



MITEL

Technical Data **Voltage Translator with 3-State Outputs**

MD4104 ISO-CMOS™
Quad Low Voltage to High

FEB. 79

- PIN-FOR-PIN COMPATIBLE WITH FAIRCHILD'S F4104/34104
- NO LATCH-UP PROBLEMS
- 3-STATE FULLY BUFFERED OUTPUTS
- BUS-ORIENTED TRANSLATOR/DRIVERS
- DUAL POWER SUPPLY INPUTS
- ISO-CMOS™ HIGH SPEED PERFORMANCE

PIN NAMES

$I_0 - I_3$

OE

$Z_0 - Z_3$

$\bar{Z}_0 - \bar{Z}_3$

FUNCTION

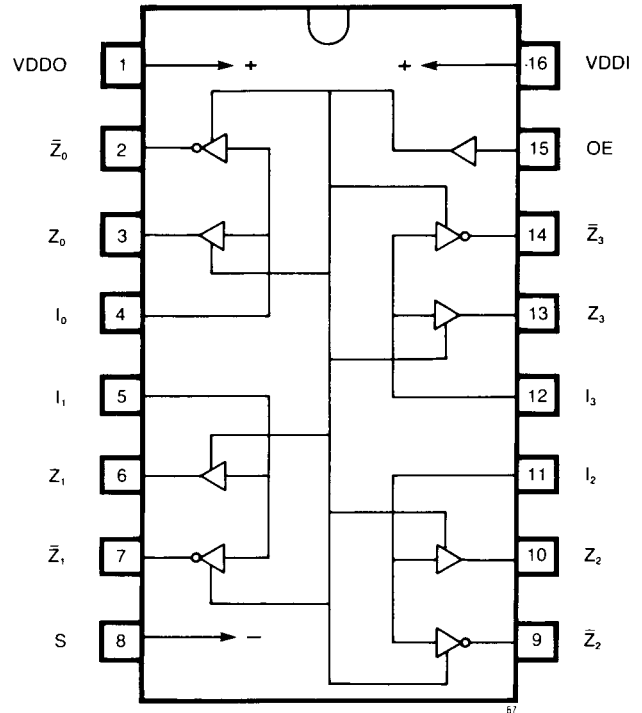
Data Inputs

Active HIGH enable

3-State Data Outputs

3-State Complimentary Data Outputs

LOGIC AND CONNECTION DIAGRAM



Description

The MD4104 Quad Low Voltage to High Voltage Translator with 3-state outputs is designed to interface low voltage circuits to high voltage circuits, such as 5 Volt CMOS, NMOS or TTL to 15 Volt CMOS. It contains 4 Data Inputs ($I_0 - I_3$), an active HIGH Output Enable Input (EO), 4 Data Outputs ($Z_0 - Z_3$) and their complements ($\bar{Z}_0 - \bar{Z}_3$). With the Enable HIGH, the Outputs are either HIGH or LOW as determined by the Data inputs with the Output enable LOW, all the Outputs are in the high impedance 'OFF' state.

The device uses a common negative supply, separate positive supplies, inputs (V_{DDI}) and outputs (V_{DDO}). V_{DDI} must always be less than or equal to V_{DDO} , even during power turn-on and turn-off. The input signals may be driven from any potential between V_{DDO} and V_{SS} without regard to current limiting. When driving from potentials greater than V_{DDO} or less than V_{SS} , the current at each input must be limited to 10mA.

When used in a bus organized system all MD4104 devices on the same bus line should be connected to the same V_{DDO} and V_{SS} supplies.

ORDERING INFORMATION		
Part Number	Package	Temp. Range
MD4104BE	16-Pin Plastic DIP	-40°C to 85°C
MD4104BC	16-Pin Ceramic DIP	-40°C to 85°C
MD4104BD	16-Pin Ceramic DIP	-55°C to 125°C

ISO-CMOS™ MD4104

MAXIMUM RATINGS: (Non-operating) All voltages are referenced to VSS.			
RATING	SYMBOL	VALUE	UNIT
VDDO SUPPLY VOLTAGE	V _{DDO}	-0.5 to 18	Vdc
VDDI SUPPLY VOLTAGE	V _{DDI}	-0.5 ≤ VDDO	Vdc
Voltage at any Input	V _{IN}	-0.5 to VDDO + 0.5V	Vdc
Current into any Input	I _{IN}	± 10	mAdc
Storage Temperature	T _S	-65 to 150	°C

ELECTRICAL CHARACTERISTICS: VDDO = VDDI as shown, VSS = 0V.

