

NB2780A

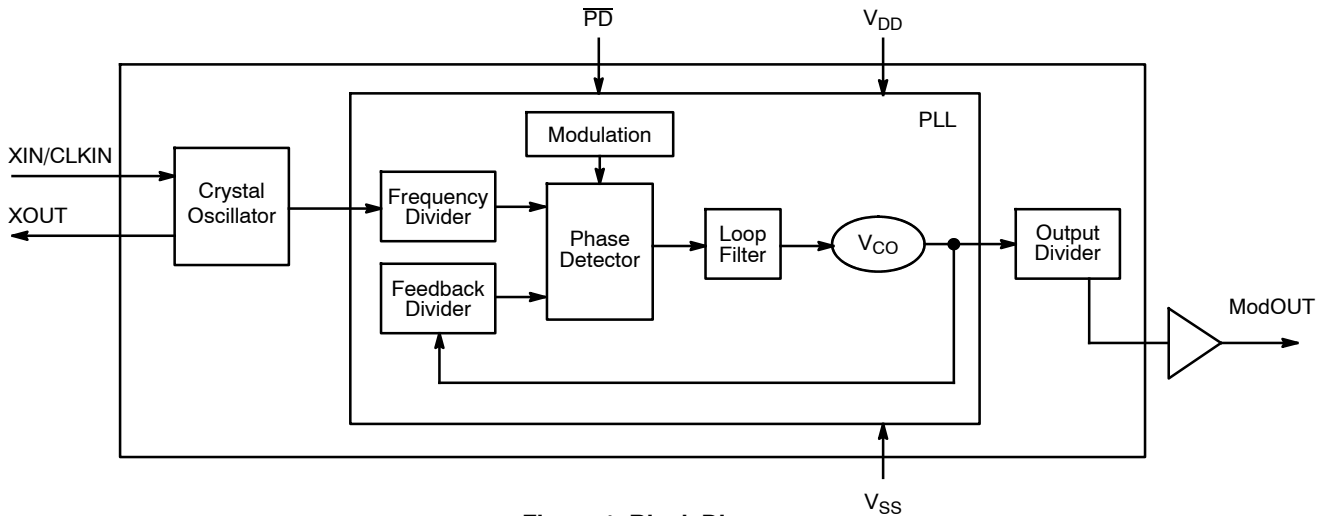


Figure 1. Block Diagram

Table 1. KEY SPECIFICATIONS

| Description | Specification |
|--------------------------|--|
| Supply Voltages | $V_{DD} = 3.3 \text{ V} / 2.5 \text{ V}$ |
| Frequency Range | $30 \text{ MHz} < \text{CLKIN} < 50 \text{ MHz}$ |
| Cycle-to-Cycle Jitter | 200 ps (maximum) |
| Output Duty Cycle | 45/55% (worst case) |
| Modulation Rate Equation | $F_{IN}/1280$ |
| Frequency Deviation | $\pm 0.75\%$ (TYP) @ 46 MHz |

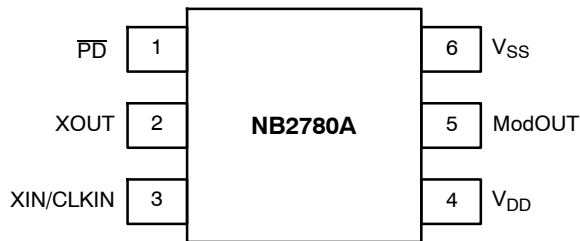


Figure 2. Pin Configuration

Table 2. PIN DESCRIPTION

| Pin # | Pin Name | Type | Description |
|-------|-----------|------|---|
| 1 | PD | I | Powerdown control pin. Pull low to enable Powerdown mode. Connect to V_{DD} if not used. |
| 2 | XOUT | O | Crystal connection. If using an external reference, this pin must be left unconnected. |
| 3 | XIN/CLKIN | I | Crystal connection or external reference frequency input. This pin has dual functions. It can be connected either to an external crystal or an external reference clock |
| 4 | V_{DD} | P | Power supply for the entire chip. |
| 5 | ModOUT | O | Spread spectrum clock output. |
| 6 | V_{SS} | P | Ground connection. |

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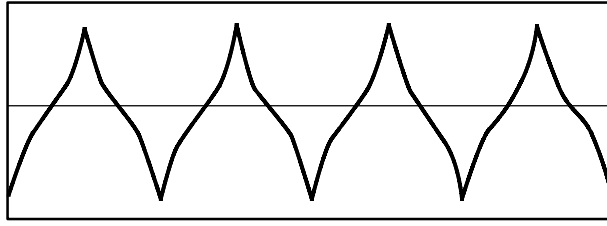


