

# Rad-Hard 16 Channel CMOS Analog Multiplexer with High-Z Analog Input Protection

## HS-1840ARH, HS-1840AEH, HS-1840BRH

The HS-1840ARH, HS-1840AEH, HS-1840BRH are radiation hardened, monolithic 16 channel multiplexers constructed with the Intersil Rad-Hard Silicon Gate, bonded wafer, Dielectric Isolation process. They are designed to provide a high input impedance to the analog source if device power fails (open), or the analog signal voltage inadvertently exceeds the supply by up to  $\pm 35V$ , regardless of whether the device is powered on or off. Excellent for use in redundant applications, since the secondary device can be operated in a standby unpowered mode affording no additional power drain. More significantly, a very high impedance exists between the active and inactive devices preventing any interaction. One of sixteen channel selections is controlled by a 4-bit binary address plus an Enable-Inhibit input which conveniently controls the ON/OFF operation of several multiplexers in a system. All inputs have electrostatic discharge protection. The HS-1840ARH, HS-1840AEH, HS-1840BRH are processed and screened in full compliance with MIL-PRF-38535 and QML standards. The devices are available in a 28 Ld SBDIP and a 28 Ld Ceramic Flatpack.

**Specifications for Rad Hard QML devices are controlled by the Defense Logistics Agency Land and Maritime (DLA). The SMD numbers listed here must be used when ordering.**

Detailed Electrical Specifications for these devices are contained in SMD 5962-95630. A "hot-link" is provided on our homepage for downloading:

<http://www.landandmaritime.dla.mil/Downloads/MilSpec/Smd/95630.pdf>

## Features

- Electrically Screened to SMD # 5962-95630
- QML Qualified per MIL-PRF-38535 Requirements
- Pin-to-Pin for Intersil's HS-1840RH and HS-1840/883S
- Improved Radiation Performance
  - Gamma Dose ( $\gamma$ )  $3 \times 10^5$  RAD(Si)
- Improved  $r_{DS(ON)}$  Linearity
- Improved Access Time 1.5 $\mu$ s (Max) Over Temp and Post Rad
- High Analog Input Impedance 500M $\Omega$  During Power Loss (Open)
- $\pm 35V$  Input Overvoltage Protection (Power On or Off)
- Dielectrically Isolated Device Islands
- Excellent in Hi-Rel Redundant Systems
- Break-Before-Make Switching
- No Latch-Up

