



# Microcircuits

## CMOS Advanced Communication Terminal Unit (Telecommunication Microcomputer)

### Features

- Generates signals compatible with switched telephone networks or packet switched data networks
- Provides Dial Pulse (DP) or Dual Tone Multi-Frequency (DTMF), and 0-600 baud modem signaling capability.
- Low power mode (300uA) enables telephone line-powered operation
- External microprocessor address and data bus facilitates memory and I/O expansion
- On-chip memory: 2K bytes ROM  
128 bytes RAM
- Standard DTMF and modem frequencies can be generated which are accurate to  $\pm 1.0\%$  with a 3.58 MHz crystal
- Two sine wave generators
- 6800 and 6500 bus compatible
- Utilizes C65SC00 microprocessor as CPU
- 27 TTL compatible I/O lines
- Bus expandable to address 65K bytes of external memory
- Three 16-bit timers, including watchdog
- Single 5V supply
- Low Power CMOS
- Available in 68-pin chip carries

### General Description

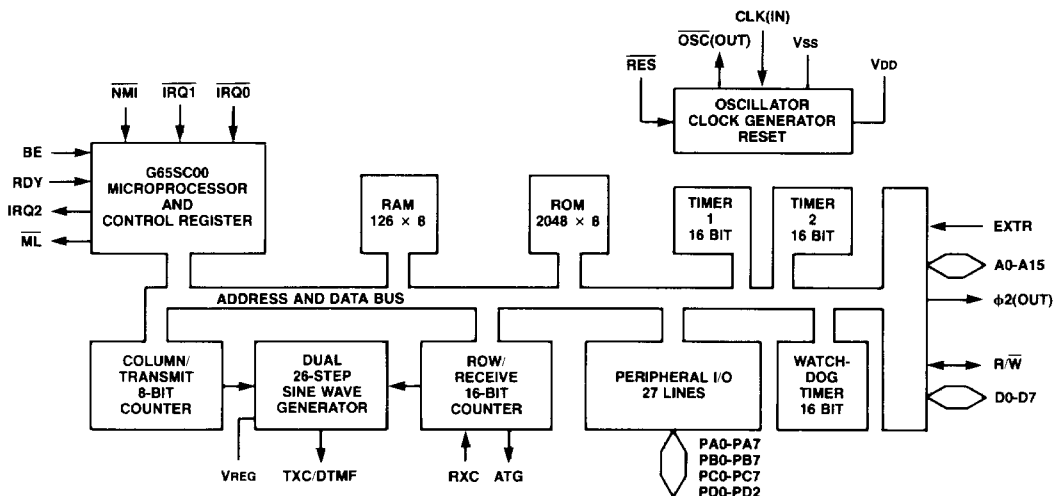
CMD Microcircuits' C65150A Communication Terminal Unit (CTU) is a single-chip telecommunications microcomputer manufactured using state-of-the-art silicon gate CMOS process technology, which is optimized for telephone line signaling and data transmission applications. A functional block diagram is shown which illustrates the major system functions that are included on the integrated circuit.

The CTU uses the CMD C65SC00 8-bit microprocessor which executes the complete C65SC00 series instruction set. With 2K bytes of ROM and 128 bytes of RAM, the CTU operates as a single-chip microcomputer.

The internal bus interconnects all microcomputer functions. The address and data bus buffers permit expansion of ROM, RAM, and memory mapped I/O using the full 65K addressing space of the microprocessor. A peripheral mode is available for use with multiprocessor systems. A test and prototyping mode switches internal ROM addresses to external access. An on-chip oscillator may be driven by an external clock.

The telecommunication interface circuitry consists of three 16-bit timers, row/receive counter, column/transmit counter, and dual sine wave generators. In addition, 27 general purpose I/O lines can be used for keyboard, telephone Dial Pulse signaling, phone line control, and other peripheral devices.

