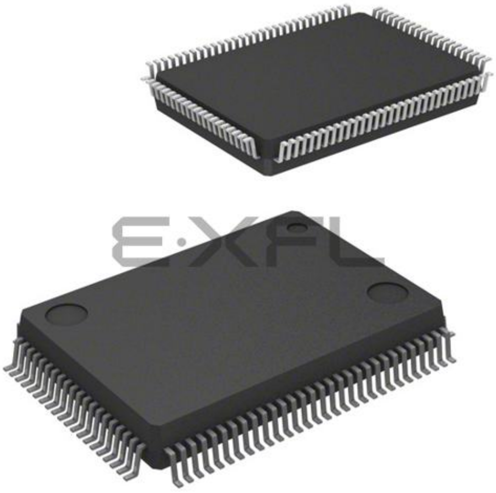
Microchip Technology - ATF1504ASV-15QC100 Datasheet



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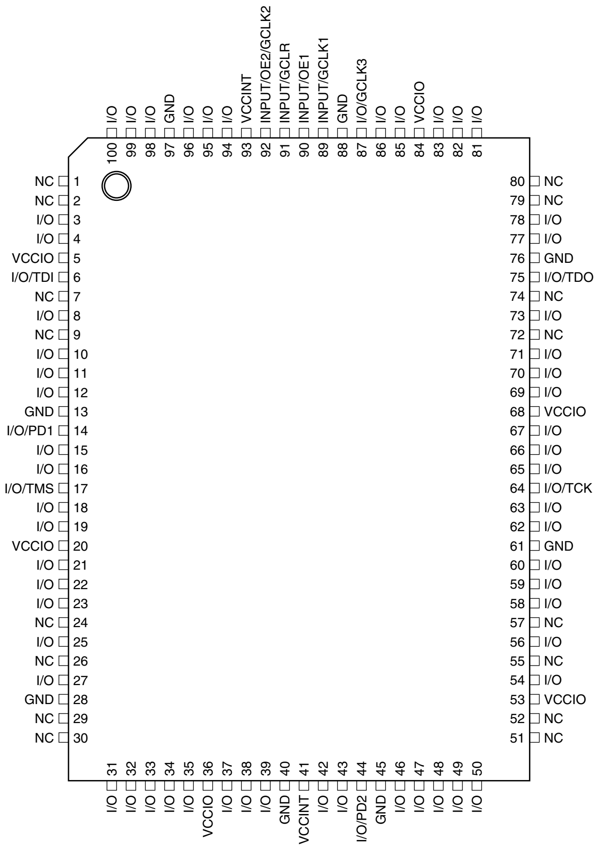
Understanding Embedded - CPLDs (Complex Programmable Logic Devices)

Embedded - CPLDs, or Complex Programmable Logic Devices, are highly versatile digital logic devices used in electronic systems. These programmable components are designed to perform complex logical operations and can be customized for specific applications. Unlike fixed-function ICs, CPLDs offer the flexibility to reprogram their configuration, making them an ideal choice for various embedded systems. They consist of a set of logic gates and programmable interconnects, allowing designers to implement complex logic circuits without needing custom hardware.

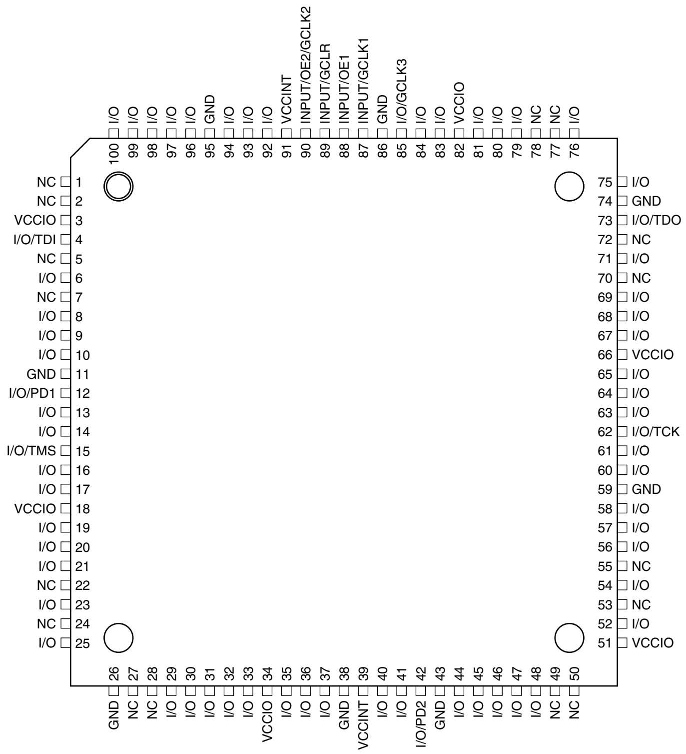
Applications of Embedded - CPLDs

Details	
Product Status	Obsolete
Programmable Type	In System Programmable (min 10K program/erase cycles)
Delay Time tpd(1) Max	15 ns
Voltage Supply - Internal	3V ~ 3.6V
Number of Logic Elements/Blocks	-
Number of Macrocells	64
Number of Gates	-
Number of I/O	64
Operating Temperature	0°C ~ 70°C (TA)
Mounting Type	Surface Mount
Package / Case	100-BQFP
Supplier Device Package	100-PQFP (14x20)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/atf1504asv-15qc100

