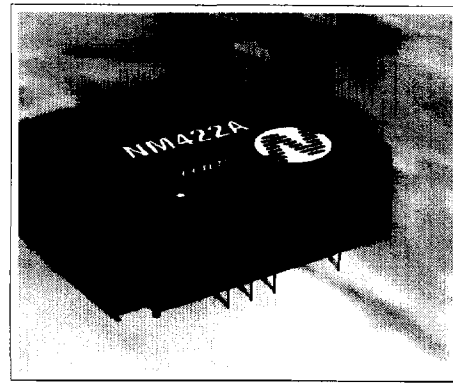
features

- Bi-directional Transceiver
- 5V Only Operation
- Meets EIA RS-232-C, EIA RS-422-A and EIA-485 Standards
- 3 State Driver Output
- Individual Driver and Receiver Enables



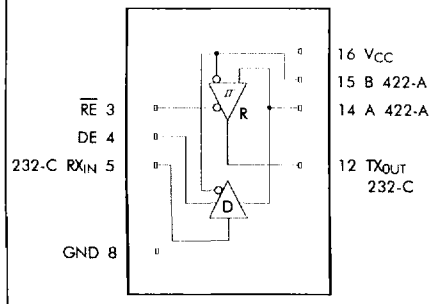
description

The NM422A Transceiver is designed for balanced transmission lines and meets EIA RS-422-A & EIA-485 standards for the bus port connection. At the RX_{IN} and TX_{OUT} connection it conforms with the specifications of EIA RS-232-C standard. The device operates from a single 5V power supply yet provides full EIA RS-232-C transmitter voltage levels.

The bus port driver and receiver have active enable lines that can be connected externally to function as a direction control. The driver differential output and the receiver differential input are internally connected forming a differential input/output bus port. The loading on the bus is minimised whenever the bus driver is disabled (three-state) or V_{CC} = zero. The bus receiver has a minimum input impedance of 12kΩ and input sensitivity of ±200mV. The bus driver can handle loads up to 60mA of sink or source current and the total power demand is typically 200mW. The RX_{IN} and TX_{OUT} lines provide a data receive channel and data transmit channel both EIA RS-232-C compatible connected as input and output to the EIA RS-422-A compatible driver and receiver.

pin connections

16 Pin DIP (top view)



absolute maximum ratings over operating free air temperature range

Supply voltage V_{CC} 7V
Voltage at any bus terminal . . . . . –10V to 15V
Enable input voltage 5.5V
Input voltage EIA RS-232-C receiver . . . . . ±30V
Output voltage EIA RS-232-C transmitter . . . . . ±15V
Continuous total dissipation at or below 25°C free air temperature 750mW

Operating free-air temperature range . . . . . 0°C to 70°C
Storage temperature range . . . . . –55°C to 125°C
Lead temperature 1.5mm from case for 10 seconds . . . . . 300°C

other parameters

weight (typical) . . . . . 6.5 grams

electrical characteristics over operating free air temperature range

Parameter	Test Conditions	Value			Unit
		MIN	TYP	MAX	
Supply Current, I_{CC}	No Loads, Input High		30		mA
	No Loads, Input Low		40		
Total Power Dissipation, P_D	EIA RS-232-C $R_L=3k\Omega$ EIA RS-422-A $R_L=60\Omega$		385		mW

Note : All data taken at $T_A=25°C$, $V_{CC}=5V$.

EIA RS-232-C receiver

electrical characteristics over operating free air temperature range

Parameter	Test Conditions	Value			Unit
		MIN	TYP	MAX	
High Threshold Differential Input , V_{TH}				0.2	V
Low Threshold Differential Input , V_{TL}		–0.2			V
VT+ to VT– Hysteresis			50		mV
High Level Enable Input Voltage, V_{IH}		2.0			V
Low Level Enable Input Voltage, V_{IL}				0.8	V
High Level Output Voltage, V_{OH}	V_{IH}=0.2V, R_L=3kΩ	8.0	9.0		V
Low Level Output Voltage, V_{OL}	V_{IH}=–0.2V, R_L=3kΩ		–8.0	–7.0	V
Line Input Current, I_I	Other Input=0, V_I=12V			1.0	mA
	Other Input=0, V_I=–7V			–0.8	
High Level Enable Input Current, I_{IH}	V_{IH}=2.7V			20	μA
Low Level Enable Input Current, I_{IL}	V_{IL}=0.4V			–100	μA
Input Resistance, R_I		12			kΩ
Short Circuit Ouput Current, $I_{OS(H)}$	V_{IH}=0.2V	15	20		mA
Short Circuit Ouput Current, $I_{OS(L)}$	V_{IL}=–0.2V		–15	–10	mA
Output Resistance Power Off, R_O	V_{CC}=0V	300			Ω