### Block Diagram

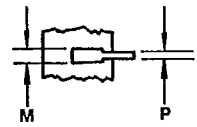
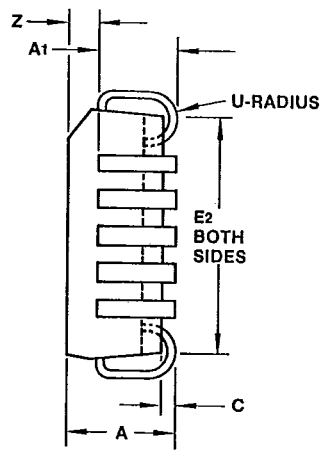
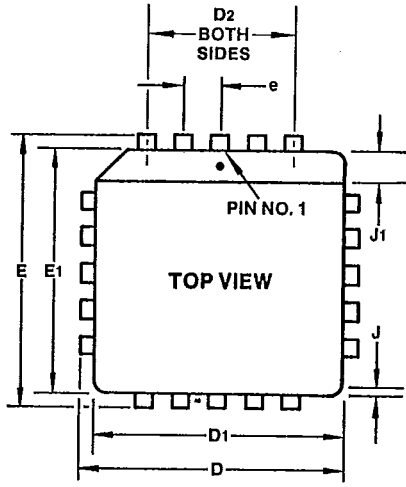


## ADVANCE INFORMATION

T-90-20

# Packaging Information

Plastic Leaded Chip Carrier



N = NO. LEADS

SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.165	0.180	4.20	4.57
A1	0.090	0.120	2.29	3.04
C	0.020	—	0.51	—
D	0.385	0.395	9.78	10.03
D1	0.350	0.356	8.890	9.042
D2	0.200 REF		5.08 BSC	
E	0.385	0.395	9.78	10.03
E1	0.350	0.356	8.890	9.042
E2	0.290	0.330	7.37	8.38
e	0.050 TYP		1.27 TYP	
J	—	0.020	—	0.51
J1	0.042	0.048	1.067	1.219
M	0.026	0.032	0.661	0.812
N	20		20	
P	0.013	0.021	0.331	0.533
Z	0.042	0.056	1.07	1.42

SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.165	0.180	4.20	4.57
A1	0.090	0.120	2.29	3.04
C	0.020	—	0.51	—
D	0.485	0.495	12.32	12.57
D1	0.450	0.456	11.430	11.582
D2	0.300 REF		7.62 BSC	
E	0.485	0.495	12.32	12.57
E1	0.450	0.456	11.430	11.582
E2	0.390	0.430	9.91	10.92
e	0.050 TYP		1.27 TYP	
J	—	0.020	—	0.51
J1	0.042	0.048	1.067	1.219
M	0.026	0.032	0.661	0.812
N	28		28	
P	0.013	0.021	0.331	0.533
Z	0.042	0.056	1.07	1.42

SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.165	0.180	4.20	4.57
A1	0.090	0.120	2.29	3.04
C	0.020	—	0.51	—
D	0.685	0.695	17.40	17.65
D1	0.650	0.656	16.510	16.662
D2	0.500 REF		12.70 BSC	
E	0.685	0.695	17.40	17.65
E1	0.650	0.656	16.510	16.662
E2	0.590	0.630	14.99	16.00
e	0.050 TYP		1.27 TYP	
J	—	0.020	—	0.51
J1	0.042	0.048	1.067	1.219
M	0.026	0.032	0.661	0.812
N	44		44	
P	0.013	0.021	0.331	0.533
Z	0.042	0.056	1.07	1.42

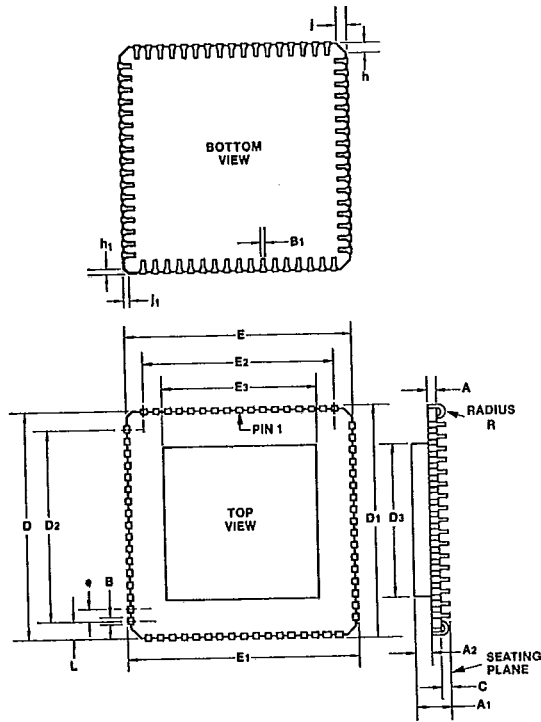
SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.165	0.200	4.20	5.08
A1	0.090	0.130	2.29	3.30
C	0.020	—	0.51	—
D	0.985	0.995	25.02	25.27
D1	0.950	0.958	24.130	24.330
D2	0.800 REF		20.32 BSC	
E	0.985	0.995	25.02	25.27
E1	0.950	0.958	24.130	24.333
E2	0.890	0.930	22.61	23.62
e	0.050 TYP		1.27 TYP	
J	—	0.020	—	0.51
J1	0.042	0.048	1.067	1.219
M	0.026	0.032	0.661	0.812
N	68		68	
P	0.013	0.021	0.331	0.533
Z	0.042	0.056	1.07	1.42

SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.165	0.200	4.20	5.08
A1	0.090	0.130	2.29	3.30
C	0.020	—	0.510	—
D	1.185	1.195	30.10	30.35
D1	1.150	1.158	29.210	29.413
D2	1.000 REF		25.40 BSC	
E	1.185	1.195	30.10	30.35
E1	1.150	1.158	29.210	29.413
E2	1.090	1.130	27.69	28.70
e	0.050 TYP		1.27 TYP	
J	—	0.020	—	0.51
J1	0.042	0.048	1.067	1.219
M	0.026	0.032	0.661	0.812
N	84		84	
P	0.013	0.021	0.331	0.533
Z	0.042	0.056	1.07	1.42



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Loaded Ceramic Chip Carrier



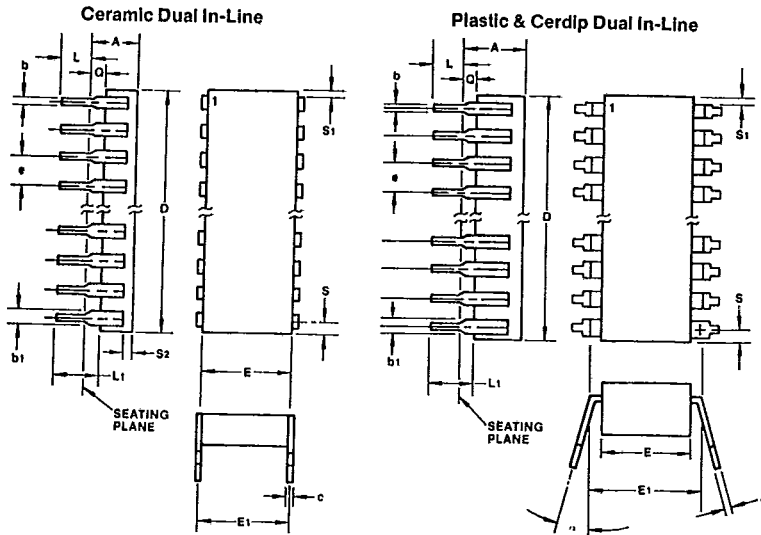
SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.035	0.045	0.89	1.14
A1	—	0.160	—	4.51
A2	0.050	0.075	1.27	1.90
B	0.020	0.025	0.51	0.64
C	0.020	—	0.51	—
D	0.420	0.440	10.67	11.18
D1	0.480	0.500	12.19	12.70
D2	0.300		7.62	
D3	0.395	0.425	10.03	10.80
E	0.420	0.440	10.67	11.18
E1	0.460	0.500	12.19	12.70
E2	0.300		7.62	
E3	0.395	0.425	10.03	10.80
e	0.050 BSC		1.27 BSC	
h	0.040 BSC		1.02 BSC	
h1	0.015	0.025	0.38	0.64
j	0.040 BSC		1.02 BSC	
j1	0.015	0.025	0.38	0.64
L	0.065 REF		1.66 REF	
N	28		28	
R	0.010	0.030	0.25	0.76