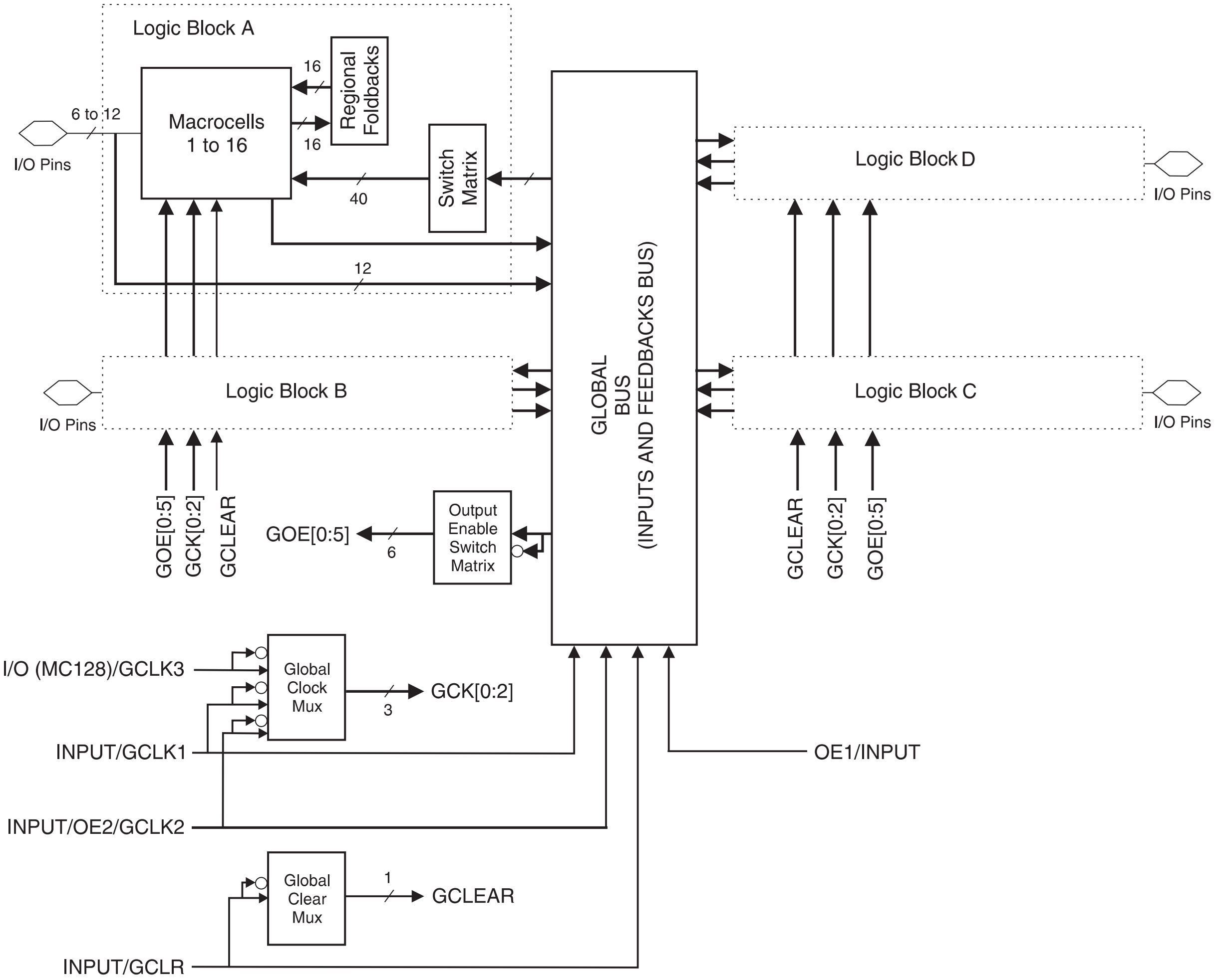
100-lead PQFP Top View



100-lead TQFP Top View



Block Diagram



Unused product terms are automatically disabled by the compiler to decrease power consumption. A security fuse, when programmed, protects the contents of the ATF1504ASV(L). Two bytes (16 bits) of User Signature are accessible to the user for purposes such as storing project name, part number, revision or date. The User Signature is accessible regardless of the state of the security fuse.

The ATF1504ASV(L) device is an in-system programmable (ISP) device. It uses the industry-standard 4-pin JTAG interface (IEEE Std. 1149.1), and is fully-compliant with JTAG's Boundary-scan Description Language (BSDL). ISP allows the device to be programmed without removing it from the printed circuit board. In addition to simplifying the manufacturing flow, ISP also allows design modifications to be made in the field via software.

Product Terms and Select Mux

Each ATF1504ASV(L) macrocell has five product terms. Each product term receives as its inputs all signals from both the global bus and regional bus.

The product term select multiplexer (PTMUX) allocates the five product terms as needed to the macrocell logic gates and control signals. The PTMUX programming is determined by the design compiler, which selects the optimum macrocell configuration.

OR/XOR/CASCADE Logic

The ATF1504ASV(L)'s logic structure is designed to efficiently support all types of logic. Within a single macrocell, all the product terms can be routed to the OR gate, creating a 5-input AND/OR sum term. With the addition of the CASIN from neighboring macrocells, this can be expanded to as many as 40 product terms with little additional delay.

The macrocell's XOR gate allows efficient implementation of compare and arithmetic functions. One input to the XOR comes from the OR sum term. The other XOR input can be a product term or a fixed high- or low-level. For combinatorial outputs, the fixed level input allows polarity selection. For registered functions, the fixed levels allow DeMorgan minimization of product terms. The XOR gate is also used to emulate T- and JK-type flip-flops.

Flip-flop

The ATF1504ASV(L)'s flip-flop has very flexible data and control functions. The data input can come from either the XOR gate, from a separate product term or directly from the I/O pin. Selecting the separate product term allows creation of a buried registered feedback within a combinatorial output macrocell. (This feature is automatically implemented by the fitter software). In addition to D, T, JK and SR operation, the flip-flop can also be configured as a flow-through latch. In this mode, data passes through when the clock is high and is latched when the clock is low.

The clock itself can either be one of the Global CLK Signal (GCK[0 : 2]) or an individual product term. The flip-flop changes state on the clock's rising edge. When the GCK signal is used as the clock, one of the macrocell product terms can be selected as a clock enable. When the clock enable function is active and the enable signal (product term) is low, all clock edges are ignored. The flip-flop's asynchronous reset signal (AR) can be either the Global Clear (GCLEAR), a product term, or always off. AR can also be a logic OR of GCLEAR with a product term. The asynchronous preset (AP) can be a product term or always off.

Extra Feedback

The ATF1504ASV(L) macrocell output can be selected as registered or combinatorial. The extra buried feedback signal can be either combinatorial or a registered signal regardless of whether the output is combinatorial or registered. (This enhancement function is automatically implemented by the fitter software.) Feedback of a buried combinatorial output allows the creation of a second latch within a macrocell.

I/O Control

The output enable multiplexer (MOE) controls the output enable signal. Each I/O can be individually configured as an input, output or for bi-directional operation. The output enable for each macrocell can be selected from the true or compliment of the two output enable pins, a subset of the I/O pins, or a subset of the I/O macrocells. This selection is automatically done by the fitter software when the I/O is configured as an input, all macrocell resources are still available, including the buried feedback, expander and cascade logic.

