Buffers

74F240/74F240A
74F241/74F241A

74F240/240A Octal inverter buffer (3–state)
74F241/241A Octal buffer (3–state)

FEATURES

- Octal bus interface
- 3–state buffer outputs sink 64mA
- 15mA source current
- Guaranteed output skew less than 2.0ns (74F240A/74F241A)
- Reduced ground bounce (74F240A/74F241A)
- Reduced I_{CC} (74F241A only)
- Reduced loading (74F240A I_{IL} = 100µA, 74F241A I_{IL} = 40µA)

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F240	4.3ns	37mA
74F240A	3.8ns	40mA
74F241	5.0ns	53mA
74F241A	4.5ns	32mA

ORDERING INFORMATION

DESCRIPTION	ORDER CODE
	COMMERCIAL RANGE V_{CC} = 5V ±10%, T_{amb} = 0°C to +70°C
20–pin plastic DIP	N74F240N, N74F240AN, N74F241N, N74F241AN
20–pin plastic SOL	N74F240D, N74F240AD, N74F241D, N74F241AD

DESCRIPTION

The 74F240 and 74F241 are octal buffers that are ideal for driving bus lines of buffer memory address registers. The outputs are all capable of sinking 64mA and sourcing up to 15mA. The device features two output enables, each controlling four of the 3–state outputs.

The 74F240A and 74F241A are functionally equivalent to their non–A counterparts. They have been designed to reduce effects of ground noise. Other advantages are noted in the features.

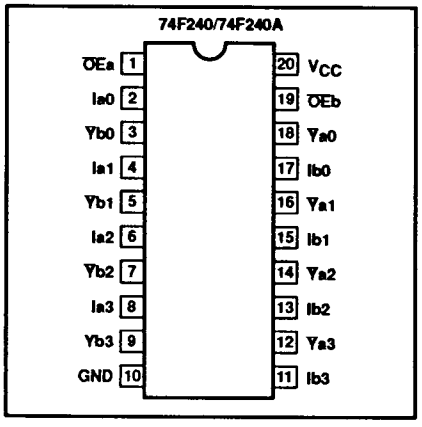
INPUT AND OUTPUT LOADING AND FAN OUT TABLE

PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
Ian, Ibn	Data inputs (74F240)	1.0/1.67	20µA/1.0mA
	Data inputs (74F240A)	1.0/0.167	20µA/100µA
	Data inputs (74F241)	1.0/2.67	20µA/1.6mA
	Data inputs (74F241A)	1.0/0.067	20µA/40µA
$\overline{OE}$a, $\overline{OE}$b	Output enable inputs (active low) (74F240)	1.0/0.33	20µA/0.2mA
	Output enable inputs (active low) (74F240A)	1.0/0.167	20µA/100µA
$\overline{OE}$a, OEb	Output enable input (74F241)	1.0/1.67	20µA/1.0mA
	Output enable input (74F241A)	1.0/0.067	20µA/40µA
Yan, Ybn	Data outputs (74F241, 74F241A)	750/106.7	15mA/64mA
$\overline{Y}$an, $\overline{Y}$bn	Data outputs (74F240, 74F240A)	750/106.7	15mA/64mA

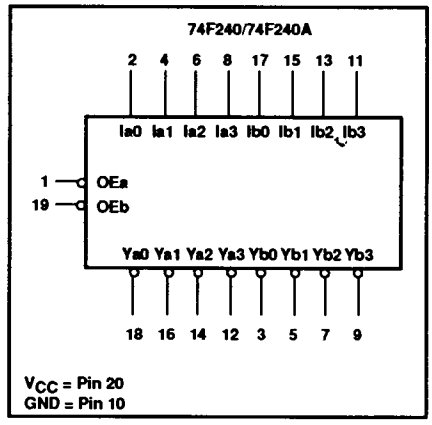
Note to input and output loading and fan out table

