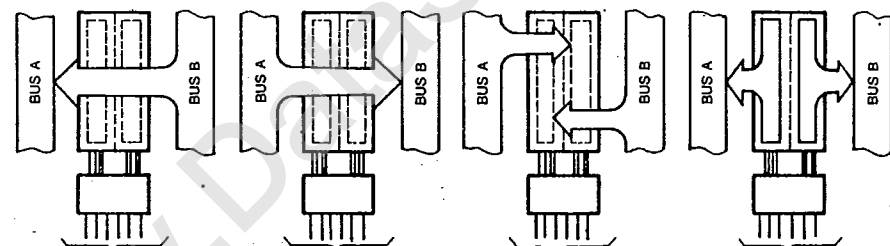
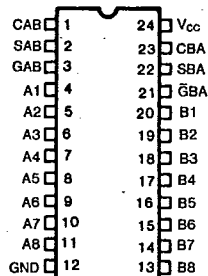


**KS54AHCT 651/652**  
**KS74AHCT**
**Octal 3-State Bus Transceivers**  
**with Registers**

T-52-31

**Preliminary Specifications**
**FEATURES**

- Independent Registers and Enables for A and B Buses
- Multiplexed Real-Time and Stored-Data
- Choice of Time and Inverting Data Paths
- Function, pin-out, speed and drive compatibility with 54/74ALS logic family
- Low power consumption characteristic of CMOS
- 3-State outputs with high drive current ( $I_{OL} = 24 \text{ mA}$  @  $V_{OL} = 0.5\text{V}$ ) for direct bus interface
- Inputs and outputs interface directly with TTL, NMOS and CMOS devices
- Wide operating voltage range: 4.5V to 5.5V
- Characterized for operation over industrial and military temperature ranges:  
KS74AHCT:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$   
KS54AHCT:  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Package options include plastic "small outline" packages, standard plastic and ceramic 300-mil DIPs

**PIN CONFIGURATION**


| (3) | (21) | (1) | (23) | (2) | (22) |
|-----|------|-----|------|-----|------|
| GAB | GBA  | CAB | CBA  | SAB | SBA  |
| L   | L    | X   | X    | X   | L    |

Real-Time transfer  
bus B to bus A

| (3) | (21) | (1) | (23) | (2) | (22) |
|-----|------|-----|------|-----|------|
| GAB | GBA  | CAB | CBA  | SAB | SBA  |
| L   | H    | X   | X    | L   | X    |

Real-Time transfer  
bus A to bus B

| (3) | (21) | (1) | (23) | (2) | (22) |
|-----|------|-----|------|-----|------|
| GAB | GBA  | CAB | CBA  | SAB | SBA  |
| X   | X    | X   | X    | X   | X    |
| X   | X    | X   | X    | X   | X    |
| H   | X    | X   | X    | X   | X    |

Storage from  
A AND/OR B

| (3) | (21) | (1) | (23) | (2) | (22) |
|-----|------|-----|------|-----|------|
| AB  | GBA  | CAB | CBA  | SAB | SBA  |
| L   | L    | X   | X    | X   | H    |
| L   | H    | X   | X    | H   | X    |

Transfer stored data  
TO A AND/OR B



SAMSUNG SEMICONDUCTOR

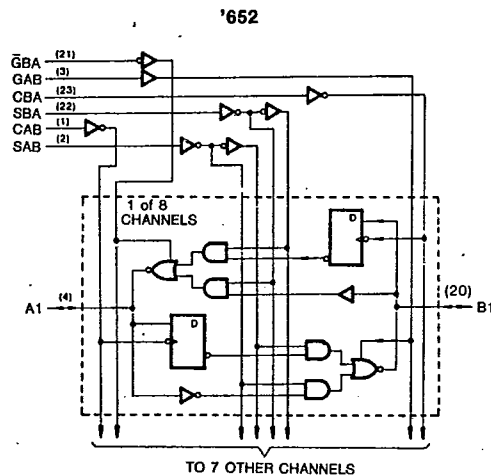
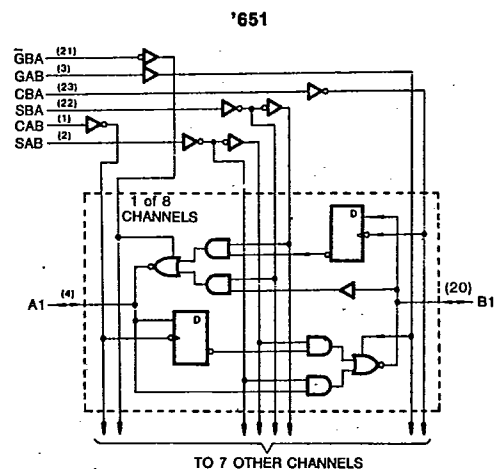
**KS54AHCT 651/652**  
**KS74AHCT**
**Octal 3-State Bus Transceivers**  
**with Registers**
**FUNCTION TABLE**

