

## Features

- Up to 30MHz operation
- Fundamental oscillation
- Capacitors 8pF  $C_G$  and 10pF  $C_D$  built-in (except A2A, A4A series)
- Inverter amplifier feedback resistor built-in
- TTL input level
- 8 mA ( $V_{DD} = 4.5$  V) drive capability
- 4 mA ( $V_{DD} = 2.7$  V) drive capability
- Output three-state function
- 2.7 to 5.5 V supply voltage (AxA series)
- 4.5 to 5.5 V supply voltage (BxA series)
- Clock output ( $f_O$ ,  $f_O/2$ ,  $f_O/4$ ,  $f_O/8$  determined by internal connection,  $f_O$  is oscillator frequency)
- 6-Pin SOT23 package

## Application

Used for crystal oscillate

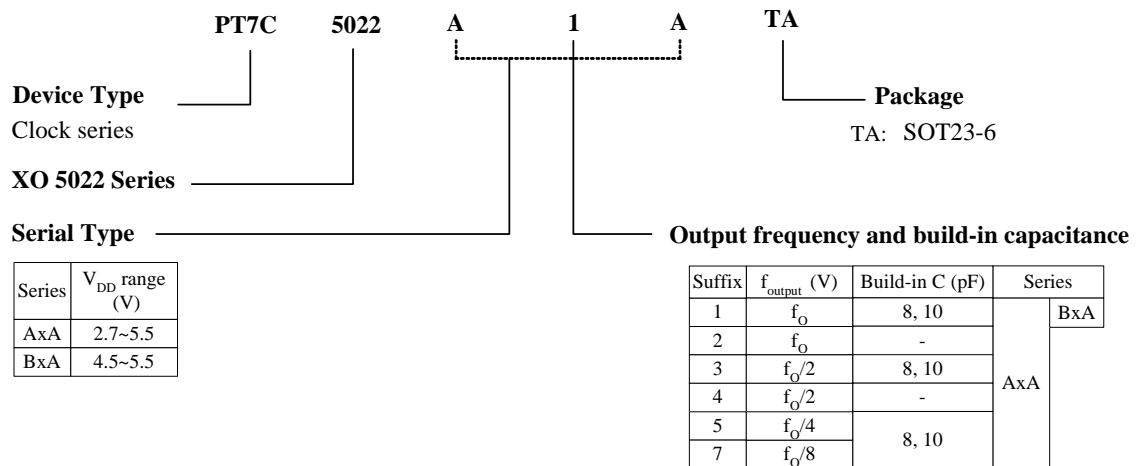
## Description

The PT7C5022 series are crystal oscillator module ICs that incorporate high-frequency, low current consumption oscillator and output buffer circuits. Feedback resistors and high-frequency capacitors are built-in, eliminating the need for external components to make a stable fundamental-harmonic oscillator.

## Ordering Information

Part No.	Package	Operating Range
PT7C5022AxA	SOT23-6	Industrial
PT7C5022AxA	Lead free SOT23-6	Industrial
PT7C5022BxA	SOT23-6	Industrial
PT7C5022BxA	Lead free SOT23-6	Industrial