1. One (1.0) FAST unit load is defined as: 20µA in the high state and 0.6mA in the low state.

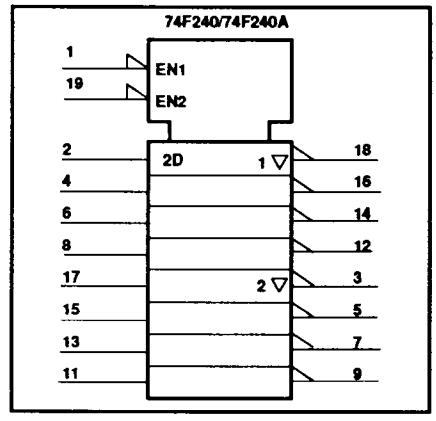
PIN CONFIGURATION



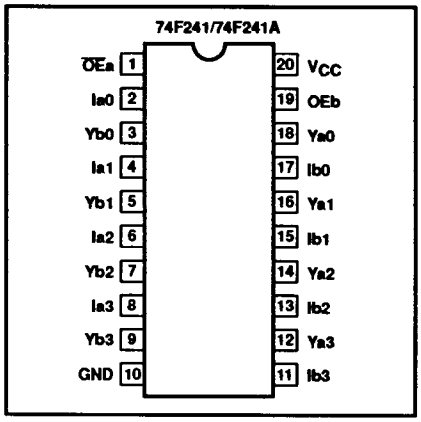
LOGIC SYMBOL



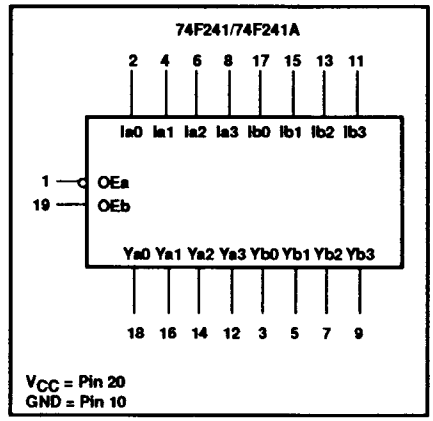
IEC/IEEE SYMBOL



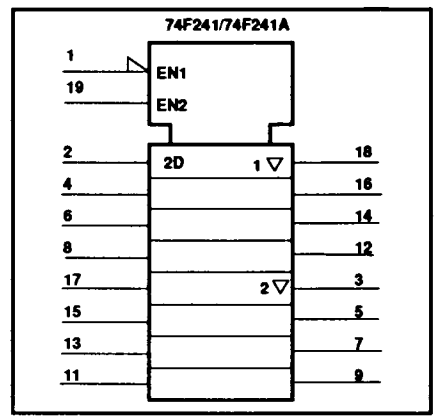
PIN CONFIGURATION



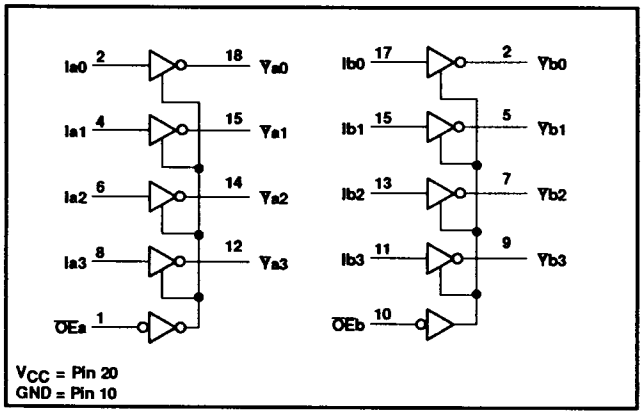
LOGIC SYMBOL



IEC/IEEE SYMBOL



LOGIC DIAGRAM FOR 74F240/74F240A



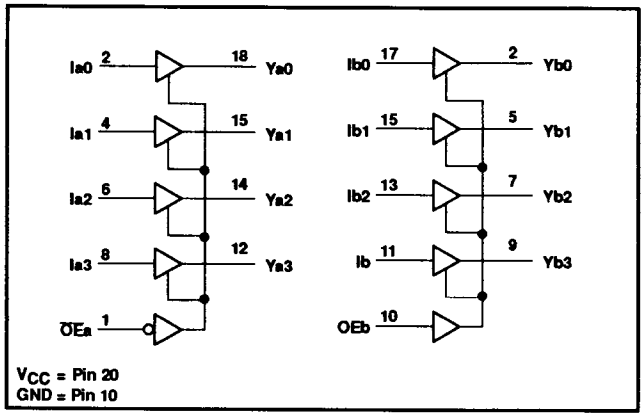
FUNCTION TABLE FOR 74F240/74F240A

INPUTS				OUTPUTS	
$\overline{OEa}$	Ia	$\overline{OEb}$	Ib	$\overline{Ya}$	$\overline{Yb}$
L	L	L	L	H	H
L	H	L	H	L	L
H	X	H	X	Z	Z

