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## NTE128 (NPN) & NTE129 (PNP) Silicon Complementary Transistors Audio Output, Video, Driver

**Description:**

The NTE128 (NPN) and NTE129 (PNP) are silicon complementary transistors in a TO39 type package designed primarily for amplifier and switching applications. These devices features high break-down voltages, low leakage currents, low capacity, and a beta useful over an extremely wide current range.

**Absolute Maximum Ratings:**

Collector–Emitter Voltage, $V_{CEO}$ .....	80V
Collector–Base Voltage, $V_{CBO}$	
NTE128 .....	140V
NTE129 .....	80V
Emitter–Base Voltage, $V_{EBO}$	
NTE128 .....	7V
NTE129 .....	5V
Continuous Collector Current, $I_C$ .....	1A
Total Device Dissipation ( $T_A = +25^\circ\text{C}$ ), $P_D$	
NTE128 .....	0.8W
Derate Above $25^\circ\text{C}$ .....	4.6mW/ $^\circ\text{C}$
NTE129 .....	1.25W
Derate Above $25^\circ\text{C}$ .....	7.15mW/ $^\circ\text{C}$
Total Device Dissipation ( $T_C = +25^\circ\text{C}$ ), $P_D$	
NTE128 .....	5W
Derate Above $25^\circ\text{C}$ .....	28.6mW/ $^\circ\text{C}$
NTE129 .....	7W
Derate Above $25^\circ\text{C}$ .....	40mW/ $^\circ\text{C}$
Operating Junction Temperature Range, $T_J$ .....	$-65^\circ$ to $+200^\circ\text{C}$
Storage Temperature Range, $T_{stg}$ .....	$-65^\circ$ to $+200^\circ\text{C}$
Thermal Resistance, Junction–to–Case, $R_{thJC}$	
NTE128 .....	16.5 $^\circ\text{C}/\text{W}$
NTE129 .....	20 $^\circ\text{C}/\text{W}$
Thermal Resistance, Junction–to–Ambient, $R_{thJA}$	
NTE128 .....	89.5 $^\circ\text{C}/\text{W}$
NTE129 .....	140 $^\circ\text{C}/\text{W}$
Lead Temperature (During Soldering, 1/16" from case, 60sec max), $T_L$ .....	$+300^\circ\text{C}$

Note 1. NTE129MCP is a matched complementary pair containing 1 each of NTE128 (NPN) and NTE129 (PNP).

