



**Integrated  
Circuit  
Systems, Inc.**

**ICS1720**

**Advance Information**

**QuickSaver™ Controller for Nickel-Metal Hydride Batteries**

T-65-15

**Features**

- Capable of full charge in 1 hour\*
- Pulsed topping and maintenance mode charge control
- Multiple charge rate selectability
- Sophisticated multiple charge termination methods
- Internal cell heating reduced
- Detects defective cells
- RISC processor based with internal ROM
- Internal safety timer

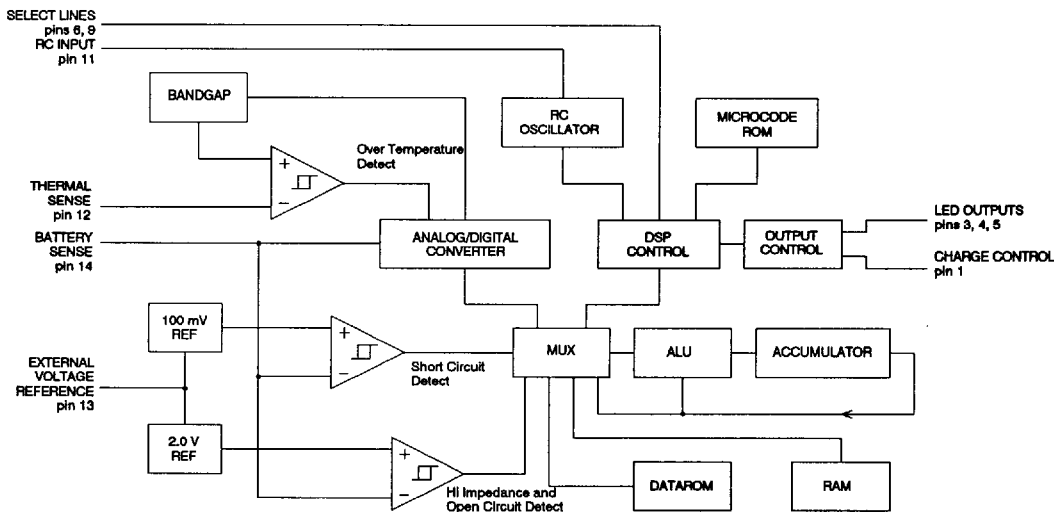
**Applications**

- AC or DC powered NiMH battery chargers
- Notebook and laptop PCs
- Portable communications equipment
- Portable video and audio equipment
- Portable point-of-sale equipment
- Portable power tools

**Description**

The ICS1720 is a monolithic CMOS part specifically designed for intelligently controlling the charge of nickel-metal hydride (NiMH) batteries. The ICS1720 operates by monitoring a constant current charge in combination with the inflection point termination method necessary to take advantage of the unique charging characteristics of nickel-metal hydride batteries.

**Block Diagram**



\* A one hour charge assumes a charging rate of 1C. NOT ALL BATTERIES ARE CAPABLE OF ACCEPTING A HIGH CHARGE RATE.

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# ICS1720

## Pin Descriptions

<u>PIN NUMBER (DIP)</u>	<u>PIN NUMBER (SO)</u>	<u>NAME</u>	<u>TYPE</u>	<u>DESCRIPTION</u>
1	1	CHARGE	OUT	Active high TTL compatible signal turns on external current source providing current to charge battery.
2	2	NC		No connect.
3	3	$\overline{\text{BF}}$	OUT	Battery fault. An active low turns on external LED, indicating that a fault condition exists while the battery is under charge.
4	5	$\overline{\text{CM}}$	OUT	Charge mode. An active low turns on external LED, indicating the state of the charge cycle. Continuous low indicates charge in progress, while an alternating low/high indicates maintenance mode.
5	7	$\overline{\text{OT}}$	OUT	Over temperature. An active low turns on external LED when the over temperature switch opens. Also active when no battery is present.
6	8	S0	IN	Select 0. Used with the S1 signal to program the device for the desired charge rate.
7	9	LVSS	PWR	Ground pin for output indicator (LED) drivers.
8	10	VSS	PWR	Logic ground.
9	11	S1	IN	Select 1. Used with the S0 signal to program the device for the desired charge rate.
10	12	$\overline{\text{RESET}}$	IN	Master reset signal initiates the charge sequence.
11	13	RC	IN	Resistor/Capacitor pin sets the frequency of the internal clock.
12	14	TS	IN	Thermal switch. Input is from a normally closed thermal switch encased in battery pack. The input has an internal pullup.
13	16	NC		No connect.
14	18	VIN	IN	Battery voltage normalized to one cell with external resistor divider.
15	19	TEST	IN	Active high on this pin activates test mode. Tie to VSS.
16	20	VDD	PWR	+5 volt supply.