| INPUTS          |        |        |                   | DATA I/O*     |               | OPERATION OR FUNCTION                                                |                                                      |
|-----------------|--------|--------|-------------------|---------------|---------------|----------------------------------------------------------------------|------------------------------------------------------|
| GAB $\bar{G}BA$ | CAB    | CBA    | SAB SBA           | A1 THRU A8    | B1 THRU B8    | '651                                                                 | '652                                                 |
| L H             | H or L | H or L | X <sup>ro</sup> X | Input         | Input         | Isolation<br>Store A and B Data                                      | Isolation<br>Store A and B Data                      |
| L H             | ↑      | ↑      | X X               | Input         | Input         | Store A, Hold B                                                      | Store A Hold B                                       |
| X H             | ↑      | H or L | X X               | Input         | Not specified | Store A in both registers                                            | Store A in both registers                            |
| H H             | ↑      | ↑      | X** X             | Input         | Output*       |                                                                      |                                                      |
| L X             | H or L | ↑      | X X               | Not specified | Input         | Hold A, Store B                                                      | Hold A, Store B                                      |
| L L             | ↑      | ↑      | X X*              | Output*       | Input         | Store B in both registers                                            | Store B in both registers                            |
| L L             | X      | X      | X L               | Output        | Input         | Real-Time $\bar{B}$ Data to A Bus<br>Stored $\bar{B}$ Data to A Bus  | Real-Time B Data to a Bus<br>Stored B Data to A Bus  |
| H H             | X      | X      | L X               | Input         | Output        | Real-Time $\bar{A}$ Data to B Bus<br>Stored $\bar{A}$ Data to Bus    | Real-Time A Data to B Bus<br>Stored A Data to B Bus  |
| H H             | H or L | X      | H X               |               |               |                                                                      |                                                      |
| H L             | H or L | H or L | H H               | Output        | Output        | Stored $\bar{A}$ Data to B Bus and<br>Stored $\bar{B}$ Data to A Bus | Stored A Data to B Bus and<br>Stored B Data to A Bus |

\* The data output functions may be enabled or disabled by various signals at the GAB and  $\bar{G}BA$  inputs. Data input functions are always enabled, i.e., data at the bus pins will be stored on every low-to-high transition on the clock inputs.

\*\* Select control=L: clocks can occur simultaneously

Select control=H: clocks must be staggered in order to load both registers

**LOGIC DIAGRAMS**


**KS54AHCT 651/652**  
**KS74AHCT****Octal 3-State Bus Transceivers**  
**with Registers****Absolute Maximum Ratings\***

Supply Voltage Range  $V_{CC}$  ..... -0.5V to +7V  
 DC Input Diode Current,  $I_{IK}$   
 ( $V_I < -0.5V$  or  $V_I > V_{CC} + 0.5V$ ) .....  $\pm 20$  mA  
 DC Output Diode Current,  $I_{OK}$   
 ( $V_O < -0.5V$  or  $V_O > V_{CC} + 0.5V$ ) .....  $\pm 20$  mA  
 Continuous Output Current Per Pin,  $I_O$   
 ( $-0.5V < V_O < V_{CC} + 0.5V$ ) .....  $\pm 70$  mA  
 Continuous Current Through  
 $V_{CC}$  or GND pins .....  $\pm 250$  mA  
 Storage Temperature Range,  $T_{stg}$  ... -85°C to +150°C  
 Power Dissipation Per Package,  $P_d$ † ..... 500 mW

\* Absolute Maximum Ratings are those values beyond which permanent damage to the device may occur. These are stress ratings only and functional operation of the device at or beyond them is not implied. Long exposure to these conditions may affect device reliability.

