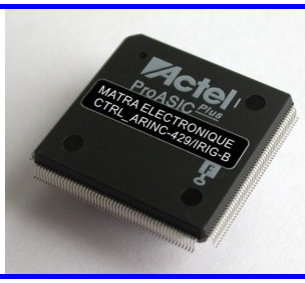
CTRL_A-429 / IRIG-B

ARINC-429 Controller
2Rx / 2Tx with SPI interface
IRIG-B 003 Decoder



Matra Électronique

Rue Ferdinand MEUNIER
60610 LA CROIX ST-OUEN
Tél : 03.44.91.45.00
Fax : 03.44.91.45.45

Features :

- Two independent Receiver Channels (Rx)
- Two independent Transmitter Channels (Tx)
- Serial Peripheral Interface with selectable modes
- ARINC 429 interface : '1' and '0' lines, RZ code
- Support all ARINC 429 Data Transfer Rate
- Label Filtering Capability
- Parity Control : Odd, Even and No parity
- Interrupt generated on selectable events
- Self-Test Mode Capability
- 16 General Purpose IO : 8 Inputs, 8 Outputs
- Boundary-Scan Test IEEE 1149.1 (JTAG) compliant
- ACTEL ProASIC+ design on PQFP208 package
- Available in Industrial (-40/+85°C)

Applications :

- **Avionics Data Communication**

- **ARINC 429 to SPI conversion**

- **SPI to ARINC 429 conversion**

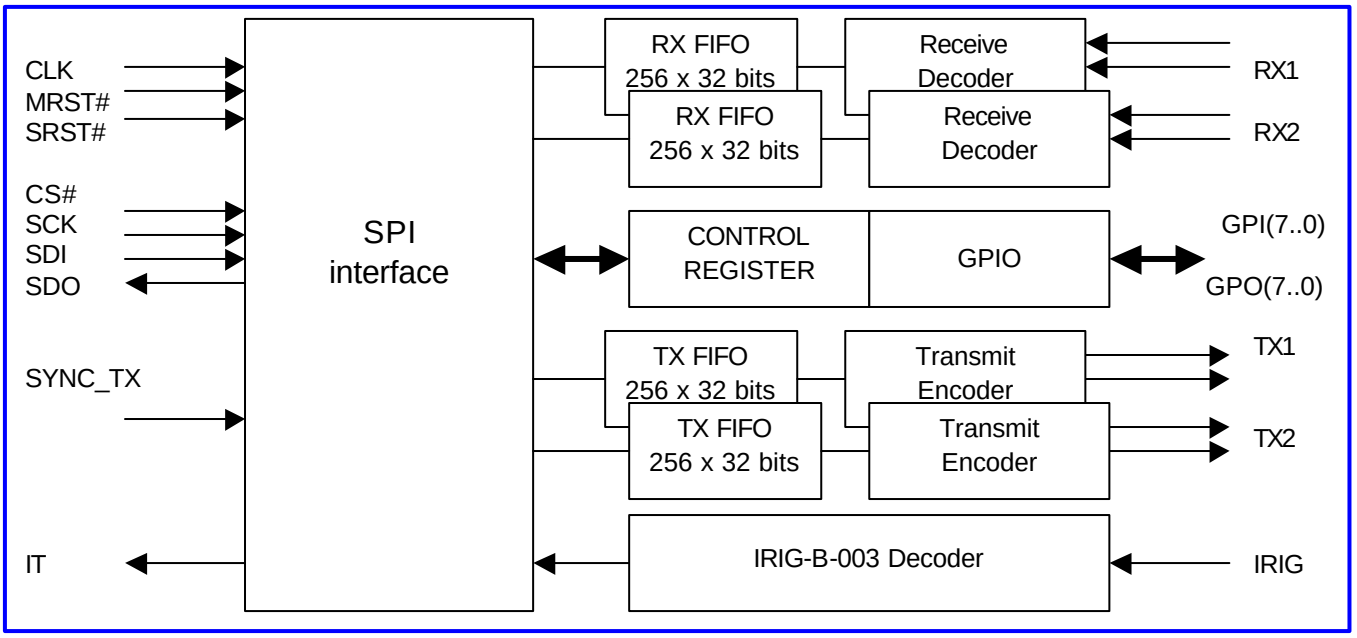
General Description :