Pins 4, 6, 15, and 17 are "No Connects" in the SO package.



# ICS1720

## Absolute Maximum Ratings\*

Supply Voltage .....6.5V  
 Logic Inputs .....-0.5V to 5.5V  
 Ambient Operating Temperature 0 to 70 °C  
 Storage Temperature .....-55 to 125 °C

## Electrical Characteristics

V<sub>DD</sub> = 5.0 V; T<sub>AMB</sub> = 25 °C

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage	V <sub>DD</sub>		4.5	5.0	5.5	V
Supply Current (static)	I <sub>DDs</sub>		2.9	3.9	4.2	mA
Supply Current (dynamic)	I <sub>DDd</sub>		15.4	16.4	17.4	mA
Internal Bandgap Reference	V <sub>BG</sub>		1.192	1.246	1.280	V
Hi Impedance/Open Circuit Detect	V <sub>HI</sub>		2.010	2.067	2.130	V
Short Circuit Detect	V <sub>LO</sub>		0.122	0.131	0.138	V
V <sub>IN</sub> Input Impedance				1.0		MΩ
Charge Pulse Width	t <sub>CPW</sub>	f <sub>CLK</sub> = 1.0 MHz		990		ms
Clock Frequency	f <sub>CLK</sub>	R = 16 kΩ; C = 100 pf		1.0		MHz

## Logic Signals

Note: LED pins are open drain outputs

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
High Level Input Voltage	V <sub>IH</sub>		3.5			V
Low Level Input Voltage	V <sub>IL</sub>		0.80	0.84	0.89	V
High Level Output Voltage	V <sub>OH</sub>	I <sub>OH</sub> = 2.0 mA; V <sub>DD</sub> = min	2.4			V
Low Level Output Voltage	V <sub>OL</sub>	I <sub>OL</sub> = 2.0 mA; V <sub>DD</sub> = min			0.4	V
Low Level Sink Current (LED outputs)	I <sub>SL</sub>		130.0	138.5	146.0	mA
Low Level Output Voltage (LED outputs)	V <sub>OL</sub>	I <sub>OH</sub> = 10 mA	0.102	0.109	0.115	V

\* Absolute maximum ratings are those values beyond which the safety of this device cannot be guaranteed. These values are NOT recommended operating conditions.

