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## NTE933 Integrated Circuit Positive 3 Terminal Voltage Regulator, 12V, 5A

**Description:**

The NTE933 is a 3 terminal fixed positive voltage regulator in a TO3 type package designed for use in applications requiring a well regulated positive output voltage. Outstanding features include full power usage up to 5A of load current, internal current limiting, thermal shutdown, and safe area protection on the chip, providing protection of the series pass Darlington, under most operating conditions. Hermetically sealed steel packages are utilized for high reliability and low thermal resistance. A low-noise temperature stable band-gap reference is the key design factor insuring excellent temperature regulation of the NTE933. This coupled to a very low output impedance insures superior load regulation.

**Features:**

- Guaranteed Power Dissipation:  $P_D = 50W @ T_C = +80^\circ C$
- Guaranteed Input-Output Differential:  $V_{IN} - V_O = +2.6V$
- Low Noise, Band Gap Reference
- Remote Sense Capability
- Sample Power Cycled Burn-In
- Guaranteed Thermal Resistance Junction to Case:  $R_{\theta JC} = 0.9^\circ C/W$

**Absolute Maximum Ratings:**

Input Voltage (Note 1), $V_{IN}$ .....	30V
Power Dissipation, $P_D$ .....	Internally Limited
Derate Above $T_C = +80^\circ C$ .....	1.111W/ $^\circ C$
Operating Junction Temperature Range, $T_J$ .....	$-55^\circ$ to $+150^\circ C$
Storage Temperature Range, $T_{stg}$ .....	$-65^\circ$ to $+150^\circ C$
Lead Temperature (During Soldering, 60sec Max), $T_L$ .....	$+300^\circ C$
Thermal Resistance, Junction-to-Case, $R_{thJC}$ .....	0.9 $^\circ C/W$

Note 1. Short circuit protection is only assured to  $V_{INmax}$ . In case of short circuit, with input-output voltages approaching  $V_{INmax}$ , regulator may require the removal of the input voltage to restart.

**Electrical Characteristics:** ( $T_J = +25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	$V_O$	$V_{IN} = 15\text{V to } 22\text{V}$ , $I_O = 10\text{mA to } 3\text{A}$ , Note 2	11.05	12.0	13.05	V
Input-Output Differential	$V_{IN}-V_O$	$I_O = 5\text{A}$ , $T_J = 0 \text{ to } +125^\circ\text{C}$	2.6	-	-	V
Line Regulation	$\text{Reg}_{\text{Line}}$	$V_{IN} = 15\text{V to } 27\text{V}$ , $I_O = 3\text{A}$ , Note 2	-	-	1.0	% $V_O$
Load Regulation	$\text{Reg}_{\text{Load}}$	$V_{IN} = 15\text{V}$ , $I_O = 10\text{mA to } 5\text{A}$ , Note 2	-	-	0.6	% $V_O$
Quiescent Current	$I_Q$	$V_{IN} = 15\text{V}$ , $I_O = 10\text{mA}$	-	-	25	mA
Quiescent Current Line	$I_{Q(\text{Line})}$	$V_{IN} = 15\text{V to } 22\text{V}$ , $I_O = 10\text{mA}$	-	-	5	mA
Quiescent Current Load	$I_{Q(\text{Load})}$	$V_{IN} = 15\text{V}$ , $I_O = 10\text{mA to } 5\text{A}$	-	-	5	mA
Current Limit	$I_{\text{LIM}}$	$V_{IN} = 17\text{V}$ , Note 2	-	-	15	A
Temperature Coefficient	$T_C$	$V_{IN} = 15\text{V}$ , $I_O = 100\text{mA}$ , $T_J = 0 \text{ to } +125^\circ\text{C}$	-	-	0.03	% $V_O/^\circ\text{C}$
Output Noise Voltage	$V_N$	$V_{IN} = 15\text{V}$ , $I_O = 100\text{mA}$ , $T_J = 0 \text{ to } +125^\circ\text{C}$ , Note 3	-	-	10	$\mu\text{V}_{\text{rms}}/\text{V}$
Ripple Attenuation	$R_A$	$V_{IN} = 17\text{V}$ , $I_O = 2\text{A}$ , $T_J = 0 \text{ to } +125^\circ\text{C}$ , Note 4	60	-	-	dB
Power Dissipation	$P_D$	$V_{IN} - V_O$ (2.5V to 10V), $I_O = 10\text{mA to } 5\text{A}$ , $T_J = 0 \text{ to } +125^\circ\text{C}$	-	-	50	W

Note 2. Low duty cycle pulse testing with Kelvin connections required. Die temperature changes must be accounted for separately.

Note 3. BW = 10Hz to 100kHz.

Note 4. Ripple attenuation is specified for a 1Vrms, 120Hz, input ripple. Ripple attenuation is minimum of 60dB at 5V output and is 1dB less for each volt increase in the output voltage.