**Note:** Below is the detailed definition of part no.

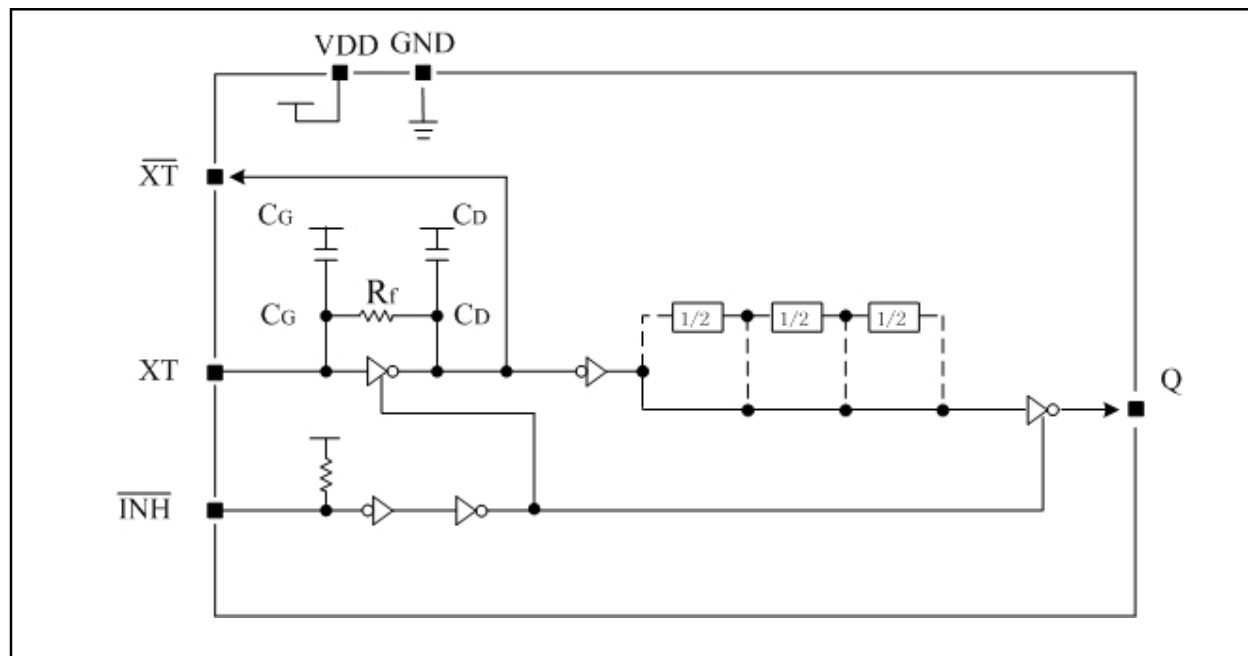


### Series configuration

Series	Part No.	Output freq.	Built-in capacitance (pF)		Recommended operating freq. (MHz)		V <sub>DD</sub> (V)	Output level	Standby output state
			C <sub>G</sub>	C <sub>D</sub>	3V V <sub>DD</sub>	5V V <sub>DD</sub>			
AxA	PT7C5022A1A	f <sub>o</sub>	8	10	4~24	4~30	2.7 ~ 5.5	CMOS	High impedance
	PT7C5022A2A	f <sub>o</sub>	-	-					
	PT7C5022A3A	f <sub>o</sub> /2	8	10	4~30	4~30			
	PT7C5022A4A	f <sub>o</sub> /2	-	-					
	PT7C5022A5A	f <sub>o</sub> /4	8	10					
	PT7C5022A7A	f <sub>o</sub> /8							
BxA	PT7C5022B1A	f <sub>o</sub>	8	10	-	4~30	4.5 ~ 5.5	TTL	

g<sub>m</sub> ratio is 1; feedback resistor R<sub>f</sub> is 600Ω.

### Block Diagram



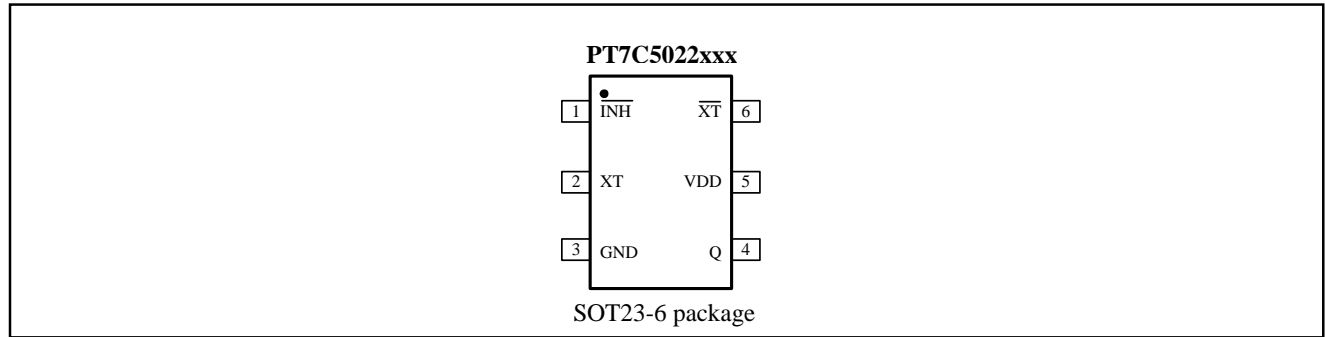
### Function Description

When INH goes LOW, the output on Q becomes high impedance

INH	Q	Oscillator
HIGH (or open)	Any f <sub>o</sub> , f <sub>o</sub> /2, f <sub>o</sub> /4, f <sub>o</sub> /8 output frequency	Normal operation
Low	High impedance	Stopped

## Pin Information

### Pin Configuration



### Pin Description

Pin	Sym	Type	Description	
1	$\overline{\text{INH}}$	I	Output state control input. High impedance when LOW. Pull-up resistor built in.	
2	XT	I	Amplifier input.	Crystal oscillator connected between XT and $\overline{\text{XT}}$ .
3	GND	P	Ground.	
4	Q	O	Output. Output frequency ( $f_o$ , $f_o/2$ , $f_o/4$ , $f_o/8$ ) determined by internal connection, $f_o$ is oscillator frequency.	
5	$V_{DD}$	P	Supply voltage.	
6	$\overline{\text{XT}}$	O	Amplifier output.	Crystal oscillator connected between XT and $\overline{\text{XT}}$ .