N = NO. LEADS

SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.035	0.045	0.89	1.14
A1	—	0.200	—	5.08
A2	0.070	0.095	1.78	2.41
B	0.020	0.025	0.51	0.64
C	0.020	—	0.51	—
D	0.620	0.640	15.75	16.26
D1	0.680	0.700	17.27	17.78
D2	0.500		12.70	
D3	0.485	0.530	12.32	13.46
E	0.620	0.640	15.75	16.26
E1	0.680	0.700	17.27	17.78
E2	0.500		12.70	
E3	0.485	0.530	12.32	13.46
e	0.050 BSC		1.27 BSC	
h	0.040 BSC		1.02 BSC	
h1	0.015	0.025	0.38	0.64
j	0.040 BSC		1.02 BSC	
j1	0.015	0.025	0.38	0.64
L	0.065 REF		1.66 REF	
N	44		44	
R	0.010	0.030	0.25	0.76

SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.035	0.045	0.89	1.14
A1	—	0.200	—	5.08
A2	0.070	0.095	1.78	2.41
B	0.020	0.025	0.51	0.64
C	0.020	—	0.51	—
D	0.920	0.940	23.37	23.88
D1	0.980	1.000	24.89	25.40
D2	0.600		20.32	
D3	0.600	0.630	15.24	16.00
E	0.920	0.940	23.37	23.88
E1	0.980	1.000	24.89	25.40
E2	0.600		20.32	
E3	0.600	0.630	15.24	16.00
e	0.050 BSC		1.27 BSC	
h	0.040 BSC		1.02 BSC	
h1	0.015	0.025	0.38	0.64
j	0.040 BSC		1.02 BSC	
j1	0.015	0.025	0.38	0.64
L	0.065 REF		1.66 REF	
N	68		68	
R	0.010	0.030	0.25	0.76

SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.035	0.045	0.89	1.14
A1	—	0.200	—	5.08
A2	0.070	0.095	1.78	2.41
B	0.020	0.025	0.51	0.64
C	0.020	—	0.51	—
D	0.990	1.010	25.15	25.65
D1	1.180	1.200	29.5	30.48
D2	1.000		25.40	
D3	0.600	0.630	15.24	16.00
E	0.990	1.010	25.15	25.65
E1	1.180	1.200	29.97	30.48
E2	1.000		25.40	
E3	0.600	0.630	15.24	16.00
e	0.050 BSC		1.27 BSC	
h	0.040 BSC		1.02 BSC	
h1	0.015	0.025	0.38	0.64
j	0.040 BSC		1.02 BSC	
j1	0.015	0.025	0.38	0.64
L	0.065 REF		1.66 REF	
N	84		84	
R	0.010	0.030	0.25	0.76



8-PIN PACKAGE				
SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	—	0.200	—	5.08
b	0.014	0.023	0.36	0.58
b1	0.030	0.070	0.76	1.78
c	0.008	0.015	0.20	0.38
D	—	0.420	—	10.67
E	0.220	0.310	5.59	7.87
E1	0.290	0.320	7.37	8.13
e	0.100 BSC		2.54 BSC	
L	0.125	0.200	3.18	5.08
L1	0.150	—	3.81	—
Q	0.015	0.060	0.38	1.52
S	—	0.080	—	2.03
S1	0.005	—	0.13	—
S2	0.005	—	0.13	—
α	0°	15°	0°	15°

14-PIN PACKAGE				
SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	—	0.200	—	5.08
b	0.014	0.023	0.36	0.58
b1	0.030	0.070	0.76	1.78
c	0.008	0.015	0.20	0.38
D	—	0.785	—	19.94
E	0.220	0.310	5.59	7.87
E1	0.290	0.320	7.37	8.13
e	0.100 BSC		2.54 BSC	
L	0.125	0.200	3.18	5.08
L1	0.150	—	3.81	—
Q	0.015	0.060	0.38	1.52
S	—	0.098	—	2.49
S1	0.005	—	0.13	—
S2	0.005	—	0.13	—
α	0°	15°	0°	15°

16-PIN PACKAGE				
SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	—	0.200	—	5.08
b	0.014	0.023	0.36	0.58
b1	0.030	0.070	0.76	1.78
c	0.008	0.015	0.20	0.38
D	—	0.840	—	21.34
E	0.220	0.310	5.59	7.87
E1	0.290	0.320	7.37	8.13
e	0.100 BSC		2.54 BSC	
L	0.125	0.200	3.18	5.08
L1	0.150	—	3.81	—
Q	0.015	0.060	0.38	1.52
S	—	0.080	—	2.03
S1	0.005	—	0.13	—
S2	0.005	—	0.13	—
α	0°	15°	0°	15°