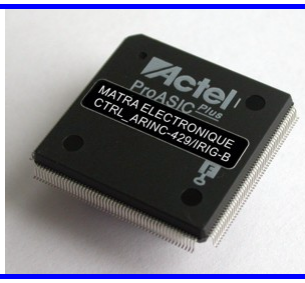
The MEA429_R2T2 provides an interface between ARINC 429 avionic serial data bus and SPI bus. The interface circuit consists of two independent transmitter channels, two independent receiver channels, and a host programmable control register to setup operating functions.

The two receiver channels operate identically, each providing RXA / RXB input pins needing RZ code with LVTTL_3V3 format.

Each transmitter circuit contains a 256 words by 32 bits buffer memory and control logic which allows the host to write a block of data into the transmitter. The block of data is transmitted automatically by enabling the transmitter with no further attention by the host computer. Data is transmitted in RZ code with LVTTL_3V3 format on the TXA / TXB output pins.

Block Diagram :





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Absolute Maximum Ratings :

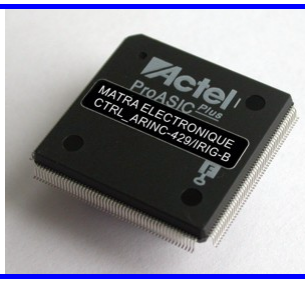
Parameter	Symbol	Min	Max	Units
Supply Voltage Core	V_{DD}	- 0.3	+ 3	V
Supply Voltage I/O Ring	V_{DDP}	- 0.3	+ 4	V
DC Input Voltage		- 0.3	VDDP + 0.3	V
Ground	GND	0	0	V

Temperature Conditions :

Parameter	Symbol		Min	Max	Units
Operating Temperature	T_{op}	Industrial	- 40	+ 85	°C
		Military	- 55	+ 125	
Storage Temperature	T_{stg}	Industrial	- 55	+ 110	°C
		Military	- 65	+ 150	
Junction Temperature (operating)	T_{jmax}	Industrial	-	+ 110	°C
		Military	-	+ 150	
Lead Temperature	T_{lead}		-	+ 260	°C

DC Electrical Characteristics (VDDP = 3.3 ± 0.3V, VDD = 2.5 ± 0.2V) :

Parameter	Symbol	Min	Max	Units
Power Supply Inputs				
Supply Voltage Core	V_{DD}	+ 2.3	+ 2.7	V
Supply Current Core	I_{DD}	-	25	mA
Supply Voltage I/O Ring	V_{DDP}	+ 3.0	+ 3.6	V
Supply Current I/O	I_{DDP}	-	50	mA
Logic Inputs (LVTTL_3V3)				
Input High Voltage	V_{IH}	2	VDDP + 0.3	V
Input Low Voltage	V_{IL}	- 0.3	0.8	V
Input Current	I_{IN}	- 20	20	µA
Logic Outputs (LVTTL_3V3)				
Output High Voltage	V_{OH}	2.4	-	V
Output Low Voltage	V_{OL}	-	0.7	V
Output Current High	I_{OH}	- 12	-	mA
Output Current Low	I_{OL}	-	12	mA
Tristate Output Leakage Current	I_{OZ}	- 10	10	µA
Output Short Circuit Current	I_{OSH}	- 100	-	mA
I/O pad capacitance	$C_{I/O}$	-	10	pF
Clock Input Capacitance	C_{CLK}	-	10	pF



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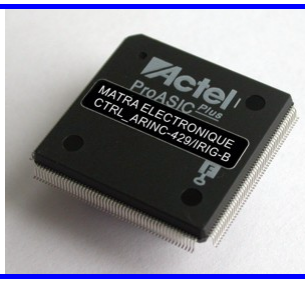
AC Electrical Characteristics :