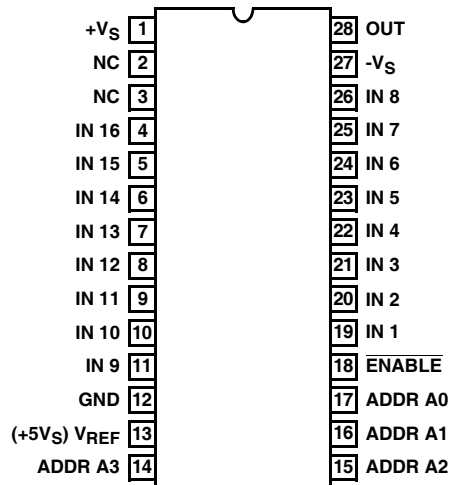
# HS-1840ARH, HS-1840AEH, HS-1840BRH

## Ordering Information

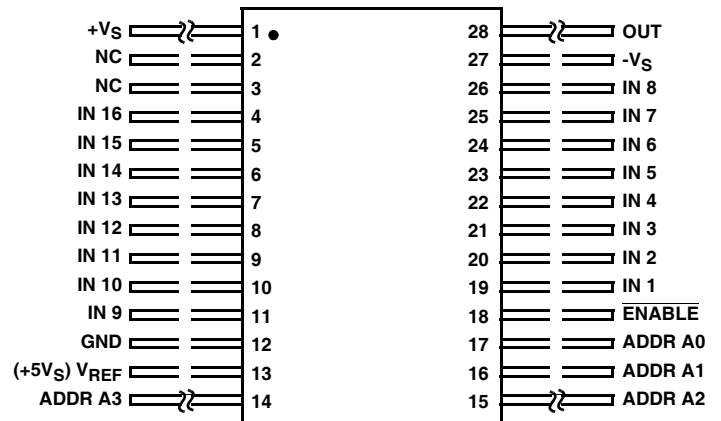
ORDERING NUMBER	INTERNAL MKT. NUMBER	TEMP. RANGE (°C)	PART MARKING NO.	PACKAGE
5962F9563002QXC	HS1-1840ARH-8	-55 to +125	Q 5962F95 63002QXC	28 Ld SBDIP
5962F9563002QYC	HS9-1840ARH-8	-55 to +125	Q 5962F95 63002QYC	28 Ld Flatpack
5962F9563002VXC	HS1-1840ARH-Q	-55 to +125	Q 5962F95 63002VXC	28 Ld SBDIP
5962F9563002VYC	HS9-1840ARH-Q	-55 to +125	Q 5962F95 63002VYC	28 Ld Flatpack
HS1-1840ARH/PROTO	HS1-1840ARH/PROTO	-55 to +125	HS1- 1840ARH /PROTO	28 Ld SBDIP
HS9-1840ARH/PROTO	HS9-1840ARH/PROTO	-55 to +125	HS9- 1840ARH /PROTO	28 Ld Flatpack
HS1-1840ARH-T	HS1-1840ARH-T	-55 to +125	Q 5962R95 63002TXC	28 Ld SBDIP
5962F9563002V9A	HS0-1840ARH-Q	-55 to +125		
5962F9563004V9A	HS0-1840AEH-Q	-55 to +125		
5962F9563004VXC	HS1-1840AEH-Q	-55 to +125	Q 5962F95 63004VXC	28 Ld SBDIP
5962F9563004VYC	HS9-1840AEH-Q	-55 to +125	Q 5962F95 63004VYC	28 Ld Flatpack
5962F9563003QXC	HS1-1840BRH-8	-55 to +125	Q 5962F95 63003QXC	28 Ld SBDIP
5962F9563003QYC	HS9-1840BRH-8	-55 to +125	Q 5962F95 63003QYC	28 Ld Flatpack
5962F9563003VXC	HS1-1840BRH-Q	-55 to +125	Q 5962F95 63003VXC	28 Ld SBDIP
5962F9563003VYC	HS9-1840BRH-Q	-55 to +125	Q 5962F95 63003VYC	28 Ld Flatpack
HS1-1840BRH/PROTO	HS1-1840BRH/PROTO	-55 to +125	HS1- 1840BRH /PROTO	28 Ld SBDIP
HS9-1840BRH/PROTO	HS9-1840BRH/PROTO	-55 to +125	HS9- 1840BRH /PROTO	28 Ld Flatpack
5962F9563003V9A	HS0-1840BRH-Q	-55 to +125		