18-PIN PACKAGE				
SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	—	0.200	—	5.08
b	0.014	0.023	0.36	0.58
b1	0.030	0.070	0.76	1.78
c	0.008	0.015	0.20	0.38
D	—	0.960	—	24.38
E	0.220	0.310	5.59	7.87
E1	0.290	0.320	7.37	8.13
e	0.100 BSC		2.54 BSC	
L	0.125	0.200	3.18	5.08
L1	0.150	—	3.81	—
Q	0.015	0.060	0.38	1.52
S	—	0.098	—	2.49
S1	0.005	—	0.13	—
S2	0.005	—	0.13	—
α	0°	15°	0°	15°

20-PIN PACKAGE				
SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	—	0.200	—	5.08
b	0.014	0.023	0.36	0.58
b1	0.030	0.070	0.76	1.78
c	0.008	0.015	0.20	0.38
D	—	1.060	—	26.92
E	0.220	0.310	5.59	7.87
E1	0.290	0.320	7.37	8.13
e	0.100 BSC		2.54 BSC	
L	0.125	0.200	3.18	5.08
L1	0.150	—	3.81	—
Q	0.015	0.060	0.38	1.52
S	—	0.080	—	2.03
S1	0.005	—	0.13	—
S2	0.005	—	0.13	—
α	0°	15°	0°	15°

22-PIN PACKAGE				
SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	—	0.225	—	5.72
b	0.014	0.023	0.36	0.58
b1	0.030	0.070	0.76	1.78
c	0.008	0.015	0.20	0.38
D	—	1.260	—	32.00
E	0.350	0.390	8.89	9.91
E1	0.390	0.420	9.91	10.67
e	0.100 BSC		2.54 BSC	
L	0.125	0.200	3.18	5.08
L1	0.150	—	3.81	—
Q	0.015	0.075	0.38	1.91
S	—	0.080	—	2.03
S1	0.005	—	0.13	—
S2	0.005	—	0.13	—
α	0°	15°	0°	15°

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continued from page 3

24-PIN PACKAGE				
SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	—	0.225	—	5.72
b	0.014	0.023	0.36	0.58
b1	0.030	0.070	0.76	1.78
c	0.008	0.015	0.20	0.38
D	—	1.290	—	32.77
E	0.500	0.610	12.70	15.49
E1	0.520	0.620	13.21	15.75
e	0.100 BSC		2.54 BSC	
L	0.120	0.200	3.05	5.08
L1	0.150	—	3.81	—
Q	0.015	0.075	0.38	1.91
S	—	0.098	—	2.49
S1	0.005	—	0.13	—
S2	0.005	—	0.13	—
α	0°	15°	0°	15°

28-PIN PACKAGE				
SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	—	0.225	—	5.72
b	0.014	0.023	0.36	0.58
b1	0.030	0.070	0.76	1.78
c	0.008	0.015	0.20	0.38
D	—	1.490	—	37.84
E	0.510	0.620	12.95	15.75
E1	0.620	0.630	15.75	16.00
e	0.100 BSC		2.54 BSC	
L	0.125	0.200	3.18	5.08
L1	0.150	—	3.81	—
Q	0.015	0.060	0.38	1.52
S	—	0.098	—	2.49
S1	0.005	—	0.13	—
S2	0.005	—	0.13	—
α	0°	15°	0°	15°

40-PIN PACKAGE				
SYM-BOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	—	0.225	—	5.72
b	0.014	0.023	0.36	0.58
b1	0.030	0.070	0.76	1.78
c	0.008	0.015	0.20	0.38
D	—	2.096	—	53.24
E	0.510	0.620	12.95	15.75
E1	0.520	0.630	13.21	16.00
e	0.100 BSC		2.54 BSC	
L	0.125	0.200	3.18	5.08
L1	0.150	—	3.81	—
Q	0.015	0.060	0.38	1.52
S	—	0.098	—	2.49
S1	0.005	—	0.13	—
S2	0.005	—	0.13	—
α	0°	15°	0°	15°