Note : All data taken at T_A=25°C, V_{CC}=5V.

EIA RS-232-C receiver and transmitter

switching characteristics

Parameter	Test Conditions	Value			Unit
		MIN	TYP	MAX	
Propagation Delay Time L to H, T_{PLH}	R_L=3kΩ, C_L=30pF		1.3		μs
Propagation Delay Time H to L, T_{PHL}	R_L=3kΩ, C_L=30pF		1.2		μs
Transition Time L to H Level, T_{TLH}	R_L=3kΩ, C_L=30pF		1.0	1.6	μs
	R_L=3–7kΩ, C_L=2500pF		2.0	1.6	μs
Transition Time H to L Level, T_{THL}	R_L=3kΩ, C_L=30pF		1.0	2.5	μs
	R_L=3–7kΩ, C_L=2500pF		2.0	2.5	μs

Note : All data taken at T_A=25°C, V_{CC}=5V.

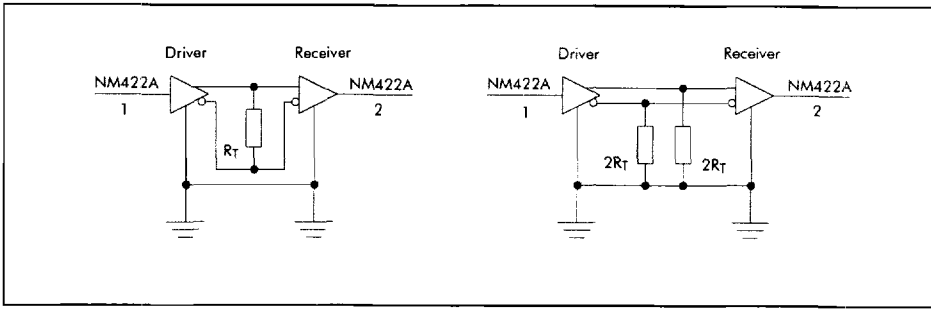
EIA RS-232-C receiver to EIA RS-422-A driver

electrical characteristics over operating free air temperature range

Parameter	Test Conditions	Value			Unit
		MIN	TYP	MAX	
Positive Going Threshold, V_T+			2.4	2.0	V
Negative Going Threshold, V_T-		1.0		1.6	V
High Level Output Voltage, V_{OH}	V_{IH}=3.0V, I_{OH}=–33mA			4.0	V
Low Level Output Voltage, V_{OL}	V_{IL}=–3.0V, I_{OL}= 33mA			0.9	V
Differential Output Voltage, V_{OD1}	I_O=0		$2V_{OD2}$		V
Differential Output Voltage, V_{OD2}	R_L=100Ω	2.0		3.0	V
	R_L=54Ω	1.5		2.4	
Change in Magnitude of Differential Output Voltage, ΔV_{OD}	R_L=54 or 100Ω		±0.2		V
Common Mode Output Voltage, V_{OC}	R_L=54 or 100Ω		3.0		V
Change in Magnitude of Common Mode Output Voltage, ΔV_{OC}	R_L=54 or 100Ω		±0.2		V
Output Current, I_O	Output Disabled, V_O=12V		1.0		mA
	Output Disabled, V_O=–7V		–0.8		
High Level Input Current, I_{IH}	V_{IN}=25V	5.5	6.3		mA
	V_{IN}=3.0V		0.65	0.6	
Low Level Input Current, I_{IL}	V_{IN}=–25V		–6.8	–6.0	mA
	V_{IN}=–3.0V	–0.6	–0.65		
Short Circuit Ouput Current, I_{OS}	V_O=–7.0V		–180		mA
	V_O=V_{CC}		180		
	V_O=12V		500		

Note : All data taken at T_A=25°C, V_{CC}=5V.

