

DATA SHEET

NE590

Addressable peripheral driver

Product data
Supersedes data of 1994 Aug 31
File under Integrated Circuits, IC11 Handbook

2001 Aug 03

Addressable peripheral driver

NE590

DESCRIPTION

The NE590 addressable peripheral driver is a high current latched driver, similar in function to the 9334 address decoder. The device has eight Darlington power outputs, each capable of 250 mA load current. The outputs are turned on or off by respectively loading a logic HIGH or logic LOW into the device data input. The required output is defined by a 3-bit address. The device must be enabled by a \overline{CE} input line. A common clear input, \overline{CLR} , turns all outputs off when a logic LOW is applied.

The NE590 has eight open-collector Darlington outputs which sink current to ground. The device is packaged in a 16-pin plastic DIP package.

FEATURES

- 8 high current outputs
- Low-loading bus compatible inputs
- Power-on clear ensures safe operation
- NE590 will operate in addressable or demultiplex mode
- Allows random (addressed) data entry
- Easily expandable
- NE590 is pin compatible with 54/74LS259

APPLICATIONS

- Relay driver
- Indicator lamp driver
- Triac trigger
- LED display digit driver
- Stepper motor driver

PIN CONFIGURATIONS

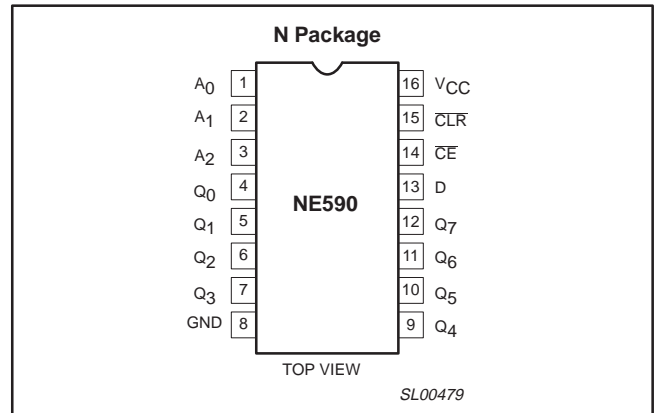


Figure 1. Pin Configuration

PIN DESCRIPTION

PIN	SYMBOL	NAME & FUNCTION
1-3	A_0 - A_2	A 3-bit binary address on these pins defines which of the 8 output latches is to receive the data.
4-7, 9-12	Q_0 - Q_7	The 8 device outputs. The NE590 has open-collector Darlington outputs.
13	D	The data input. When the chip is enabled, this data bit is transferred to the defined output such that: "1" turns output switch "ON" "0" turns output switch "OFF" Thus in logic terms, the NE590 inverts data to the relevant output.
14	\overline{CE}	The chip enable. When this input is LOW, the output latches will accept data. When \overline{CE} goes HIGH, all outputs will retain their existing state regardless of address or data input conditions.
15	\overline{CLR}	The clear input. When \overline{CLR} goes LOW all output switches are turned "OFF". A HIGH data input will override the clear function on the addressed latch.

ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE	DWG #
16-Pin Plastic Dual In-Line Package (DIP)	0 °C to +70 °C	NE590N	SOT38-4