Notes to function table for 74F240/74F240A

1. H = High voltage level
2. L = Low voltage level
3. X = Don't care
4. Z = High impedance "off" state

LOGIC DIAGRAM FOR 74F241/74F241A



FUNCTION TABLE FOR 74F241/74F241A

INPUTS				OUTPUTS	
$\overline{OEa}$	Ia	OEb	Ib	Ya	Yb
L	L	H	L	L	L
L	H	H	H	H	H
H	X	L	X	Z	Z

Notes to function table for 74F241/74F241A

1. H = High voltage level
2. L = Low voltage level
3. X = Don't care
4. Z = High impedance "off" state

ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limit set forth in this table may impair the useful life of the device. Unless otherwise noted these limits are over the operating free air temperature range.)

SYMBOL	PARAMETER	RATING	UNIT
V_{CC}	Supply voltage	–0.5 to +7.0	V
V_{IN}	Input voltage	–0.5 to +7.0	V
I_{IN}	Input current	–30 to +5	mA
V_{OUT}	Voltage applied to output in high output state	–0.5 to V_{CC}	V
I_{OUT}	Current applied to output in low output state	128	mA
T_{amb}	Operating free air temperature range	0 to +70	°C
T_{stg}	Storage temperature range	–65 to +150	°C

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS			UNIT
		MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5.0	5.5	V
V_{IH}	High–level input voltage	2.0			V
V_{IL}	Low–level input voltage			0.8	V
I_{IK}	Input clamp current			–18	mA
I_{OH}	High–level output current			–15	mA
I_{OL}	Low–level output current			64	mA
T_{amb}	Operating free air temperature range	0		+70	°C

DC ELECTRICAL CHARACTERISTICS

(Over recommended operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER		TEST CONDITIONS[1]			LIMITS MIN	LIMITS TYP[2]	LIMITS MAX	UNIT
V_{OH}	High-level output voltage		V_{CC} = MIN, V_{IL} = MAX, V_{IH} = MIN	I_{OH} = –3mA	±10%V_{CC}	2.4			V
					±5%V_{CC}	2.7	3.4		V
				I_{OH} = –15mA	±10%V_{CC}	2.0			V
					±5%V_{CC}	2.0			V
V_{OL}	Low-level output voltage		V_{CC} = MIN, V_{IL} = MAX, V_{IH} = MIN,	I_{OL} = MAX	±10%V_{CC}			0.50	V
					±5%V_{CC}		0.42	0.50	V
V_{IK}	Input clamp voltage		V_{CC} = MIN, I_I = I_{IK}				–0.73	-1.2	V
I_I	Input current at maximum input voltage		V_{CC} = MAX, V_I = 7.0V					100	µA
I_{IH}	High–level input current		V_{CC} = MAX, V_I = 2.7V					20	µA
I_{IL}	Low–level input current	74F240 all inputs	V_{CC} = MAX, V_I = 0.5V					–1.0	mA
		74F240A all inputs						–100	µA
		74F241 $\overline{OE}$a, OEb						–1.0	mA
		74F241 Ian, Ibn						–1.6	mA
		74F241A all inputs						–40	µA
I_{OZH}	Off–state output current, high–level voltage applied		V_{CC} = MAX, V_O = 2.7V					50	µA
I_{OZL}	Off–state output current, low–level voltage applied		V_{CC} = MAX, V_O = 0.5V					–50	µA
I_{OS}	Short–circuit output current[3]		V_{CC} = MAX			-100		-225	mA
I_{CC}	Supply current (total)	74F240	I_{CCH}	V_{CC} = MAX			12	18	mA
			I_{CCL}				50	70	mA
			I_{CCZ}				35	45	mA
		74F240A	I_{CCH}				28	37	mA
			I_{CCL}				58	75	mA
			I_{CCZ}				34	50	mA
		74F241	I_{CCH}	V_{CC} = MAX			40	60	mA
			I_{CCL}				60	90	mA
			I_{CCZ}				65	90	mA
		74F241A	I_{CCH}				20	30	mA
			I_{CCL}				49	65	mA
			I_{CCZ}				26	40	mA