Parameter	Symbol	Min	Max	Units
Clock Frequency	CLK	5	40	MHz
Clock Duty Cycle	CLK_{DC}	40	60	%
CLK Rise / Fall Time	T_{CRF}	-	10	ns
Master Reset Pulse Width	T_{MR}	200	-	ns

Pin Definition :

Symbol	Definition	Pin List
Power Supply		
VDD	CORE POWER INPUT	16,36,71,88,126,142,171,187
VDDP	I/O POWER INPUT	22,40,53,72,89,104,123,138,157, 170,186,208
GND	POWER GROUND	1,17,25,29,41,52,65,81,97,105,122, 130,133,141,156, 162,178,195
System		
CLK	SYSTEM CLOCK	24
MRST#	MASTER RESET	30
SRST#	SOFT RESET	134
IT	INTERRUPT OUTPUT	86
SPI Interface		
SPI_CS#	SPI CHIP SELECT	74
SCK	SPI CLOCK	80
SDI	SPI DATA IN	78
SDO	SPI DATA OUT	76
CPOL	SPI POLARITY SELECT MODE	82
CPHA	SPI PHASE SELECT MODE	83
LSB_FIRST	SPI BIT ORDER SELECT MODE	84
GPIO		
GPI[7..0]	LVTTL GENERAL PURPOSE INPUTS	112,113,116,117,120,121,124,125
GPO[7..0]	LVTTL GENERAL PURPOSE OUTPUTS	139,140,143,144,147,148,151,152
ARINC 429		
RX1A	RECEIVER 1 LVTTL INPUT A	206
RX1B	RECEIVER 1 LVTTL INPUT B	204
TEST_TX1A	TEST 1 LVTTL OUTPUT A	198
TEST_TX1B	TEST 1 LVTTL OUTPUT B	196
SPEED_TX1	TRANSMITTER 1 SPEED SELECT LVTTL OUPTUT	194
TX1B	TRANSMITTER 1 LVTTL OUTPUT B	192
TX1A	TRANSMITTER 1 LVTTL OUTPUT A	190
RX2A	RECEIVER 2 LVTTL INPUT A	175
RX2B	RECEIVER 2 LVTTL INPUT B	173
TEST_TX2A	TEST 2 LVTTL OUTPUT A	167
TEST_TX2B	TEST 2 LVTTL OUTPUT B	165
SPEED_TX2	TRANSMITTER 2 SPEED SELECT LVTTL OUPTUT	163
TX2A	TRANSMITTER 2 LVTTL OUTPUT A	161
TX2B	TRANSMITTER 2 LVTTL OUTPUT B	159
JTAG		
TCK	JTAG CLOCK	101
TDI	JTAG DATA IN	102
TMS	JTAG MODE SELECT	103
TDO	JTAG DATA OUT	108
TRST	JTAG RESET	109