Addressable peripheral driver

NE590

BLOCK DIAGRAM

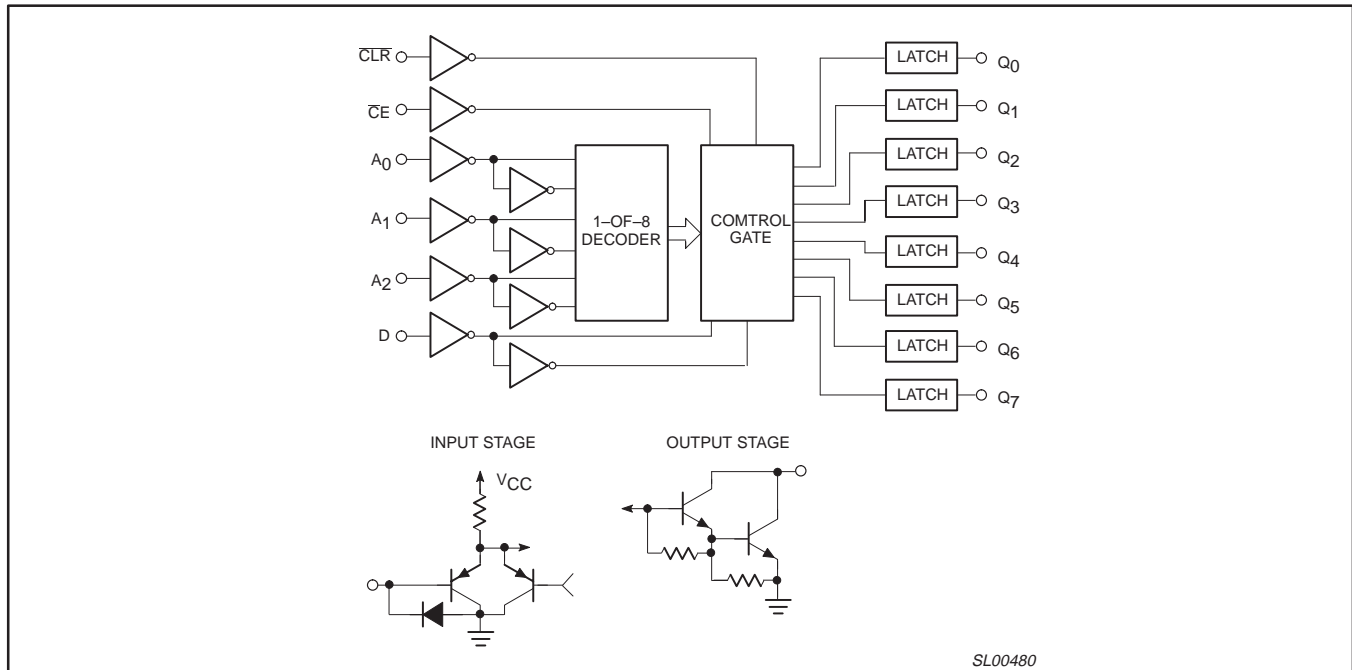


Figure 2. Block Diagram

TRUTH TABLE

INPUTS						OUTPUTS								MODE	
CLR	CE	D	A ₀	A ₁	A ₂	Q ₀	Q ₁	Q ₂	Q ₃	Q ₄	Q ₅	Q ₆	Q ₇		
L	H	X	X	X	X	H	H	H	H	H	H	H	H	Clear	
L	L	L	L	L	L	H	H	H	H	H	H	H	H	Demultiplex	
L	L	H	L	L	L	L	H	H	H	H	H	H	H		
L	L	L	H	L	L	H	H	H	H	H	H	H	H		
L	L	H	H	L	L	H	L	H	H	H	H	H	H		
L	L	L	H	H	H	H	H	H	H	H	H	H	H		
L	L	H	H	H	H	H	H	H	H	H	H	H	L		
H	H	X	X	X	X	Q _{N-1}	—————>							Memory	
H	L	L	L	L	L	H	Q _{N-1}	—————>							Addressable Latch
H	L	H	L	L	L	L	Q _{N-1}	—————>							
H	L	L	H	L	L	Q _{N-1}	H	Q _{N-1}	—————>						
H	L	H	H	L	L	Q _{N-1}	L	Q _{N-1}	—————>						
H	L	L	H	H	H	Q _{N-1}	—————>							H	
H	L	H	H	H	H	Q _{N-1}	—————>							L	

NOTES:

X = Don't care condition

Q_{N-1} = Previous output state

L = Low voltage level/"OFF" output state

H = High voltage level/"ON" output state

Addressable peripheral driver

NE590

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
V _{CC}	Supply voltage	-0.5 to +7	V
V _{IN}	Input voltage	-0.5 to +15	V
V _{OUT}	Output voltage	0 to +7	V
I _{OUT}	Output current Each output All outputs	300 1000	mA
P _D	Maximum power dissipation ¹ T _{amb} = 25 °C (still air)	1450	mW
T _{amb}	Ambient temperature range	0 to +70	°C
T _j	Junction temperature	165	°C
T _{stg}	Storage temperature range	-65 to +150	°C
T _{sld}	Lead soldering temperature (10 sec max)	230	°C

NOTE:

- Derate above 25 °C at the following rates:
N package at 11.6 mW/°C.