Figure 3. Modulation Profile

Table 3. MAXIMUM RATINGS

| Symbol | Description | Rating | Unit |
|------------------|--|--------------|------|
| V_{DD}, V_{IN} | Voltage on any pin with respect to Ground | 0.5 to + 7.0 | V |
| T_{STG} | Storage Temperature | -65 to +125 | °C |
| T_A | Operating Temperature | 0 to 70 | °C |
| T_s | Max. Soldering Temperature (10 sec) | 260 | °C |
| T_J | Junction Temperature | 150 | °C |
| T_{DV} | Static Discharge Voltage (As per MIL-STD-883, Method 3015) | 2 | kV |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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Table 4. DC ELECTRICAL CHARACTERISTICS FOR 2.5 V SUPPLY (Test Conditions: All parameters are measured at room temperature 25°C)

| Symbol | Description | Min | Typ | Max | Unit |
|------------------|---|-----------|-----|-----------------------|------|
| V _{IL} | Input LOW Voltage | GND - 0.3 | | 0.8 | V |
| V _{IH} | Input HIGH Voltage | 2.0 | | V _{DD} + 0.3 | V |
| I _{IL} | Input LOW Current | | | -35 | μA |
| I _{IH} | Input HIGH Current | | | 35 | μA |
| I _{XOL} | XOUT Output LOW Current (@ 0.6 V, V _{DD} = 2.5 V) | | 3.0 | | mA |
| I _{XOH} | XOUT Output HIGH Current (@ 1.8 V, V _{DD} = 2.5 V) | | 3.0 | | mA |
| V _{OL} | Output LOW Voltage (V _{DD} = 2.5 V, I _{OL} = 8.0 mA) | | | 0.6 | V |
| V _{OH} | Output HIGH Voltage (V _{DD} = 2.5 V, I _{OH} = 8.0 mA) | 1.8 | | | V |
| I _{DD} | Static Supply Current (Note 1) | | | 10 | μA |
| I _{CC} | Dynamic Supply Current (2.5 V, 46 MHz, and No Load) | | 4.0 | | mA |
| V _{DD} | Operating Voltage | 2.375 | 2.5 | 2.625 | V |
| t _{ON} | Powerup Time (first locked cycle after powerup) (Note 2) | | | 5.0 | mS |
| Z _{OUT} | Clock Output Impedance | | 50 | | Ω |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

1. XIN/CLKIN pin and \overline{PD} are pulled low.
2. V_{DD} and XIN/CLKIN input are stable, \overline{PD} pin is made high from low.

Table 5. AC ELECTRICAL CHARACTERISTICS FOR 2.5 V SUPPLY

| Symbol | Description | Min | Typ | Max | Unit |
|--------------------------|---|-----|-----|----------------|------|
| CLKIN | Input Frequency | 30 | | 50 | MHz |
| ModOUT | Output Frequency | 30 | | 50 | MHz |
| f _d | Frequency Deviation Input Frequency = 30 MHz Input Frequency = 50 MHz | | | ±1.10 ±0.62 | % |
| t _{LH} (Note 3) | Output Rise Time (measured at 0.7 V to 1.7 V) | 0.7 | 1.3 | 1.6 | ns |
| t _{HL} (Note 3) | Output Fall Time (measured at 1.7 V to 0.7 V) | 0.4 | 0.8 | 1.0 | ns |
| t _{JC} | Jitter (Cycle-to-Cycle) | | | 200 | ps |
| t _D | Output Duty Cycle | 45 | 50 | 55 | % |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

3. t_{LH} and t_{HL} are measured at capacitive load of 15 pF.

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Table 6. DC ELECTRICAL CHARACTERISTICS FOR 3.3 V SUPPLY (Test Conditions: All parameters are measured at room temperature 25°C)