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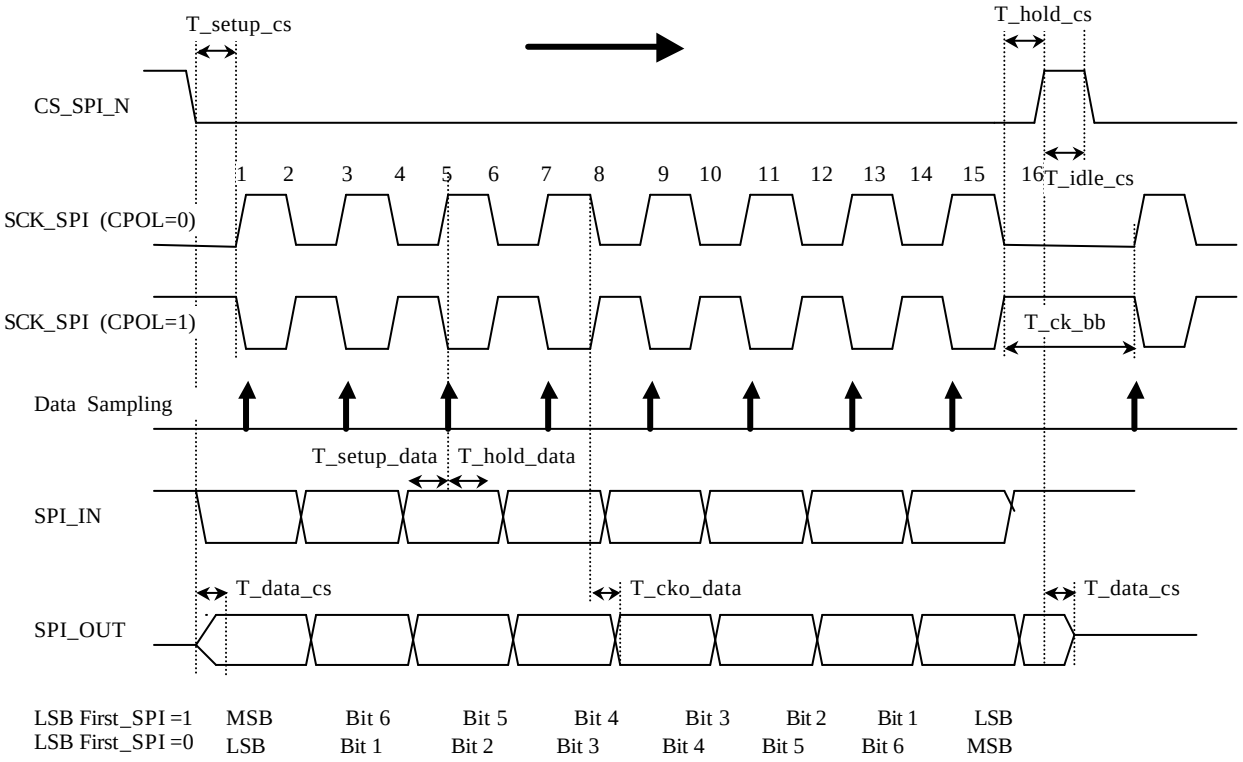
Serial Peripheral Interface :

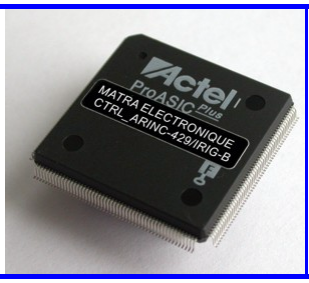
SPI is a serial digital bus, widely encountered on digital circuit like microcontrollers, ADC, DAC, …
It's an easy to design solution on a board to link and dial with components with minimum I/O needs and fast data transfer rate up to 5Mb/s.

By modifying CPHA value, SPI can be configured to sample data on SCK rising edge or falling edge.
By modifying CPOL value, SPI idle state value can be configured.
By modifying LSB_FIRST value, data octet bit order can be reversed in each frame.
These parameters can be setup by pull-up/pull-down or by microcontroller I/Os.

Mode SPI_0 (CPHA = 0)



Paramètres	Description	Min	Max	Units
T_setup_cs	Setup time of SPI_CS# face of SCK first edge	10	-	ns
T_hold_cs	Hold time of SPI_CS# after SCK last edge	0	-	ns
T_idle_cs	Idle time of SPI_CS# between two frames	SCK/2	-	ns
T_data_cs	Time to valid or invalid SDO value depending on SPI_CS# value	-	20	ns
T_setup_data	Setup time of SDI before sampling edge	20	-	ns
T_hold_data	Hold time of SDI after sampling edge	5	-	ns
T_cko_data	New data valid on SDO after SCK edge	-	20	ns
T_ck_bb	Minimum time between two frames	SCK/2	-	ns