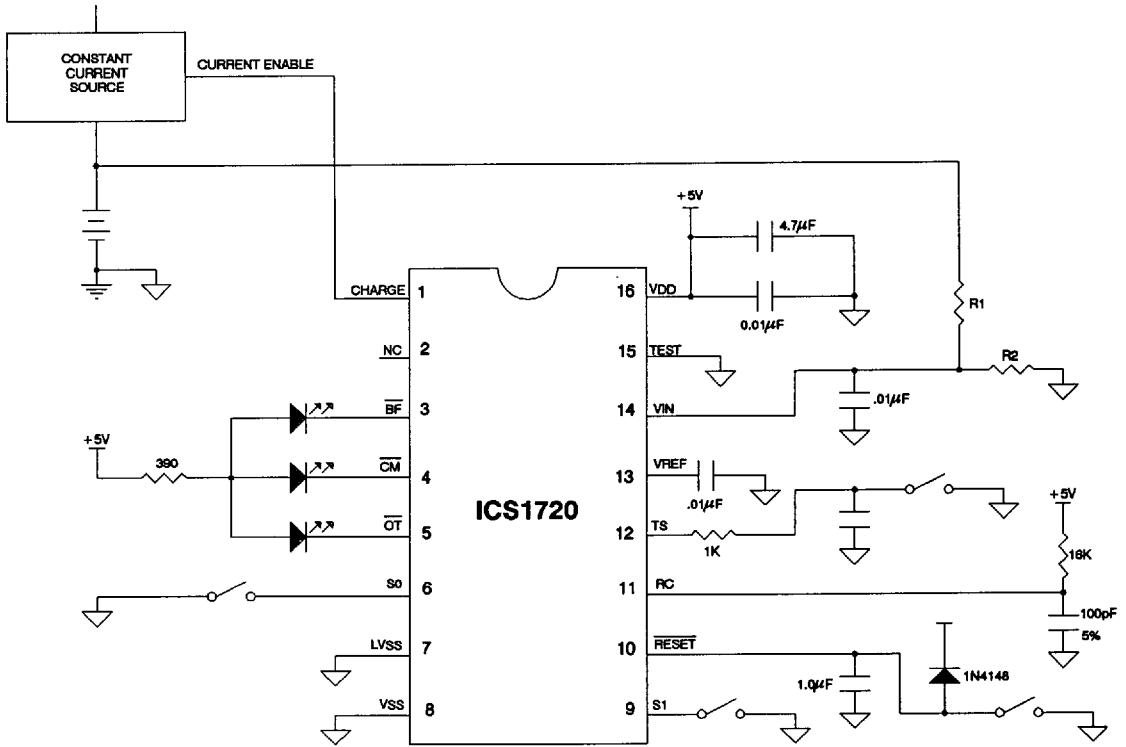


# ICS1720

## Select Line Inputs

S0	S1	CHARGE RATE	TIMER
L	L	1C	65 min
L	H	C/2	130 min
H	L	C/4	260 min
H	H	C/8	520 min

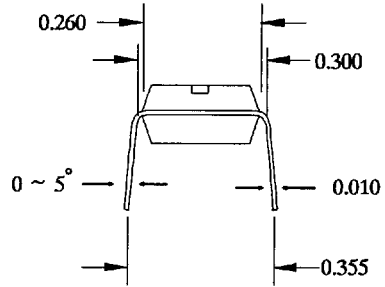
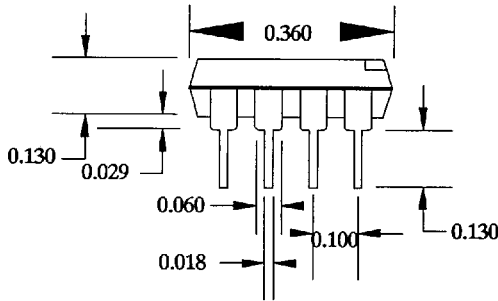
## Functional Diagram



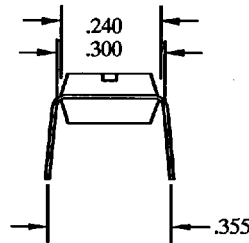
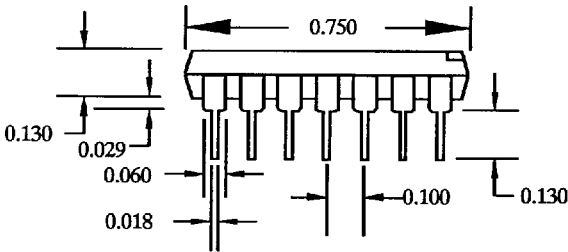


T-90-20

DIP Packages



8 Pin DIP Package



14 Pin DIP Package

Ordering Information:

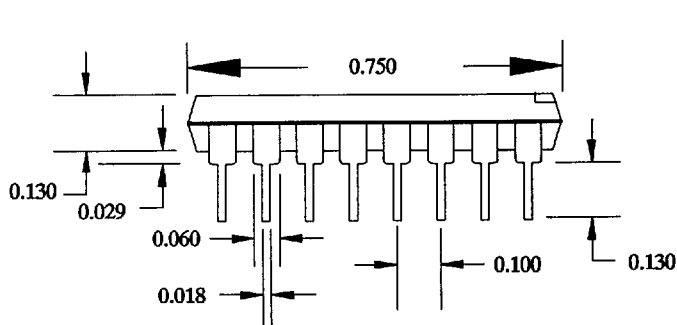
All ICS devices in DIP packages carry an "N" designation. See individual data sheets for more specific information.

Example: ICSXXXXN

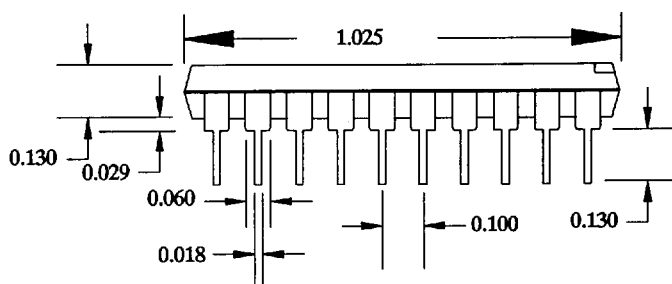
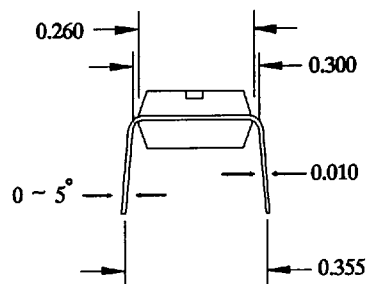