## Pin Configurations

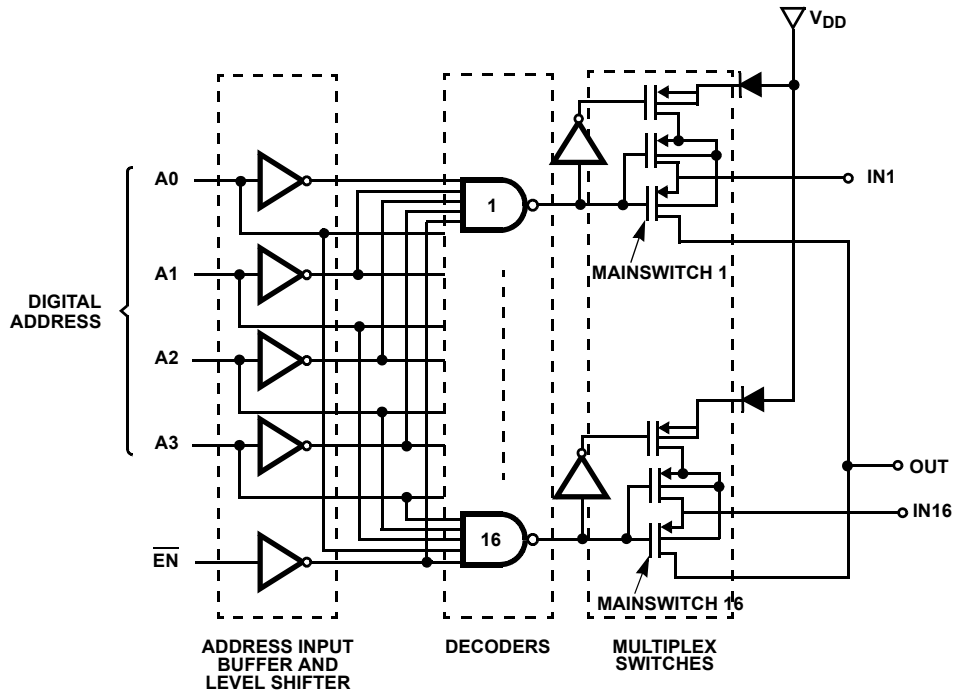
HS1-1840ARH, HS1-1840AEH, HS1-1840BRH  
(28 LD SBDIP) CDIP2-T28  
TOP VIEW



HS9-1840ARH, HS9-1840AEH, HS9-1840BRH  
(28 LD FLATPACK) CDFP3-F28  
TOP VIEW



## Functional Diagram

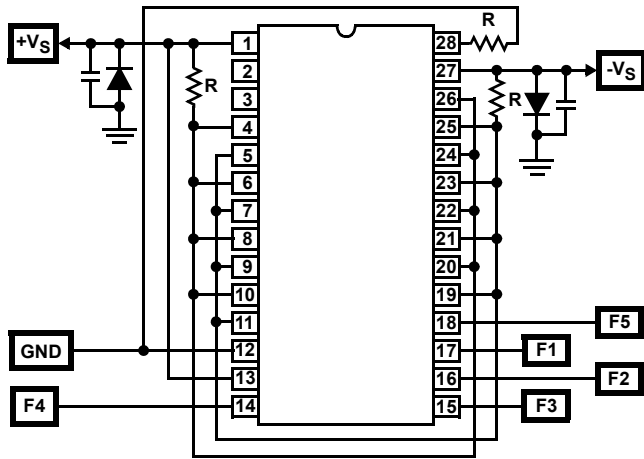


NOTE: MAINSWITCH INXX: SWITCH ON, BODY TIED TO SOURCE  
SWITCH OFF, BODY TIED TO VCC-0.7V

**TABLE 1. TRUTH TABLE**

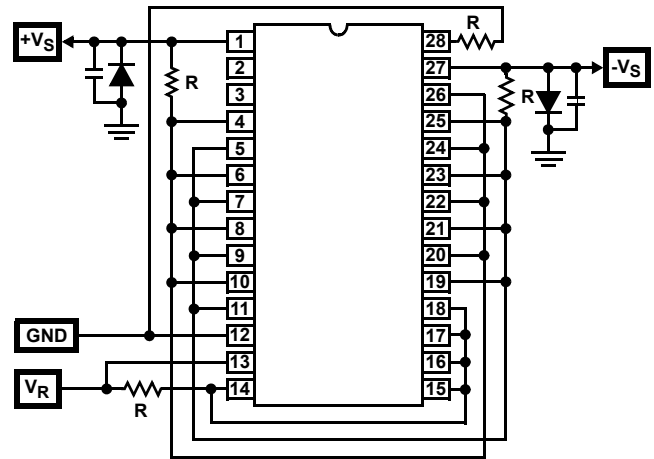
A3	A2	A1	A0	EN	"ON" CHANNEL
X	X	X	X	H	None
L	L	L	L	L	1
L	L	L	H	L	2
L	L	H	L	L	3
L	L	H	H	L	4
L	H	L	L	L	5
L	H	L	H	L	6
L	H	H	L	L	7
L	H	H	H	L	8
H	L	L	L	L	9
H	L	L	H	L	10
H	L	H	L	L	11
H	L	H	H	L	12
H	H	L	L	L	13
H	H	L	H	L	14
H	H	H	L	L	15
H	H	H	H	L	16