## Maximum Ratings

Storage Temperature (die form) .....	-65°C to +150°C
Storage Temperature (package form) .....	-55°C to +125°C
Ambient Temperature with Power Applied.....	-40°C to +85°C
Supply Voltage to Ground Potential ( $V_{DD}$ to GND) .....	-0.5V to 7.0V
DC Input (All Other Inputs except $V_{DD}$ & GND) ..	-0.5V to $V_{DD} + 0.5V$
DC Output Current.....	13mA
Power Dissipation.....	250mW (package form)

### Note:

Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

## Recommended Operating Conditions

3 V operation: AxA series

$f \leq 30\text{MHz}$ ,  $C_L \leq 15\text{pF}$

Parameter	Sym	Conditions	Min	Typ	Max	Unit
Supply voltage	$V_{DD}$	-	2.7	-	3.6	V
Input voltage	$V_{IN}$	-	GND	-	$V_{DD}$	V
Operating temperature	$T_{OPR}$	-	-20	-	80	°C

5 V operation: AxA series, BxA series

$f \leq 30\text{MHz}$ ,  $C_L \leq 15\text{pF}$

Parameter	Sym	Conditions	Min	Typ	Max	Unit
Supply voltage	$V_{DD}$	-	4.5	-	5.5	V
Input voltage	$V_{IN}$	-	GND	-	$V_{DD}$	V
Operating temperature	$T_{OPR}$	-	-20	-	80	°C

## DC Electrical Characteristics

3V operation: AxA series

$V_{DD} = 2.7$  to  $3.6V$ ,  $T_A = -20$  to  $80^\circ C$ , unless otherwise noted.

Sym.	Parameter	Condition		Min	Typ	Max	Unit
I <sub>DD</sub>	Current consumption	INH = open, Measurement cct 3, load cct 1, C <sub>L</sub> = 15 pF, 30 MHz crystal oscillator		-	4	7	mA
V <sub>IH</sub>	High level input voltage	INH pin		2.0	-	-	V
V <sub>IL</sub>	Low level input voltage	INH pin		-	-	0.5	V
R <sub>UP</sub>	INH pull-up resistance	Measurement cct 4		25	100	250	kΩ
R <sub>f</sub>	Feedback resistance	Measurement cct 5		200	600	1000	kΩ
C <sub>G</sub>	Built-in capacitance	Design value, determined by the internal wafer pattern	PT7C5022A1A, PT7C5022A3A, PT7C5022A5A, PT7C5022A7A	7.44	8	8.56	pF
C <sub>D</sub>				9.3	10	10.7	
V <sub>OH</sub>	High level output voltage	Q: Measurement cct 1, I <sub>OH</sub> = 4mA		2.1	2.4	-	V
V <sub>OL</sub>	Low level output voltage	Q: Measurement cct 2, I <sub>OL</sub> = 4mA		-	0.3	0.4	V
I <sub>Z</sub>	Output leakage current	Q: Measurement cct 2, V <sub>DD</sub> = 3.6V, V <sub>INH</sub> = LOW	V <sub>OH</sub> = V <sub>DD</sub>	-	-	10	μA
			V <sub>OL</sub> = GND	-	-	10	

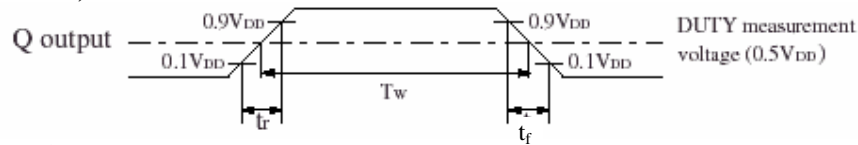
5V operation: AxA series/BxA series

$V_{DD} = 4.5$  to  $5.5$  V,  $T_A = -20$  to  $80^\circ C$ , unless otherwise noted.

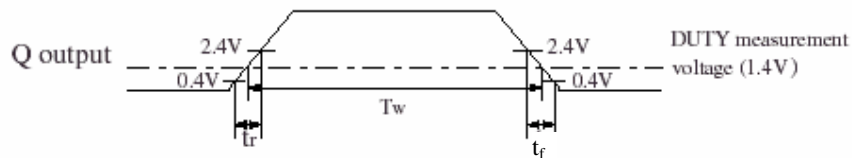
Sym.	Parameter	Condition			Min	Typ	Max	Unit
I <sub>DD</sub>	Current consumption	INH = open, Measurement cct 3, C <sub>L</sub> = 15 pF, 30MHz crystal	Load cct 1	PT7C5022AxAXA	-	7	12	mA
			Load cct 2	PT7C5022BxA	-	7	12	
V <sub>IH</sub>	High level input voltage	INH			2.0	-	-	V
V <sub>IL</sub>	Low level input voltage	INH			-	-	0.8	V
R <sub>UP</sub>	INH pull-up resistance	Measurement cct 4			25	100	250	kΩ
R <sub>f</sub>	Feedback resistance	Measurement cct 5			200	600	1000	kΩ
C <sub>G</sub>	Built-in capacitance	Design value, determined by the internal wafer pattern	PT7C5022A1A, PT7C5022A3A, PT7C5022A5A, PT7C5022A7A, PT7C5022B1A		7.44	8	8.56	pF
C <sub>D</sub>					9.3	10	10.7	
V <sub>OH</sub>	High level output voltage	Q: Measurement cct 1, I <sub>OH</sub> = 8 mA			3.9	4.2	-	V
V <sub>OL</sub>	Low level output voltage	Q: Measurement cct 1, I <sub>OL</sub> = 8 mA			-	0.3	0.4	V
I <sub>Z</sub>	Output leakage current	Q: Measurement cct 2, INH=LOW		V <sub>OH</sub> = V <sub>DD</sub>	-	-	10	μA
				V <sub>OL</sub> = GND	-	-	10	