Notes to DC electrical characteristics

1. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
2. All typical values are at V_{CC} = 5V, T_{amb} = 25°C.
3. Not more than one output should be shorted at a time. For testing I_{OS}, the use of high-speed test apparatus and/or sample-and-hold techniques are preferable in order to minimize internal heating and more accurately reflect operational values. Otherwise, prolonged shorting of a high output may raise the chip temperature well above normal and thereby cause invalid readings in other parameter tests. In any sequence of parameter tests, I_{OS} tests should be performed last.

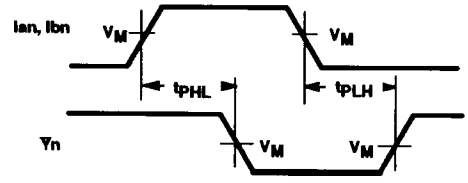
AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER		TEST CONDITION	LIMITS					UNIT
				T_{amb} = +25°C, V_{CC} = +5.0V, C_L = 50pF, R_L = 500Ω			T_{amb} = 0°C to +70°C, V_{CC} = +5.0V ± 10%, C_L = 50pF, R_L = 500Ω		
				MIN	TYP	MAX	MIN	MAX	
t_{PLH} t_{PHL}	Propagation delay Ian, Ibn to Yn	74F240	Waveform 1	3.0 2.0	4.5 3.0	6.5 4.5	3.0 2.0	7.5 5.0	ns
t_{PZH} t_{PZL}	Output enable time to high or low level		Waveform 3 Waveform 4	3.0 4.5	5.0 6.5	7.5 8.5	3.0 4.0	9.0 10.0	ns
t_{PHZ} t_{PLZ}	Output disable time from high or low level		Waveform 3 Waveform 4	3.0 3.0	5.5 5.0	7.0 7.0	3.0 3.0	7.5 7.5	ns
t_{PLH} t_{PHL}	Propagation delay Ian, Ibn to Yn	74F240A	Waveform 1	2.5 2.0	4.0 3.5	5.5 5.5	2.0 2.0	6.5 6.0	ns
t_{PZH} t_{PZL}	Output enable time to high or low level		Waveform 3 Waveform 4	2.0 3.5	4.0 5.0	6.5 7.5	2.0 3.0	7.0 8.5	ns
t_{PHZ} t_{PLZ}	Output disable time from high or low level		Waveform 3 Waveform 4	2.0 1.5	3.5 2.5	6.0 5.0	1.5 1.0	6.5 5.5	ns
$t_{sk(0)}$	Output skew[1, 2]		Waveform 5			1.5		2.0	ns
t_{PLH} t_{PHL}	Propagation delay Ian, Ibn to Yn	74F241	Waveform 2	2.5 2.5	4.0 4.0	5.2 5.2	2.5 2.5	6.2 6.5	ns
t_{PZH} t_{PZL}	Output enable time to high or low level		Waveform 3 Waveform 4	2.0 2.0	4.0 5.0	5.7 7.0	2.0 2.0	6.7 8.0	ns
t_{PHZ} t_{PLZ}	Output disable time from high or low level		Waveform 3 Waveform 4	2.0 2.0	4.0 4.0	6.0 6.0	2.0 2.0	7.0 7.0	ns
t_{PLH} t_{PHL}	Propagation delay Ian, Ibn to Yn	74F241A	Waveform 2	2.5 2.5	4.5 4.5	5.8 5.8	2.5 2.5	6.5 6.5	ns
t_{PZH} t_{PZL}	Output enable time to high or low level		Waveform 3 Waveform 4	2.5 3.5	4.5 5.0	6.0 7.0	2.0 3.0	6.7 8.0	ns
t_{PHZ} t_{PLZ}	Output disable time from high or low level		Waveform 3 Waveform 4	2.0 1.5	4.0 3.5	6.0 5.5	1.5 1.0	6.5 6.0	ns
$t_{sk(0)}$	Output skew[1, 2]		Waveform 5			1.5		2.0	ns