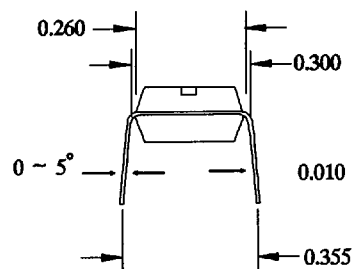
## DIP Packages



**16 Pin DIP Package**



**20 Pin DIP Package**



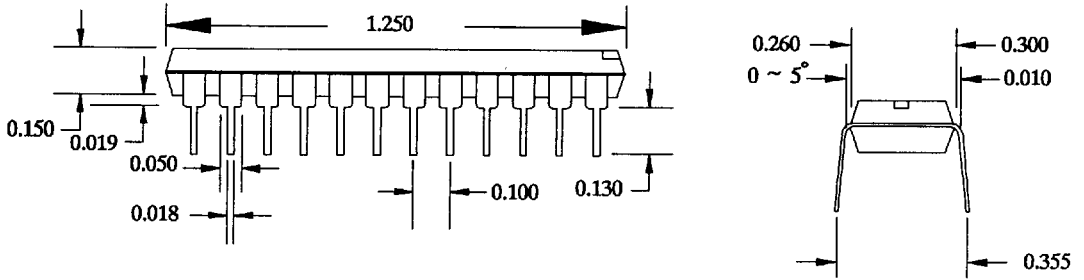
### Ordering Information:

All ICS devices in DIP packages carry an "N" designation. See individual data sheets for more specific information.

Example: ICSXXXXN



## DIP Packages



**24 Pin DIP Package**

**Ordering Information:**

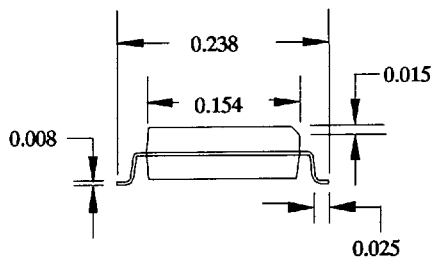
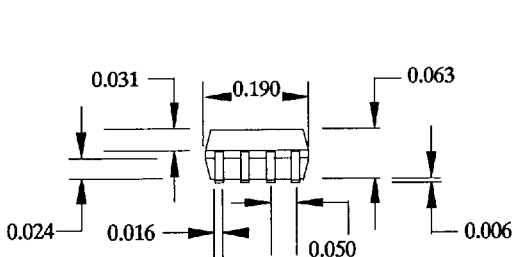
All ICS devices in DIP packages carry an "N" designation. See individual data sheets for more specific information.

Example: ICSXXXXN

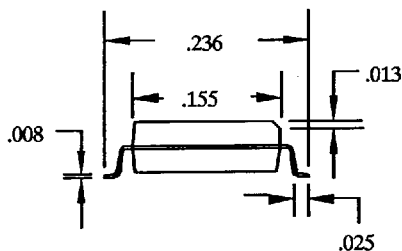
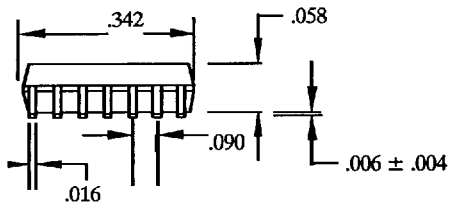




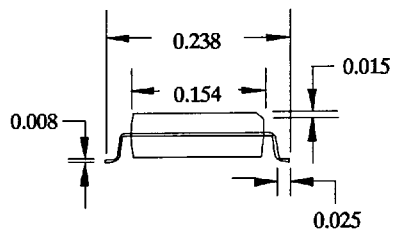
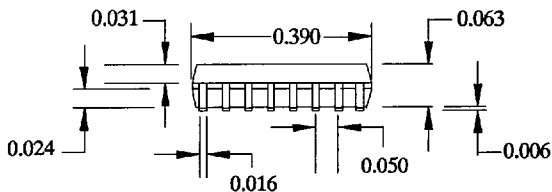
# SO Packages