## AC Electrical Characteristics

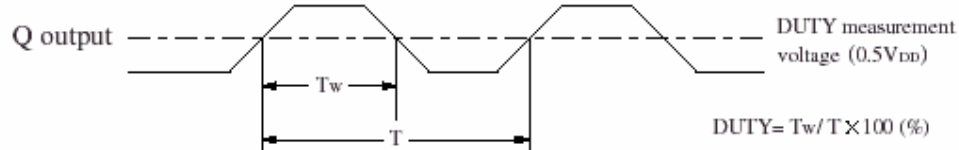
### Output duty level (CMOS)



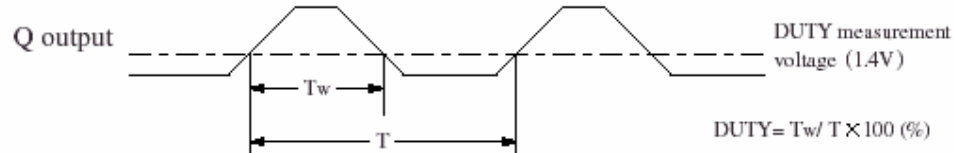
### Output duty level (TTL)



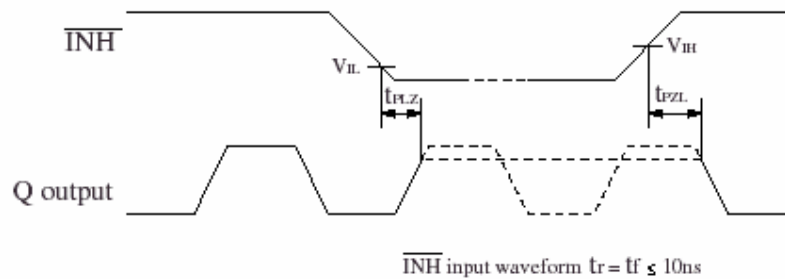
### Output duty cycle (CMOS)



### Output duty cycle (TTL)



### Output Enable/Disable Delay



CMOS: AxA series

3V operation:  $V_{DD} = 2.7$  to  $3.6V$ ,  $T_A = -20$  to  $80^\circ C$ , unless otherwise noted.

Sym	Parameter	Conditions		Min	Typ	Max	Unit
t <sub>r</sub>	Output rise time	Measurement cct 6, load cct 1, C <sub>L</sub> = 15 pF	0.2V <sub>DD</sub> to 0.8V <sub>DD</sub>	-	5	10	ns
			0.1V <sub>DD</sub> to 0.9V <sub>DD</sub>	-	10	20	
t <sub>f</sub>	Output fall time	Measurement cct 6, load cct 1, C <sub>L</sub> = 15 pF	0.8V <sub>DD</sub> to 0.2V <sub>DD</sub>	-	5	10	ns
			0.9V <sub>DD</sub> to 0.1V <sub>DD</sub>	-	10	20	
Duty	Output duty cycle	Measurement cct 6, load cct 1, T <sub>A</sub> = 25°C, V <sub>DD</sub> = 3V, C <sub>L</sub> = 15 pF, f = 30MHz		45	-	55	%
t <sub>PLZ</sub>	Output disable delay time (Note)	Measurement cct 7, load cct 1, T <sub>A</sub> = 25°C, V <sub>DD</sub> = 3 V, C <sub>L</sub> =15 pF		-	-	100	ns
t <sub>PZL</sub>	Output enable delay time (Note)			-	-	100	

**Note:** Oscillator stop function is built-in. When INH goes LOW, normal output stops. When INH goes HIGH, normal output is not resumed until after the oscillator start-up time has elapsed.

5V operation:  $V_{DD} = 4.5$  to  $5.5$  V,  $T_A = -20$  to  $80^\circ C$ , unless otherwise noted.

Sym	Parameter	Conditions	Min	Typ	Max	Unit
$t_r$	Output rise time	Measurement cct 6, load cct 1, 0.1 $V_{DD}$ to 0.9 $V_{DD}$ , $C_L = 15$ pF	-	3.5	7	ns
$t_f$	Output fall time	Measurement cct 6, load cct 1, 0.1 $V_{DD}$ to 0.9 $V_{DD}$ , $C_L = 15$ pF	-	3.5	7	ns
Duty	Output duty cycle1	Measurement cct 6, load cct 1, $T_A = 25^\circ C$ , $V_{DD} = 5$ V, $C_L = 15$ pF, $f = 30MHz$	45	-	55	%
$t_{PLZ}$	Output disable delay time (Note)	Measurement cct 6, load cct 1, $T_A = 25^\circ C$ , $V_{DD} = 5$ V, $C_L = 15$ pF	-	-	100	ns
$t_{PZL}$	Output enable delay time (Note)		-	-	100	

**Note:** Oscillator stop function is built-in. When INH goes LOW, normal output stops. When INH goes HIGH, normal output is not resumed until after the oscillator start-up time has elapsed.