† Power Dissipation temperature derating:

Plastic Package (N): -12mW/°C from 65°C to 85°C  
 Ceramic Package (J): -12mW/°C from 100°C to 125°C

**Recommended Operating Conditions**

Supply Voltage,  $V_{CC}$  ..... 4.5V to 5.5V  
 DC Input & Output Voltages\*,  $V_{IN}$ ,  $V_{OUT}$  ... 0V to  $V_{CC}$   
 Operating Temperature\*

Range KS74AHCT: -40°C to +85°C  
 KS54AHCT: -55°C to +125°C

Input Rise & Fall Times,  $t_r$ ,  $t_f$  ..... Max 500 ns

\* Unused inputs must always be tied to an appropriate logic voltage level (either  $V_{CC}$  or GND)

**DC ELECTRICAL CHARACTERISTICS** ( $V_{CC}=5V \pm 10\%$  Unless Otherwise Specified)

| Characteristic                       | Symbol           | Test Conditions                                                                                                             | T <sub>a</sub> = 25°C  |                               | KS74AHCT                      | KS54AHCT                     |  | Unit |
|--------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------------------|-------------------------------|------------------------------|--|------|
|                                      |                  |                                                                                                                             | Typ                    | Guaranteed Limits             |                               |                              |  |      |
| Minimum High-Level Input Voltage     | V <sub>IH</sub>  |                                                                                                                             |                        | 2.0                           | 2.0                           | 2.0                          |  | V    |
| Maximum Low-Level Input Voltage      | V <sub>IL</sub>  |                                                                                                                             |                        | 0.8                           | 0.8                           | 0.8                          |  | V    |
| Minimum High-Level Output Voltage    | V <sub>OH</sub>  | V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>O</sub> =-20μA<br>I <sub>O</sub> =-6mA                        | V <sub>CC</sub><br>4.2 | V <sub>CC</sub> - 0.1<br>3.98 | V <sub>CC</sub> - 0.1<br>3.84 | V <sub>CC</sub> - 0.1<br>3.7 |  | V    |
| Maximum Low-Level Output Voltage     | V <sub>OL</sub>  | V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>O</sub> =20μA<br>I <sub>O</sub> =12mA<br>I <sub>O</sub> =24mA | 0                      | 0.1<br>0.26<br>0.39           | 0.1<br>0.33<br>0.5            | 0.1<br>0.4                   |  | V    |
| Maximum Input Current                | I <sub>IN</sub>  | V <sub>IN</sub> =V <sub>CC</sub> or GND                                                                                     |                        | ±0.1                          | ±1.0                          | ±1.0                         |  | μA   |
| Maximum 3-State Leakage Current      | I <sub>OZ</sub>  | Output Enable<br>=V <sub>IH</sub><br>V <sub>OUT</sub> =V <sub>CC</sub> or GND                                               |                        | ±0.5                          | ±5.0                          | ±10.0                        |  | μA   |
| Maximum Quiescent Supply Current     | I <sub>CC</sub>  | V <sub>IN</sub> =V <sub>CC</sub> or GND<br>I <sub>OUT</sub> =0μA                                                            |                        | 8.0                           | 80.0                          | 160.0                        |  | μA   |
| Additional Worst Case Supply Current | ΔI <sub>CC</sub> | per input pin<br>V <sub>I</sub> =2.4V<br>other Inputs:<br>at V <sub>CC</sub> or GND<br>I <sub>OUT</sub> =0μA                |                        | 2.7                           | 2.9                           | 3.0                          |  | mA   |



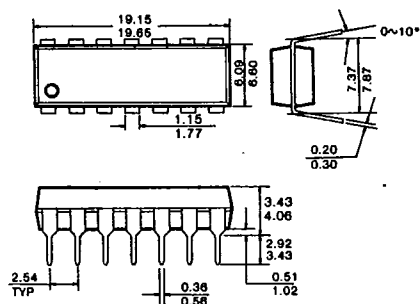
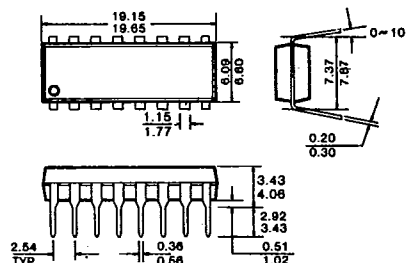
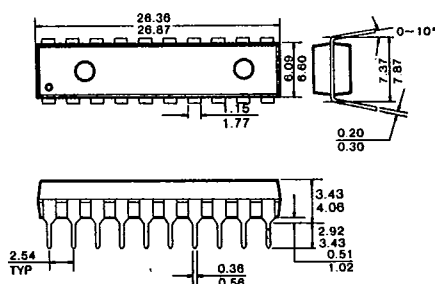
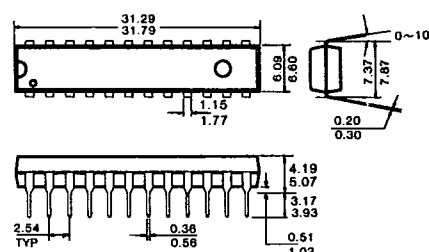
**KS54AHCT 651/652**  
**KS74AHCT****Octal 3-State Bus Transceivers  
with Registers****AC ELECTRICAL CHARACTERISTICS** (Input  $t_r, t_f \leq 2$  ns), AHCT651, AHCT652