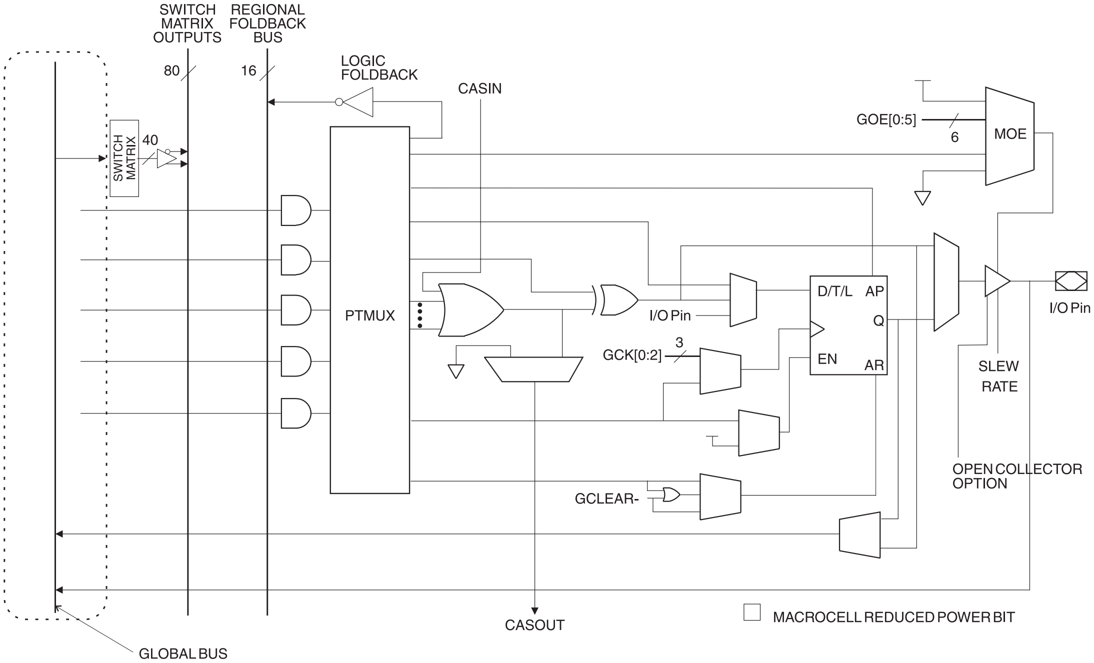
Global Bus/Switch Matrix

The global bus contains all input and I/O pin signals as well as the buried feedback signal from all 64 macrocells. The switch matrix in each logic block receives as its inputs all signals from the global bus. Under software control, up to 40 of these signals can be selected as inputs to the logic block.

Foldback Bus

Each macrocell also generates a foldback product term. This signal goes to the regional bus and is available to four macrocells. The foldback is an inverse polarity of one of the macrocell's product terms. The four foldback terms in each region allow generation of high fan-in sum terms (up to nine product terms) with little additional delay.

Figure 1. ATF1504ASV(L) Macrocell



Programmable Pin-keeper Option for Inputs and I/Os

The ATF1504ASV(L) offers the option of programming all input and I/O pins so that pin keeper circuits can be utilized. When any pin is driven high or low and then subsequently left floating, it will stay at that previous high- or low-level. This circuitry prevents unused input and I/O lines from floating to intermediate voltage levels, which causes unnecessary power consumption and system noise. The keeper circuits eliminate the need for external pull-up resistors and eliminate their DC power consumption.

DC and AC Operating Conditions

	Commercial	Industrial
Operating Temperature (Ambient))	0°C - 70°C	-40°C - 85°C
V_{CC} (3.3V) Power Supply	3.0V - 3.6V	3.0V - 3.6V

DC Characteristics

Symbol	Parameter	Condition			Min	Typ	Max	Units
I_{IL}	Input or I/O Low Leakage Current	$V_{IN} = V_{CC}$				-2	-10	µA
I_{IH}	Input or I/O High Leakage Current					2	10	
I_{OZ}	Tri-State Output Off-State Current	$V_O = V_{CC}$ or GND			-40		40	µA
I_{CC1}	Power Supply Current, Standby	V_{CC} = Max V_{IN} = 0, V_{CC}	Std Mode	Com.		60		mA
				Ind.		75		mA
			"L" Mode	Com.		5		µA
				Ind.		5		µA
I_{CC2}	Power Supply Current, Power-down Mode	V_{CC} = Max V_{IN} = 0, V_{CC}	"PD" Mode			0.1	5	mA
I_{CC3}(2)	Reduced-power Mode Supply Current, Standby	V_{CC} = Max V_{IN} = 0, V_{CC}	Std Power	Com		40		ma
				Ind		55		
V_{IL}	Input Low Voltage				-0.3		0.8	V
V_{IH}	Input High Voltage				1.7		V_{CCIO} + 0.3	V
V_{OL}	Output Low Voltage (TTL)	$V_{IN} = V_{IH}$ or V_{IL} V_{CCIO} = Min, I_{OL} = 8 mA		Com.			0.45	V
				Ind.			0.45	
	Output Low Voltage (CMOS)	$V_{IN} = V_{IH}$ or V_{IL} V_{CC} = Min, I_{OL} = 0.1 mA		Com.			0.2	V
				Ind.			0.2	V
V_{OH}	Output High Voltage - 3.3V (TTL)	$V_{IN} = V_{IH}$ or V_{IL} V_{CCIO} = Min, I_{OH} = -2.0 mA			2.4			V
	Output High Voltage - 3.3V (CMOS)	$V_{IN} = V_{IH}$ or V_{IL} V_{CCIO} = Min, I_{OH} = -0.1 mA			V_{CCIO} - 0.2			V

Notes: 1. Not more than one output at a time should be shorted. Duration of short circuit test should not exceed 30 sec.
2. When microcell reduced-power feature is enabled.

Pin Capacitance

	Typ	Max	Units	Conditions
C_{IN}		8	pF	V_{IN} = 0V; f = 1.0 MHz
$C_{I/O}$		8	pF	V_{OUT} = 0V; f = 1.0 MHz

Note: Typical values for nominal supply voltage. This parameter is only sampled and is not 100% tested.
The OGI pin (high-voltage pin during programming) has a maximum capacitance of 12 pF.