DC CHARACTERISTICS: V _{DDO} = V _{DDI} as shown, V _{SS} = 0V													
SYMBOL	PARAMETER	LIMITS									UNITS	TEMP	TEST CONDITIONS
		V _{DDO/I} = 5 V			V _{DDO/I} = 10V			V _{DDO/I} = 15V					
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX			
V _{IH}	Input HIGH Voltage	3.5		*	7.0		*	10.5		*	V	All	Guaranteed Input HIGH Voltage
V _{IL}	Input LOW Voltage	**		1.5	**		3.0	**		4.5	V	All	Guaranteed Input LOW voltage
V _{OH}	Output HIGH Voltage	4.99			9.99			14.99			V	MIN, 25°C	I _{OH} =0 mA Note 1
		4.95			9.95			14.95				All	I _{OH} =0 mA Note 2
V _{OL}	Output LOW Voltage			0.01			0.01			0.01	V	MIN, 25°C	I _{OL} =0 mA Note 1
				0.05			0.05			0.05		All	I _{OL} =0 mA Note 2
				0.5			1.0			2.0			
I _i	Input Current $\frac{XC}{XM}$			0.1			0.1			1.0	μA	25°C	Lead Under Test at 0 V or V _{DDO} . All Other Inputs Simultaneously at 0 V or V _{DDO}
				0.01			0.01			1.0			
I _{OH}	Output HIGH Current	-1.5									mA	MIN, 25°C	V _{OUT} =2.5 V for V _{DDO} =5V Note 1
		-1.0										MIN, 25°C	V _{OUT} =V _{DDO} -0.5 V Note 1
				-0.7			-1.4			-2.2			
				-0.4			-0.8			-1.4			
I _{OL}	Output LOW Current	1.0			2.6			3.6			mA	MIN	V _{OUT} =0.4 V for V _{DDO} =5 V
		0.8			2.0			3.6				25°C	V _{OUT} =0.5 V for V _{DDO} =10 V
		0.4			1.2			2.0				MAX	V _{OUT} =0.5 V for V _{DDO} =15 V Note 1
I _{ozH} Note 3	Output OFF Current HIGH, XM			0.05			0.1			0.02	μA	MIN, 25°C	Output Returned to V _{DDO} , EO=V _{SS}
				3.0			6.0			1.2		MAX	
I _{ozL} Note 3	Output OFF Current LOW, XM			-0.05			-0.1			-0.02	μA	MIN, 25°C	Output Returned to V _{SS} , EO=V _{SS}
				-3.0			-6.0			-1.2		MAX	
I _{DD}	Quiescent Power Supply Current	XC		50			100			20	μA	MIN, 25°C	All Inputs Common and at 0 V or V _{DDI}
				700			1400			280		MAX	
		XM		5			300			60	μA	MIN, 25°C	
				10			600			120		MAX	

*V_{IH} must be less than or equal to V_{DDO}. If V_{IH} is greater than V_{DDO}, current at each input must be limited to 10 mA.

**V_{IL} must be greater than or equal to V_{SS}. If V_{IL} is less than V_{SS}, current at each input must be limited to 10 mA.

Notes:

- Inputs at 0 V or V_{DDO} per function.
- Inputs at 0.3 V_{DDO} or 0.7 V_{DDO} per function.
- For I_{ozH} and I_{ozL} commercial product limits, multiply the above military product limits by 10.

AC CHARACTERISTICS AND SET-UP REQUIREMENTS: $V_{DD1}=5\text{ V}$, V_{DD0} as shown, $V_{SS}=0\text{ V}$, $T_A=25^\circ\text{C}$

SYMBOL	PARAMETER	LIMITS									UNITS	TEST CONDITIONS	
		$V_{DD0}=5\text{ V}$			$V_{DD0}=10\text{ V}$			$V_{DD0}=15\text{ V}$					
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX			
t_{PLH} t_{PHL}	Propagation Delay. I_n to Z_n or \bar{Z}_n		135			75			65		ns	$C_L=15\text{ pF}$ Input Transition Times < 20 ns	
t_{PZH} t_{PZL}	Output Enable Time		190			95			75		ns		$R_L=1\text{ k}\Omega$ to V_{SS} $R_L=1\text{ k}\Omega$ to V_{DD0}
t_{PHZ} t_{PLZ}	Output Disable Time		100			75			70		ns		
t_{TLH} t_{THL}	Output Transition Time		30			18			16		ns	$R_L=1\text{ k}\Omega$ to V_{SS} $R_L=1\text{ k}\Omega$ to V_{DD0}	
t_{PLH} t_{PHL}	Propagation Delay. I_n to Z_n or \bar{Z}_n		160			85			75		ns		
t_{PZH} t_{PZL}	Output Enable Time		200			100			80		ns	$R_L=1\text{ k}\Omega$ to V_{SS} $R_L=1\text{ k}\Omega$ to V_{DD0}	
t_{PHZ} t_{PLZ}	Output Disable Time		115			80			75		ns		
t_{TLH} t_{THL}	Output Transition Time		60			30			25		ns	$R_L=1\text{ k}\Omega$ or V_{SS} $R_L=1\text{ k}\Omega$ to V_{DD0}	
			60			30			25		ns		

