T-50-23

he broadest family of CMOS and TTL-compatible compact oscillators available, NDK Compact Crystal Clock Oscillators deliver reliable performance in half the space. Ideal for high-density PC boards (such as portable and hand held applications) where space and power are at a premium, these NDK devices are available in a range of frequencies from 28 kHz to 70 MHz. Despite their small size, NDK Compact Crystal Clock Oscillators offer superior resistance to shock, vibration, EMI, and humidity.

1300 SERIES FEATURES

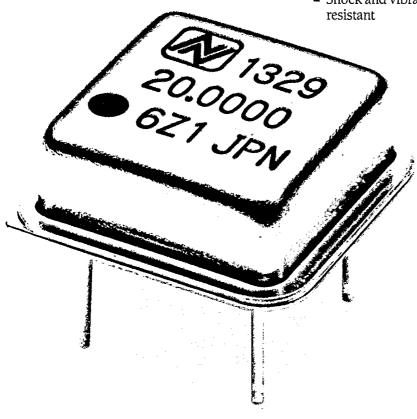
- Broadest range of available frequencies (28 kHz to 70 MHz) speeds design and procurement process
- Choice of TTL, CMOS or dual compatibility for maximum selection
- Compact size perfect for portables
- CMOS technology for low power consumption/ low heat
- Fast rise and fall times (5,7, 10 ns)
- Excellent fan out (2 or 5 TTL gates)
- Sealed, grounded metal case resists EMI and humidity
- Shock and vibration resistant



Headquartered in Tokyo, Japan, NDK is the world's premier manufacturer of synthetic quartz crystal. NDK surpasses all other manufacturers in both quality and quantity of synthetic quartz production. NDK offers the widest range of microprocessor quartz crystals, crystal oscillators, and compact crystal oscillators available. All NDK products are fabricated under the strictest quality controls, and are guaranteed to be free from impurities and defects.

NDK standard products are available through a nation-wide network of stocking distributors. NDK also offers custom crystal oscillator fabrication to meet individual needs. For more information on NDK custom services or distribution, write:

NDK America, Inc. 20300 Stevens Creek Blvd. Suite 400 Cupertino, CA 95014-2210



NDK 1300 SERIES SPECIFICATIONS

Available Frequencies

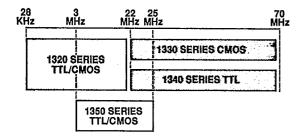


Table 1. 1300 Series Quick-Reference Comparison

Frequency Range	Part - Number	Output	Power Consumption	Rise and Fall Times		··· Duty Cycle %	Fan Out	Standby/ Dual Output
28 kHz 6.99 MHz	1321- 1328	CMOS/ TTL	5mA typical 10mA maximum	10ns	0.5V V _{DD} -0.5V	45/55	TTL2 LS-TTL10	Standby Only
7 kHz 22 MHz	1329	CMOS/ TIL	5mA typical 10mA maximum	10ns	0.5V V _{DD} 0.5V	40/60	TTL2 LS-TTL10	Standby or Dual
22 MHz- 29.9 MHz	1330- 1332	CMOS Only	13mA typicał 20mA maximum	5ns	0.5V V _{DD} -0.5V	40/60	TTL5 LS-TTL25	Standby Only
30 MHz- 50.9 MHz	1333- 1337	CMOS Only	17mA typical 30mA maximum	5ns	0.5V V _{DD} −0.5V	40/60	TTL5 LS-TTL25	Standby Only
51 MHz- 70 MHz	1338- 1339	CMOS Only	22mA typical 40mA maximum	5ns	0.5V V _{DD} =0.5V	40/60	TTL5 LS-TTL25	Standby Only
22 MHz 29.9 MHz	1340- 1342	TTL Only	13mA typical 20mA maximum	5ns	0.4V 2.4V	40/60	TTL5 LS-TTL25	Standby Only
30 MHz- 50.9 MHz	1343- 1347	TTL Only	17mA typical 30mA maximum	5ns	0.4V 2.4V	40/60	TTL5 LS-TTL25	Standby Only
51 MHz- 70 MHz	1348- 1349	TTL Only	22mA typical 40mA maximum	5ns	0.5V 2.4V	40/60	TIL5 LS-TIL25	Standby Only
3 MHz- 25 MHz	1351 1359	CMOS/ TTL	11mA typical 20mA maximum	7ns	0.5V V _{DD} =0.5V	45/55 at ½V _{DD} 40/60 at 1.4V	TTL5 LS-TTL25	Standby Only