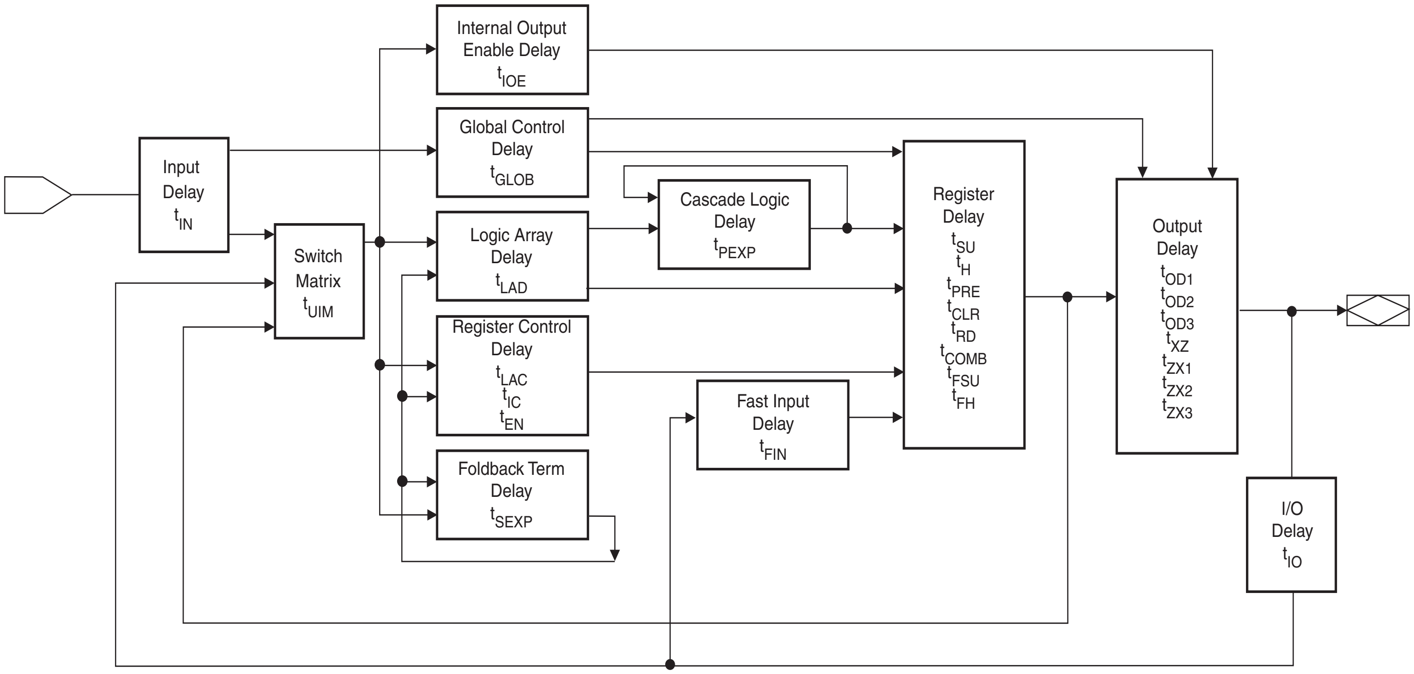
Absolute Maximum Ratings*

Temperature Under Bias	-40°C to +85°C
Storage Temperature	-65°C to +150°C
Voltage on Any Pin with Respect to Ground	-2.0V to +7.0V(1)
Voltage on Input Pins with Respect to Ground During Programming	-2.0V to +14.0V(1)
Programming Voltage with Respect to Ground	-2.0V to +14.0V(1)

*NOTICE: Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Note: 1. Minimum voltage is -0.6V DC, which may undershoot to -2.0V for pulses of less than 20 ns. Maximum output pin voltage is V_{CC} + 0.75V DC, which may overshoot to 7.0V for pulses of less than 20 ns.

Timing Model



AC Characteristics

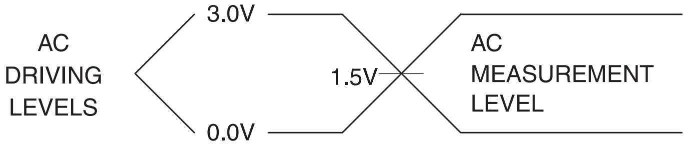
Symbol	Parameter	-15		-20		Units
		Min	Max	Min	Max	
t_{PD1}	Input or Feedback to Non-Registered Output	3	15		20	ns
t_{PD2}	I/O Input or Feedback to Non-Registered Feedback	3	12		16	ns
t_{SU}	Global Clock Setup Time	11		13.5		ns
t_H	Global Clock Hold Time	0		0		ns
t_{FSU}	Global Clock Setup Time of Fast Input	3		3		ns
t_{FH}	Global Clock Hold Time of Fast Input	1.0		2		MHz
t_{COP}	Global Clock to Output Delay		9		12	ns
t_{CH}	Global Clock High Time	5		6		ns
t_{CL}	Global Clock Low Time	5		6		ns
t_{ASU}	Array Clock Setup Time	5		7		ns
t_{AH}	Array Clock Hold Time	4		4		ns
t_{ACOP}	Array Clock Output Delay		15		18.5	ns
t_{ACH}	Array Clock High Time	6		8		ns
t_{ACL}	Array Clock Low Time	6		8		ns
t_{CNT}	Minimum Clock Global Period		13		17	ns
f_{CNT}	Maximum Internal Global Clock Frequency	76.9		66		MHz
t_{ACNT}	Minimum Array Clock Period		13		17	ns
f_{ACNT}	Maximum Internal Array Clock Frequency	76.9		58.8		MHz
f_{MAX}	Maximum Clock Frequency	100		83.3		MHz
t_{IN}	Input Pad and Buffer Delay		2		2.5	ns
t_{IO}	I/O Input Pad and Buffer Delay		2		2.5	ns
t_{FIN}	Fast Input Delay		2		2	ns
t_{SEXP}	Foldback Term Delay		8		10	ns
t_{PEXP}	Cascade Logic Delay		1		1	ns
t_{LAD}	Logic Array Delay		6		8	ns
t_{LAC}	Logic Control Delay		3.5		4.5	ns
t_{IOE}	Internal Output Enable Delay		3		3	ns
t_{OD1}	Output Buffer and Pad Delay (Slow slew rate = OFF; V_{CCIO} = 5V; C_L = 35 pF)		3		4	ns
t_{OD2}	Output Buffer and Pad Delay (Slow slew rate = OFF; V_{CCIO} = 3.3V; C_L = 35 pF)		3		4	ns
t_{OD3}	Output Buffer and Pad Delay (Slow slew rate = ON; V_{CCIO} = 5V or 3.3V; C_L = 35 pF)		5		6	ns
t_{ZX1}	Output Buffer Enable Delay (Slow slew rate = OFF; V_{CCIO} = 5.0V; C_L = 35 pF)		7		9	ns

AC Characteristics (Continued)

Symbol	Parameter	-15		-20		Units
		Min	Max	Min	Max	
t_{ZX2}	Output Buffer Enable Delay (Slow slew rate = OFF; V_{CCIO} = 3.3V; C_L = 35 pF)		7		9	ns
t_{ZX3}	Output Buffer Enable Delay (Slow slew rate = ON; V_{CCIO} = 5.0V/3.3V; C_L = 35 pF)		10		11	ns
t_{XZ}	Output Buffer Disable Delay (C_L = 5 pF)		6		7	ns
t_{SU}	Register Setup Time	5		6		ns
t_H	Register Hold Time	4		5		ns
t_{FSU}	Register Setup Time of Fast Input	2		2		ns
t_{FH}	Register Hold Time of Fast Input	2		2		ns
t_{RD}	Register Delay		2		2.5	ns
t_{COMB}	Combinatorial Delay		2		3	ns
t_{IC}	Array Clock Delay		6		7	ns
t_{EN}	Register Enable Time		6		7	ns
t_{GLOB}	Global Control Delay		2		3	ns
t_{PRE}	Register Preset Time		4		5	ns
t_{CLR}	Register Clear Time		4		5	ns
t_{UIM}	Switch Matrix Delay		2		2.5	ns
t_{RPA}	Reduced-power Adder[2]		10		13	ns

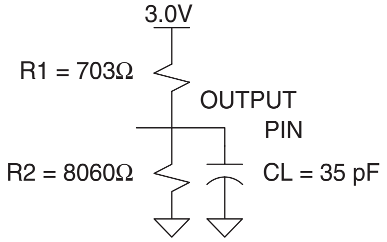
Notes:
1. See ordering information for valid part numbers.
2. The t_{RPA} parameter must be added to the t_{LAD}, t_{LAC},t_{TIC}, t_{ACL}, and t_{SEXP} parameters for macrocells running in the reduced-power mode.
3. See ordering information for valid part numbers.