EIA RS-422-A connection techniques



EIA RS-422-A switching characteristics

Parameter	Test Conditions	Value			Unit
		MIN	TYP	MAX	
Differential Output Delay Time, T_{DD}	R_L=60Ω		35	50	ns
Differential Output Transition Time, T_{TD}	R_L=60Ω		50	75	ns
Propagation Delay Time L to H, T_{PLH}	R_L=27Ω		16	25	ns
Propagation Delay Time H to L, T_{PHL}	R_L=27Ω		44	65	ns
Output Enable Time to H Level, T_{PZH}	R_L=110Ω		60	80	ns
Output Enable Time to L Level, T_{PZL}	R_L=110Ω		30	45	ns
Output Disable Time from H Level, T_{PHZ}	R_L=110Ω		51	75	ns
Output Disable Time from L Level, T_{PLZ}	R_L=110Ω		18	30	ns

Note : All data taken at T_A=25°C, V_{CC}=5V.

logic state table

EIA RS-232-C	Voltage	EIA RS-422-A	Voltage A	Voltage B
0	+V	0	+V	–V
1	–V	1	–V	+V

application notes

inverted or non-inverted

There is sometimes confusion in the user's mind about whether Newport's interfaces provide signal inversion. Between a UART and the EIA-232-D lines an inversion is ALWAYS required. The NM232 series of interfaces all provide this inversion in the same way that the old-fashioned 1488/1489 combination did (see figure 1).
The NM422 series does NOT provide an inversion since it is designed to convert from EIA-232-D to EIA RS-422-A and the sense of the signal lines must be preserved during this conversion.

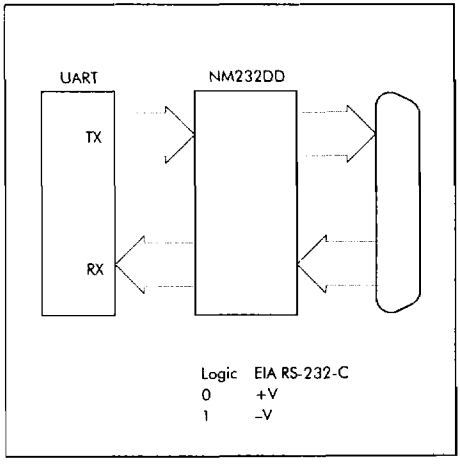


Figure 1 : *Simple Bi-directional Interface*

EIA-485 compatibility

The question of compatibility of the NM422 types with the EIA-485 standard is often raised. The NM422A is fully compatible with the standard. In contrast the NM422AD is not compatible with the EIA-485 standard and this is witnessed by the lack of a driver disable line on the device which is necessary for party line applications. It is mainly this feature which separates EIA-485 from EIA RS-422-A. On EIA RS-422-A lines there can be only one driver and it is usually intended for point-to-point communications. EIA-485 lines are party lines where up to 32 drivers and receivers can be interconnected and control of the drivers is mandatory.

explanation of 2-wire operation differential mode

The EIA RS-422-A standard is a communication method using 2 signal wires differentially connected. In addition an earth or reference line is also used. Compare this with EIA-232-D which has just a signal and ground line. The receiver input on an EIA