Table 2. Output Load and Power Consumption

V_{DD}	=	5V

Fan out	T	rit.	I.	Line		
	Resistance (Ω)	Power Consumption (mA)	Resistance (Ω)	Power Consumption (mA)		
1	4,000	1.25	20,000	0.25		
2	2,000	2.50	10,000	0.50		
5	800	6.25	4,000	1.25		
10	400	12.50	2,000	2.50		

SPECIFICATIONS CONTINUED

Table 3. Standby Feature

A feature designed to facilitate board testing, the standby feature permits external digital signals to control oscillator output.

#5 pin output #1 pin Condition	1320 Series 1350 Series	1330 Series 1340 Series 1360 Series*
H level (+4V min.) or OPEN	Oscillation output	Oscillation output
L level (+1V max.)	Oscillation stops with the status at an L level.	Oscillation stops with the status at an H level.

*1360 Series is a standby option of the 1350 series.

Dual-Output Option

Available only on Part Number 1329, the dual-output option permits simultaneous output of the original oscillation frequency and the output frequency multiplied by $\frac{1}{2}n$ (where n is a positive integer from 1–8) from separate pins of the device.

When the dual-output option is selected, the optional standby feature is not available.

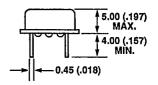
Packaging/Marking

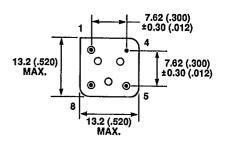
Due to space limitations, output frequency is listed to:

6 digits MHz (ie 14.3181) 5 digits kHz (ie 32.768k)

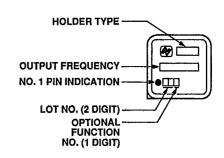
Only the original oscillation frequency is indicated on Part No. 1329 with the dual-output option.







Dimensions in mm (inches).



Pinout

Pin	Function
1	NC or standby or output (Part 1329: Divided frequency for dual output)
4	GND (Ground to case)
5	Output (Original oscillation frequency)
8	+5VDC

Absolute Maximum Rating

Source

-0.5V to +7.0V DC

Voltage (V_{DD})

▶ Storage

 -55° C to $+125^{\circ}$ C

Temperature

Range

Operating Conditions

▶ Source

 $+5.0VDC \pm 0.5V$

Voltage (V_{DD})

▶ Operating

Subject to specifications

Temperature

Range

T_r/T_f Measuring Conditions

▶ TTL-Compatible

Value between V_OL max. & V_OH min.

(Refer to Measuring Load Conditions,

Figures 1 & 2)

CMOS-

Difference between $0.1 \times V_{DD}$ and

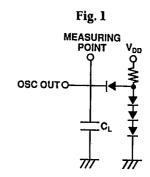
Compatible 0.9 x V_{DD} (Refer to Measuring Load Conditions, Figures 3 & 4)

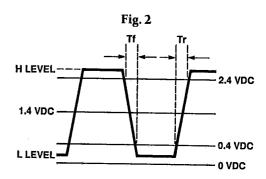
Table 5. Measuring Load Conditions

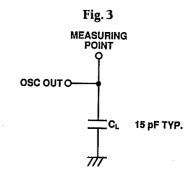
1TTL = 5 LSTTL

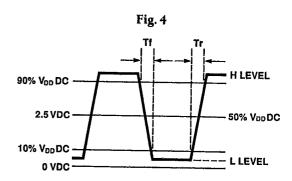
TTL	C _L	R
1	15pF	4 kΩ
2	15pF	2kO
5	I5pF	800Ω
10	15pF	400Ω

(Note) CL: includes the stray capacitance of measuring system.