Input Test Waveforms and Measurement Levels



t_R, t_F = 1.5 ns typical

Output AC Test Loads



JTAG-BST/ISP Overview

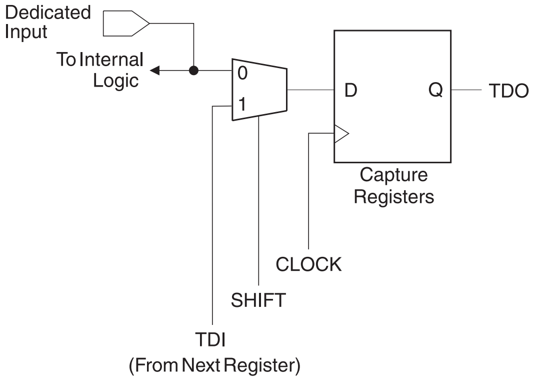
The JTAG boundary-scan testing is controlled by the Test Access Port (TAP) controller in the ATF1504ASV(L). The boundary-scan technique involves the inclusion of a shift-register stage (contained in a boundary-scan cell) adjacent to each component so that signals at component boundaries can be controlled and observed using scan testing principles. Each input pin and I/O pin has its own boundary-scan cell (BSC) in order to support boundary-scan testing. The ATF1504ASV(L) does not currently include a Test Reset (TRST) input pin because the TAP controller is automatically reset at power-up. The five JTAG modes supported include: SAMPLE/PRELOAD, EXTEST, BYPASS, IDCODE and HIGHZ. The ATF1504ASV(L)'s ISP can be fully described using JTAG's BSDL as described in IEEE Standard 1149.1b. This allows ATF1504ASV(L) programming to be described and implemented using any one of the third-party development tools supporting this standard.

The ATF1504ASV(L) has the option of using four JTAG-standard I/O pins for boundary-scan testing (BST) and in-system programming (ISP) purposes. The ATF1504ASV(L) is programmable through the four JTAG pins using the IEEE standard JTAG programming protocol established by IEEE Standard 1149.1 using 5V TTL-level programming signals from the ISP interface for in-system programming. The JTAG feature is a programmable option. If JTAG (BST or ISP) is not needed, then the four JTAG control pins are available as I/O pins.

JTAG Boundary-scan Cell (BSC) Testing

The ATF1504ASV(L) contains up to 68 I/O pins and four input pins, depending on the device type and package type selected. Each input pin and I/O pin has its own boundary-scan cell (BSC) in order to support boundary-scan testing as described in detail by IEEE Standard 1149.1. A typical BSC consists of three capture registers or scan registers and up to two update registers. There are two types of BSCs, one for input or I/O pin, and one for the macrocells. The BSCs in the device are chained together through the capture registers. Input to the capture register chain is fed in from the TDI pin while the output is directed to the TDO pin. Capture registers are used to capture active device data signals, to shift data in and out of the device and to load data into the update registers. Control signals are generated internally by the JTAG TAP controller. The BSC configuration for the input and I/O pins and macrocells are shown below.

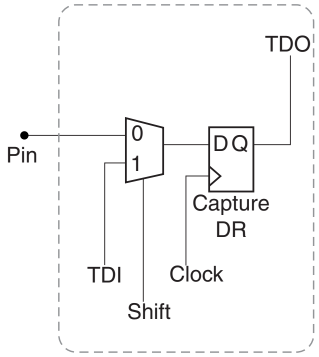
BSC Configuration for Input and I/O Pins (Except JTAG TAP Pins)

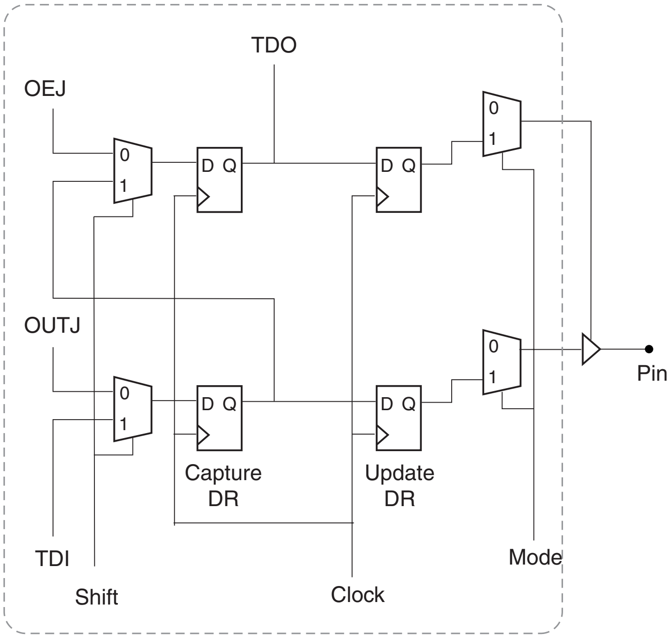


Note: The ATF1504ASV(L) has pull-up option on TMS and TDI pins. This feature is selected as a design option.

BSC Configuration for Macrocell

Pin BSC





Macrocell BSC

ATF1504ASV Dedicated Pinouts

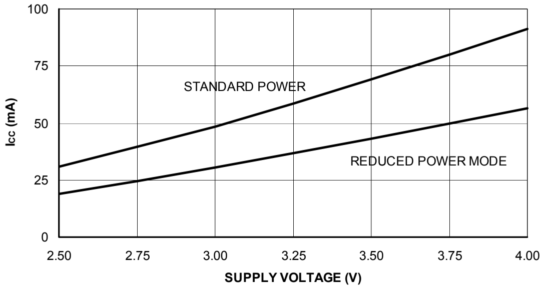
Dedicated Pin	44-lead TQFP	44-lead J-lead	68-lead J-lead	84-lead J-lead	100-lead PQFP	100-lead TQFP
INPUT/OE2/GCLK2	40	2	2	2	92	90
INPUT/GCLR	39	1	1	1	91	89
INPUT/OE1	38	44	68	84	90	88
INPUT/GCLK1	37	43	67	83	89	87
I/O /GCLK3	35	41	65	81	87	85
I/O / PD (1,2)	5, 19	11, 25	17, 37	20, 46	14, 44	12, 42
I/O / TDI (JTAG)	1	7	12	14	6	4
I/O / TMS (JTAG)	7	13	19	23	17	15
I/O / TCK (JTAG)	26	32	50	62	64	62
I/O / TDO (JTAG)	32	38	57	71	75	73
GND	4, 16, 24, 36	10, 22, 30, 42	6, 16, 26, 34, 38, 48, 58, 66	7, 19, 32, 42, 47, 59, 72, 82	13, 28, 40, 45, 61, 76, 88, 97	11, 26, 38, 43, 59, 74, 86, 95
V_{CC}	9, 17, 29, 41	3, 15, 23, 35	3, 11, 21, 31, 35, 43, 53, 63	3,13, 26, 38, 43, 53, 66, 78	5, 20, 36, 41, 53, 68, 84, 93	3, 18, 34, 39, 51, 66, 82, 91
N/C	–	–	–	–	1, 2, 7, 9, 24, 26, 29, 30, 51, 52, 55, 57, 72, 74, 79, 80	1, 2, 5, 7, 22, 24, 27, 28, 49, 50, 53, 55, 70, 72, 77, 78
# of Signal Pins	36	36	52	68	68	68
# User I/O Pins	32	32	48	64	64	64