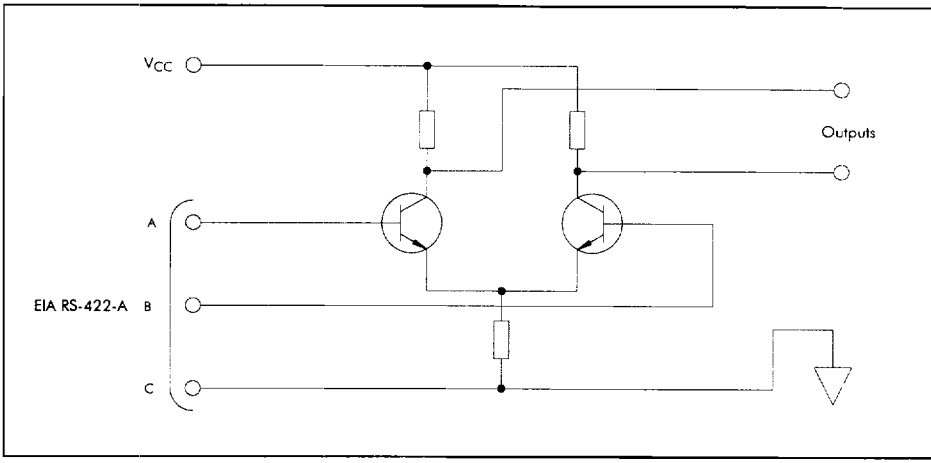


Figure 2 : *Simple Bi-directional Interface*

RS-422-A line is in concept like figure 2.

The differential signal is connected to the base of two transistors which are referred to ground via the emitters.
Clearly for stable operation which avoids saturating either transistor it is necessary for a ground connection from the driving circuit. This allows the signal currents to return to the driving circuit. Many implementation problems stem from the mistaken belief that just two wires constitute an EIA RS-422-A channel BUT there must be three wires - two signal and a return or ground wire.

mean time to failure (MTTF) in thousands of hours

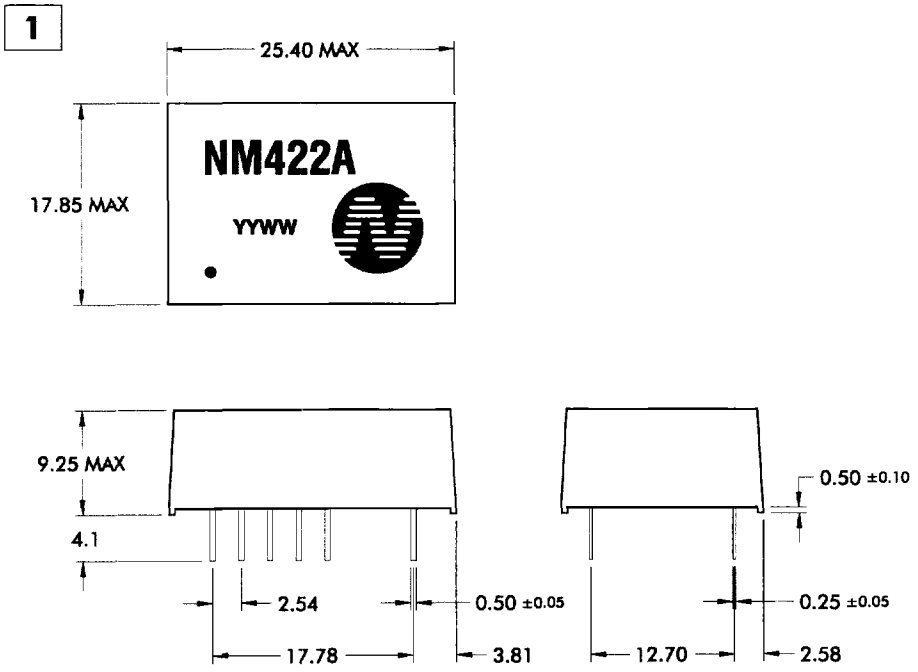
Part Number	0°C	25°C	70°C
NM422A	1625	673	50

ordering information

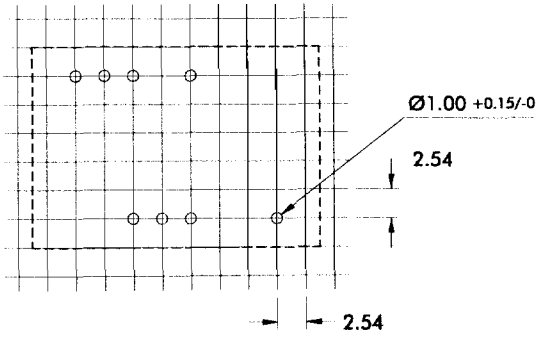
Part Number	Function	Package Style
NM422A	5V only EIA RS-232-C to EIA RS-422-A Transceiver	1

outline dimensions

16 Pin DIP package style



recommended footprint details



All pins on a 2.54mm pitch.
All dimensions in mm XX.X ±0.50, XX.XX ±0.25.