

Interface Transceiver of the Serial Data of RS-232 Standard

ILX3221

DESCRIPTION

The ILX3221 is interface transceiver of serial data under RS - 232 standard with single power supply source & bipolar output voltage of transmitter, low power consumption.

The ILX3221 is purposed for application in modern high efficient calculating systems with the wide range of supply voltage, fast-operating electronic devices with high level of fidelity of information exchange among distant devices. The chip is designed in 16-pin SSOP and TSSOP package.


SSOP-16

TSSOP-16

Fig.1

T_A = from -40 to 85 °C
for all packages

FEATURES

- 1 transmitter and 1 receivers of the serial data of the standard RS-232;
- Auto Shutdown function provide low power consumption;
- Supply voltage range: 3.0 ... 5.5 V;
- Operating temperature range: -40 ... +85 °C;
- ESD protection up to 2000 V for transmitter input and receiver output (TTL/CMOS levels) and up to 15000V for transmitter output and receiver input (RS-232 levels);
- Latch current, min – 100 mA at normal climatic condition.

ORDERING INFORMATION

Device	Operating Temperature Range	Package	Shipping
ILX3221ESD	T_A = -40° to 85° C	SSOP-16	Tube
ILX3221ESDT		SSOP-16	Taping
ILX3221ETSD		TSSOP-16	Tube
ILX3221ETSDT		TSSOP-16	Taping

PIN CONFIGURATION

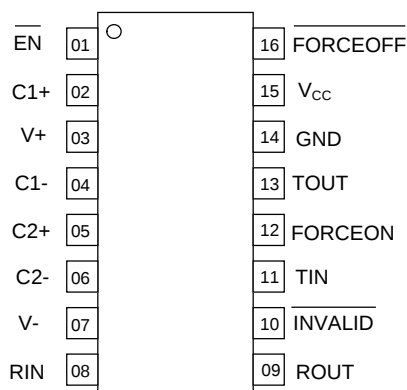
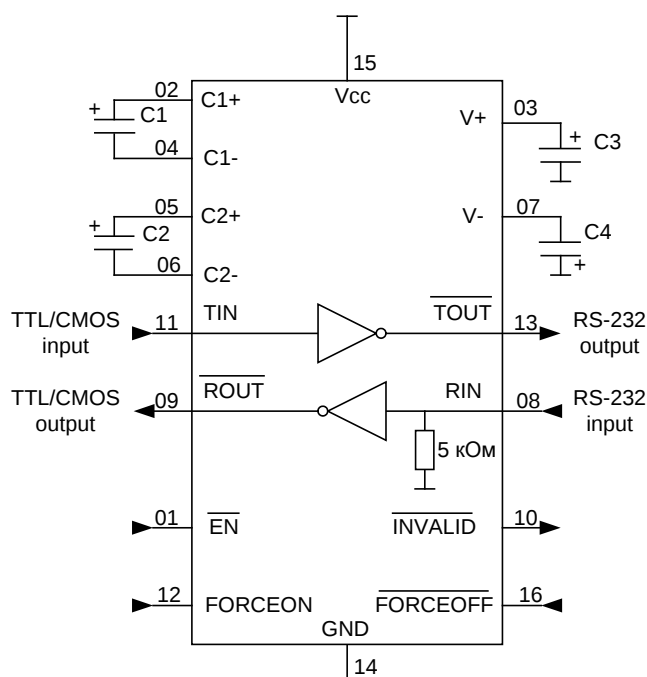


Fig.2

Table. 1 PIN DESCRIPTION

Pin number	Symbol	Pin description
01	$\overline{\text{EN}}$	Receiver enable control input
02	C1+	Positive terminal of the voltage multiplier charge-pump capacitor
03	V+	Positive voltage multiplier output
04	C1-	Negative terminal of the voltage multiplier charge-pump capacitor
05	C2+	Positive terminal of the voltage multiplier charge-pump capacitor
06	C2-	Negative terminal of the voltage multiplier charge-pump capacitor
07	V-	Negative voltage multiplier output
08	RIN	RS-232 Receiver data inputs
09	$\overline{\text{ROUT}}$	TTL/CMOS Receiver data output
10	$\overline{\text{INVALID}}$	Output of the valid signal detector. Indicates if a valid RS-232 level is present on receiver inputs logic "1".
11	TIN	TTL/CMOS transmitter data input
12	FORCEON	Autoshutdown mode control input (enable active operation of the IC)
13	$\overline{\text{TOUT}}$	RS-232 transmitter data outputs
14	GND	Common pin
15	Vcc	Supply voltage
16	$\overline{\text{FORCEOFF}}$	Autoshutdown mode control input (switch the IC to low power consumption mode)

