conditions for testing shown in the tables are not necessarily worst case. For worst case testing guidelines, refer to DC Testing, Chapter 1, Section 3.
- The specified limits shown in the DC Electrical Characteristics table can be met only after thermal equilibrium has been established. Thermal equilibrium is established by applying power for at least 2 minutes, while maintaining transverse airflow of 2.5 meters/sec (500 linear feet/min) over the device, mounted either in a test socket or on a printed circuit board. Test voltage values are given in the DC Operating Conditions table.

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AC ELECTRICAL CHARACTERISTICS $V_{CC1} = V_{CC2} = \text{ground}$, $V_{EE} = -5.2V \pm 0.010V$

SYMBOL	PARAMETER	TEST CONDITION	LIMITS							UNIT
			$T_A = -30^\circ\text{C}$		$T_A = +25^\circ\text{C}$			$T_A = +85^\circ\text{C}$		
			MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.	
t_{PLH} t_{PHL}	Propagation delay D_n to Q_n , Q_3	Waveform 1	1.00 1.00	4.30 4.30	1.00 1.00	2.70 2.70	4.00 4.00	1.00 1.00	4.20 4.20	ns ns
t_{TLH} t_{THL}	Transition time 20% to 80%, 80% to 20%	Waveform 1	1.50 1.50	3.70 3.70	1.50 1.50	2.00 2.00	3.50 3.50	1.50 1.50	3.60 3.60	ns ns

NOTE:

For AC test setup information, see AC Testing, Chapter 2, Section 3.

AC WAVEFORMS