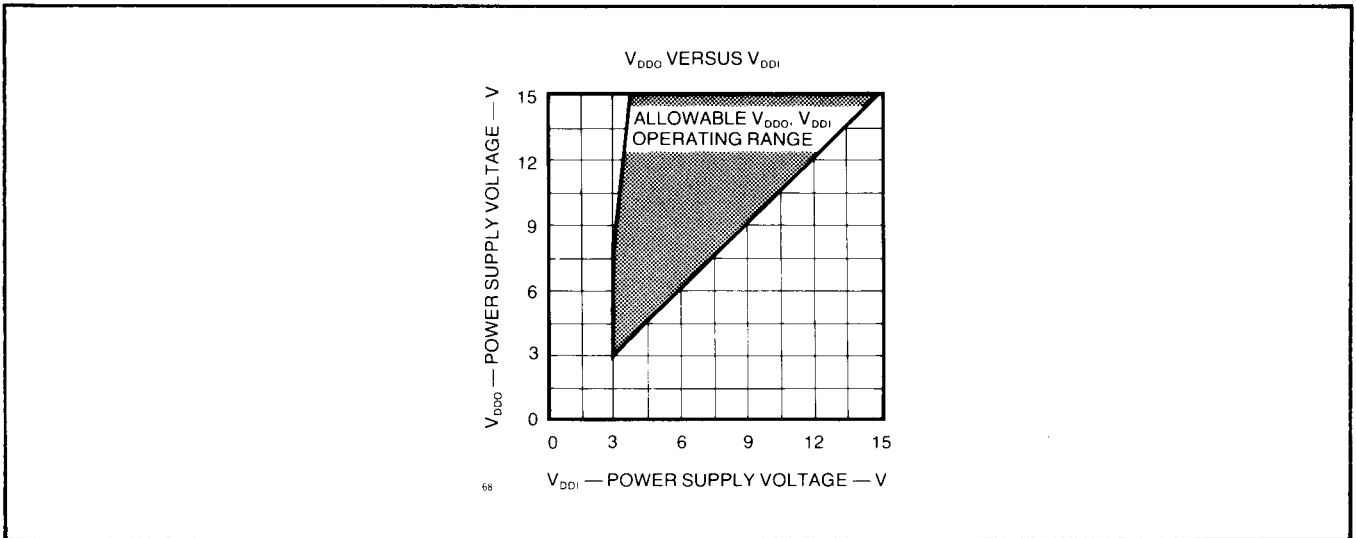


Fig. 1 Typical Electrical Characteristics

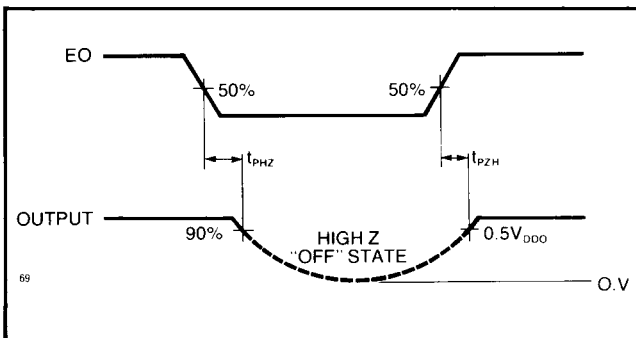


Fig. 2 Output Enable Time (t_{pZH}) And Output Disable Time (t_{pHZ})

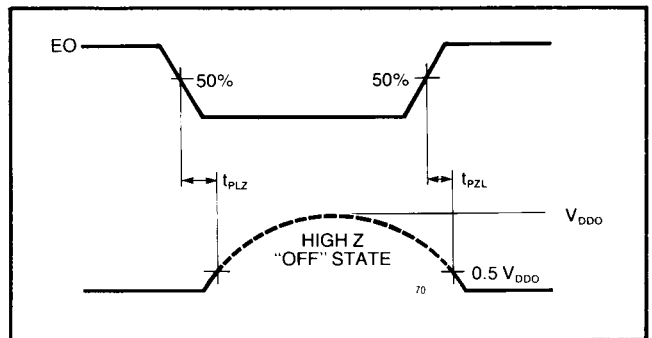


Fig. 3 Output Enable Time (t_{pLH}) And Output Disable Time (t_{pLZ})

ISO-CMOS™ MD4104

TYPICAL APPLICATION:

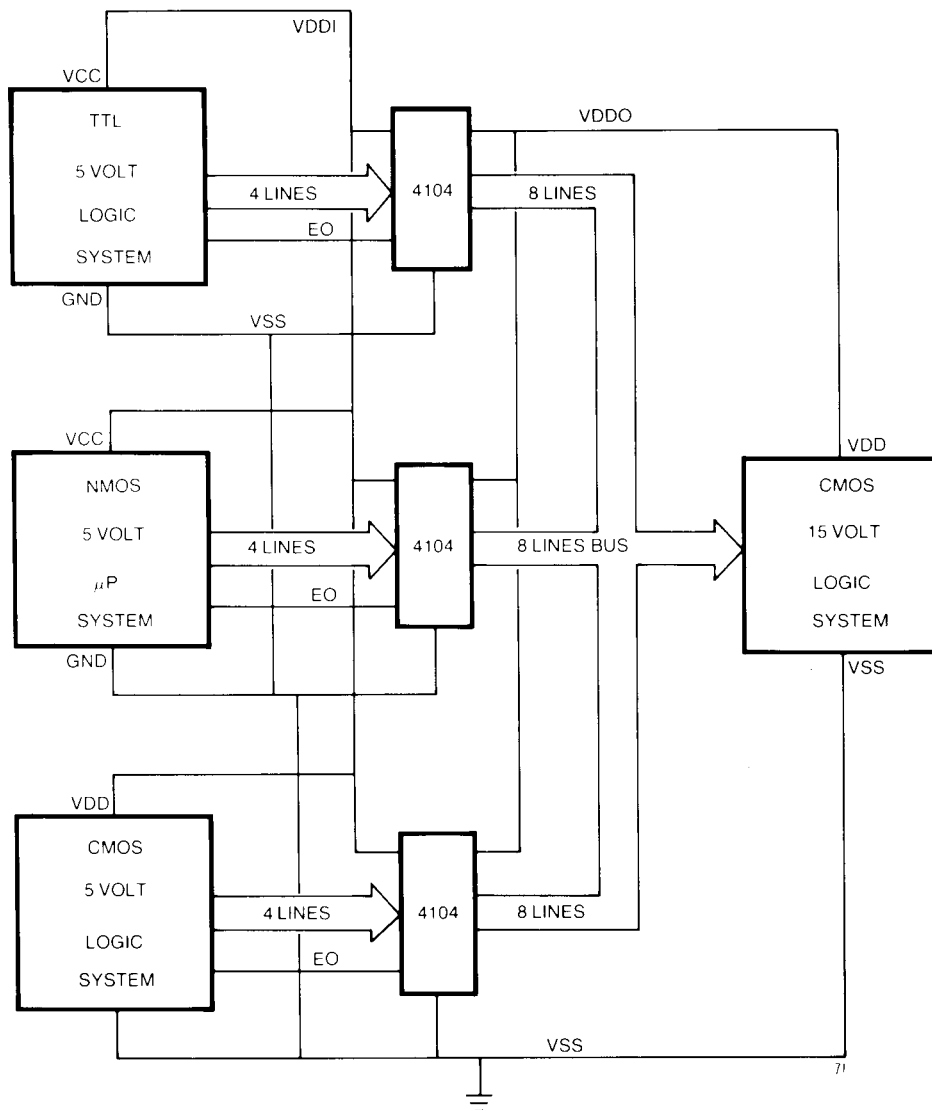


Fig. 4 MD4104 Application Block Diagram

Information furnished by MITEL Semiconductor is believed to be accurate and reliable. However, no responsibility is assumed by MITEL Semiconductor for its use; nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of MITEL Semiconductor. Specifications are subject to change without notice.

For more information write or phone the leaders in CMOS technology, MITEL Semiconductor:

UNITED STATES: 1745 Jefferson Davis Hwy., Suite 603, Arlington, Va. 22202 (703) 243-1600 TWX; 710-955-0026
 1 So. Main St., Janesville, Wis. 53545 (608) 752-3537
 2321 Morena Blvd., Suite M, San Diego, Calif. 92110 (714) 276-3421
 6236 Tulip Lane, Dallas, Texas 75230 (214) 692-1554
 3100 Lorna Road, Suite 317, Birmingham, Alabama 35216 (205) 822-7723
 5600 South Syracuse Circle, Suite 201A, Englewood, Colorado 80110; (303) 779-3027

CANADA: P.O. Box 13089, Kanata, Ottawa K2K 1X3 (613) 592-2122 TLX: 053-4596
 18 Airport Blvd., Bromont, Quebec, JOE 1L0 (514) 534-2321 TLX: 05-267474
 1124 Lonsdale Ave., Suite 304A, North Vancouver, British Columbia V7M 2H1 (604) 988-2510

EUROPE: 1A Albert Street, Slough, England, SL1 2BL (0753) 28154 TLX: 847730
 Fredericiagade 16, Suite 309, 1310 Copenhagen K., Denmark, Telephone (01) 119302

FAR EAST: Park-In Commercial Centre, Suite 1423, 56 Dundas Street, Mong Kok, Kowloon, Hong Kong, TLX: 64235