Functional diagram



C1 – capacitor 0.1 $\mu\text{F} \pm 10\%$ for $V_{CC} = 3.0 \dots 3.6\text{V}$ and
0.047 $\mu\text{F} \pm 10\%$ for $V_{CC} = 4.5 \dots 5.5\text{V}$
C2, C3, C4 – capacitors 0.1 $\mu\text{F} \pm 10\%$ for $V_{CC} = 3.0 \dots 3.6\text{V}$ and
0.33 $\mu\text{F} \pm 10\%$ for $V_{CC} = 4.5 \dots 5.5\text{V}$

Fig. 3 - Functional diagram

Table 2. Truth table

Mode	Inputs					Outputs	
	FORCEON	FORCEOFF	$\overline{\text{EN}}$	RIN	TIN	$\overline{\text{ROUT}}$	$\overline{\text{TOUT}}$
Low power consumption (without Autoshtutdown function)	X	L	L	L	X	H	Z
	X	L	L	H	X	L	Z
	X	L	H	X	X	Z	Z
Data transfer (without Autoshtutdown function)	H	H	L	L	L	H	H
	H	H	L	L	H	H	L
	H	H	L	H	L	L	H
	H	H	L	H	H	L	L
	H	H	H	X	L	Z	H
	H	H	H	X	H	Z	L
Data transfer (with Autoshtutdown function)	L	H	L	L	L	H	H
	L	H	L	L	H	H	L
	L	H	L	H	L	L	H
	L	H	L	H	H	L	L
	L	H	H	X	H	Z	L
	L	H	H	X	L	Z	H
Low power consumption (with Autoshtutdown function)	L	H	L	L _{INVL}	X	H	Z
	L	H	H	L _{INVL}	X	Z	Z

Note: H – high level;
 L – low level;
 X – any level (H or L);
 L_{INVL} – low level signal not less than -0.3 V & not more than 0.3 V with duration not less than t_{PHLINV};
 Z – third state of output

Table 3. Truth table for $\overline{\text{INVALID}}$ pin

RIN	$\overline{\text{INVALID}}$
L	H
H	H
L _{INVL}	L

Note: H – high level;
 L – low level;
 L_{INVL} – low level signal not less than -0.3 V & not more than 0.3 V with duration not less than t_{PHLINV};

Table 4. – Maximum Ratings

Symbol	Parameter	Norm		Unit
		min	max	
V_{CC}	Supply voltage	-0.3	6.0	V
V_{IL}	Transmitter low level input voltage	-0.3	–	V
V_{IH}	Transmitter high level input voltage	–	6.0	V
V_{OT}	Voltage applied to transmitter output	-13.2	13.2	V
V_{OR}	Receiver output voltage	-0.3	$V_{CC} + 0.3$	V
V_O	INVALID pin voltage	-0.3	$V_{CC} + 0.3$	V
$V_{V+} + V_{V-}$	Multiplier outputs voltages difference	–	13	V
V_{V+}	Multiplier positive output voltage, V	-0.3	7.0	V
V_{V-}	Multiplier negative output voltage, V	-7.0	0.3	V
V_{IR}	Receiver input voltage, V	-25	25	V
T	Ambient temperature	-60	150	°C

* Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device.

These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied.

Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Table 5 – Recommended Operating Conditions