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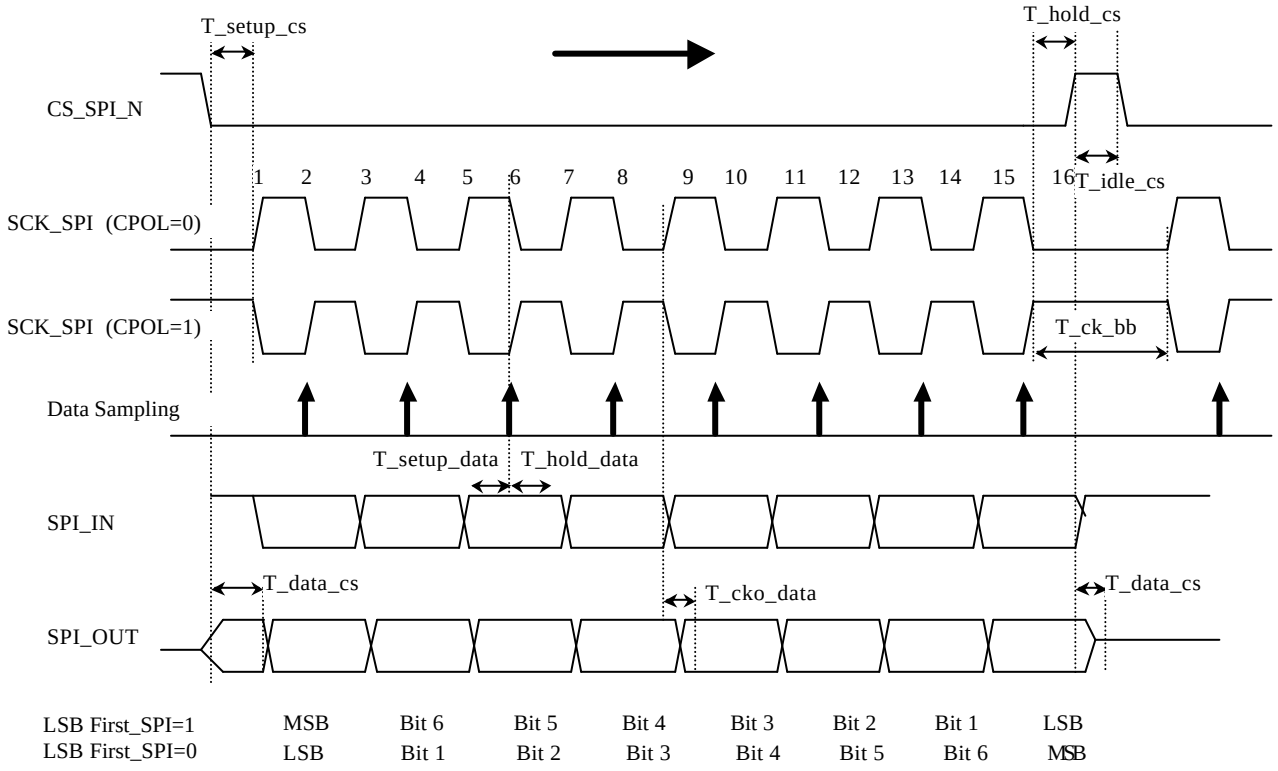
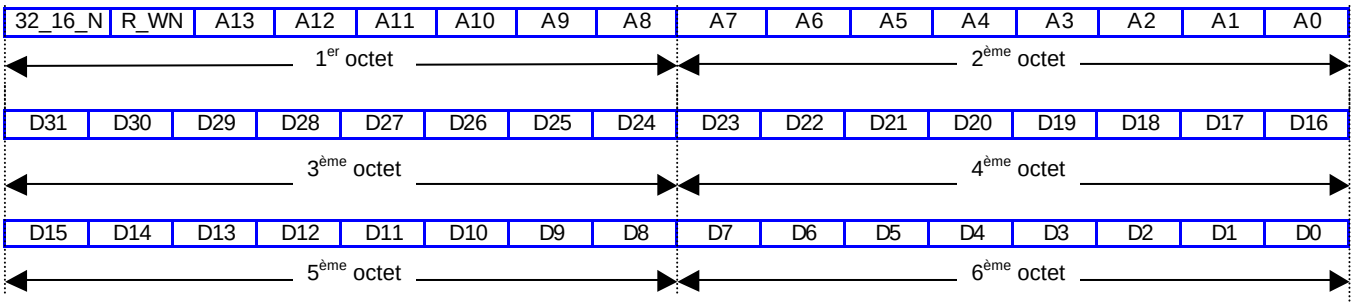
Mode SPI_1 (CPHA = 1)