TTL: BxA series

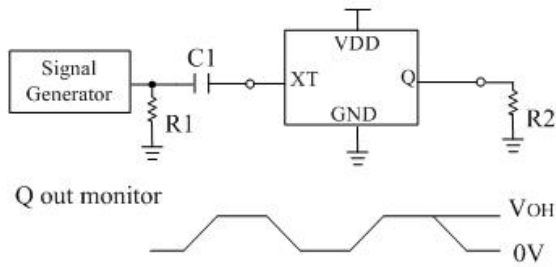
5V operation:  $V_{DD} = 4.5$  to  $5.5$  V,  $T_A = -20$  to  $80^\circ C$ , unless otherwise noted.

Sym	Parameter	Conditions	Min	Typ	Max	Unit
$t_{r3}$	Output rise time	Measurement cct 6, load cct 2, 0.4V to 2.4V, $C_L = 15$ pF	-	2.5	7	ns
$t_{f3}$	Output fall time	Measurement cct 6, load cct 2, 2.4V to 0.4V, $C_L = 15$ pF	-	2.5	7	ns
Duty	Output duty cycle	Measurement cct 6, load cct 2, $T_A = 25^\circ C$ , $V_{DD} = 5$ V, $C_L = 15$ pF, $f = 30MHz$	45	-	55	%
$t_{PLZ}$	Output disable delay time (Note)	Measurement cct 7, load cct 2, $T_A = 25^\circ C$ , $V_{DD} = 5$ V, $C_L = 15$ pF	-	-	100	ns
$t_{PZL}$	Output enable delay time (Note)		-	-	100	

**Note:** Oscillator stop function is built-in. When INH goes LOW, normal output stops. When INH goes HIGH, normal output is not resumed until after the oscillator start-up time has elapsed.

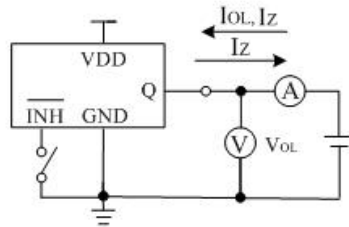
## Measurement Circuit

**Measurement cct 1**

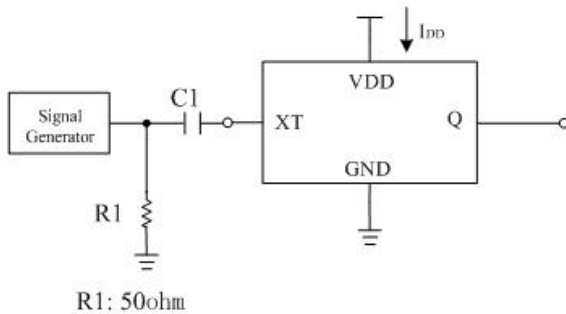


2.0 V<sub>p-p</sub>, 10MHz sine wave input signal (3V operation)  
 3.5 V<sub>p-p</sub>, 10MHz sine wave input signal (5V operation)  
 C1: 0.001mF  
 R1: 50  
 R2: 525 (3V operation)  
 490 (5V operation)

**Measurement cct 2**

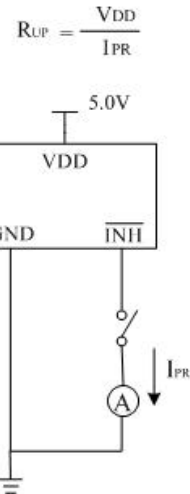


**Measurement cct 3**



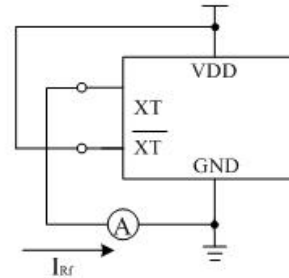
2.0 V<sub>p-p</sub>, 30MHz sine wave input signal (3V operation)  
 3.5 V<sub>p-p</sub>, 30MHz sine wave input signal (5V operation)  
 C1: 0.001F  
 R1: 50