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>OFF Characteristics</b>						
Collector–Emitter Breakdown Voltage NTE128	$V_{(BR)CEO}$	$I_C = 30\text{mA}, I_B = 0$	80	–	–	V
NTE129		$I_C = 10\text{mA}$	80	–	–	V
Collector–Base Breakdown Voltage NTE128	$V_{(BR)CBO}$	$I_C = 100\mu\text{A}, I_E = 0$	140	–	–	V
NTE129		$I_C = 10\mu\text{A}$	80	–	–	V
Emitter–Base Breakdown Voltage NTE128	$V_{(BR)EBO}$	$I_E = 100\mu\text{A}, I_C = 0$	7	–	–	V
NTE129		$I_E = 10\mu\text{A}$	5	–	–	V
Collector Cutoff Current NTE128	$I_{CBO}$	$V_{CB} = 90\text{V}, I_E = 0$	–	–	0.01	$\mu\text{A}$
NTE129		$V_{CB} = 90\text{V}, I_E = 0, T_A = +150^\circ\text{C}$	–	–	10	$\mu\text{A}$
		$V_{CB} = 60\text{V}$	–	–	50	nA
		$V_{CB} = 60\text{V}, T_A = +150^\circ\text{C}$	–	–	50	$\mu\text{A}$
Emitter Cutoff Current NTE128	$I_{EBO}$	$V_{BE} = 5\text{V}, I_C = 0$	–	–	0.010	$\mu\text{A}$
NTE129		$V_{BE} = 5\text{V}$	–	–	10	$\mu\text{A}$
<b>ON Characteristics (Note 2)</b>						
DC Current Gain NTE128	$h_{FE}$	$I_C = 0.1\text{mA}, V_{CE} = 10\text{V}$	50	–	–	
NTE129		$I_C = 10\text{mA}, V_{CE} = 10\text{V}$	90	–	–	
		$I_C = 150\text{mA}, V_{CE} = 10\text{V}$	100	–	300	
		$I_C = 150\text{mA}, V_{CE} = 10\text{V}, T_C = -55^\circ\text{C}$	40	–	–	
		$I_C = 500\text{mA}, V_{CE} = 10\text{V}$	50	–	–	
		$I_C = 1.0\text{A}, V_{CE} = 10\text{V}$	15	–	–	
		$I_C = 100\mu\text{A}, V_{CE} = 5\text{V}$	75	–	–	
		$I_C = 100\text{mA}, V_{CE} = 5\text{V}$	100	–	300	
		$I_C = 100\text{mA}, V_{CE} = 5\text{V}, T_C = -55^\circ\text{C}$	40	–	–	
		$I_C = 500\text{mA}, V_{CE} = 5\text{V}$	70	–	–	
$I_C = 1.0\text{A}, V_{CE} = 5\text{V}$	25	–	–			
Collector–Emitter Saturation Voltage NTE128	$V_{CE(sat)}$	$I_C = 150\text{mA}, I_B = 15\text{mA}$	–	–	0.2	V
NTE129		$I_C = 500\text{mA}, I_B = 50\text{mA}$	–	–	0.5	V
		$I_C = 150\text{mA}, I_B = 15\text{mA}$	–	–	0.15	V
		$I_C = 500\text{mA}, I_B = 50\text{mA}$	–	–	0.5	V
Base–Emitter Saturation Voltage NTE128	$V_{BE(sat)}$	$I_C = 150\text{mA}, I_B = 15\text{mA}$	–	–	1.1	V
NTE129			–	–	0.9	V
Base–Emitter ON Voltage (NTE129 Only)	$V_{BE(on)}$	$I_C = 500\text{mA}, V_{CE} = 500\text{mV}$	–	–	1.1	V

Note 2. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 1\%$ .

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Small-Signal Characteristics</b>						
Current-Gain – Bandwidth Product (NTE128 Only)	$f_T$	$I_C = 50\text{mA}, V_{CE} = 10\text{V}, f = 20\text{MHz}$	100	–	400	MHz
Output Capacitance NTE128	$C_{obo}$	$V_{CB} = 10\text{V}, I_E = 0, f = 1\text{MHz}$	–	–	12	pF
NTE129		$V_{CE} = 10\text{V}, f = 1\text{MHz}$	–	–	20	pF
Input Capacitance NTE128	$C_{ibo}$	$V_{BE} = 500\text{mV}, I_C = 0, f = 1\text{MHz}$	–	–	60	pF
NTE129		$V_{EB} = 500\text{mV}, f = 1\text{MHz}$	–	–	110	pF
Small-Signal Current Gain NTE128	$h_{fe}$	$I_C = 1\text{mA}, V_{CE} = 5\text{V}, f = 1\text{kHz}$	80	–	400	
NTE129		$I_C = 50\text{mA}, V_{CE} = 10\text{V}, f = 100\text{MHz}$	1	–	4	
Collector-Base Time Constant (NTE128 Only)	$r_b'C_c$	$I_E = 10\text{mA}, V_{CB} = 10\text{V}, f = 79.8\text{MHz}$	–	–	400	ps
Noise Figure (NTE128 Only)	NF	$I_C = 100\mu\text{A}, V_{CE} = 10\text{V}, R_S = 1\text{k}\Omega, f = 1\text{kHz}$	–	–	4	dB
<b>Switching Characteristics (NTE129 Only)</b>						
Storage Time	$t_s$	$I_C = 500\text{mA}, I_{B1} = I_{B2} = 50\text{mA}$	–	–	350	ns
Turn-On Time	$t_{on}$	$I_C = 500\text{mA}, I_{B1} = 50\text{mA}$	–	–	100	ns
Fall Time	$t_f$	$I_C = 500\text{mA}, I_{B1} = I_{B2} = 50\text{mA}$	–	–	50	ns