Symbol	Parameter	Norm		Unit
		min	max	
V_{CC}	Supply voltage	3.0	5.5	V
V_{IL}	Transmitter low level input voltage	0	0.8	V
V_{IH}	Transmitter high level input voltage			V
	- for $V_{CC} = 3.3 \text{ V} \pm 10 \%$	2.0	V_{CC}	
	- for $V_{CC} = 5.0 \text{ V} \pm 10 \%$	2.4		
V_{INVL}	Receiver threshold input voltage corresponding to low level on INVALID pin	-0.3	0.3	V
V_{INVH}	Receiver threshold input voltage corresponding to high level on INVALID pin	-2.7	2.7	V
V_{ITH}	Receiver high level threshold input voltage,	–	2.4	V
V_{ITL}	Receiver low level threshold input voltage			V
	for $V_{CC} = 3.3 \text{ V} \pm 10 \%$	0.6	–	
	for $V_{CC} = 5.0 \text{ V} \pm 10 \%$	0.8		
V_{V+}	Multiplier positive output voltage, V	5.0	–	V
V_{V-}	Multiplier negative output voltage, V	–	-5.0	V
V_{IR}	Receiver input voltage, V	-25	25	V
T	Ambient temperature	-40	85	°C

Table 6 – Electric parameters ($V_{CC} = 3.0 - 5.5 \text{ V}$)

Symbol	Parameter	Mode	Target		$T_A, ^\circ\text{C}$	Unit
			Min	Max		
I_{CC1}	AutoShutdown mode supply current	$V_{CC} = 3.3; 5.0 \text{ V}$; FORCEON is connected to GND; FORCEOFF is connected to V_{CC} RIN not connected	–	10 14	25 ± 10 -40; 85	μA
I_{CC2}	Low power consumption mode supply current	$V_{CC} = 3.3; 5.0 \text{ V}$; FORCEOFF is connected to GND RIN connected to GND	–	10 14	25 ± 10 -40; 85	μA
I_{CC3}	AutoShutdown Disabled supply current	$V_{CC} = 3.3; 5.0 \text{ V}$; FORCEON & FORCEOFF is connected to V_{CC} without load	–	1.0 1.4	25 ± 10 -40; 85	mA
I_{ILL}	Low level input leakage current (for control inputs and transmitter inputs)	$V_{CC} = 5.5 \text{ V}$; $V_{IL} = 0 \text{ V}$	–	-0.5 -1.0	25 ± 10 -40; 85	μA
I_{ILH}	High level input leakage current (for control inputs and transmitter inputs)	$V_{CC} = 5.5 \text{ V}$; $V_{IH} = V_{CC}$	–	0.5 1.0	25 ± 10 -40; 85	μA
Receiver						
V_{OLR}	Low level output voltage, V	$I_{OL} = 1.6 \text{ mA}$	–	0.3 0.4	25 ± 10 -40; 85	V
V_{OHR}	High level output voltage	$I_{OH} = -1.0 \text{ mA}$	$V_{CC} - 0.6$	–	25 ± 10 -40; 85	V
V_{hR}^*	Receiver hysteresis, V	–	0.2	1.0	25 ± 10	V
V_{OLINV}	Low level output voltage (for INVALID pin)	$I_{OL} = 1.6 \text{ mA}$; FORCEON is connected to GND; FORCEOFF is connected to V_{CC}	–	0.3 0.4	25 ± 10 -40; 85	V
V_{OHINV}	High level output voltage (for INVALID pin)	$I_{OH} = -1.0 \text{ mA}$; FORCEON is connected to GND; FORCEOFF is connected to V_{CC}	$V_{CC} - 0.6$	–	25 ± 10 ; -40; 85	V

Table 6 continued

Sym- bol	Parameter	Mode	Target		T _A , °C	Unit
			Min	Max		
Receiver						
I _{OZLR}	Low level output current for OFF-state	Receiver output is disabled; V _O = 0 V	—	-2.5	25±10	μA
				-10	-40; 85	
I _{OZHR}	High level output current for “OFF”-state	Receiver output is disabled; V _O = 5.5 V	—	2.5	25±10	μA
				10	-40; 85	
R _I	Input resistance	-	3.0	7.0	25±10	kΩ
t _{PHLR} , t _{PLHR}	OFF-ON switching propagation delay	V _{CC} = 5.0 V; C _L = 150 pF;	—	500		ns
t _{SKD}	Propagation delays difference	V _{IL} = 0 V; V _{IH} = 3.0 V; t _{LH} = t _{HL} ≤ 10 ns	—	200		ns
t _{PLZR} , t _{PHZR}	Propagation delay of transition from high (low) level state to OFF-state	V _{CC} = 5.0 V; V _{IL} = 0 V; V _{IH} = 3.0 V;	—	400		ns
t _{PZLR} , t _{PZHR}	Propagation delay of transition from OFF-state to high (low) level state	t _{LH} = t _{HL} ≤ 10 ns; R _L = 1 kΩ	—	400		ns
t _{PHLINV}	Propagation delay of transition <u>INVALID</u> pin to low level state	V _{CC} = 5.0 V; V _{IL} = 0; -3.0 V; V _{IH} = 3.0; 0 V;	—	80		μs
t _{PLHINV}	Propagation delay of transition <u>INVALID</u> pin to high level state	t _{LH} = t _{HL} ≤ 10 ns; C _L = 15 pF	—	2.9		μs
Transmitter						
V _{OLT}	Low level output voltage	R _L = 3 kΩ	—	-5.07	25±10	V
				-5.0	-40; 85	
V _{OHT}	High level output voltage	R _L = 3 kΩ	5.07	—	25±10	V
			5.0		-40; 85	
V _{hT}	Transmitter hysteresis	—	0.1	1.0	25±10	V
R _O	Output resistance	V _{CC} = V _{V+} = V _V = 0 V; V _O = ±2 V	350	—	25±10	Ω
			300		-40; 85	