**8 Pin SO Package**



**14 Pin SO Package**



**16 Pin SO Package**

**Ordering Information:**

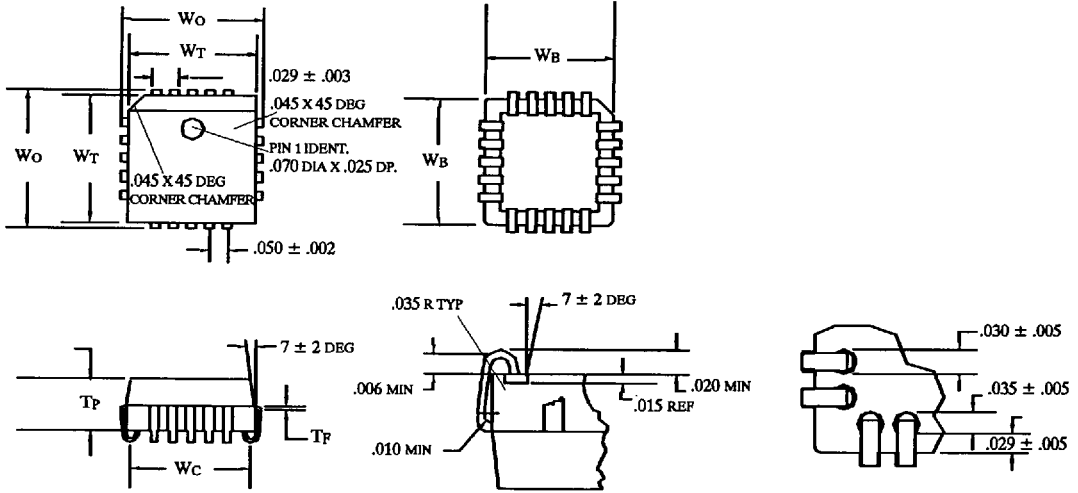
All ICS devices in SO packages carry an "M" designation. See individual data sheets for more specific information.

Example: ICSXXXXM





PLCC Packages



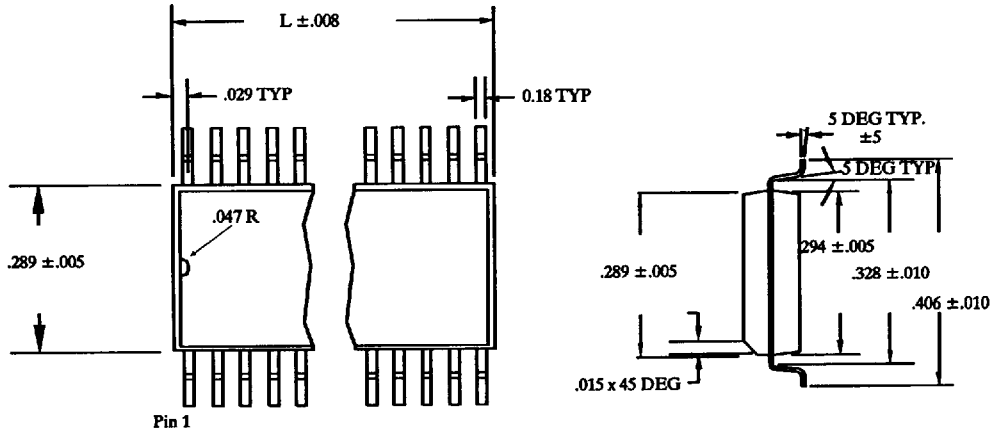
LEAD COUNT	FRAME THICKNESS $T_F$ +/- .0003	PKG. THICKNESS $T_P$ +/- .004	PKG. WIDTH TOP $W_T$ +/- .004	PKG. WIDTH BOTTOM $W_B$ +/- .066	OVERALL PKG. WIDTH $W_o$ +/- .005	CONTACT WIDTH $W_o$ + .010/- .030
20L	0.010	0.152	0.350	0.323	0.390	0.320
28L	0.010	0.152	0.450	0.423	0.490	0.420
44L	0.010	0.152	0.650	0.623	0.690	0.620
52L	0.010	0.152	0.750	0.723	0.790	0.720
68L	0.008	0.150	0.950	0.923	0.990	0.920
84L	0.008	0.150	1.160	1.123	1.190	1.120

Ordering Information:

All ICS devices in PLCC packages carry a "V" designation. See individual data sheets for more specific information.

Example: ICSXXXXXV

# SOIC Packages



## SOIC Packages (wide body)

LEAD COUNT	14L	16L	18L	20L	24L	28L	32L
DIMENSION L	.354	.404	.454	.504	.604	.704	.704

### Ordering Information:

All ICS devices in SOIC packages carry an "M" designation. See individual data sheets for more specific information.

Example: ICSXXXXM