DC ELECTRICAL CHARACTERISTICS

V_{CC} = 4.75 V to 5.25 V; 0 °C ≤ T_{amb} ≤ +70 °C; unless otherwise specified. ¹

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			Min	Typ	Max	
V _{IH}	HIGH-level input voltage		2.0			V
V _{IL}	LOW-level input voltage				0.8	
V _{OL}	LOW-level output voltage	I _{OL} = 250 mA; T _{amb} = 25 °C Over temperature		1.0	1.3 1.5	V
I _{IH}	HIGH-level input current	V _{IN} = V _{CC}		0.1	10	μA
I _{IL}	LOW-level input current CE input All other inputs	V _{IN} = 0 V		-25 -15	-60 -50	μA μA
I _{OH}	Leakage current	V _{OUT} = 5.25 V		10	250	μA
I _{CCL} I _{CCH}	Supply current All outputs LOW All outputs HIGH	V _S = V _{CC} = 5 V		33 15	50 50	mA mA
P _D	Power dissipation	No output load			350	mW

NOTES:

- All typical values are at V_{CC} = 5 V and T_{amb} = 25 °C.

Addressable peripheral driver

NE590

SWITCHING CHARACTERISTICS $V_{CC} = 5\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

SYMBOL	PARAMETER	TO	FROM	Limits			UNIT
				Min	Typ	Max	
t_{PLH} t_{PHL}	Propagation delay time Low-to-High ¹ High-to-Low ¹	Output	\overline{CE}		65 115	150 230	ns
t_{PLH} t_{PHL}	Low-to-High ² High-to-Low ²	Output	Data		65 120	130 240	ns
t_{PLH} t_{PHL}	Low-to-High ³ High-to-Low ³	Output	Address		100 130	200 260	ns
t_{PLH} t_{PHL}	Low-to-High ⁴ High-to-Low ⁴	Output	\overline{CLR}		65	130	ns
Switching setup requirements							
$t_{S(H)}$		Chip enable	High data	210			ns
$t_{S(L)}$		Chip enable	Low data	210			ns
$t_{S(A)}$		Chip enable	Address	30			ns
$t_{H(H)}$		Chip enable	High data	40			ns
$t_{H(L)}$		Chip enable	Low data	30			ns
$t_{PW(E)}$	Chip enable pulse width ¹			120			ns

NOTES:

1. See Turn-On and Turn-Off Delays, Enable to Output and Enable Pulse Width timing diagram.
2. See Turn-On and Turn-Off Delays, Data to Output timing diagram.
3. See Turn-On and Turn-Off Delays, Address to Output timing diagram.
4. See Turn-Off Delay, Clear to Output timing diagram.
5. See Setup and Hold Time, Data to Enable timing diagram.
6. See Setup Time, Address to Enable timing diagram.

FUNCTIONAL DESCRIPTION

These peripheral drivers have latched outputs which hold the input data until cleared. The NE590 has active-Low, open-collector outputs. All outputs are cleared when power is first applied.

Addressable Latch Function

Any given output can be turned on or off by presenting the address of the output to be set or cleared to the three address pins, by holding the "D" input High to turn on the selected input, or by holding it Low to turn off, holding the \overline{CLR} input High, and bringing the \overline{CE} input Low. Once an output is turned on or off, it will remain so until addressed again, or until all outputs are cleared by bringing the \overline{CLR} , \overline{CE} , and "D" inputs Low.

Demultiplexer Operation

By bringing the \overline{CLR} and \overline{CE} inputs Low and the "D" input High, the addressed output will remain on and all other outputs will be off. This condition will remain only as long as the output is addressed.

High Current Outputs

The obvious advantage of these devices over the 9334 and N74LS259 (which provide a similar function) is the fact that the NE590 is capable of output currents of 250 mA at each of its eight outputs. It should be noted, however, that the load power dissipation would be over 2.5 W if all 8 outputs were to carry their full rated load current at one time. Since the total power dissipation is limited by the package to 1 W, and since the power dissipation due to supply current is 0.25 W, the total load power dissipation by the device is limited to 0.75 W, and decreases as ambient temperature rises.