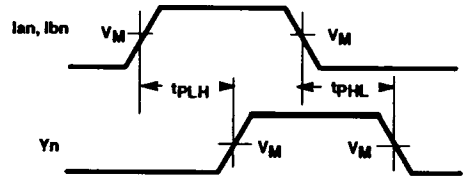
Notes to AC electrical characteristics

1. $|t_{PN}$ actual – t_{PM} actual| for any output compared to any other output where N and M are either LH or HL.
2. Skew times are valid only under same test conditions (temperature, V_{CC}, loading, etc.,).

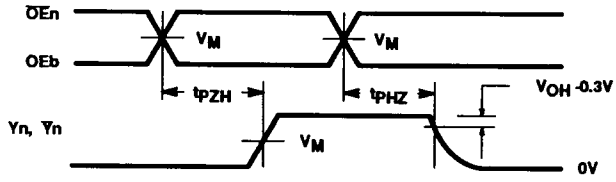
AC WAVEFORMS



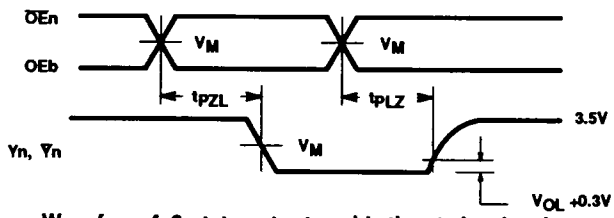
Waveform 1. Propagation delay for inverting outputs



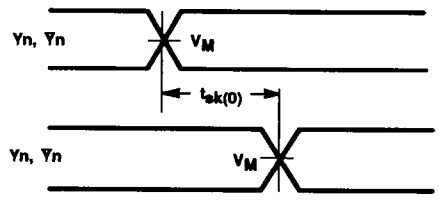
Waveform 2. Propagation delay for non–inverting outputs



Waveform 3. 3-state output enable time to high level and output disable time from high level



Waveform 4. 3-state output enable time to low level and output disable time from low level



Waveform 5. Output skew

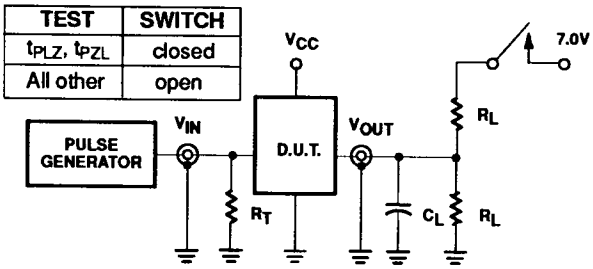
Notes to AC waveforms

1. For all waveforms, V_M = 1.5V.
2. The shaded areas indicate when the input is permitted to change for predictable output performance.

TEST CIRCUIT AND WAVEFORMS

SWITCH POSITION

TEST	SWITCH
t_{PLZ}, t_{PZL}	closed
All other	open



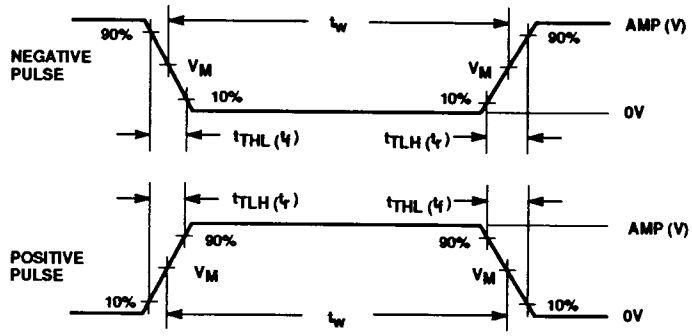
Test circuit for 3–state outputs

DEFINITIONS:

R_L = Load resistor; see AC electrical characteristics for value.

C_L = Load capacitance includes jig and probe capacitance; see AC electrical characteristics for value

R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.