Environmental and Mechanical Characteristics

>	Vibration	No abnormality after vibration under MIL-STD-202F, Method 204D, Condition B. Six hour total test time; three orthogonal directions for two hours each.
>	Shock	No abnormality after shock test; MIL-STD-202F, Method 213B. 1000 G, 0.5ms, half sine for one time, each in three orthogonal directions.
Þ	Humidity	No abnormality under MIL-STD-202F, Method 103B, Condition A.
>	Soldering Heat	No abnormality under MIL-STD-202F, Method 210A, Condition B.
>	Thermal Shock	No abnormality after execution of 100 cycles. Cycle range and duration: -40°C for 30 minutes, +85°C for 30 minutes.
>	Terminal Strength	No damage or leakage under MIL- STD-202F, Method 211A, Condition A.

Handling/Assembly Considerations

The mechanical and electronic properties of crystal products require that they be handled differently than other components.

► Bending of Leads	Repeated bending or rough handling of leads may break the hermetic seal of the device, leading to performance
	degradation.

Dropping	NDK Compact Crystal Clock Oscil-
11 0	lators have been designed to resist
	natural physical shocks. However,
	drops onto hard surfaces may de-
	calibrate these devices. If a device is
	dropped, remeasure it to confirm
	accurate calibration before use.

Static	These components, like all CMOS
	devices, should be kept away from
	static electricity.

► High Temperature Specifications are not guaranteed if component storage temperature exceeds + 125°C for 24 hours.

► Storage and Solderability The solder-dipped leads of these devices will oxidize over time, negatively impacting solderability. Therefore, we recommend storage

Therefore, we recommend storage of these components be limited to

6 months or less.

ORDERING INFORMATION

When ordering, refer to the tables to select the components and options which meet your frequency specifications.

Please supply the quantity of parts needed, the original oscillating frequency, and the divided frequency (if selecting Part 1329, 7 to 22 MHz, with the dual output option).

To Specify a Product

List part number, frequency stability code, option code and desired frequency. An example is shown below:

1351	В	1	3.0 MHz
(Part	(Frequency	(Output	(Desired
Number)	Stability)	Option)	Frequency)

To Determine Part Number

Use Table 1 to determine the correct series designation and frequency range. The part listed in the example is a 50 series part. Then refer to Table 9 to determine the correct frequency designation. In the example above, a 50 series 3.0 MHz part is designated by 1351. (13 designates the model, 5 designates the series and 1 designates the frequency range.)

To Determine Desired Frequency Stability

Use Table 7. In the example above, the letter B indicates NDK standard is ± 100 ppm over 0°C to 70°C.

To Determine the Desired Output Option

Use Table 8. In the example below, the number 1 indicates NDK standard which has the standby (enable/disable) feature.

Table 7. Operating Temperature/Frequency Stability Code Chart

	Frequenc	y Stability
Operating Temperature	±50ppm	±100ppm
0°C~+70°C	A	В
-10°C~+70°C		G
−20°C~+70°C		М

Table 8. Standby/Dual Output Option Code Chart

Option	Code	Applicable Parts
Not Connected on Pin 1	0	All
Standby Active	1	All
Dual-Output Active	2	1329

NDK 1300 SERIES

Table 9.

