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## **NTE950/NTE951/NTE977 Integrated Circuit Positive 3 Terminal Voltage Regulator, 100mA**

**Description:**

The NTE950, NTE951, and NTE977 are positive 3-terminal voltage regulators in available in a TO92 type package. With adequate heat sinking these regulators can deliver 100mA output current. Current limiting is included to limit peak output current to safe value. Safe area protection for the output transistors is provided to limit internal power dissipation. If internal power dissipation becomes too high for the heat sinking provided, the thermal shutdown circuit takes over preventing the IC from overheating.

When used as a zener diode/resistor combination replacement, these devices usually result in an effective output impedance improvement of two orders of magnitude, and lower quiescent current. These regulators can provide local on card regulation, eliminating the distribution problems associated with single point regulation. Typical applications include use in logic systems, instrumentation, HiFi, and other solid state electronic equipment. Although designed primarily as fixed voltage regulators these devices can be used with external components to obtain adjustment voltages and currents.

**Features:**

- Output Voltage Tolerances of  $\pm 5\%$  over the Temperature Range
- Output Current of 100mA
- Internal Thermal Overload Protection
- Output Transistor Safe Area Protection
- Internal Short Circuit Current Limit

**Absolute Maximum Ratings:**

Output Voltage, $V_{OUT}$	
NTE977 .....	5V
NTE950 .....	12V
NTE951 .....	15V
Input Voltage, $V_{IN}$	
NTE977 .....	30V
NTE950, NTE951 .....	35V
Internal Power Dissipation (Note 1), $P_D$ .....	Internally Limited
Operating Temperature Range, $T_{opr}$ .....	0°C to +70°C
Maximum Junction Temperature, $T_J$ .....	+125°C
Storage Temperature Range, $T_{stg}$ .....	-55°C to +150°C
Lead Temperature (Soldering, 10 sec), $T_L$ .....	+260°C

Note 1. Thermal resistance is typically +60°C/W junction to case, +232°C/W junction to ambient, and +88°C/W junction to ambient at 400ft min of air. The maximum junction temperature shall not exceed +125°C on Electrical parameters.

**Electrical Characteristics:** ( $T_J = 0^\circ$  to  $+125^\circ\text{C}$ ,  $I_O = 40\text{mA}$ ,  $C_{IN} = 0.33\mu\text{F}$ ,  $C_O = 0.1\mu\text{F}$ , Note 2 unless otherwise specified)

NTE Type Number			NTE977			NTE950			NTE951			Unit
Input Voltage (unless otherwise specified)			$V_{IN} = 10\text{V}$			$V_{IN} = 19\text{V}$			$V_{IN} = 23\text{V}$			
Parameter	Symbol	Test Conditions	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Output Voltage (Note 4)	$V_O$	$T_J = +25^\circ\text{C}$	4.8	5.0	5.2	11.5	12.0	12.5	14.4	15.0	15.6	V
		$1\text{mA} \leq I_O \leq 70\text{mA}$	4.75	–	5.25	11.4	–	12.6	14.25	–	15.75	V
		$1\text{mA} \leq I_O \leq 70\text{mA}$	4.75	–	5.25	11.4	–	12.6	14.25	–	15.75	V
		$V_{MIN} \leq V_{IN} \leq V_{MAX}$	(7 ≤ $V_{IN}$ ≤ 20)		(14.5 ≤ $V_{IN}$ ≤ 27)		(17.5 ≤ $V_{IN}$ ≤ 30)					
Line Regulation	$\Delta V_O$	$T_J = +25^\circ\text{C}$	–	10	54	–	20	110	–	25	140	mV
			(8 ≤ $V_{IN}$ ≤ 20)		(16 ≤ $V_{IN}$ ≤ 27)		(20 ≤ $V_{IN}$ ≤ 30)					
			–	18	75	–	30	180	–	37	250	mV
			(7 ≤ $V_{IN}$ ≤ 20)		(14.5 ≤ $V_{IN}$ ≤ 27)		(17.5 ≤ $V_{IN}$ ≤ 30)					
Load Regulation	$\Delta V_O$	$T_J = +25^\circ\text{C}$ , $1\text{mA} \leq I_O \leq 40\text{mA}$	–	5	30	–	10	50	–	12	75	mV
		$T_J = +25^\circ\text{C}$ , $1\text{mA} \leq I_O \leq 100\text{mA}$	–	20	60	–	30	100	–	35	150	mV
Long Term Stability	$\Delta V_O$		–	12	–	–	24	–	–	30	–	$\frac{\text{mV}}{1000\text{Hrs}}$
Quiescent Current	$I_Q$	$T_J = +25^\circ\text{C}$	–	3	5	–	3	5	–	3.1	5	mA
		$T_J = +125^\circ\text{C}$	–	–	4.7	–	–	4.7	–	–	4.7	mA
Quiescent Current Change	$\Delta I_Q$	$1\text{mA} \leq I_O \leq 40\text{mA}$	–	–	0.1	–	–	0.1	–	–	0.1	mA
		$V_{MIN} \leq V_{IN} \leq V_{MAX}$	–	–	1.0	–	–	1.0	–	–	1.0	mA
		(8 ≤ $V_{IN}$ ≤ 20)		(16 ≤ $V_{IN}$ ≤ 27)		(20 ≤ $V_{IN}$ ≤ 30)						
Output Noise Voltage	$V_n$	$T_J = +25^\circ\text{C}$ , Note 3, $f = 10\text{Hz}$ to $10\text{kHz}$	–	40	–	–	80	–	–	90	–	$\mu\text{V}$
Ripple Rejection	$\frac{\Delta V_{IN}}{\Delta V_{OUT}}$	$f = 120\text{Hz}$	47	62	–	40	54	–	37	51	–	dB
	(8 ≤ $V_{IN}$ ≤ 16)		(15 ≤ $V_{IN}$ ≤ 25)		(18.5 ≤ $V_{IN}$ ≤ 28.5)							
Input Voltage Required to Maintain Line Regulation		$T_J = +25^\circ\text{C}$	7	–	–	14.5	–	–	17.5	–	–	V

Note 2. The maximum steady state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represent pulse test conditions with junction temperatures as indicated at the initiation of test.

Note 3. Recommended minimum load capacitance of  $0.01\mu\text{F}$  to limit high frequency noise bandwidth.

Note 4. The temperature coefficient of  $V_{OUT}$  is typically within  $\pm 0.01\% V_O/^\circ\text{C}$ .