Input pulse definition

family	INPUT PULSE REQUIREMENTS					
	amplitude	V_M	rep. rate	t_w	t_{TLH}	t_{THL}
74F	3.0V	1.5V	1MHz	500ns	2.5ns	2.5ns

VI. COMMERCIAL PRODUCT SPECIAL PROCESSING T-90-20

SUPR II LEVEL B

Signetics Upgraded Product Reliability (SUPR) program is designed to provide customers whose systems require an infant mortality level less than that of our non-burned-in products (which is typically below 1000 PPM).

DEVICE AVAILABILITY

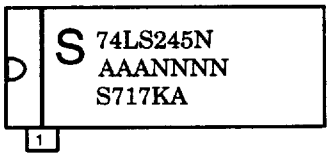
Products available for Level B processing are identified in the Price Book with a "B" suffix to the basic part number.

SUPR II LEVEL B PRICING ADDERS

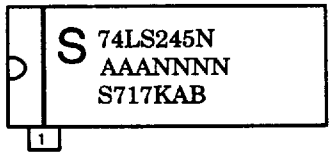
PRODUCT FAMILY	SUGGESTED RESALE ADDERS 1–99	100–999	OVER 1000
LIN	.14	.14	.11
LOG (TTL)			
(SSI)	.12	.10	.08
(MSI)	.16	.14	.11
(OCT)	.16	.14	.11
(CTM)	.16	.14	.11
LOG (ECL)			
(SSI)	.25	.23	.20
(MSI)	.25	.23	.20
LOG (LSI) (RAM) MIC (8X)	Consult Factory for Pricing		
PLD	Consult Factory for Pricing		
MCG	Consult Factory for Pricing		
DAT MIC	Not Available		

MARKING FORMAT EXAMPLES

Standard (no Burn-In) Products (Dual-in-line)



SUPR II (Burned-In) Products (Dual-in-line)



NOTE: The "B" in the 7th position on the 3rd line, when present, is the SUPR II Burn-In indicator.

TAPE AND REEL PACKAGING

SPECIFICATIONS

Tape and Reel specifications conform to Electronic Industries Association (EIA) Proposed Specification #EIA-481-A using 13 inch reels. Current incremental quantities reflect the quantities per reel. As more customers are able to handle a larger quantity per reel, this quantity will be increased.

DEVICE AVAILABILITY

Products available in tape and reel packaging are identified in the Price Book with a "T" suffix to the basic part number and are only offered as a product for sale by the reel. Return of product is limited to full reels with unbroken quality seals.

TAPE AND REEL PRICING ADDERS

PRODUCT FAMILY	SUGGESTED RESALE ADDER
MCG	.07
LIN	.07
LOG	.07
DAT MIC	PACKAGE A28 = .20 A44 = .25 A52 = .30 A68 = .40 A84 = .45 D24 = .17

VII. PACKING QUANTITY INFORMATION T-90-20

CERAMIC DUAL IN-LINE (CERDIP)

PACKAGE CODE	PIN COUNT	QUANTITIES	
		DEVICES PER TUBE	DEVICES PER BOX
F/FE, BPA, PA	8-pin (300-mil)	48	1920
F, BCA, CA	14-pin (300-mil)	25	1000
F, BEA, EA	16-pin (300-mil)	25	1000
F, BVA, MVA	18-pin (300-mil)	21	840
F/FA, BRA, RA	20-pin (300-mil)	20	800
F, BWA, WA	22-pin (400-mil)	17	544
F/FA/F6, BJA, JA	24-pin (600-mil)	15	360
F/FA/F3/F24, BLA, LA	24-pin (300-mil)	15	600
F, BXA, XA	24-pin (400-mil)	15	480
F/FA/F28, BXA, XA	28-pin (600-mil)	13	312
FA	32-pin (600-mil)	11	264
F/FA/F40, BQA, MQA, QA	40-pin (600-mil)	9	216

CERPAC

PACKAGE CODE	PIN COUNT	QUANTITIES
		DEVICES PER TUBE
BDA/DA/W	14-pin	145
BFA/FA/W	16-pin	145
BXA/BYA/W	18-pin	100
BSA/SA/W/WB	20-pin	100
BKA/KA/W	24-pin	120
BYA/YA/W	28-pin	50