The maximum die junction temperature must be limited to 165 °C, and the temperature rise above ambient and the junction temperature are defined as:

$$T_R = \theta_{JA} \times P$$

$$T_j = T_{amb} + T_R$$

where

θ_{JA} is die junction to ambient thermal resistance.
 P_D is total power dissipation
 T_R is junction temperature rise above ambient
 T_j is die junction temperature
 T_{amb} is ambient (surrounding medium) temperature

For example, if we are using the NE590 in a plastic package in an application where the ambient temperature is never expected to rise above 50 °C, and the output current at the 8 outputs, when on, are 100, 40, 50, 200, 15, 30, 80, and 10 mA, we find from the graph of output voltage versus load current that the output voltages are expected to be about 0.92, 0.75, 0.78, 1.04, 0.5, 0.7, 0.9, and 0.4 V, respectively. Total device power due to these loads is found to be 473.5 mW. Adding the 250 mW due to the power supply brings total device power dissipation to 723.5 mW. The thermal resistance is 83 °C per W for plastic packages. Using the equations above we find:

$$T_R = 83 \times 0.7235 = 60\text{ }^{\circ}\text{C}$$

$$T_j = 50 + 60 = 100\text{ }^{\circ}\text{C}$$

Thus we find that T_j is below the 165 °C maximum and this package could be used in this application. The graphs of total load power versus ambient temperature would also give us this same information, although interpreting the graphs would not yield the same accuracy.