Table 6 continued

Sym- bol	Parameter, unit	Mode	Target		T _A , °C	Unit
			Min	Max		
Transmitter						
I _{OS}	Short circuit current	—	—	53	25±10	mA
				60	-40; 85	
				-53	25±10	
				-60	-40; 85	
I _{OZLT}	Low level output current for OFF-state	V _{CC} = 0; 3.0 – 5.5 V; V _O = -12 V; transmitter output is disabled	—	-10	25±10	µA
				-25	-40; 85	
I _{OZHT}	High level output current for OFF-state	V _{CC} = 0; 3.0 – 5.5 V; V _O = 12 V; transmitter output is disabled	—	10	25±10	µA
				25	-40; 85	
ST	Maximum Data Rate	R _L = 3 kΩ; C _L = 1000 pF; only transmitter is switching	250	—	25±10; -40; 85	kbit/s
SR	Transition-Region Slew Rate	V _{CC} = 3.3 V; R _L = (3-7) kΩ; V _{OT} is changing from +3 to -3 V or from -3 to +3 V; only transmitter is switching C _L = (150 -1000) pF	6.0	30	25±10	V/µs
t _{SKREW}	Propagation delays difference	V _{CC} = 5.0 V; V _{IL} = 0 V; V _{IH} = 3.0 V; t _{LH} = t _{HL} ≤ 10 ns; R _L =3 kOhm; C _L =1000 pF	—	300		ns
t _{WU}	Transmitter output enable time	V _{CC} = 5.0 V; V _{IL} = 0 V; V _{IH} = 3.0 V; V _{IL} = -3.0 V; V _{IH} = 0 V	—	120		µs
* V_{V+}, V_{V-} - voltages applied to pins 03 , 07. Note: Electric parameters is indicated for C1=0.047 µF, C2-C4 = 0.33 µF & V_{CC} = 3.0 ... 3.6V (or C1-C4 = 0.1 µF & V_{CC} = 4.5 ... 5.5)						