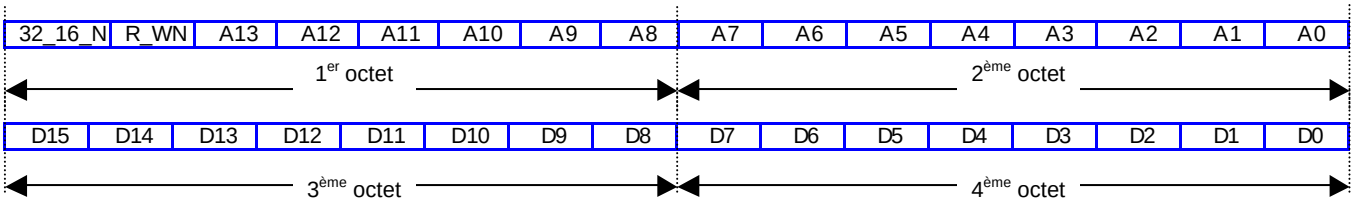


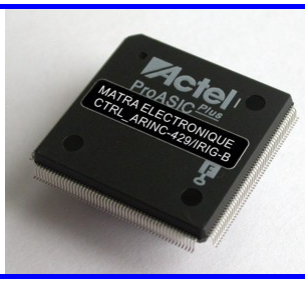
Read and Write Cycles can be configured in 16 bits or 32 bits by modifying a status register.

32-bits Read or Write Cycle



16-bits Read or Write Cycle





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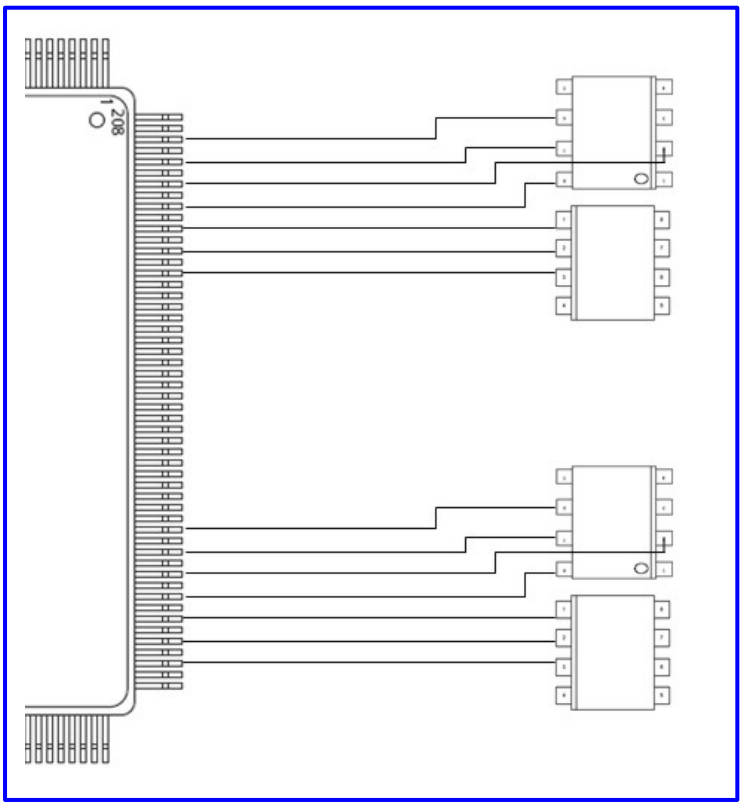
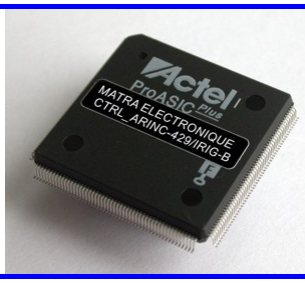
Application Note :

Direct Interfacing :

- with ARINC429 level translator receiver like DEI104x / HOLT 8588
- with ARINC429 level translator driver like DEI107x / HOLT 8585.