OE (1, 2)	Global OE pins
GCLR	Global Clear pin
GCLK (1, 2, 3)	Global Clock pins
PD (1, 2)	Power-down pins
TDI, TMS, TCK, TDO	JTAG pins used for boundary-scan testing or in-system programming
GND	Ground pins
VCC	VCC pins for the device

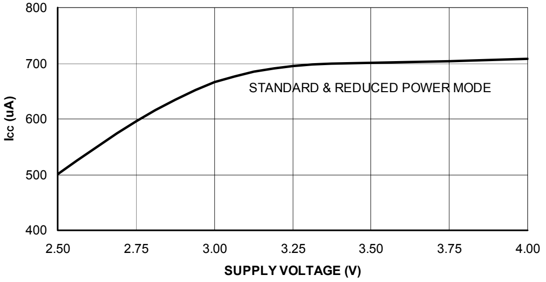
ATF1504ASV I/O Pinouts

MC	PLC	44-lead PLCC	44-lead TQFP	68-lead PLCC	84-lead PLCC	100-lead PQFP	100-lead TQFP	MC	PLC	44-lead PLCC	44-lead TQFP	68-lead PLCC	84-lead PLCC	100-lead PQFP	100-lead TQFP
1	A	12	6	18	22	16	14	33	C	24	18	36	44	42	40
2	A	-	-	-	21	15	13	34	C	-	-	-	45	43	41
3	A/ **PD1**	11	5	17	20	14	12	35	C/ **PD2**	25	19	37	46	44	42
4	A	9	3	15	18	12	10	36	C	26	20	39	48	46	44
5	A	8	2	14	17	11	9	37	C	27	21	40	49	47	45
6	A	-	-	13	16	10	8	38	C	-	-	41	50	48	46
7	A	-	-	-	15	8	6	39	C	-	-	-	51	49	47
8/ **TDI**	A	7	1	12	14	6	4	40	C	28	22	42	52	50	48
9	A	-	-	10	12	4	100	41	C	29	23	44	54	54	52
10	A	-	-	-	11	3	99	42	C	-	-	-	55	56	54
11	A	6	44	9	10	100	98	43	C	-	-	45	56	58	56
12	A	-	-	8	9	99	97	44	C	-	-	46	57	59	57
13	A	-	-	7	8	98	96	45	C	-	-	47	58	60	58
14	A	5	43	5	6	96	94	46	C	31	25	49	60	62	60
15	A	-	-	-	5	95	93	47	C	-	-	-	61	63	61
16	A	4	42	4	4	94	92	48/ **TCK**	C	32	26	50	62	64	62
17	B	21	15	33	41	39	37	49	D	33	27	51	63	65	63
18	B	-	-	-	40	38	36	50	D	-	-	-	64	66	64
19	B	20	14	32	39	37	35	51	D	34	28	52	65	67	65
20	B	19	13	30	37	35	33	52	D	36	30	54	67	69	67
21	B	18	12	29	36	34	32	53	D	37	31	55	68	70	68
22	B	-	-	28	35	33	31	54	D	-	-	56	69	71	69
23	B	-	-	-	34	32	30	55	D	-	-	-	70	73	71
24	B	17	11	27	33	31	29	56/ **TDO**	D	38	32	57	71	75	73
25	B	16	10	25	31	27	25	57	D	39	33	59	73	77	75
26	B	-	-	-	30	25	23	58	D	-	-	-	74	78	76
27	B	-	-	24	29	23	21	59	D	-	-	60	75	81	79
28	B	-	-	23	28	22	20	60	D	-	-	61	76	82	80
29	B	-	-	22	27	21	19	61	D	-	-	62	77	83	81
30	B	14	8	20	25	19	17	62	D	40	34	64	79	85	83
31	B	-	-	-	24	18	16	63	D	-	-	-	80	86	84
32/ **TMS**	B	13	7	19	23	17	15	64	D/ **GCLK3**	41	35	65	81	87	85

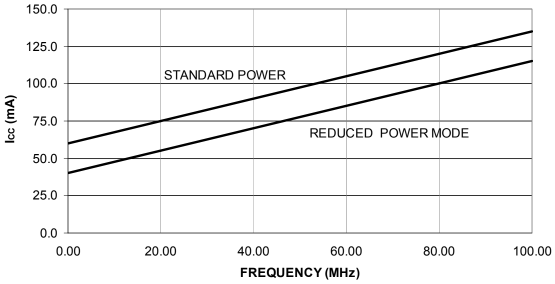
SUPPLY CURRENT VS. SUPPLY VOLTAGE
(T_A = 25°C, F = 0)



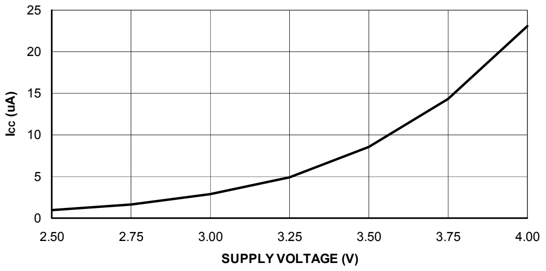
SUPPLY CURRENT VS. SUPPLY VOLTAGE
PIN-CONTROLLED POWER-DOWN MODE
(T_A = 25°C, F = 0)



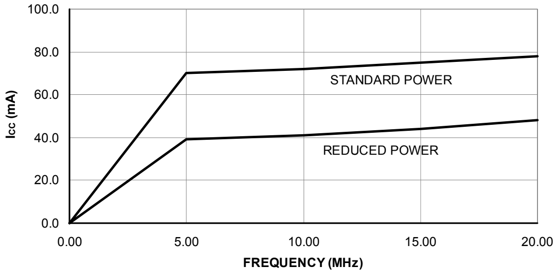
SUPPLY CURRENT VS. FREQUENCY
STANDARD POWER (T_A = 25°C)



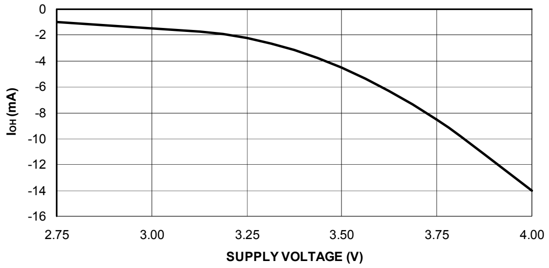
SUPPLY CURRENT VS. SUPPLY VOLTAGE
LOW-POWER ("L") VERSION
(T_A = 25°C, F = 0)