1322 $0.054 \approx 0.10$ $0.109 \approx 0.21$ 1324 $0.109 \approx 0.21$ $0.218 \approx 0.43$ 1325 $0.875 \approx 1.74$ $0.875 \approx 1.74$ 1326 $1.750 \approx 3.49$ $3.500 \approx 6.99$ 1328 $3.500 \approx 22.00$ 1330 $22.000 \approx 22.00$ 1331 $23.000 \approx 25.90$ 1332 $26.000 \approx 29.90$ 1333 $30.000 \approx 39.90$ 1334 $36.000 \approx 39.90$ 1335 $36.000 \approx 39.90$ 1337 $44.000 \approx 50.90$ 1338 $51.000 \approx 59.90$ 1339 $60.000 \approx 70.00$ 1340 $22.000 \approx 22.90$ 1341 $23.000 \approx 25.90$ 1342 $26.000 \approx 29.90$ 1343 $30.000 \approx 39.90$ 1344 $23.000 \approx 25.90$ 1345 $36.000 \approx 39.90$ 1346 $40.000 \approx 59.90$ 1347 $44.000 \approx 50.90$ 1348 $51.000 \approx 59.90$ 1349 $60.000 \approx 70.00$ 1351 $3.000 \approx 10.90$ 1352 $11.000 \approx 11.40$ 1353 $11.500 \approx 19.90$ <t< th=""><th>Part Number</th><th>Output</th><th>Frequency (MHz</th></t<>	Part Number	Output	Frequency (MHz
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1335 1336 1337 1338 1337 1338 1339 1339 1339 1339 1340 1341 1341 1342 1343 1344 1345 1345 1346 1347 1348 1349 1351 1352 1351 1352 1354 1355 CMOS/FIL 1500 \approx 39.90 18.000 \approx 39.90 19.90 18.000 \approx 33.90 11.500 \approx 39.90 11.500 \approx 59.90 11.500 \approx 59.90 11.500 \approx 11.40 11.500 \approx 11.40 11.500 \approx 11.500 11.500 \approx 11.90	1334	CMOSTER	34.000 ≈ 35.900
1336 $40.000 \approx 43.90$ 1337 $44.000 \approx 50.90$ 1338 $51.000 \approx 59.90$ 1339 $60.000 \approx 70.00$ 1340 $22.000 \approx 22.90$ 1341 $23.000 \approx 25.90$ 1342 $26.000 \approx 29.90$ 1343 $30.000 \approx 33.90$ 1344 $36.000 \approx 39.90$ 1345 $40.000 \approx 39.90$ 1346 $40.000 \approx 43.90$ 1349 $51.000 \approx 59.90$ 1351 $3.000 \approx 10.90$ 1352 $11.000 \approx 11.40$ 1353 $11.500 \approx 12.90$ 1354 $13.000 \approx 14.90$ 1355 $17.000 \approx 17.90$ 1357 $18.000 \approx 19.90$ 1358 $20.000 \approx 21.90$	1335	CMOSTELE	36.000 ≈ 39.900
1337 $44.000 \approx 50.90$ 1338 $51.000 \approx 59.90$ 1339 $60.000 \approx 70.00$ 1340 $22.000 \approx 22.90$ 1341 $23.000 \approx 25.90$ 1342 $26.000 \approx 29.90$ 1343 $30.000 \approx 33.90$ 1344 $36.000 \approx 39.90$ 1345 $40.000 \approx 43.90$ 1347 $44.000 \approx 59.90$ 1348 $51.000 \approx 59.90$ 1349 $60.000 \approx 70.00$ 1351 $3.000 \approx 10.90$ 1352 $11.500 \approx 11.40$ 1353 $11.500 \approx 11.40$ 1355 $11.500 \approx 16.90$ 1356 $17.000 \approx 17.90$ 1357 $18.000 \approx 19.90$ 1358 $20.000 \approx 21.90$	1336		