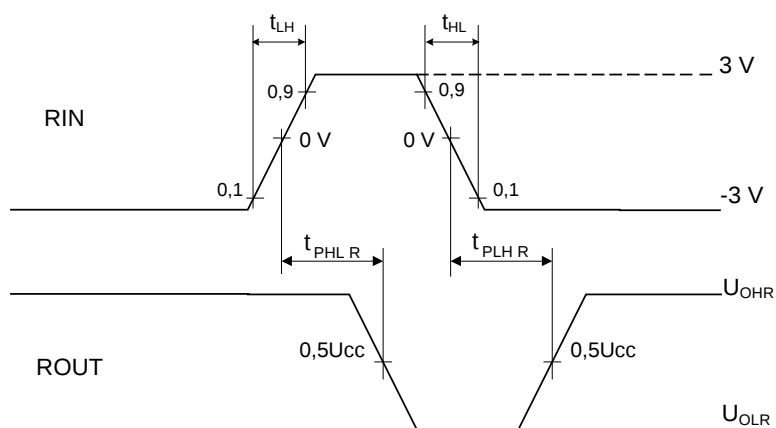


Fig. 4 – Receiver output & input signals time diagram

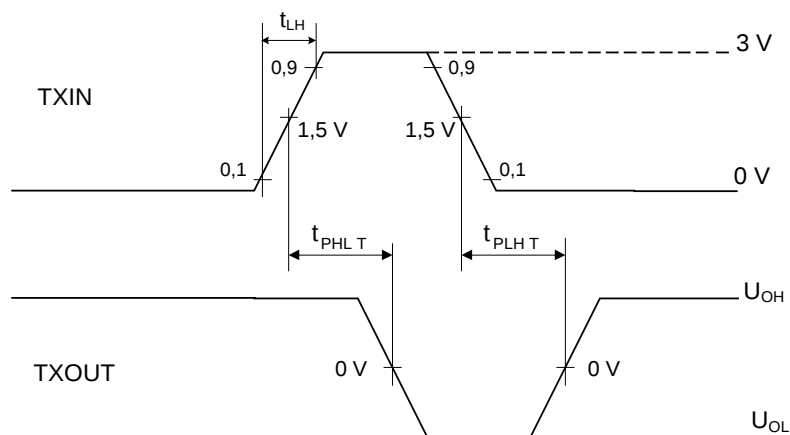


Fig. 5 – Transmitter output & input signals time diagram

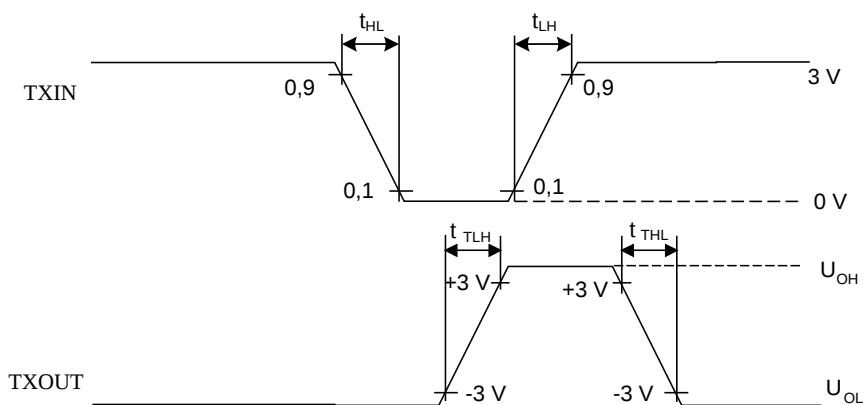
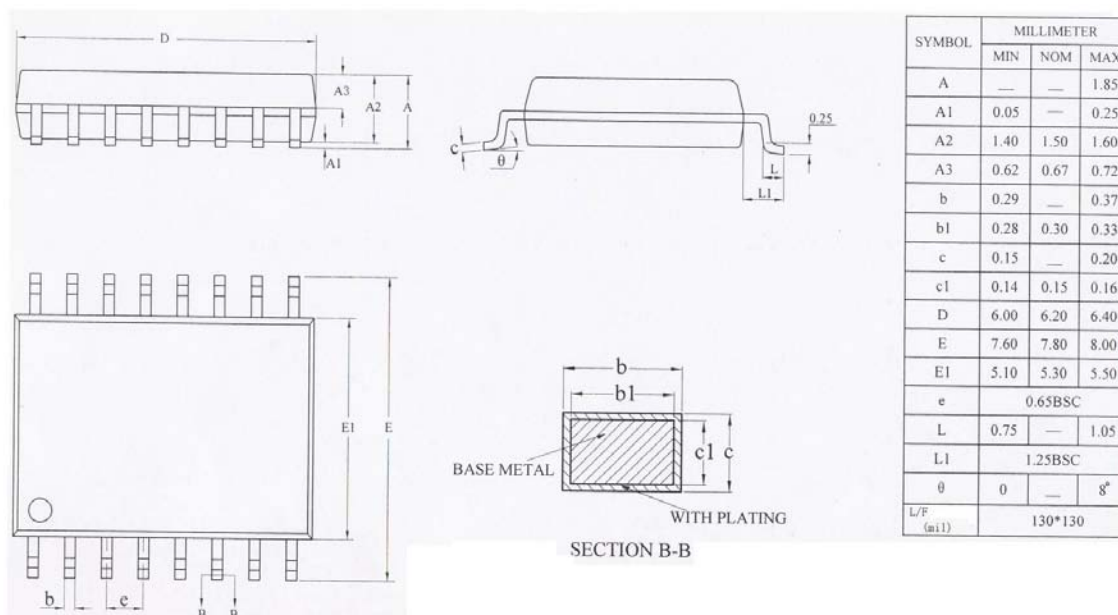