## Burn-In/Life Test Circuits



NOTE:  
 $V_{S+} = +15.5V \pm 0.5V$ ,  $V_{S-} = -15.5V \pm 0.5V$ .  
 $R = 1k\Omega \pm 5\%$ .  
 $C_1 = C_2 = 0.01\mu F \pm 10\%$ , 1 EACH PER SOCKET, MINIMUM.  
 $D_1 = D_2 = 1N4002$ , 1 EACH PER BOARD, MINIMUM.  
 INPUT SIGNALS:  
 SQUARE WAVE, 50% DUTY CYCLE, 0V TO 15V PEAK  $\pm 10\%$ .  
 $F_1 = 100kHz$ ;  $F_2 = F_1/2$ ;  $F_3 = F_1/4$ ;  $F_4 = F_1/8$ ;  $F_5 = F_1/16$ .

FIGURE 1. DYNAMIC BURN-IN AND LIFE TEST CIRCUIT



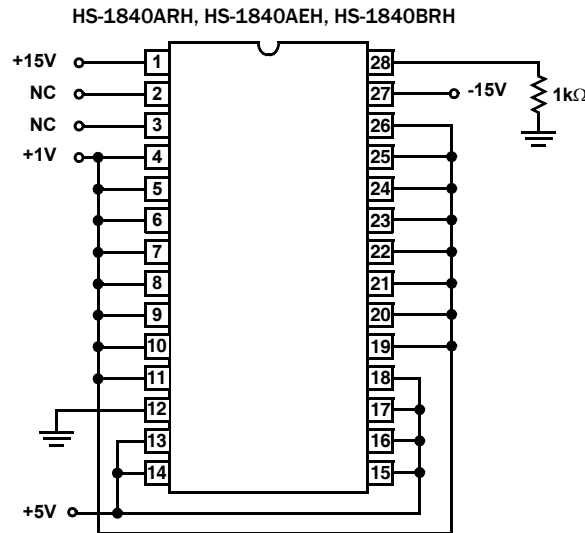
NOTE:  
 $R = 1k\Omega \pm 5\%$ , 1/4W.  
 $C_1 = C_2 = 0.01\mu F$  MINIMUM, 1 EACH PER SOCKET, MINIMUM.  
 $V_{S+} = 15.5V \pm 0.5V$ ,  $V_{S-} = -15.5V \pm 0.5V$ ,  $V_R = 15.5 \pm 0.5V$

FIGURE 2. STATIC BURN-IN TEST CIRCUIT

NOTES:

1. The above test circuits are utilized for all package types.
2. The Dynamic Test Circuit is utilized for all life testing.

## Irradiation Circuit



NOTE:

3. All irradiation testing is performed in the 28 lead CERDIP package.

# HS-1840ARH, HS-1840AEH, HS-1840BRH

## Die Characteristics

### DIE DIMENSIONS:

(2820 $\mu\text{m}$  x 4080 $\mu\text{m}$  x 483 $\mu\text{m}$   $\pm$ 25.4 $\mu\text{m}$ )  
111 mils x 161 mils x 19 mils  $\pm$ 1 mil

### INTERFACE MATERIALS:

#### Glassivation:

Type: PSG (Phosphorus Silicon Glass)  
Thickness: 8.0k $\text{\AA}$   $\pm$ 1k $\text{\AA}$

#### Top Metallization:

Type: AlSiCu  
Thickness: 16.0k $\text{\AA}$   $\pm$ 2k $\text{\AA}$

#### Backside Finish:

Silicon

### ASSEMBLY RELATED INFORMATION:

#### Substrate Potential:

Unbiased (DI)