1338 $51.000 \approx 59.90$ 1339 $60.000 \approx 70.00$ 1340 $22.000 \approx 22.90$ 1341 $23.000 \approx 25.90$ 1342 $26.000 \approx 29.90$ 1343 $30.000 \approx 33.90$ 1344 $36.000 \approx 39.90$ 1345 $40.000 \approx 43.90$ 1347 $44.000 \approx 50.90$ 1348 $51.000 \approx 59.90$ 1349 $60.000 \approx 70.00$ 1351 $3.000 \approx 10.90$ 1352 $11.000 \approx 11.40$ 1353 $11.500 \approx 12.90$ 1354 $13.000 \approx 14.90$ 1355 $17.000 \approx 17.90$ 1357 $18.000 \approx 19.90$ 1358 $20.000 \approx 21.90$	1337		44.000 ~ 50.900
1339 $60.000 \approx 70.00$ 1340 1341 1342 1343 1344 1345 1346 1347 1348 1349 1351 1351 1351 1351 1351 1351 1351 135	1338	시시하는 호텔 때문에서 내용을	51.000 - 59.900
1341 $23.000 \approx 25.90$ 1342 $26.000 \approx 29.90$ 1343 $30.000 \approx 33.90$ 1344 $34.000 \approx 35.90$ 1345 $36.000 \approx 39.90$ 1346 $40.000 \approx 43.90$ 1347 $44.000 \approx 59.90$ 1348 $51.000 \approx 59.90$ 1349 $60.000 \approx 70.00$ 1351 $3.000 \approx 10.90$ 1352 $11.500 \approx 11.40$ 1353 $11.500 \approx 12.90$ 1354 $13.000 \approx 14.90$ 1355 $17.000 \approx 17.90$ 1356 $17.000 \approx 19.90$ 1357 $18.000 \approx 19.90$ 1358 $20.000 \approx 21.90$	1339		60.000 ~ 70.000
1341 $23.000 \approx 25.90$ 1342 $26.000 \approx 29.90$ 1343 $30.000 \approx 33.90$ 1345 $34.000 \approx 35.90$ 1346 $40.000 \approx 43.90$ 1347 $44.000 \approx 59.90$ 1348 $51.000 \approx 59.90$ 1351 $3.000 \approx 10.90$ 1352 $11.500 \approx 11.40$ 1353 $11.500 \approx 12.90$ 1354 $13.000 \approx 14.90$ 1355 $17.000 \approx 17.90$ 1356 $17.000 \approx 19.90$ 1357 $18.000 \approx 19.90$ 1358 $20.000 \approx 21.90$	1340		22,000 ≈ 22,900
1343 $30.000 \approx 33.90$ 1344 $34.000 \approx 35.90$ 1345 $36.000 \approx 39.90$ 1346 $40.000 \approx 43.90$ 1347 $44.000 \approx 50.90$ 1348 $51.000 \approx 59.90$ 1349 $60.000 \approx 70.00$ 1351 $3.000 \approx 10.90$ 1352 $11.500 \approx 11.40$ 1353 $11.500 \approx 12.90$ 1354 $13.000 \approx 14.90$ 1355 $15.000 \approx 16.90$ 1356 $17.000 \approx 17.90$ 1357 $18.000 \approx 19.90$ 1358 $20.000 \approx 21.90$	1341		23.000 ~ 25.900
1343 $30.000 \approx 33.90$ 1344 $34.000 \approx 35.90$ 1345 $36.000 \approx 39.90$ 1346 $40.000 \approx 43.90$ 1347 $44.000 \approx 59.90$ 1348 $51.000 \approx 59.90$ 1349 $60.000 \approx 70.00$ 1351 $3.000 \approx 10.90$ 1352 $11.500 \approx 11.40$ 1353 $11.500 \approx 12.90$ 1354 $13.000 \approx 14.90$ 1355 $15.000 \approx 16.90$ 1356 $17.000 \approx 17.90$ 1357 $18.000 \approx 19.90$ 1358 $20.000 \approx 21.90$	1342		26.000 - 29.900