| Symbol | Description | Min | Typ | Max | Unit |
|------------------|---|-----------|-----|-----------------------|------|
| V _{IL} | Input LOW Voltage | GND - 0.3 | | 0.8 | V |
| V _{IH} | Input HIGH Voltage | 2.0 | | V _{DD} + 0.3 | V |
| I _{IL} | Input LOW Current | | | -35 | μA |
| I _{IH} | Input HIGH Current | | | 35 | μA |
| I _{XOL} | XOUT Output LOW Current (@ 0.4 V, V _{DD} = 3.3 V) | | 3.0 | | mA |
| I _{XOH} | XOUT Output HIGH Current (@ 2.5 V, V _{DD} = 3.3 V) | | 3.0 | | mA |
| V _{OL} | Output LOW Voltage (V _{DD} = 3.3 V, I _{OL} = 8.0 mA) | | | 0.4 | V |
| V _{OH} | Output HIGH Voltage (V _{DD} = 3.3 V, I _{OH} = 8.0 mA) | 2.5 | | | V |
| I _{DD} | Static Supply Current (Note 4) | | | 10 | μA |
| I _{CC} | Dynamic Supply Current (3.3 V, 46 MHz, and No Load) | | 5.0 | | mA |
| V _{DD} | Operating Voltage | 2.7 | 3.3 | 3.6 | V |
| t _{ON} | Powerup Time (first locked cycle after powerup) (Note 5) | | | 5.0 | mS |
| Z _{OUT} | Clock Output Impedance | | 45 | | Ω |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

4. XIN/CLKIN pin and \overline{PD} are pulled low.
5. V_{DD} and XIN/CLKIN input are stable, \overline{PD} pin is made high from low.

Table 7. AC ELECTRICAL CHARACTERISTICS FOR 3.3 V SUPPLY

| Symbol | Description | Min | Typ | Max | Unit |
|--------------------------|---|-----|-----|----------------|------|
| CLKIN | Input Frequency | 30 | | 50 | MHz |
| ModOUT | Output Frequency | 30 | | 50 | MHz |
| f _d | Frequency Deviation Input Frequency = 30 MHz Input Frequency = 50 MHz | | | ±1.10 ±0.62 | % |
| t _{LH} (Note 6) | Output Rise Time (measured at 0.8 V to 2.0 V) | 0.5 | 1.1 | 1.4 | ns |
| t _{HL} (Note 6) | Output Fall Time (measured at 2.0 V to 0.8 V) | 0.3 | 0.8 | 1.1 | ns |
| t _{JC} | Jitter (Cycle-to-Cycle) | | | 200 | ps |
| t _D | Output Duty Cycle | 45 | 50 | 55 | % |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

6. t_{LH} and t_{HL} are measured at capacitive load of 15 pF.

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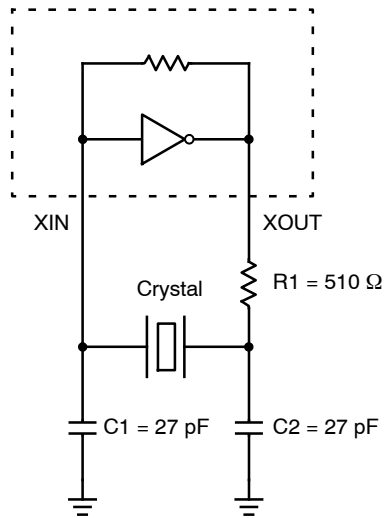


Figure 4. Typical Crystal Oscillator Circuit

Table 8. TYPICAL CRYSTAL SPECIFICATIONS

| Fundamental AT Cut Parallel Resonant Crystal | |
|--|---------------------------|
| Nominal Frequency | 33 MHz |
| Frequency Tolerance | ±50 ppm or better at 25°C |
| Operating Temperature Range | -25°C to +85°C |
| Storage Temperature | -40°C to +85°C |
| Load Capacitance | 18 pF |
| Shunt Capacitance | 7 pF Maximum |
| ESR | 25 Ω |

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ORDERING INFORMATION

| Device | Marking | Temperature Range | Package | Shipping [†] | Availability |
|--------------|---------|-------------------|------------------------------------|-----------------------|---|
| NB2780ASNR2 | E07 | 0°C - 70°C | TSOP-6 (TSOT-23-6) | 2500 Tape & Reel | <i>Now</i> |
| NB2780ASNR2G | E07 | 0°C - 70°C | TSOP-6 (TSOT-23-6) (Pb-Free) | 2500 Tape & Reel | <i>Contact Sales Representative</i> |

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

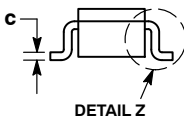
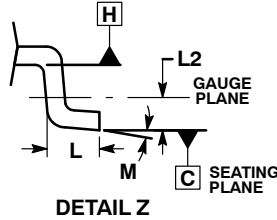
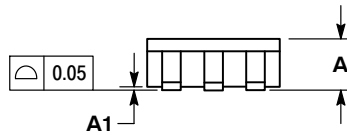
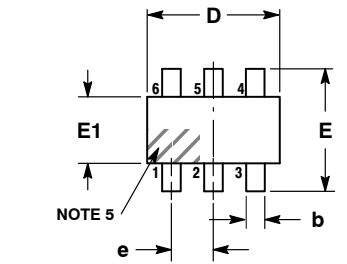
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SCALE 2:1