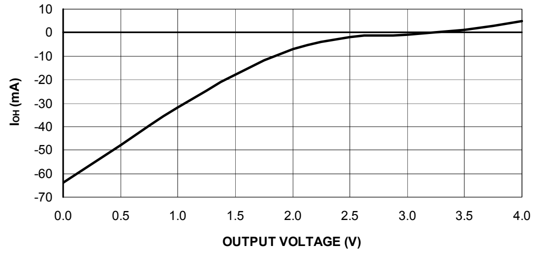
SUPPLY CURRENT VS. FREQUENCY
LOW-POWER ("L") VERSION
(T_A = 25°C)



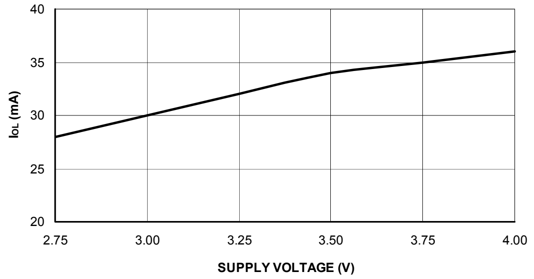
OUTPUT SOURCE CURRENT
VS. SUPPLY VOLTAGE
(V_{OH} = 2.4V, T_A = 25°C)



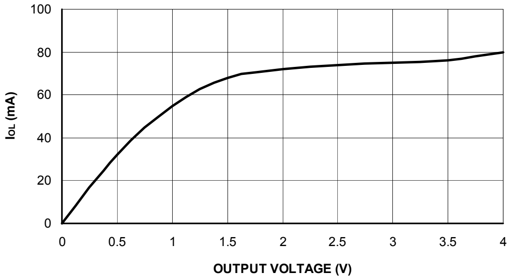
OUTPUT SOURCE CURRENT
VS. OUTPUT VOLTAGE
(V_{CC} = 3.3V, T_A = 25°C)



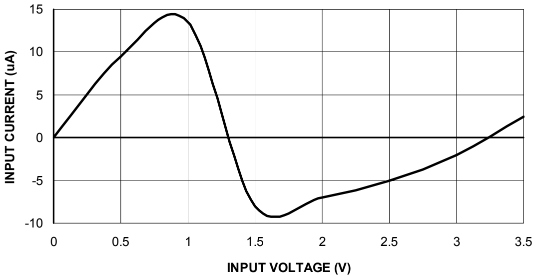
OUTPUT SINK CURRENT VS. SUPPLY VOLTAGE
(V_{OL} = 0.5V, T_A = 25°C)



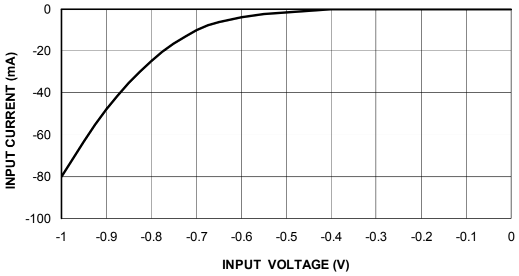
OUTPUT SINK CURRENT VS. OUTPUT VOLTAGE
(V_{CC} = 3.3V, T_A = 25°C)



INPUT CURRENT VS. INPUT VOLTAGE
(V_{CC} = 3.3V, T_A = 25°C)

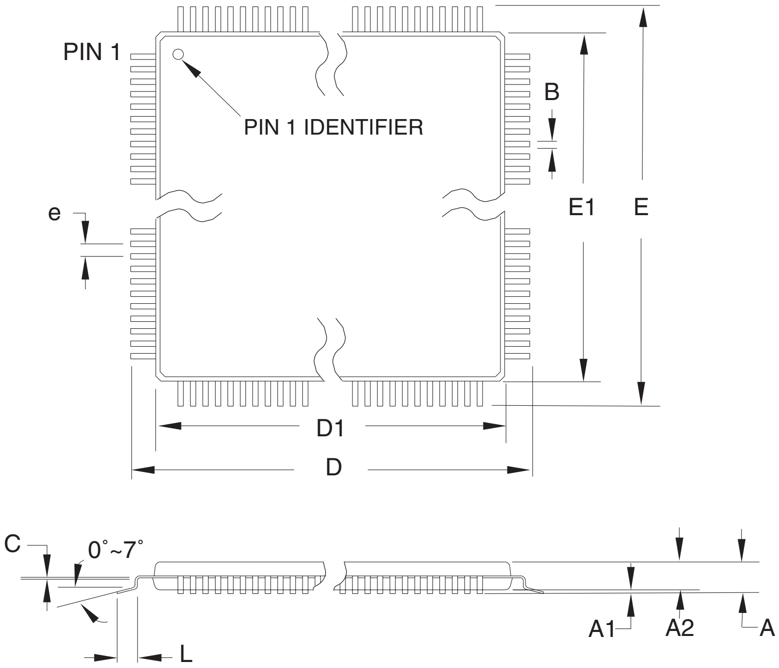


INPUT CLAMP CURRENT VS. INPUT VOLTAGE
(V_{CC} = 3.3V, T_A = 25°C)



Packaging Information

44A – TQFP



COMMON DIMENSIONS
(Unit of Measure = mm)

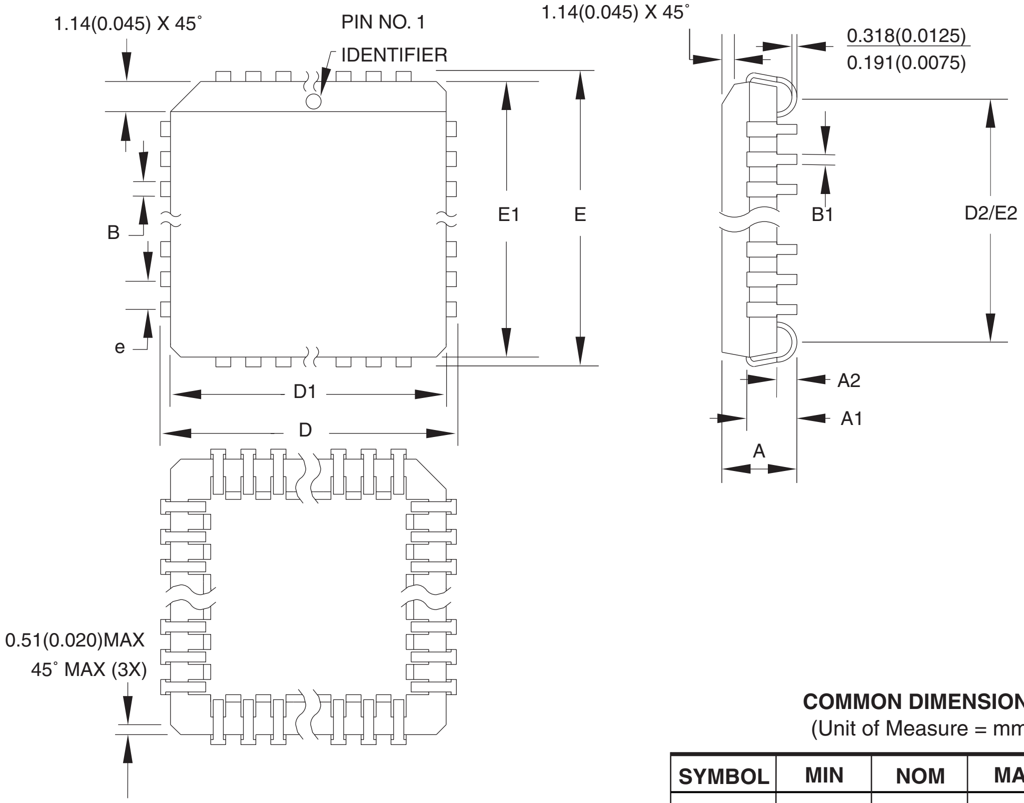
SYMBOL	MIN	NOM	MAX	NOTE
A	–	–	1.20	
A1	0.05	–	0.15	
A2	0.95	1.00	1.05	
D	11.75	12.00	12.25	
D1	9.90	10.00	10.10	Note 2
E	11.75	12.00	12.25	
E1	9.90	10.00	10.10	Note 2
B	0.30	–	0.45	
C	0.09	–	0.20	
L	0.45	–	0.75	
e	0.80 TYP			