CERQUAD

PACKAGE CODE	PIN COUNT	QUANTITIES	
		DEVICES PER TRAY	DEVICES PER BOX
KA/K44	44-pin	6	6
KA/K68	68-pin	4	4
KA	84-pin	42	210

LEADLESS CHIP CARRIER

PACKAGE CODE	PIN COUNT	QUANTITIES
		DEVICES PER TUBE
B2A/2A/GA	20-pin	55
B3A/3A/GA/GC1	28-pin	43
YA/YA/GC2	32-pin	35
BUA/MXA/MUA/UA/XA/GA/GC	44-pin	27
BZA/BUA/UA/ZA/GA/GC	68-pin	19

QUANTITIES SHOWN IN GRAY REQUIRE PURCHASE TO BE MADE IN EXACT MULTIPLES OF THAT QUANTITY.

VII. PACKING QUANTITY INFORMATION

T-90-20

PLASTIC DUAL IN-LINE

PACKAGE CODE	PIN COUNT	QUANTITIES	
		DEVICES PER TUBE	DEVICES PER BOX
N/N8	8-pin (300-mil)	50	2000
N/N14/N16	14- 16-pin (300-mil)	25	1000
N	18-pin (300-mil)	20	800
N/N20	20-pin (300-mil)	18	720
N	22-pin (400-mil)	17	544
N/N6	24-pin (600-mil)	15	360
N/N3/N24	24-pin (300-mil)	15	600
N/N24	24-pin (400-mil)	15	480
N/N28	28-pin (600-mil)	13	312
N/N3	28-pin (300-mil)	13	520
N	32-pin (600-mil)	11	264
N/N40	40-pin (600-mil)	9	216
NB (Shrink)	42-pin (600-mil)	12	288
N/N48	48-pin (600-mil)	7	168
N	50-pin (900-mil)	7	112
N/N64	64-pin (900-mil)	5	80

PLASTIC LEADED CHIP CARRIER (PLCC)

PACKAGE CODE	PIN COUNT	QUANTITIES		
		DEVICES PER TUBE	DEVICES PER BOX	DEVICES PER REEL
A	20-pin	46	3680	1000
A/A28	28-pin	37	2368	750
A	32-pin	31	2232	750
A/A44	44-pin	26	1248	500
A/A52	52-pin	23	1012	500
A/A68	68-pin	18	648	250
A/A84	84-pin	15	420	250

QUANTITIES SHOWN IN GRAY REQUIRE PURCHASE TO BE MADE IN EXACT MULTIPLES OF THAT QUANTITY.

VII. PACKING QUANTITY INFORMATION

T-90-20

PLASTIC SMALL OUTLINE (SO)

PACKAGE CODE	PIN COUNT	QUANTITIES		
		DEVICES PER TUBE	DEVICES PER BOX	DEVICES PER REEL
D/D8	8-pin (150-mil)	100	10000	2500
D	8-pin (300-mil)	64	2560	1000 – 13" 700 – 7"
D/D14	14-pin (150-mil)	57	5700	2500
D	16-pin (150-mil)	50	5000	2500
D	16-pin (300-mil)	48	1920	1000
DK(SSOP)	20-pin (170-mil)	75	6750	2500
D	20-pin (300-mil)	38	1520	1000
D/D24	24-pin (300-mil)	32	1280	1000
D	28-pin (300-mil)	27	1080	1000
D	40-pin (VSO-40)	31	1240	1000 – 13" 300 – 7"
D	56-pin (VSO-56)	22	616	1000

QUAD FLAT PACK*

PACKAGE CODE	PIN COUNT	QUANTITIES	
		DEVICES PER TRAY	DEVICES PER BOX
B/B44	44-pin	50	500
B/B44	44-pin	96	480
B	52-pin	119	595
B	80-pin	66	330
B	100-pin	50	250
B	120-pin	24	120
B	120-pin (Philips source)	30	150

* Quad Flat Pack parts require dry pack handling according to EIA Standard - 583. These parts are identified in part list section with DRY PACK in the Cross Ref Part No field.

QUANTITIES SHOWN IN GRAY REQUIRE PURCHASE TO BE MADE IN EXACT MULTIPLES OF THAT QUANTITY.