TSOP-6 CASE 318G-02 ISSUE V

DATE 12 JUN 2012



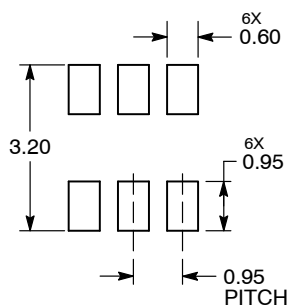
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. PIN ONE INDICATOR MUST BE LOCATED IN THE INDICATED ZONE.

| DIM | MILLIMETERS | | |
|-----|-------------|------|------|
| | MIN | NOM | MAX |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.01 | 0.06 | 0.10 |
| b | 0.25 | 0.38 | 0.50 |
| c | 0.10 | 0.18 | 0.26 |
| D | 2.90 | 3.00 | 3.10 |
| E | 2.50 | 2.75 | 3.00 |
| E1 | 1.30 | 1.50 | 1.70 |
| e | 0.85 | 0.95 | 1.05 |
| L | 0.20 | 0.40 | 0.60 |
| L2 | 0.25 BSC | | |
| M | 0° | - | 10° |

- | | | | | | |
|--|--|---|---|---|--|
| <p>STYLE 1: PIN 1. DRAIN 2. DRAIN 3. GATE 4. SOURCE 5. DRAIN 6. DRAIN</p> | <p>STYLE 2: PIN 1. EMITTER 2 2. BASE 1 3. COLLECTOR 1 4. EMITTER 1 5. BASE 2 6. COLLECTOR 2</p> | <p>STYLE 3: PIN 1. ENABLE 2. N/C 3. R BOOST 4. Vz 5. V in 6. V out</p> | <p>STYLE 4: PIN 1. N/C 2. V in 3. NOT USED 4. GROUND 5. ENABLE 6. LOAD</p> | <p>STYLE 5: PIN 1. EMITTER 2 2. BASE 2 3. COLLECTOR 1 4. EMITTER 1 5. BASE 1 6. COLLECTOR 2</p> | <p>STYLE 6: PIN 1. COLLECTOR 2. COLLECTOR 3. BASE 4. EMITTER 5. COLLECTOR 6. COLLECTOR</p> |
| <p>STYLE 7: PIN 1. COLLECTOR 2. COLLECTOR 3. BASE 4. N/C 5. COLLECTOR 6. EMITTER</p> | <p>STYLE 8: PIN 1. Vbus 2. D(in) 3. D(in)+ 4. D(out)+ 5. D(out) 6. GND</p> | <p>STYLE 9: PIN 1. LOW VOLTAGE GATE 2. DRAIN 3. SOURCE 4. DRAIN 5. DRAIN 6. HIGH VOLTAGE GATE</p> | <p>STYLE 10: PIN 1. D(OUT)+ 2. GND 3. D(OUT)- 4. D(IN)- 5. VBUS 6. D(IN)+</p> | <p>STYLE 11: PIN 1. SOURCE 1 2. DRAIN 2 3. DRAIN 2 4. SOURCE 2 5. GATE 1 6. DRAIN 1/GATE 2</p> | <p>STYLE 12: PIN 1. I/O 2. GROUND 3. I/O 4. I/O 5. VCC 6. I/O</p> |
| <p>STYLE 13: PIN 1. GATE 1 2. SOURCE 2 3. GATE 2 4. DRAIN 2 5. SOURCE 1 6. DRAIN 1</p> | <p>STYLE 14: PIN 1. ANODE 2. SOURCE 3. GATE 4. CATHODE/DRAIN 5. CATHODE/DRAIN 6. CATHODE/DRAIN</p> | <p>STYLE 15: PIN 1. ANODE 2. SOURCE 3. GATE 4. DRAIN 5. N/C 6. CATHODE</p> | <p>STYLE 16: PIN 1. ANODE/CATHODE 2. BASE 3. EMITTER 4. COLLECTOR 5. ANODE 6. CATHODE</p> | <p>STYLE 17: PIN 1. EMITTER 2. BASE 3. ANODE/CATHODE 4. ANODE 5. CATHODE 6. COLLECTOR</p> | |

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

GENERIC MARKING DIAGRAM*



- | | |
|--|---|
| <p>XXX = Specific Device Code A = Assembly Location Y = Year W = Work Week ▪ = Pb-Free Package</p> | <p>XXX = Specific Device Code M = Date Code ▪ = Pb-Free Package</p> |
|--|---|

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

| | | |
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