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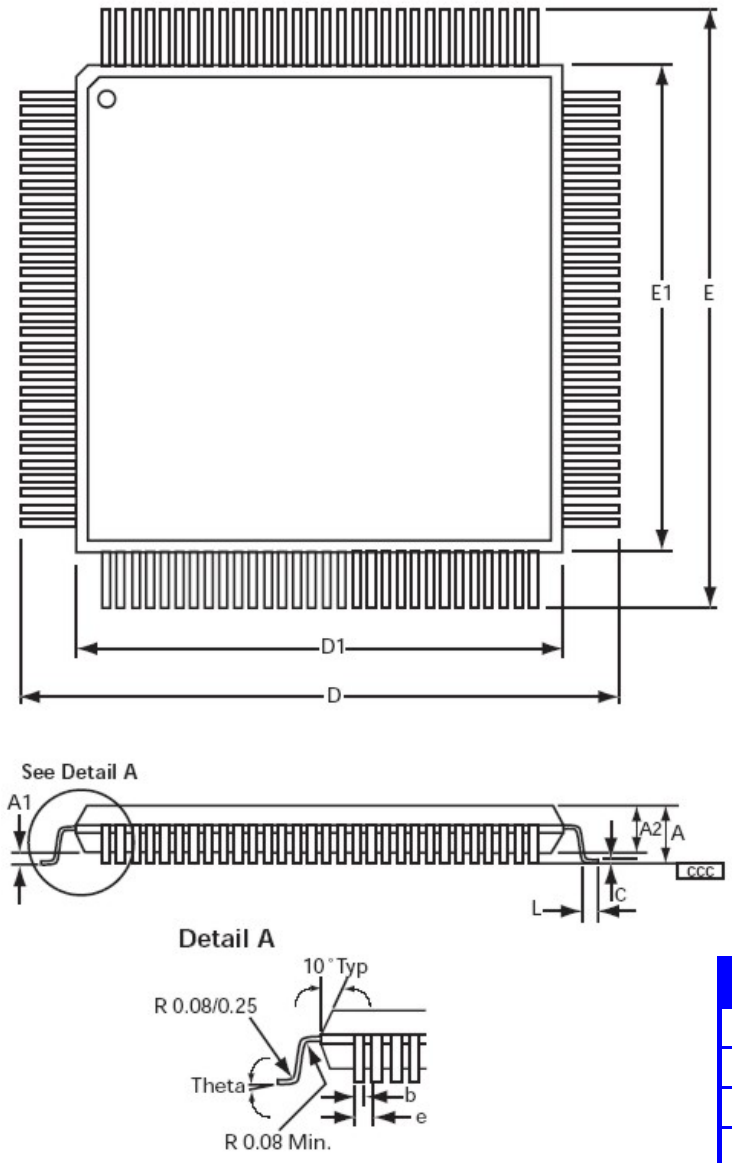
Package Characteristics : PQFP-208



Dimensions	Min.	Nom.	Max.
A			4.10
A1	0.25		0.50
A2	3.20	3.40	3.60
b	0.17		0.27
c	0.09		0.20
D/E		30.60 BSC	
D1/E1		28.00 BSC	
e		0.50 BSC	
L	0.45	0.60	0.75
ccc		0.10	
Theta	0	3.50	8 deg

Note :

1. All dimensions are in millimeters.
2. BSC : Basic Spacing between Centers