#### ADDITIONAL INFORMATION:

#### Worst Case Current Density:

Modified SEM

#### Transistor Count:

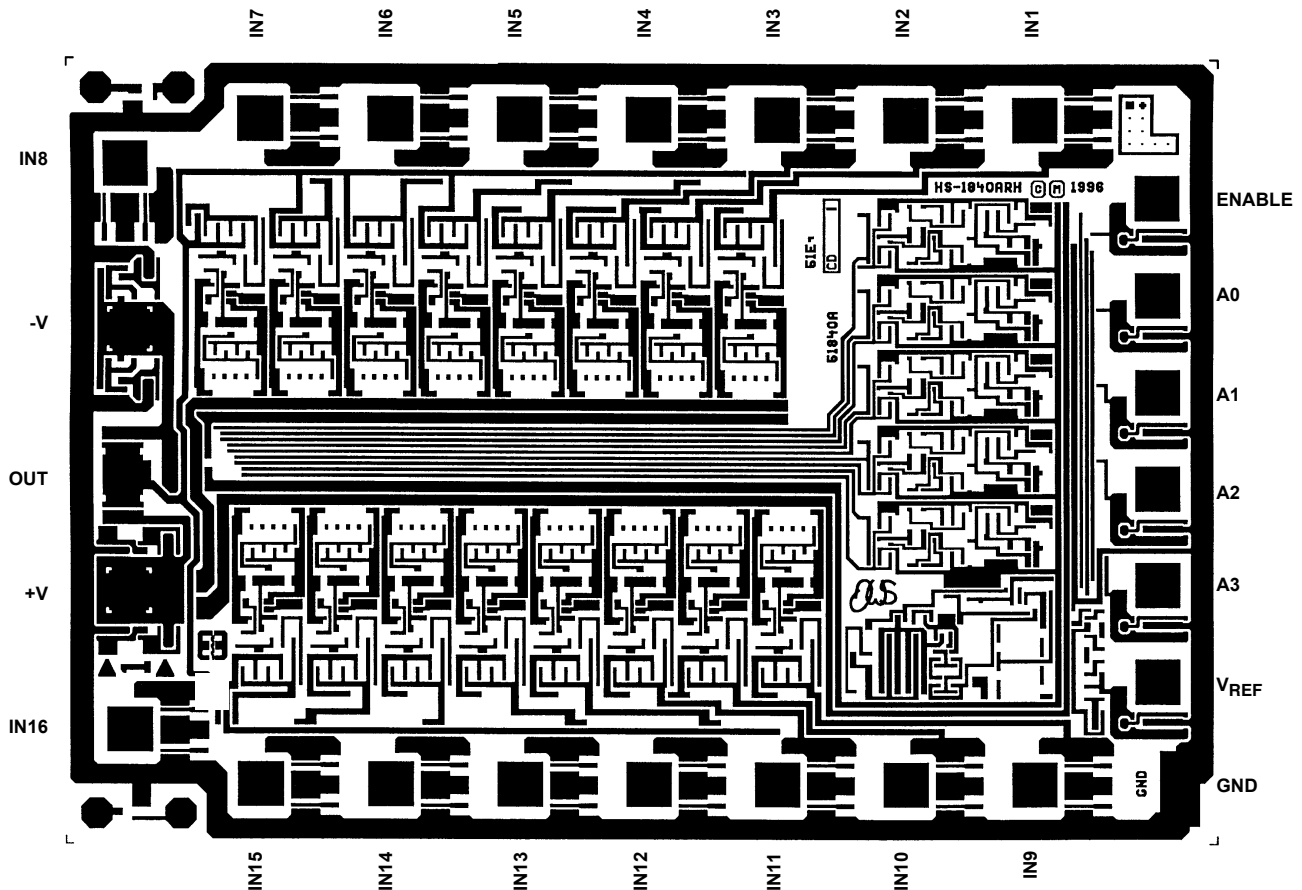
407

#### Process:

Radiation Hardened Silicon Gate,  
Bonded Wafer, Dielectric Isolation

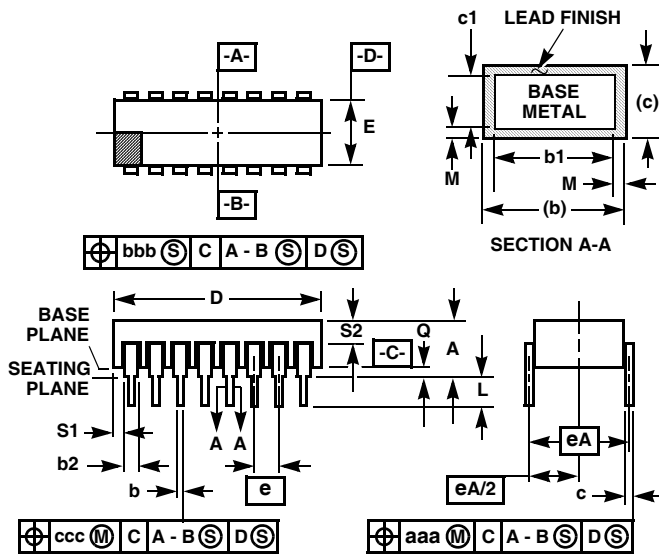
## Metallization Mask Layout

HS-1840ARH, HS-1840BRH



# HS-1840ARH, HS-1840AEH, HS-1840BRH

## Ceramic Dual-In-Line Metal Seal Packages (SBDIP)



### D28.6 MIL-STD-1835 CDIP2-T28 (D-10, CONFIGURATION C) 28 LEAD CERAMIC DUAL-IN-LINE METAL SEAL PACKAGE

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	-	0.232	-	5.92	-
b	0.014	0.026	0.36	0.66	2
b1	0.014	0.023	0.36	0.58	3
b2	0.045	0.065	1.14	1.65	-
b3	0.023	0.045	0.58	1.14	4
c	0.008	0.018	0.20	0.46	2
c1	0.008	0.015	0.20	0.38	3
D	-	1.490	-	37.85	-
E	0.500	0.610	12.70	15.49	-
e	0.100 BSC		2.54 BSC		-
eA	0.600 BSC		15.24 BSC		-
eA/2	0.300 BSC		7.62 BSC		-
L	0.125	0.200	3.18	5.08	-
Q	0.015	0.060	0.38	1.52	5
S1	0.005	-	0.13	-	6
S2	0.005	-	0.13	-	7
$\alpha$	90°	105°	90°	105°	-
aaa	-	0.015	-	0.38	-
bbb	-	0.030	-	0.76	-
ccc	-	0.010	-	0.25	-
M	-	0.0015	-	0.038	2
N	28		28		8

#### NOTES:

- Index area: A notch or a pin one identification mark shall be located adjacent to pin one and shall be located within the shaded area shown. The manufacturer's identification shall not be used as a pin one identification mark.
- The maximum limits of lead dimensions b and c or M shall be measured at the centroid of the finished lead surfaces, when solder dip or tin plate lead finish is applied.
- Dimensions b1 and c1 apply to lead base metal only. Dimension M applies to lead plating and finish thickness.
- Corner leads (1, N, N/2, and N/2+1) may be configured with a partial lead paddle. For this configuration dimension b3 replaces dimension b2.
- Dimension Q shall be measured from the seating plane to the base plane.
- Measure dimension S1 at all four corners.
- Measure dimension S2 from the top of the ceramic body to the nearest metallization or lead.
- N is the maximum number of terminal positions.
- Braze fillets shall be concave.
- Dimensioning and tolerancing per ANSI Y14.5M - 1982.
- Controlling dimension: INCH.

