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# NTE7154
# Integrated Circuit
# Control Circuit for Switch Mode Power Supplies using MOS Transistors

**Description:**

The NTE7154 is an integrated circuit in an 8–Lead DIP type package which controls the MOS power transistor and performs all necessary regulation and monitoring functions in free running flyback converters. Since good load regulation over a wide load range is attained, this device is particularly suitable for consumer as well as industrial power supplies.

**Features:**

- Fold–Back Characteristic Provides Overload Protection for External Diodes
- Burst Operation Under Short–Circuit and No Load Conditions
- Loop Error Protection
- Switch–Off In Case of Too Low Line Voltage (Under Voltage Switch–Off)
- Line Voltage Compensation of Overload Point
- Soft–Start for Smooth Start–Up
- Chip Over–Temperature Protection (Thermal Shutdown)
- On–Chip Parasitic Transformer Oscillation Suppression Circuitry
- Decrease of Regulated Voltage for Low Power Consumption

**Absolute Maximum Ratings:**

Supply Voltage (Pin1), $V_1$ . . . . . –0.3 to +3.0V
Supply Voltage (Pin2, Pin3, Pin4, Pin7), $V_2$, $V_3$, $V_4$, $V_7$ . . . . . –0.3V
Supply Voltage (Pin6), $V_6$ . . . . . –0.3 to +20V
Supply Current (Pin1, Pin2, Pin3, Pin7), $I_1$, $I_2$, $I_3$, $I_7$ . . . . . 3mA
Supply Current (Pin4, Note 1), $I_4$ . . . . . –1.5A
Supply Current (Pin5, Note 1), $I_5$ . . . . . –0.5 to +1.5A
Supply Current (Pin6, Note 1), $I_6$ . . . . . 0.5A
Supply Current (Pin8), $I_8$ . . . . . –3 to +3mA
Operating Junction Temperature, $T_J$ . . . . . +125°C
Ambient Temperature Range, $T_A$ . . . . . –20° to +85°C
Storage Temperature Range, $T_{stg}$ . . . . . –40° to +125°C
Thermal Resistance, Junction–to–Ambient, $R_{thJA}$ . . . . . 85°C/W
Thermal Resistance, Junction–to–Case, $R_{thJC}$ . . . . . 45°C/W

Note 1. $t_p \le 50\mu s$, $V \le 0.1$.

**Electrical Characteristics:** ($V_{CC}$ = 10V, $T_A$ = +25°C unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Start–Up Hysteresis** | | | | | | |
| Start–Up Current Drain | $I_{6E0}$ | $V_6 = V_{6E}$ | – | 0.6 | 0.8 | mA |
| Switch–On Voltage | $V_{6E}$ | | 11 | 12 | 13 | V |
| Switch–Off Voltage | $V_{6A}$ | | 4.5 | 5.0 | 5.5 | V |
| Switch–On Current | $I_{6E1}$ | $V_6 = V_{6E}$ | – | 11 | – | mA |
| Switch–Off Current | $I_{6A1}$ | $V_6 = V_{6A}$ | – | 10 | – | mA |
| **Voltage Clamp** ($V_6$ = 10V, IC Switched Off) | | | | | | |
| At Pin2 ($V_6 < V_{6E}$) | $V_{2(Max)}$ | $I_2$ = 1mA | 5.6 | 6.6 | 9.0 | V |
| At Pin3 ($V_6 < V_{6E}$) | $V_{3(Max)}$ | $I_3$ = 1mA | 5.6 | 6.6 | 9.0 | V |
| **Control Range** | | | | | | |
| Control Input Voltage | $V_{1R}$ | | 400 | 410 | 420 | mV |
| Voltage Gain of the Control Circuit in the Control Range | $-V_R$ | $V_R = d(V_{2S} – V_{2B})/dV_1$, f = 1kHz | – | 43 | – | dB |
| **Primary Current Simulation Voltage** | | | | | | |
| Basic Value | $V_{sB}$ | | 0.955 | 1.000 | 1.030 | V |
| **Overload Range and Short Circuit Operation** | | | | | | |
| Peak Value in the Range of Secondary Overload | $V_{2O}$ | $V_1 = V_{1R}$ = 10mV | 2.80 | 2.95 | 3.10 | V |
| Maximum Ramp Amplitude | $DV_2$ | $V_{2O} – V_{2B}$ | 1.82 | 1.95 | 2.08 | V |
| Peak value in the Range of Secondary Short–Circuit Operation | $V_{2S}$ | $V_1$ = 0 | 2.3 | 2.5 | 2.7 | V |
| **Foldback Point Correction** | | | | | | |
| Foldback Point Correction Current | $–I_2$ | $V_3$ = 3.7V | 300 | 500 | 650 | µA |
| **Generally Valid Data** ($V_6$ = 10V) **Voltage of the Zero Transition Detector** | | | | | | |
| Positive Clamping Voltage | $V_{8P}$ | $I_8$ = 1mA | – | 0.75 | – | V |
| Negative Clamping Voltage | $V_{8N}$ | $I_8$ = –1mA | – | –0.2 | – | V |
| Threshold Voltage | $V_{8S}$ | | 40 | 50 | – | mV |
| Suppression of Transformer Ringing | TUL | | 3.0 | 3.8 | 4.5 | µs |
| Input Current | $–I_8$ | $V_8$ = 0 | 0 | – | 4 | µV |
| **Push–Pull Output Stage Saturation Voltages** | | | | | | |
| Pin5 Sourcing | $V_{SatU}$ | $I_5$ = –0.1A | – | 1.5 | 2.0 | V |
| Pin5 Sinking | $V_{SatU}$ | $I_5$ = +0.1A | – | 1.0 | 1.2 | V |
| | | $I_5$ = +0.5A | – | 1.4 | 1.8 | V |
| **Output Slow Rate** | | | | | | |
| Rising Edge | $+dV_5/dt$ | | – | 70 | – | V/µs |
| Falling Edge | $–dV_5/dt$ | | – | 100 | – | V/µs |
| **Reduction of Control Voltage** | | | | | | |
| Current to Reduce the Control Voltage | $–I_1$ | $V_7$ = 1V | – | 50 | – | µA |

**Electrical Characteristics (Cont'd):** ($V_{CC}$ = 10V, $T_A$ = +25°C unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Protection Circuit** | | | | | | |
| Undervoltage Protection for $V_6$: Voltage at Pin5 = $V_{5(min)}$ if $V_6 < V_{6(Min)}$ | $V_{6(Min)}$ | | 7.00 | 7.25 | 7.50 | V |
| Overvoltage Protection for $V_6$: Voltage at Pin5 = $V_{5(min)}$ if $V_6 > V_{6(Min)}$ | $V_{6(Max)}$ | | 15.0 | 16.0 | 16.5 | V |
| Undervoltage Protection for $V_{AC}$: Voltage at Pin5 = $V_{5(min)}$ if $V_3 < V_{3A}$ | $V_{3A}$ | $V_2$ = 0V | 970 | 1005 | 1040 | mV |
| Over Temperature: At the given chip temperature the IC will switch $V_5$ to $V_{5(Min)}$ | $O_j$ | | – | 150 | – | °C |
| Voltage at Pin3 if one of the protection functions was triggered; ($V_3$ will be clamped until $V_6 < V_{6A}$) | $V_{3Sat}$ | $I_3$ = 750µA | – | 0.4 | 0.8 | V |
| Current Drain During Burst Operation | $I_6$ | $V_3 = V_2$ = 0V | – | 8 | – | mA |

**Pin Connection Diagram**