**Measurement cct 4**



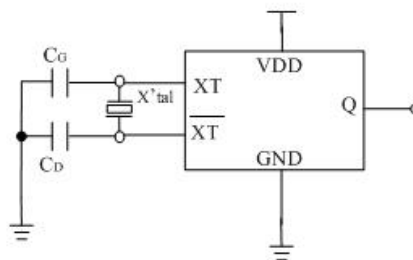
$$R_{UP} = \frac{V_{DD}}{I_{PR}}$$

**Measurement cct 5**

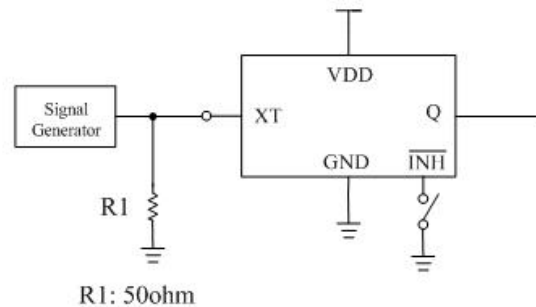


$$R_F = \frac{V_{DD}}{I_{RF}}$$

**Measurement cct 6**

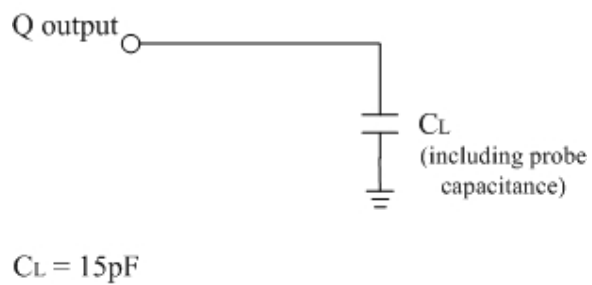


**Measurement cct 7**

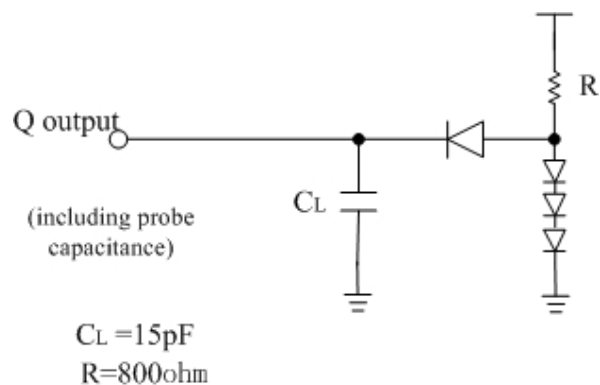




**Load cct 1**

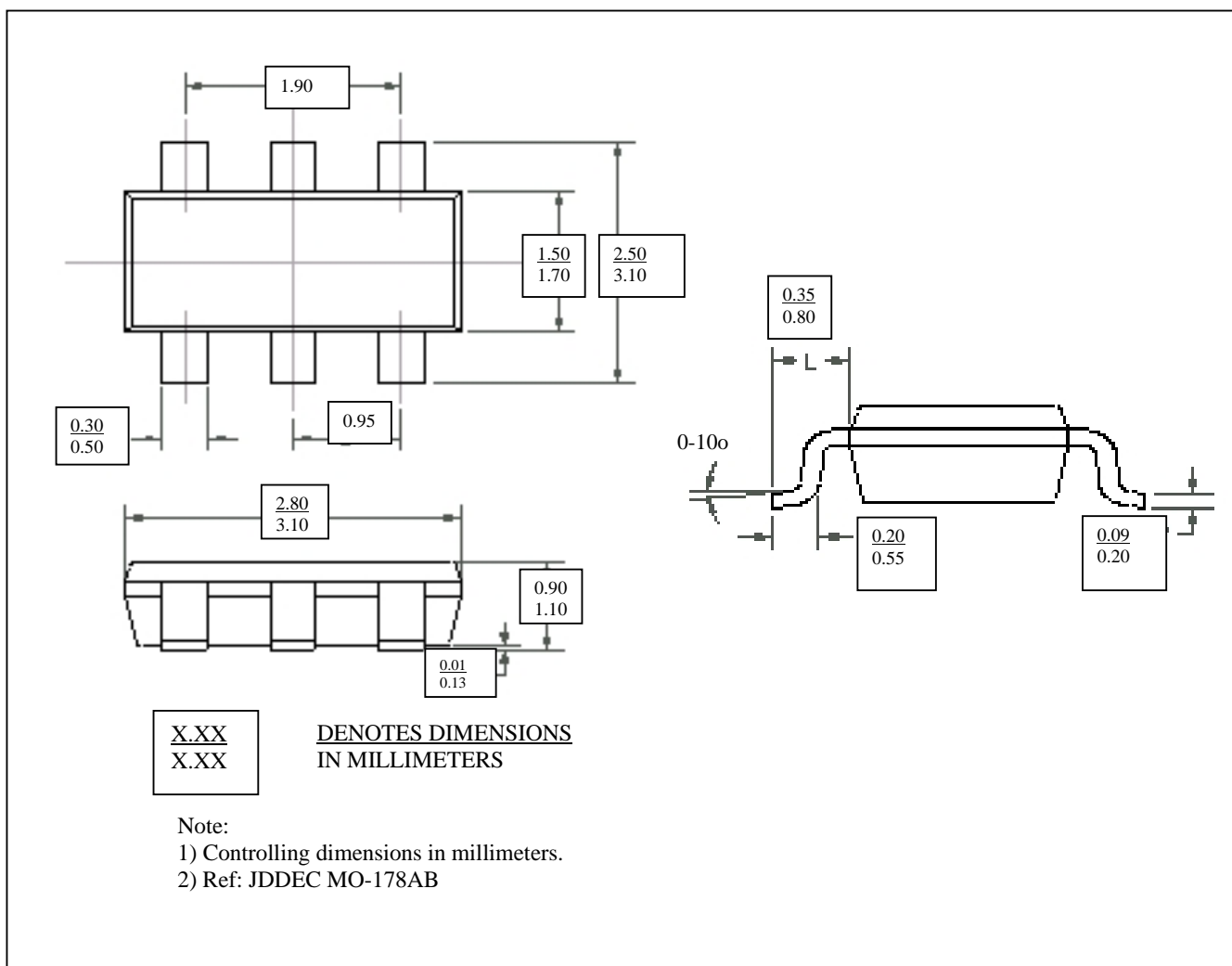


**Load cct 2**

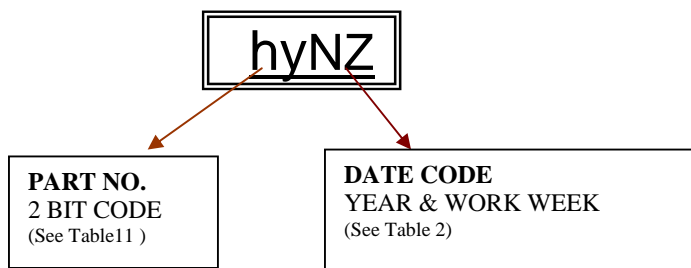


## Mechanical Information

### SOT23-6 Package Drawing



**SOT-23 Package Top Marking Instruction**



**Sample: hyNZ** → PART NO.: PT7C5022A1A  
 DATE CODE: YEAR 2004 WW26

**Table 1 :**

PART NO	2 BIT CODE	PART NO	2 BIT CODE
PT7C5022A1A	hy	PT7C5022B1A	if
PT7C5022A2A	hz	PT7C5022B2A	ig
PT7C5022A3A	ia	PT7C5022B3A	ih
PT7C5022A4A	ib	PT7C5022B4A	ii
PT7C5022A5A	ic	PT7C5022B5A	ij
PT7C5022A6A	id	PT7C5022B6A	ik
PT7C5022A7A	ie	PT7C5022B7A	il

