NTE6809 & NTE6809E
Integrated Circuit
NMOS, 8–Bit Microprocessor (MPU)

Description:

The NTE6809 and NTE6809E are revolutionary high performance 8–bit microprocessors in 40–Lead DIP type packages which support modern programming techniques such as position independece, reentrancy, and modular programming.

The basic instructions of any computer are greatly enhanced by the presence of powerful addressing modes. The NTE6809 and NTE6809E have the most complete set of addressing modes available on any 8–bit microprocessor today.

These devices contain hardware and software features which make them ideal processors for higher level language execution or standard controller applications. External clock inputs are provided on the NTE6809E to allow synchronization with peripherals, systems, or other MPUs.

Architectural Features:
- Two 16–Bit Index Registers
- Two 16–Bit Indexable Stack Pointers
- Two 8–Bit Accumulators can be Concatenated to Form One 16–Bit Accumulator
- Direct Page Register Allows Direct Addressing Throughout Memory

Hardware Features:
- On–Chip Oscillator (Crystal Frequency = 4 x E), **NTE6809 Only**
- $\overline{\text{DMA}}/\overline{\text{BREQ}}$ Allows DMA Operation on Memory Refresh, **NTE6809 Only**
- External Clock Inputs, E and Q, Allow Synchronization, **NTE6809E Only**
- TSC Input Controls Internal Bus Buffers, **NTE6809E Only**
- LIC Indicates Opcode Fetch, **NTE6809E Only**
- AVMA Allows Efficient Use of Common Resource in a Multiprocessor System, **NTE6809E Only**
- BUSY is a Status Line for Multiprocessing, **NTE6809E Only**
- Fast Interrupt Request Input Stacks Only Condition Code Register and Program Counter
- MRDY Input Extends Data Across Times for Use with Slow Memory
- Interrupt Acknowledge Output Allows Vectoring by Devices
- Sync Acknowledge Output Allows for Synchronization to External Event
- Single Bus–Cycle $\overline{\text{RESET}}$
- Single 5V Supply Operation
- $\overline{\text{NMI}}$ Inhibited After $\overline{\text{RESET}}$ Until After First Load Stack Pointer
- Early Address Valid Allows Use with Slower Memories
- Early Write Data for Dynamic Memories

Software Features:

- 10 Addressing Modes
    - M6800 Upward Compatible Addressing Modes
    - Direct Addressing Anywhere in Memory Map
    - Long RelativeBranches
    - Program Counter Relative
    - True Indirect Addressing
    - Expanded Indexed Addressing
      0–, 5–, 8–, or 16–Bit Constant Offsets
      8– or 16–Bit Accumulator Offsets
      Auto–Increment/Decrement by 1 or 2
- Improved Stack Manipulation
- 1464 Instruction with Unique Addressing Modes
- 8 x 8 Unsigned Multiply
- 16–Bit Arithmetic
- Transfer/Exchange All Registers
- Push/Pull Any Registers or Any Set of Registers
- Load Effective Address

Absolute Maximum Ratings: (Note 1)

Supply Voltage, V_{CC} .... −0.3 to +7.0V
Input Voltage, V_{in} .... −0.3 to +7.0V
Operating Ambient Temperature Range, T_A .... 0° to +70°C
Storage Temperature Range, T_{stg} .... −55° to +150°C
Thermal Resistance, Junction–to–Ambient, R_{thJA} .... 100°C/W

Note 1. These devices contain circuitry to protect the inputs against damage due to high static voltages or electric fields; however, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to these high impedance circuits. Reliability of operation is enhanced if unused inputs are tied to an appropriate logic voltage level (e.g., either V_{SS} or V_{CC}).

DC Electrical Characteristics: (V_{CC} = 5V ±5%, V_{SS} = 0, T_A = 0° to +70°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input High Voltage	V_{IH}		V_{SS}+2.0	–	V_{CC}	V
	V_{IHR}		V_{SS}+4.0	–	V_{CC}	V
NTE6809E Only	V_{IHC}		V_{CC}–0.75	–	V_{CC}+0.3	V
Input Low Voltage	V_{IL}		V_{SS}–0.3	–	V_{SS}+0.8	V
NTE6809E Only	V_{ILC}		V_{SS}–0.3	–	V_{SS}+0.4	V
	V_{ILQ}		V_{SS}–0.3	–	V_{SS}+0.6	V
Input Leakage Current	I_{in}	V_{in} = 0 to 5.25V, V_{CC} = Max	–	–	2.5	μA
NTE6809E Only (E)			–	–	100	μA
DC Output High Voltage	V_{OH}	I_{Load} = 145μA, V_{CC} = Min	V_{SS} +2.4	–	–	V
		I_{Load} = 205μA, V_{CC} = Min	V_{SS}+2.4	–	–	V
		I_{Load} = 100μA, V_{CC} = Max	V_{SS}+2.4	–	–	V
DC Output Low Voltage	V_{OL}	I_{Load} = 2mA, V_{CC} = Min	–	–	V_{SS}+0.5	V
Internal Power Dissipation	P_{INT}	T_A = 0°, Steady State Operation	–	–	1.0	W

DC Electrical Characteristics (Cont'd): $(V_{CC} = 5V \pm 5\%, V_{SS} = 0, T_A = 0°$ to $+70°C$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Capacitance (Note 2	C_{in}	$V_{in} = 0$, $T_A = +25°C$, f = 1MHz	–	10	15	pF
NTE6809E Only (E)			–	30	50	pF
Output Capacitance (Note 2)	C_{out}		–	10	15	pF
Frequency of Operation NTE6809	f	Crystal or External Input	0.4	–	4.0	MHz
NTE6809E		E and Q Inputs	0.1	–	1.0	MHz
Hi–Z (Off State) Input Current D0 – D7	I_{TSI}	$V_{in} = 0.4$ to 2.4V, V_{CC} = Max	–	2	10	µA
A0 – A15, R/$\overline{W}$			–	–	100	µA

Note 2. Capacitances are periodically tested rather than 100% tested.

Pin Connection Diagram

NTE6809

V_{SS}	1		40	$\overline{HALT}$
$\overline{NMI}$	2		39	X'tal
$\overline{IRQ}$	3		38	E X'tal
$\overline{FIRQ}$	4		37	$\overline{RESET}$
BS	5		36	MRDY
BA	6		35	Q
V_{CC}	7		34	E
A0	8		33	$\overline{DMA/BREQ}$
A1	9		32	R/$\overline{W}$
A2	10		31	D0
A3	11		30	D1
A4	12		29	D2
A5	13		28	D3
A6	14		27	D4
A7	15		26	D5
A8	16		25	D6
A9	17		24	D7
A10	18		23	A15
A11	19		22	A14
A12	20		21	A13

NTE6809E

V_{SS}	1		40	$\overline{HALT}$
$\overline{NMI}$	2		39	TSC
$\overline{IRQ}$	3		38	LIC
$\overline{FIRQ}$	4		37	$\overline{RESET}$
BS	5		36	AVMA
BA	6		35	Q
V_{CC}	7		34	E
A0	8		33	BUSY
A1	9		32	R/$\overline{W}$
A2	10		31	D0
A3	11		30	D1
A4	12		29	D2
A5	13		28	D3
A6	14		27	D4
A7	15		26	D5
A8	16		25	D6
A9	17		24	D7
A10	18		23	A15
A11	19		22	A14
A12	20		21	A13

40   21

1   20

2.055 (52.2)

.550 (13.9)
Max

.155 (3.9)

.100 (2.54)   .019 (0.5)

.137
(3.5)   .650 (16.5)