Addressable peripheral driver

NE590

TYPICAL PERFORMANCE CHARACTERISTICS

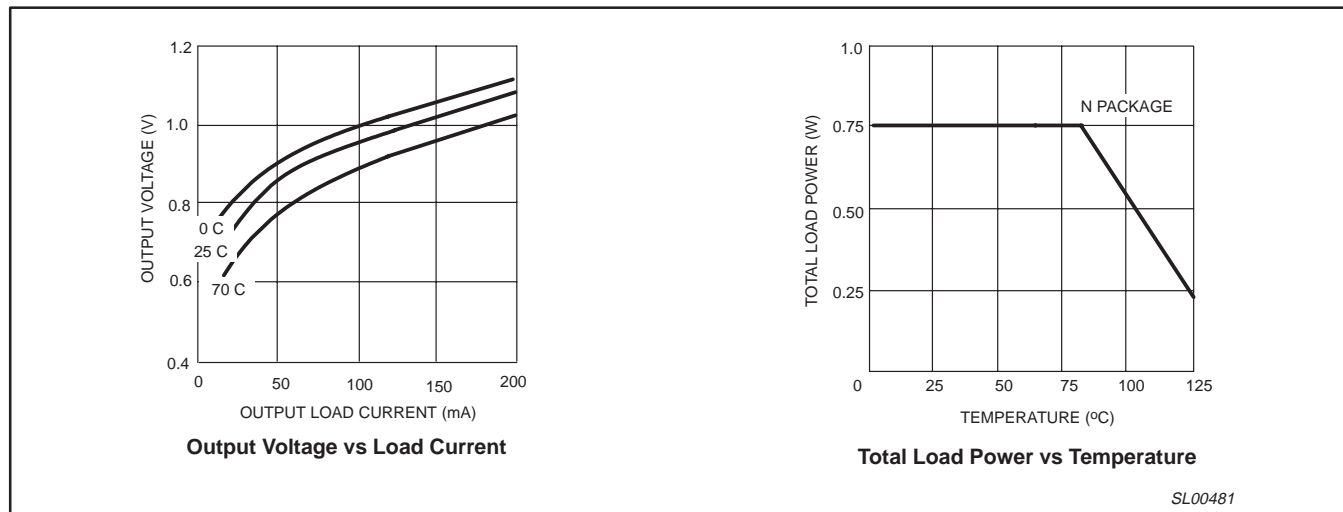


Figure 3. Typical Performance Characteristics

Addressable peripheral driver

NE590

TIMING DIAGRAMS

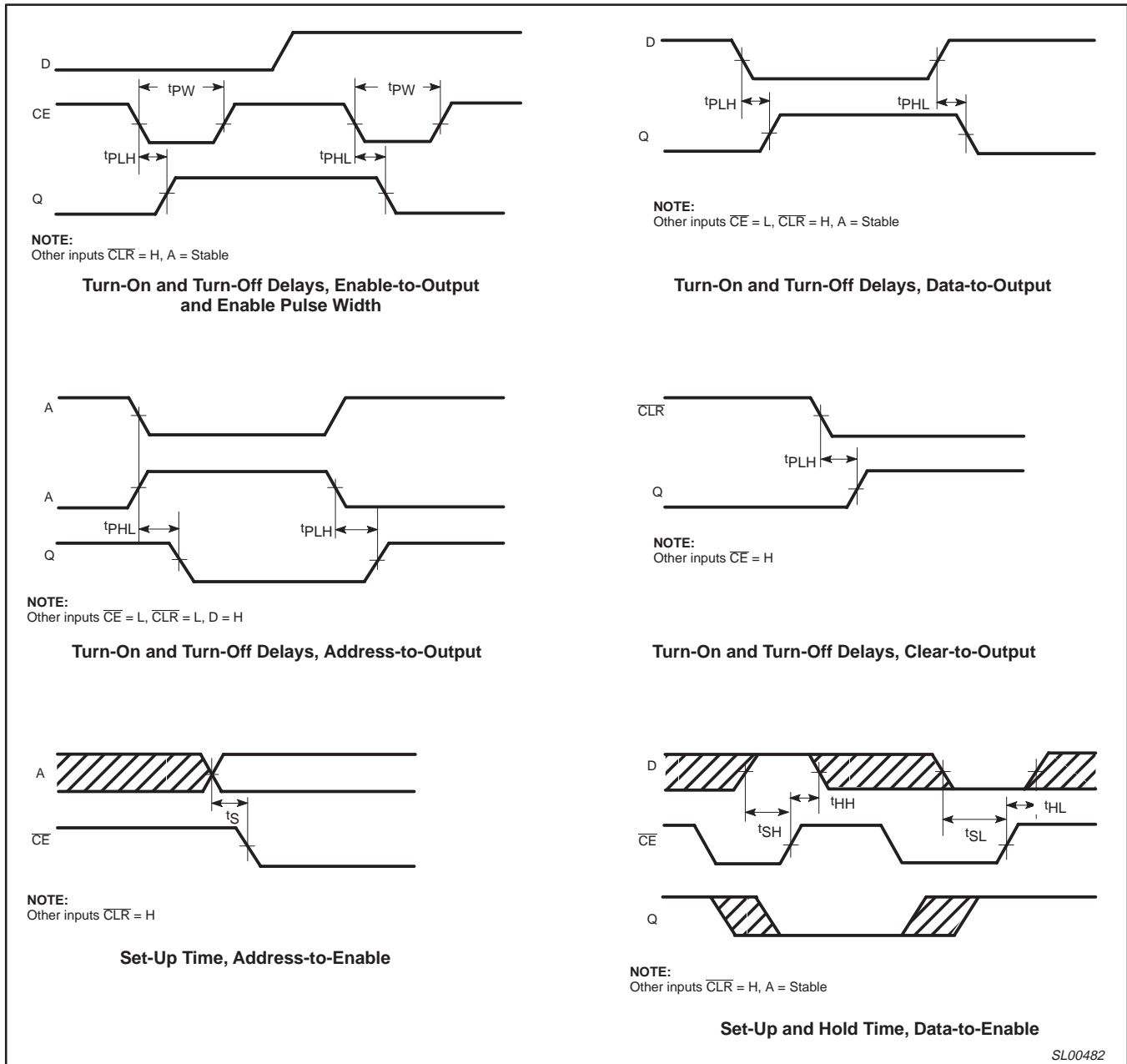


Figure 4. Timing Diagrams

SL00482

Addressable peripheral driver

NE590

TYPICAL APPLICATIONS

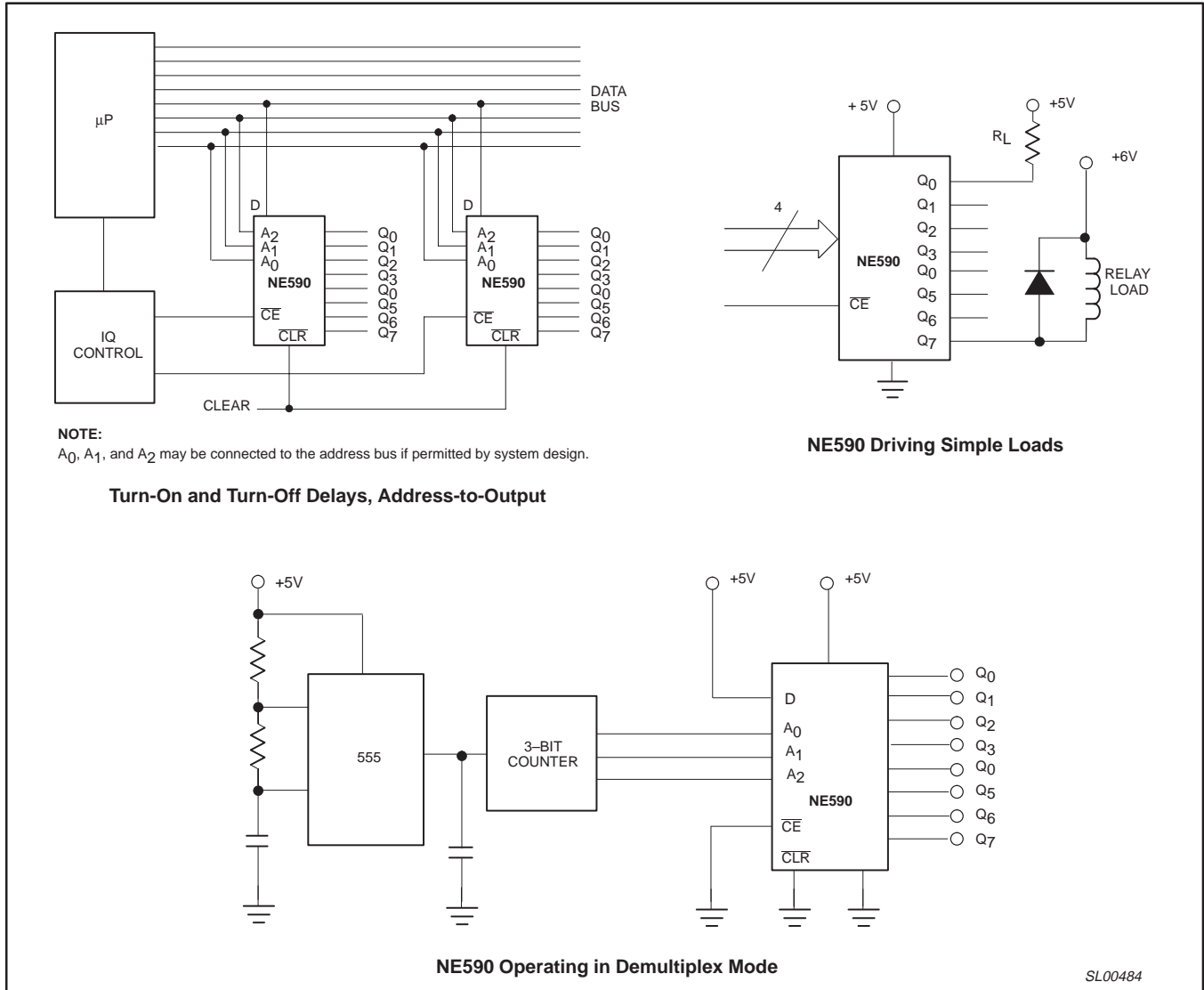


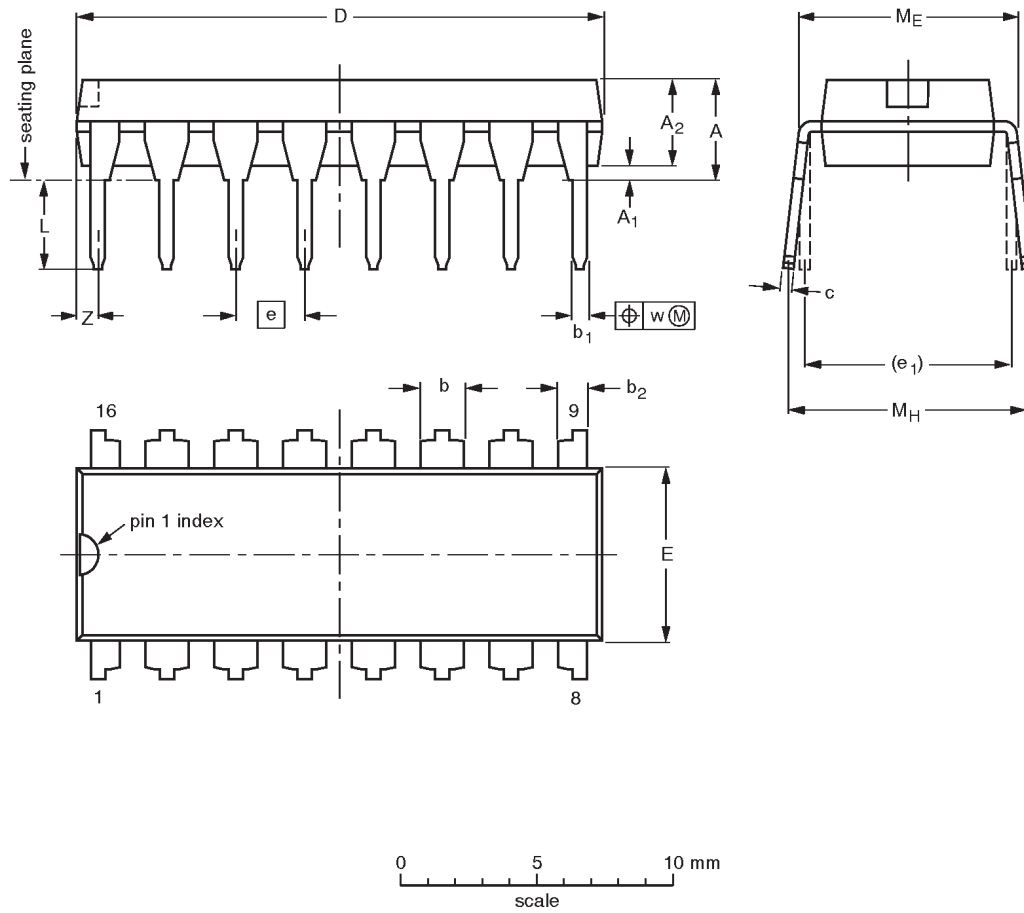
Figure 5. Typical Applications

Addressable peripheral driver

NE590

DIP16: plastic dual in-line package; 16 leads (300 mil)

SOT38-4



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A ₁ min.	A ₂ max.	b	b ₁	b ₂	c	D ⁽¹⁾	E ⁽¹⁾	e	e ₁	L	M _E	M _H	w	Z ⁽¹⁾ max.
mm	4.2	0.51	3.2	1.73 1.30	0.53 0.38	1.25 0.85	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	0.76
inches	0.17	0.020	0.13	0.068 0.051	0.021 0.015	0.049 0.033	0.014 0.009	0.77 0.73	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.030

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT38-4						92-11-17 95-01-14

Addressable peripheral driver

NE590

Data sheet status

Data sheet status ^[1]	Product status ^[2]	Definitions
Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Changes will be communicated according to the Customer Product/Process Change Notification (CPCN) procedure SNW-SQ-650A.

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

Application information — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Disclaimers

Life support — These products are not designed for use in life support appliances, devices or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

Right to make changes — Philips Semiconductors reserves the right to make changes, without notice, in the products, including circuits, standard cells, and/or software, described or contained herein in order to improve design and/or performance. Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

Contact information

For additional information please visit
<http://www.semiconductors.philips.com>. Fax: +31 40 27 24825

© Koninklijke Philips Electronics N.V. 2001
 All rights reserved. Printed in U.S.A.

Date of release: 12-01

For sales offices addresses send e-mail to:
sales.addresses@www.semiconductors.philips.com

Document order number:

9397 750 09235

Let's make things better.