**Table 2**

Year	WW		Year	WW		Year	WW		Year	WW		Year	WW		Year	WW		Year	WW								
1998	A	1	A	1999	C	1	A	2000	E	1	A	2001	G	1	A	2002	J	1	A	2003	L	1	A	2004	N	1	A
1998	A	2	B	1999	C	2	B	2000	E	2	B	2001	G	2	B	2002	J	2	B	2003	L	2	B	2004	N	2	B
1998	A	3	C	1999	C	3	C	2000	E	3	C	2001	G	3	C	2002	J	3	C	2003	L	3	C	2004	N	3	C
1998	A	4	D	1999	C	4	D	2000	E	4	D	2001	G	4	D	2002	J	4	D	2003	L	4	D	2004	N	4	D
1998	A	5	E	1999	C	5	E	2000	E	5	E	2001	G	5	E	2002	J	5	E	2003	L	5	E	2004	N	5	E
1998	A	6	F	1999	C	6	F	2000	E	6	F	2001	G	6	F	2002	J	6	F	2003	L	6	F	2004	N	6	F
1998	A	7	G	1999	C	7	G	2000	E	7	G	2001	G	7	G	2002	J	7	G	2003	L	7	G	2004	N	7	G
1998	A	8	H	1999	C	8	H	2000	E	8	H	2001	G	8	H	2002	J	8	H	2003	L	8	H	2004	N	8	H
1998	A	9	I	1999	C	9	I	2000	E	9	I	2001	G	9	I	2002	J	9	I	2003	L	9	I	2004	N	9	I
1998	A	10	J	1999	C	10	J	2000	E	10	J	2001	G	10	J	2002	J	10	J	2003	L	10	J	2004	N	10	J
1998	A	11	K	1999	C	11	K	2000	E	11	K	2001	G	11	K	2002	J	11	K	2003	L	11	K	2004	N	11	K
1998	A	12	L	1999	C	12	L	2000	E	12	L	2001	G	12	L	2002	J	12	L	2003	L	12	L	2004	N	12	L
1998	A	13	M	1999	C	13	M	2000	E	13	M	2001	G	13	M	2002	J	13	M	2003	L	13	M	2004	N	13	M
1998	A	14	N	1999	C	14	N	2000	E	14	N	2001	G	14	N	2002	J	14	N	2003	L	14	N	2004	N	14	N
1998	A	15	O	1999	C	15	O	2000	E	15	O	2001	G	15	O	2002	J	15	O	2003	L	15	O	2004	N	15	O
1998	A	16	P	1999	C	16	P	2000	E	16	P	2001	G	16	P	2002	J	16	P	2003	L	16	P	2004	N	16	P
1998	A	17	Q	1999	C	17	Q	2000	E	17	Q	2001	G	17	Q	2002	J	17	Q	2003	L	17	Q	2004	N	17	Q
1998	A	18	R	1999	C	18	R	2000	E	18	R	2001	G	18	R	2002	J	18	R	2003	L	18	R	2004	N	18	R
1998	A	19	S	1999	C	19	S	2000	E	19	S	2001	G	19	S	2002	J	19	S	2003	L	19	S	2004	N	19	S
1998	A	20	T	1999	C	20	T	2000	E	20	T	2001	G	20	T	2002	J	20	T	2003	L	20	T	2004	N	20	T
1998	A	21	U	1999	C	21	U	2000	E	21	U	2001	G	21	U	2002	J	21	U	2003	L	21	U	2004	N	21	U
1998	A	22	V	1999	C	22	V	2000	E	22	V	2001	G	22	V	2002	J	22	V	2003	L	22	V	2004	N	22	V
1998	A	23	W	1999	C	23	W	2000	E	23	W	2001	G	23	W	2002	J	23	W	2003	L	23	W	2004	N	23	W
1998	A	24	X	1999	C	24	X	2000	E	24	X	2001	G	24	X	2002	J	24	X	2003	L	24	X	2004	N	24	X
1998	A	25	Y	1999	C	25	Y	2000	E	25	Y	2001	G	25	Y	2002	J	25	Y	2003	L	25	Y	2004	N	25	Y
1998	A	26	Z	1999	C	26	Z	2000	E	26	Z	2001	G	26	Z	2002	J	26	Z	2003	L	26	Z	2004	N	26	Z