| Characteristic                                                                   | Symbol    | Conditions†             | $T_a = 25^\circ\text{C}$<br>$V_{CC} = 5.0\text{V}$ | KS74AHCT<br>$T_a = -40^\circ\text{C to } +85^\circ\text{C}$<br>$V_{CC} = 5.0\text{V} \pm 10\%$ |     | KS54AHCT<br>$T_a = -55^\circ\text{C to } +125^\circ\text{C}$<br>$V_{CC} = 5.0\text{V} \pm 10\%$ |     | Unit |
|----------------------------------------------------------------------------------|-----------|-------------------------|----------------------------------------------------|------------------------------------------------------------------------------------------------|-----|-------------------------------------------------------------------------------------------------|-----|------|
|                                                                                  |           |                         | Typ                                                | Min                                                                                            | Max | Min                                                                                             | Max |      |
| Clock Frequency                                                                  | $f_{max}$ | $C_L = 50\text{pF}$     | 45                                                 | 30                                                                                             |     | 25                                                                                              |     | MHz  |
| Propagation Delay,<br>A or B Input to<br>B or A Output                           | $t_{PLH}$ | $C_L = 50\text{pF}$     | 11                                                 |                                                                                                | 18  |                                                                                                 | 22  | ns   |
|                                                                                  | $t_{PLH}$ | $C_L = 150\text{pF}$    | 14                                                 |                                                                                                | 23  |                                                                                                 | 28  |      |
|                                                                                  | $t_{PHL}$ | $C_L = 50\text{pF}$     | 11                                                 |                                                                                                | 18  |                                                                                                 | 22  | ns   |
|                                                                                  | $t_{PHL}$ | $C_L = 150\text{pF}$    | 14                                                 |                                                                                                | 23  |                                                                                                 | 28  |      |
| Propagation Delay,<br>CBA or CAB Input to<br>A or B Output                       | $t_{PLH}$ | $C_L = 50\text{pF}$     | 15                                                 |                                                                                                | 25  |                                                                                                 | 30  | ns   |
|                                                                                  | $t_{PLH}$ | $C_L = 150\text{pF}$    | 18                                                 |                                                                                                | 30  |                                                                                                 | 36  |      |
|                                                                                  | $t_{PHL}$ | $C_L = 50\text{pF}$     | 15                                                 |                                                                                                | 25  |                                                                                                 | 30  | ns   |
|                                                                                  | $t_{PHL}$ | $C_L = 150\text{pF}$    | 18                                                 |                                                                                                | 30  |                                                                                                 | 36  |      |
| Propagation Delay,<br>SBA or SAB Input to<br>A or B Output<br>(with A or B High) | $t_{PLH}$ | $C_L = 50\text{pF}$     | 16                                                 |                                                                                                | 27  |                                                                                                 | 32  | ns   |
|                                                                                  | $t_{PLH}$ | $C_L = 150\text{pF}$    | 19                                                 |                                                                                                | 32  |                                                                                                 | 38  |      |
|                                                                                  | $t_{PHL}$ | $C_L = 50\text{pF}$     | 16                                                 |                                                                                                | 27  |                                                                                                 | 32  | ns   |
|                                                                                  | $t_{PHL}$ | $C_L = 150\text{pF}$    | 19                                                 |                                                                                                | 32  |                                                                                                 | 38  |      |
| Propagation Delay,<br>SBA or SAB Input to<br>A or B Output<br>(with A or B Low)  | $t_{PLH}$ | $C_L = 50\text{pF}$     | 15                                                 |                                                                                                | 25  |                                                                                                 | 30  | ns   |
|                                                                                  | $t_{PLH}$ | $C_L = 150\text{pF}$    | 18                                                 |                                                                                                | 30  |                                                                                                 | 36  |      |
|                                                                                  | $t_{PHL}$ | $C_L = 50\text{pF}$     | 15                                                 |                                                                                                | 25  |                                                                                                 | 30  | ns   |
|                                                                                  | $t_{PHL}$ | $C_L = 150\text{pF}$    | 18                                                 |                                                                                                | 30  |                                                                                                 | 36  |      |
| Output Enable Time,<br>$\bar{G}BA$ to A or<br>GAB to B                           | $t_{PZL}$ | $C_L = 50\text{pF}$     | 19                                                 |                                                                                                | 32  |                                                                                                 | 38  | ns   |
|                                                                                  | $t_{PZL}$ | $C_L = 150\text{pF}$    | 22                                                 |                                                                                                | 37  |                                                                                                 | 44  |      |
|                                                                                  | $t_{PZH}$ | $R_L = 1\text{k}\Omega$ | 19                                                 |                                                                                                | 32  |                                                                                                 | 38  | ns   |
|                                                                                  | $t_{PZH}$ | $C_L = 150\text{pF}$    | 22                                                 |                                                                                                | 37  |                                                                                                 | 44  |      |
| Output Disable Time,<br>$\bar{G}BA$ to A or GAB to B                             | $t_{PHZ}$ | $R_L = 1\text{k}\Omega$ | 13                                                 |                                                                                                | 22  |                                                                                                 | 26  | ns   |
|                                                                                  | $t_{PLZ}$ | $C_L = 50\text{pF}$     | 13                                                 |                                                                                                | 22  |                                                                                                 | 26  |      |
| Pulse Width Clocks<br>High or Low                                                | $t_w$     |                         | 8                                                  | 12                                                                                             |     | 15                                                                                              |     | ns   |
| Setup Time, A before CAB†<br>or B before CBA†                                    | $t_{su}$  |                         | 8                                                  | 12                                                                                             |     | 15                                                                                              |     | ns   |
| Hold Time, A after CAB†<br>or B after CBA†                                       | $t_h$     |                         | -3                                                 | 0                                                                                              |     | 0                                                                                               |     | ns   |
| Maximum Input Capacitance                                                        | $C_{IN}$  |                         | 5                                                  |                                                                                                |     |                                                                                                 |     | pF   |
| maximum Output<br>Capacitance                                                    | $C_{OUT}$ | Output Disabled         | 10                                                 |                                                                                                |     |                                                                                                 |     | pF   |
| Power Dissipation<br>Capacitance*                                                | $C_{PD}$  |                         |                                                    |                                                                                                |     |                                                                                                 |     | pF   |