1345 11Lonly $36.000 \approx 39.90$ 1346 $40.000 \approx 43.90$ 1347 $44.000 \approx 50.90$ 1348 $51.000 \approx 59.90$ 1359 $60.000 \approx 70.00$ 1351 $3.000 \approx 10.90$ 1352 $11.500 \approx 11.40$ 1353 $11.500 \approx 12.90$ 1354 $13.000 \approx 14.90$ 1355 $17.000 \approx 17.90$ 1356 $17.000 \approx 19.90$ 1357 $18.000 \approx 19.90$ 1358 $20.000 \approx 21.90$			30.000 ≈ 33.900
1345 $36.000 \approx 39.90$ 1346 $40.000 \approx 43.90$ 1347 $44.000 \approx 59.90$ 1348 $51.000 \approx 59.90$ 1351 $3.000 \approx 10.90$ 1352 $11.000 \approx 11.40$ 1353 $11.500 \approx 12.90$ 1354 $13.000 \approx 14.90$ 1355 $15.000 \approx 16.90$ 1356 $17.000 \approx 17.90$ 1357 $18.000 \approx 19.90$ 1358 $20.000 \approx 21.90$	1344	TTI only	34.000 ≈ 35.900
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1345		36.000 ~ 39.900
1348 $51.000 \approx 59.90$ 1349 $60.000 \approx 70.00$ 1351 $3.000 \approx 10.90$ 1352 $11.000 \approx 11.40$ 1353 $11.500 \approx 12.90$ 1354 $13.000 \approx 14.90$ 1355 $15.000 \approx 16.90$ 1356 $17.000 \approx 17.90$ 1357 $18.000 \approx 19.90$ 1358 $20.000 \approx 21.90$	and the second s		40.000 ~ 43.900
1349 $60.000 \approx 70.00$ 1351 $3.000 \approx 10.90$ 1352 $11.000 \approx 11.40$ 1353 $11.500 \approx 12.90$ 1354 $13.000 \approx 14.90$ 1355 $15.000 \approx 16.90$ 1356 $17.000 \approx 17.90$ 1357 $18.000 \approx 19.90$ 1358 $20.000 \approx 21.90$		[교 사용하고 하는 네트로 일본	44,000 - 50.900
1351 1352 1353 1354 1355 1355 1356 1357 1358 20.000 ≈ 10.90 11.40 11.500 ≈ 12.90 13.000 ≈ 14.90 15.000 ≈ 16.90 17.000 ≈ 17.90 18.000 ≈ 19.90 20.000 ≈ 21.90			51.000 ≈ 59.900
1352 $11.000 \approx 11.40$ 1353 $11.500 \approx 12.90$ 1354 $13.000 \approx 14.90$ 1355 $15.000 \approx 16.90$ 1356 $17.000 \approx 17.90$ 1357 $18.000 \approx 19.90$ 1358 $20.000 \approx 21.90$	1349		60.000 ~ 70.000
1352 1353 1354 1355 1356 1356 1357 1358 11.000 ≈ 12.90 13.000 ≈ 14.90 15.000 ≈ 16.90 17.000 ≈ 17.90 18.000 ≈ 19.90 20.000 ≈ 21.90	1351		3.000 ≈ 10.900
1354 13.000 ≈ 14.90 1355 CMOS/TTL 15.000 ≈ 16.90 1356 17.000 ≈ 17.90 1357 18.000 ≈ 19.90 1358 20.000 ≈ 21.90			11.000 ≈ 11.400
1355 CMOS/TTL 15.000 ~ 16.90 1356 17.000 ~ 17.90 1357 18.000 ~ 19.90 1358 20.000 ~ 21.90	1353		11.500 ≈ 12.900
1356 17,000 ≈ 17.90 1357 18,000 ≈ 19.90 1358 20,000 ≈ 21,90			13.000 - 14.900
1356 1357 1358 18.000 ~ 19.90 20.000 ~ 21.90	1355	CMOS/TTL	15.000 * 16.900
1357 18.000 ~ 19.90 1358 20.000 ~ 21.90		表的大学·农林及证验。	17.000 ~ 17.900
1358 20.000 * 21.90			18.000 ~ 19.900
1350 B 200 200 200 200 200 200 200 200 200	1358		20.000 - 21.900
*209 (🛩) まただけはい 10 mile () () () () () () () () () (1359		22.000 ~ 25.000