Rev. 0 5/18/94

For additional products, see [www.intersil.com/product\\_tree](http://www.intersil.com/product_tree)

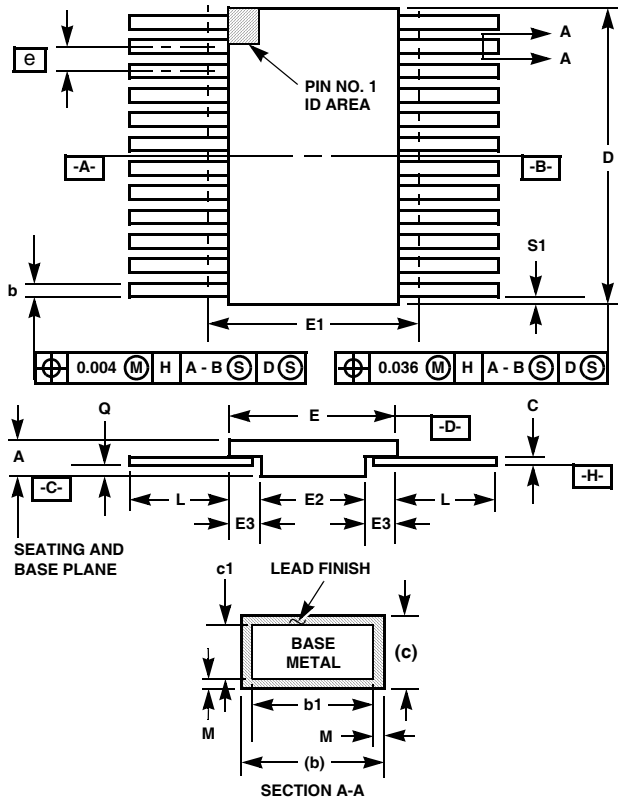
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# HS-1840ARH, HS-1840AEH, HS-1840BRH

## Ceramic Metal Seal Flatpack Packages (Flatpack)



**K28.A MIL-STD-1835 CDFP3-F28 (F-11A, CONFIGURATION B)  
28 LEAD CERAMIC METAL SEAL FLATPACK PACKAGE**

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.045	0.115	1.14	2.92	-
b	0.015	0.022	0.38	0.56	-
b1	0.015	0.019	0.38	0.48	-
c	0.004	0.009	0.10	0.23	-
c1	0.004	0.006	0.10	0.15	-
D	-	0.740	-	18.80	3
E	0.460	0.520	11.68	13.21	-
E1	-	0.550	-	13.97	3
E2	0.180	-	4.57	-	-
E3	0.030	-	0.76	-	7
e	0.050 BSC		1.27 BSC		-
k	0.008	0.015	0.20	0.38	2
L	0.250	0.370	6.35	9.40	-
Q	0.026	0.045	0.66	1.14	8
S1	0.00	-	0.00	-	6
M	-	0.0015	-	0.04	-
N	28		28		-

Rev. 0 5/18/94

**NOTES:**

1. Index area: A notch or a pin one identification mark shall be located adjacent to pin one and shall be located within the shaded area shown. The manufacturer's identification shall not be used as a pin one identification mark. Alternately, a tab (dimension k) may be used to identify pin one.
2. If a pin one identification mark is used in addition to a tab, the limits of dimension k do not apply.
3. This dimension allows for off-center lid, meniscus, and glass overrun.
4. Dimensions b1 and c1 apply to lead base metal only. Dimension M applies to lead plating and finish thickness. The maximum limits of lead dimensions b and c or M shall be measured at the centroid of the finished lead surfaces, when solder dip or tin plate lead finish is applied.
5. N is the maximum number of terminal positions.
6. Measure dimension S1 at all four corners.
7. For bottom-brazed lead packages, no organic or polymeric materials shall be molded to the bottom of the package to cover the leads.
8. Dimension Q shall be measured at the point of exit (beyond the meniscus) of the lead from the body. Dimension Q minimum shall be reduced by 0.0015 inch (0.038mm) maximum when solder dip lead finish is applied.
9. Dimensioning and tolerancing per ANSI Y14.5M - 1982.
10. Controlling dimension: INCH.