\*  $C_{PD}$  determines the no-load dynamic power dissipation:  $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ .

† For AC switching test circuits and timing waveforms see section 2.



**PACKAGE DIMENSIONS***T-90-20***1. PLASTIC PACKAGES****14-Pin Plastic DIP Units: mm****16-Pin Plastic DIP Units: mm****20-Pin Plastic DIP Units: mm****24-Pin Plastic DIP Units: mm**

7

**SAMSUNG SEMICONDUCTOR**

1675

A-04

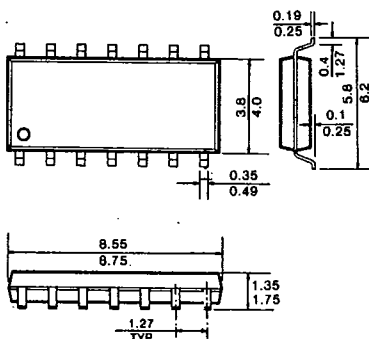
781

## PACKAGE DIMENSIONS

T-90-20

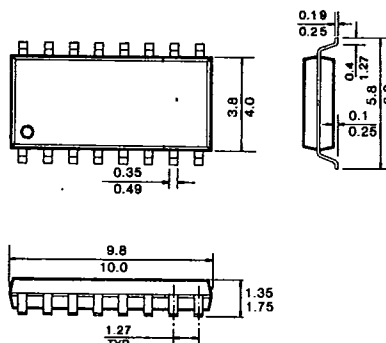
14-Pin SOP

Unit: mm



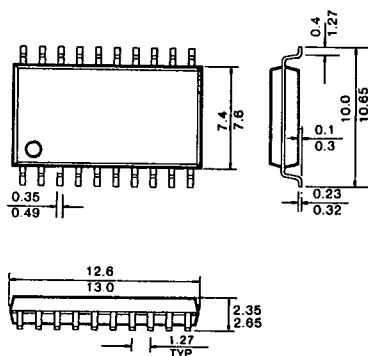
16-Pin SOP

Unit: mm



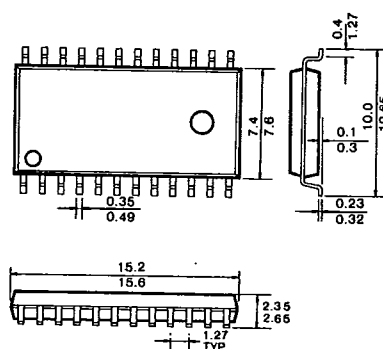
20-Pin SOP

Unit: mm



24-Pin SOP

Unit: mm



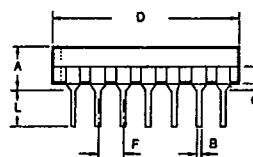
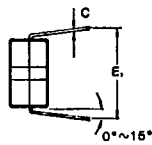
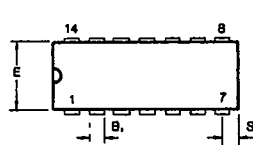
SAMSUNG SEMICONDUCTOR

1676

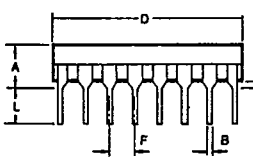
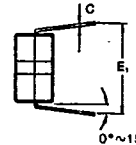
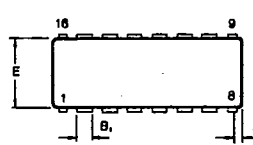
A-05

**PACKAGE DIMENSIONS**

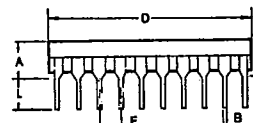
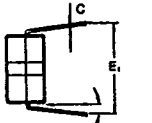
T-90-20

**2. CERAMIC PACKAGES****14-Pin Ceramic DIP Units: mm**

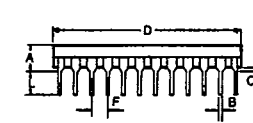
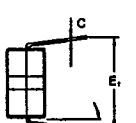
| DIM            | Millimeters |       |
|----------------|-------------|-------|
|                | Min         | Max   |
| A              | —           | 5.08  |
| B              | 0.38        | 0.58  |
| B <sub>1</sub> | 1.40        | 1.78  |
| C              | 0.20        | 0.38  |
| D              | 18.16       | 19.56 |
| E              | 8.10        | 7.49  |
| E <sub>1</sub> | 7.62        | 10.03 |
| F              | 2.54        |       |
| L              | 3.18        | 4.19  |
| Q              | 0.51        | 1.02  |
| S              | 1.91        | 2.29  |

