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NTE1537 **Integrated Circuit** **CMOS, Digital Frequency Indicator** **w/Clock LED Function**

Applications:

- Car Radio Applications: FM/AM Receiving Frequency Display and Clock Display
- Home Radio Applications: FM/AM Receiving Frequency Display and Clock Display
- Car Clock Applications: Hours–Minutes, Month–Date/Stopwatch Display

Functions:

- FM Receiving Frequency Display (4 Digits)
- AM Receiving Frequency Display (4 Digits)
- Month–Date or Stopwatch Display (Either of these Selectable)

Features:

- Single–Chip CMOS LSI for Static Display System
- Capable of Direct Driving Green LED (Drive Capacity 15mA)
- Capable of Selecting Frequency Display/Time Display
- Use FM/AM Local Oscillation Signal of Varactor Diode, Variable Capacitor, or μ Tuning System to Digitally Display FM/AM Receiving Frequency
- Covers 4 AM Intermediate Frequencies: +262.5, +452.5, +455, +470kHz
- Covers 2 FM Intermediate Frequencies: +10.7, –10.7MHz
- Capable of Fine–Adjusting AM/FM Display Frequency Error Independently
 - A variable Resistor can be used to Correct AM IF Error within ± 2.8 kHz
 - A variable Resistor can be used to Correct FM IF Error within ± 140 kHz
- Two Selections of Display System (12–Hour System with PM Sign which is Displayed During Setting Only, 24–Hour System)
- Programmed on Long Months (31 Days)/Short Months (30 Days). Date in February is Programmed to Count up to the 29th
- Easy to Set Time by th Time Signal
- Stopwatch Capable of Counting/Displaying 1 Second to 12 Hours, 59 Minutes, 59 Seconds
- Inhibit Pin for Inhibiting Time Setting with Display Unlighted
- 4MHz Crystal for Reference Frequency

Absolute Maximum Ratings: ($T_A = +25^\circ\text{C}$, $V_{SS} = 0\text{V}$ unless otherwise specified)

Maximum Supply Voltage, $V_{DD\text{max}}$	.....	-0.3 to 11V
(Cumulative applied time: 30min or less)	.....	-0.3 to 14V
Reference Voltage ($V_{\text{ref}} \leq V_{DD}$), V_{ref}}	.....	-0.3 to 10V
(Cumulative applied time: 30min or less)	.....	-0.3 to 13V
Input Voltage, V_I	.....	-0.3 to $V_{DD}+0.3\text{V}$
Output Voltage (Output OFF), V_O	.....	-0.3 to $V_{DD}+0.3\text{V}$
Allowable Power Dissipation ($T_A \leq +75^\circ\text{C}$), $P_{D\text{max}}$	.....	800mW
Allowable Power Disipation of Segment Output, $P_D(\text{seg})$		
Other than $\overline{\text{PM}}$: $I_{OL} < 25\text{mA}$	.....	15mW
$\overline{\text{PM}}$: $I_{OL} < 75\text{mA}$	.....	45mW
Operating Temperature Range, T_{opr}}	.....	-30° to $+75^\circ\text{C}$
Storage Temperature Range, T_{stg}}	.....	-40° to $+125^\circ\text{C}$

Allowable Operating Ranges: ($T_A = +25^\circ\text{C}$, $V_{DD} = 8$ to 10.3V , $V_{SS} = 0\text{V}$, $V_{\text{ref}} = 7.9$ to $9\text{V} \leq V_{DD}$, $V_{\text{ref}} = 0\text{V}$ if $V_{DD} < 8\text{V}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage	V_{DD1}	All function operating mode	8.0	9.3	10.8	V
	V_{DD2}	Only clock operating mode	4.3	5.0	8.0	V
Reference Voltage	V_{ref}	$V_{\text{ref}} \leq V_{DD}$	7.9	8.0	9.0	V
Input "H" Level Voltage	V_{IH1}	INHI, $V_{DD} = 4.3$ to 10.3V	$0.75V_{DD}$	-	V_{DD}	V
Input "L" Level Voltage	V_{IL1}		V_{SS}	-	$0.1V_{DD}$	V
Input "H" Level Voltage	V_{IH2}	FM/AM, IF-FM, IF-AM ₁ , IF-AM ₂ , 12H/24H	$0.85V_{DD}$	-	V_{DD}	V
Input "L" Level Voltage	V_{IL2}		V_{SS}	-	$0.15V_{DD}$	V
Input "H" Level Voltage	V_{IH3}	SET, DEMAND, CTR/CLK	$0.88V_{DD}$	-	V_{DD}	V
Input "L" Level Voltage	V_{IL3}		V_{SS}	-	$0.12V_{DD}$	V
Input "M" Level Voltage	V_{IM}		$0.36V_{DD}$	-	$0.64V_{DD}$	V
Input Frequency	f_{IN1}	Fin-FM, $V_{P-P} = 0.7\text{V}$, Duty 50%	0.6	-	2.0	MHz
	f_{IN2}	Fin-AM, $V_{P-P} = 0.7\text{V}$, Duty 50%	0.4	-	2.5	MHz
Operating Frequency	f_{opg}	Crystal is externally connected across OSC-IN and OSC-OUT	3.5	-	4.2	MHz
Input Amplitude	V_{P-P}	Fin-FM, Fin-AM, Ceramic capacitor of $0.4\mu\text{F}$ is connected across V_{DD} an V_{SS}	0.7	-	-	V_{P-P}