1998	B	27	A	1999	D	27	A	2000	F	27	A	2001	H	27	A	2002	K	27	A	2003	M	27	A	2004	O	27	A
1998	B	28	B	1999	D	28	B	2000	F	28	B	2001	H	28	B	2002	K	28	B	2003	M	28	B	2004	O	28	B
1998	B	29	C	1999	D	29	C	2000	F	29	C	2001	H	29	C	2002	K	29	C	2003	M	29	C	2004	O	29	C
1998	B	30	D	1999	D	30	D	2000	F	30	D	2001	H	30	D	2002	K	30	D	2003	M	30	D	2004	O	30	D
1998	B	31	E	1999	D	31	E	2000	F	31	E	2001	H	31	E	2002	K	31	E	2003	M	31	E	2004	O	31	E
1998	B	32	F	1999	D	32	F	2000	F	32	F	2001	H	32	F	2002	K	32	F	2003	M	32	F	2004	O	32	F
1998	B	33	G	1999	D	33	G	2000	F	33	G	2001	H	33	G	2002	K	33	G	2003	M	33	G	2004	O	33	G
1998	B	34	H	1999	D	34	H	2000	F	34	H	2001	H	34	H	2002	K	34	H	2003	M	34	H	2004	O	34	H
1998	B	35	I	1999	D	35	I	2000	F	35	I	2001	H	35	I	2002	K	35	I	2003	M	35	I	2004	O	35	I
1998	B	36	J	1999	D	36	J	2000	F	36	J	2001	H	36	J	2002	K	36	J	2003	M	36	J	2004	O	36	J
1998	B	37	K	1999	D	37	K	2000	F	37	K	2001	H	37	K	2002	K	37	K	2003	M	37	K	2004	O	37	K
1998	B	38	L	1999	D	38	L	2000	F	38	L	2001	H	38	L	2002	K	38	L	2003	M	38	L	2004	O	38	L
1998	B	39	M	1999	D	39	M	2000	F	39	M	2001	H	39	M	2002	K	39	M	2003	M	39	M	2004	O	39	M
1998	B	40	N	1999	D	40	N	2000	F	40	N	2001	H	40	N	2002	K	40	N	2003	M	40	N	2004	O	40	N
1998	B	41	O	1999	D	41	O	2000	F	41	O	2001	H	41	O	2002	K	41	O	2003	M	41	O	2004	O	41	O
1998	B	42	P	1999	D	42	P	2000	F	42	P	2001	H	42	P	2002	K	42	P	2003	M	42	P	2004	O	42	P
1998	B	43	Q	1999	D	43	Q	2000	F	43	Q	2001	H	43	Q	2002	K	43	Q	2003	M	43	Q	2004	O	43	Q
1998	B	44	R	1999	D	44	R	2000	F	44	R	2001	H	44	R	2002	K	44	R	2003	M	44	R	2004	O	44	R
1998	B	45	S	1999	D	45	S	2000	F	45	S	2001	H	45	S	2002	K	45	S	2003	M	45	S	2004	O	45	S
1998	B	46	T	1999	D	46	T	2000	F	46	T	2001	H	46	T	2002	K	46	T	2003	M	46	T	2004	O	46	T
1998	B	47	U	1999	D	47	U	2000	F	47	U	2001	H	47	U	2002	K	47	U	2003	M	47	U	2004	O	47	U
1998	B	48	V	1999	D	48	V	2000	F	48	V	2001	H	48	V	2002	K	48	V	2003	M	48	V	2004	O	48	V
1998	B	49	W	1999	D	49	W	2000	F	49	W	2001	H	49	W	2002	K	49	W	2003	M	49	W	2004	O	49	W
1998	B	50	X	1999	D	50	X	2000	F	50	X	2001	H	50	X	2002	K	50	X	2003	M	50	X	2004	O	50	X
1998	B	51	Y	1999	D	51	Y	2000	F	51	Y	2001	H	51	Y	2002	K	51	Y	2003	M	51	Y	2004	O	51	Y
1998	B	52	Z	1999	D	52	Z	2000	F	52	Z	2001	H	52	Z	2002	K	52	Z	2003	M	52	Z	2004	O	52	Z

**Notes**

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