**16-Pin Ceramic DIP Units: mm**

| DIM            | Millimeters |       |
|----------------|-------------|-------|
|                | Min         | Max   |
| A              | —           | 5.08  |
| B              | 0.38        | 0.58  |
| B <sub>1</sub> | 1.40        | 1.78  |
| C              | 0.20        | 0.38  |
| D              | 19.05       | 19.94 |
| E              | 8.10        | 7.49  |
| E <sub>1</sub> | 7.62        | 10.03 |
| F              | 2.54        |       |
| L              | 3.18        | 4.19  |
| Q              | 0.51        | 1.02  |
| S              | 0.51        | 1.14  |

**20-Pin Ceramic DIP Units: mm**

| DIM            | Millimeters |       |
|----------------|-------------|-------|
|                | Min         | Max   |
| A              | 4.06        | 5.08  |
| B              | 0.38        | 0.53  |
| B <sub>1</sub> | 1.14        | 1.52  |
| C              | 0.20        | 0.38  |
| D              | 25.78       | 26.93 |
| E              | 8.10        | 8.60  |
| E <sub>1</sub> | 7.77        | 7.98  |
| F              | 2.54        |       |
| L              | 3.73        | 4.01  |
| Q              | 0.38        | 0.89  |
| S              | 0.51        | 1.14  |

**24-Pin Ceramic DIP Units: mm**

| DIM            | Millimeters |       |
|----------------|-------------|-------|
|                | Min         | Max   |
| A              | 4.06        | 5.08  |
| B              | 0.38        | 0.53  |
| B <sub>1</sub> | 1.14        | 1.52  |
| C              | 0.20        | 0.38  |
| D              | 31.50       | 32.84 |
| E              | 7.24        | 7.75  |
| E <sub>1</sub> | 7.77        | 7.98  |
| F              | 2.54        |       |
| L              | 3.73        | 4.01  |
| Q              | 0.508       | 1.778 |
| S              | 1.85        | 1.93  |



SAMSUNG SEMICONDUCTOR

1677

A-06