Electrical Characteristics: ($T_A = +25^\circ\text{C}$, $V_{DD} = 8$ to 10.3V , $V_{SS} = 0\text{V}$, $V_{\text{ref}} = 7.9$ to 9V , $V_{\text{ref}} \leq V_{DD}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Current	I_{IN}	FM-Fine, AM-Fine, $V_{IN} = 0\text{V}$ or V_{ref}	-1	-	+1	μA
Input "H" Level Current	I_{IH1}	IF-FM, IF-AM ₁ , IF-AM ₂ , CTR/CLK, 12H/24H, $V_{IN} = 0.9V_{DD}$	-80	-30	-10	μA
Input "L" Level Current	I_{IL1}	IF-FM, IF-AM ₁ , IF-AM ₂ , CTR/CLK, 12H/24H, $V_{IN} = 0\text{V}$	-3	-	0	μA
Input "H" Level Current	I_{IH2}	FM/AM, $V_{IN} = 0.9V_{DD}$	-40	-15	-5	μA
Input "L" Level Current	I_{IL2}	FM/AM, $V_{IN} = 0\text{V}$	-3	-	0	μA
Middle Point Setting Resistance	r_s	SET, DEMAND	40	70	100	$\text{k}\Omega$

Note 1. + sign: Flowing into LSI
 - sign: Flowing out of LSI

Electrical Characteristics (Cont'd): ($T_A = +25^\circ\text{C}$, $V_{DD} = 8$ to 10.3V , $V_{SS} = 0\text{V}$, $V_{ref} = 7.9$ to 9V , $V_{ref} \leq V_{DD}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Floating Voltage	V_{IF3}	SET, DEMAND, input floating	$0.45V_{DD}$	–	$0.55V_{DD}$	V
Input “H” Level Current	I_{IH4}	$\overline{\text{INH}}\overline{\text{I}}$, $V_{DD} = 4.3$ to 10.3V , $V_{IN} = V_{DD}$	15	–	400	μA
Input Floating Voltage	V_{IF4}	$\overline{\text{INH}}\overline{\text{I}}$, $V_{DD} = 4.3$ to 10.3V , input floating	0	–	0.3	V
Feedback Resistance	R_{f1}	Feedback resistance across OSC–IN and OSC–OUT	–	3	–	$\text{M}\Omega$
	R_{f2}	Feedback resistance of Fin–FM	–	3	–	$\text{M}\Omega$
	R_{f3}	Feedback resistance of Fin–AM	–	3	–	$\text{M}\Omega$
Output “L” Level Voltage	V_{OL1}	PM, $V_{DD} = 8\text{V}$, $I_{OL} = 45\text{mA}$	–	–	0.7	V
	V_{OL2}	Segment outputs other than PM $V_{DD} = 8\text{V}$, $I_{OL} = 15\text{mA}$	–	–	0.7	V
Output Leakage Current	I_{OFF}	All segment outputs, $V_{DD} = 10.3\text{V}$, $V_{OH} = 10.3\text{V}$	–	–	10	μA
Current Dissipation	I_{DD1}	$V_{DD} = 10.3\text{V}$, $f_{opg} = 4\text{MHz}$ (with crystal mounted), $f_{IN2} = 2.5\text{MHz}$ ($0.7V_{P-P}$)	–	8	17	mA
	I_{DD2}	$V_{DD} = 5.5\text{V}$, $f_{opg} = 4\text{MHz}$ (with crystal mounted), $V_{ref} = 0\text{V}$, $\overline{\text{INH}}\overline{\text{I}} = 0$	–	1.0	2.5	mA
	I_{ref}	$V_{DD} = 10.3\text{V}$, $V_{ref} = 9\text{V}$, AM–Fine = FM–Fine = V_{ref}	–	0.5	1.5	mA

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– sign: Flowing out of LSI