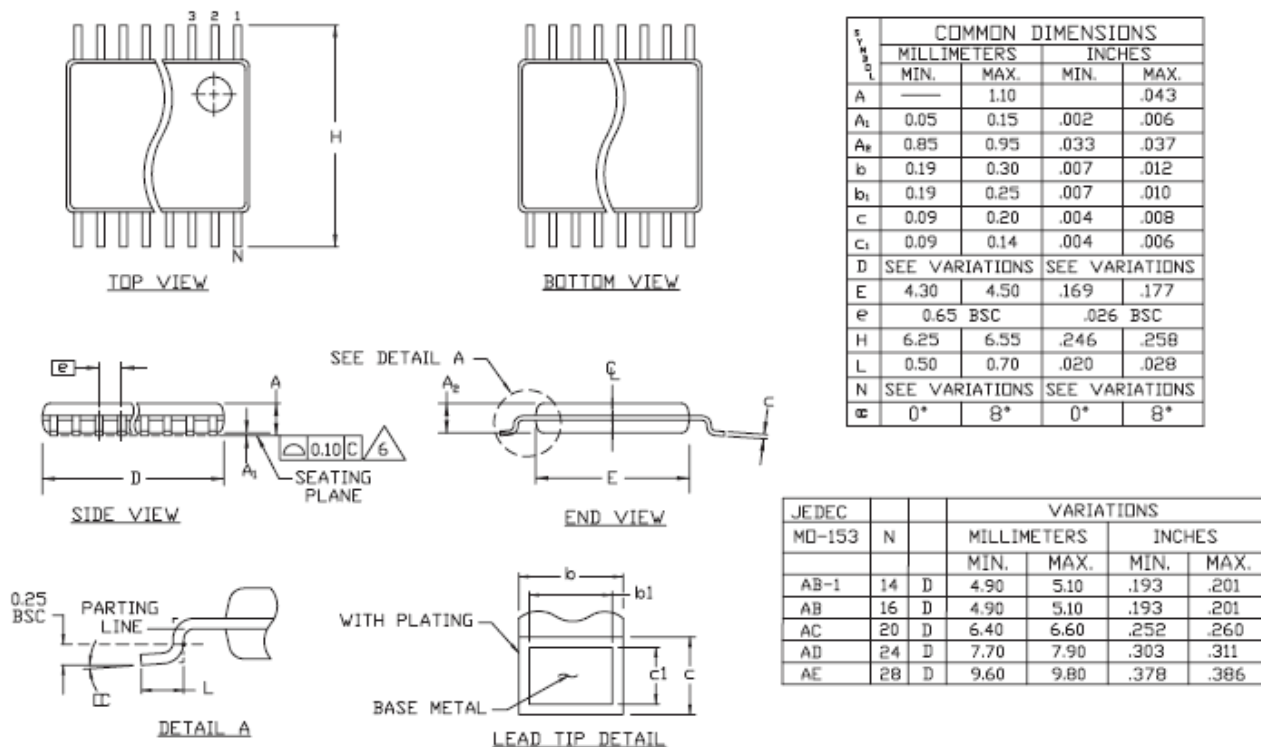
Fig.6 – Transmitter output & input signals time diagram

Package Dimension

SSOP-16



TSSOP-16



NOTES:

1. DIMENSIONS D AND E DO NOT INCLUDE FLASH
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED 0.15mm PER SIDE
3. CONTROLLING DIMENSION: MILLIMETER
4. MEETS JEDEC OUTLINE MO-153. SEE JEDEC VARIATIONS TABLE
5. 'N' REFERS TO NUMBER OF LEADS

THE LEAD TIPS MUST LIE WITHIN A SPECIFIED ZONE. THIS TOLERANCE ZONE IS DEFINED BY TWO PARALLEL PLANES. ONE PLANE IS THE SEATING PLANE, DATUM [-C-]. THE OTHER PLANE IS AT THE SPECIFIED DISTANCE FROM [-C-] IN THE DIRECTION INDICATED