Notes:
1. This package conforms to JEDEC reference MS-026, Variation ACB.
2. Dimensions D1 and E1 do not include mold protrusion. Allowable protrusion is 0.25 mm per side. Dimensions D1 and E1 are maximum plastic body size dimensions including mold mismatch.
3. Lead coplanarity is 0.10 mm maximum.

10/5/2001

	TITLE	DRAWING NO.	REV.
2325 Orchard Parkway San Jose, CA 95131	**44A,** 44-lead, 10 x 10 mm Body Size, 1.0 mm Body Thickness, 0.8 mm Lead Pitch, Thin Profile Plastic Quad Flat Package (TQFP)	44A	B

44J – PLCC



COMMON DIMENSIONS
(Unit of Measure = mm)

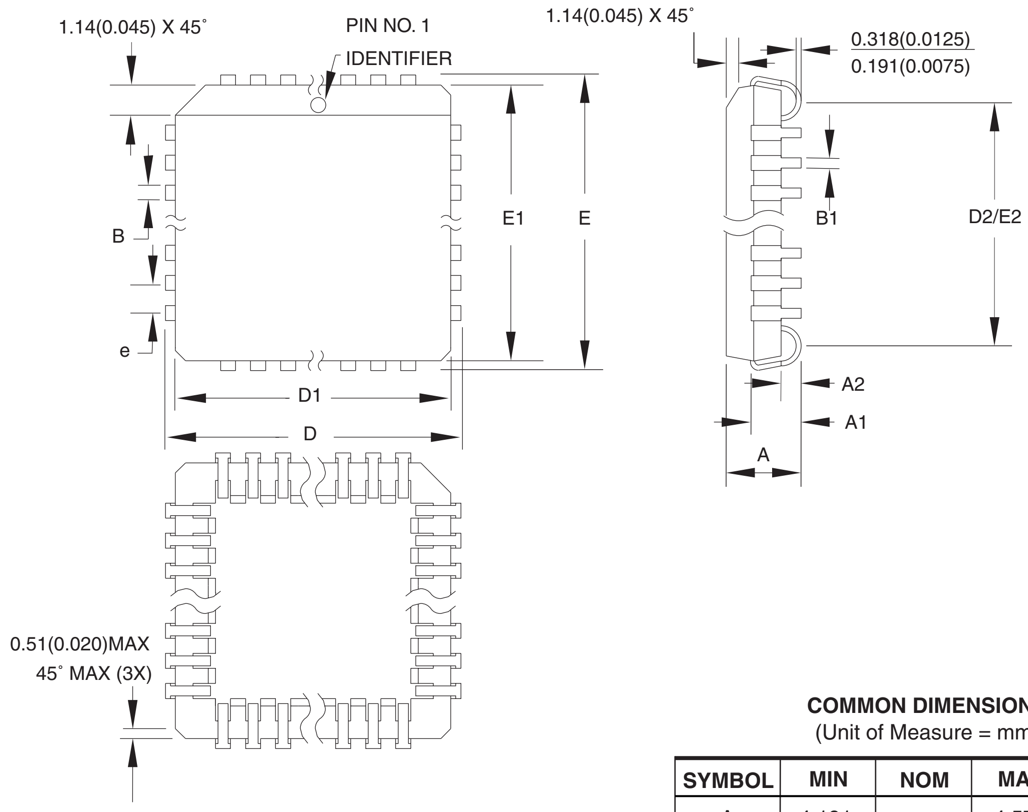
SYMBOL	MIN	NOM	MAX	NOTE
A	4.191	–	4.572	
A1	2.286	–	3.048	
A2	0.508	–	–	
D	17.399	–	17.653	
D1	16.510	–	16.662	Note 2
E	17.399	–	17.653	
E1	16.510	–	16.662	Note 2
D2/E2	14.986	–	16.002	
B	0.660	–	0.813	
B1	0.330	–	0.533	
e	1.270 TYP			

Notes:
1. This package conforms to JEDEC reference MS-018, Variation AC.
2. Dimensions D1 and E1 do not include mold protrusion. Allowable protrusion is .010"(0.254 mm) per side. Dimension D1 and E1 include mold mismatch and are measured at the extreme material condition at the upper or lower parting line.
3. Lead coplanarity is 0.004" (0.102 mm) maximum.

10/04/01

	TITLE	DRAWING NO.	REV.
2325 Orchard Parkway San Jose, CA 95131	**44J**, 44-lead, Plastic J-leaded Chip Carrier (PLCC)	44J	B

68J – PLCC



COMMON DIMENSIONS
(Unit of Measure = mm)

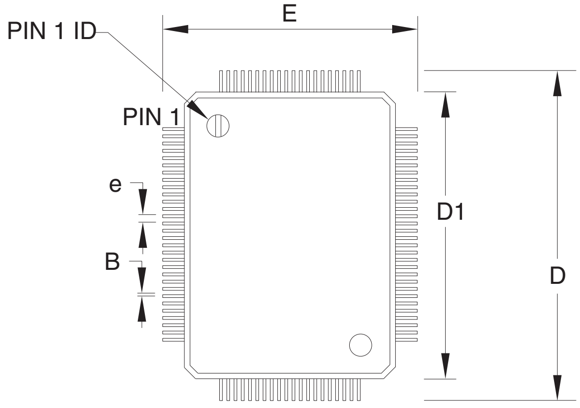
SYMBOL	MIN	NOM	MAX	NOTE
A	4.191	–	4.572	
A1	2.286	–	3.048	
A2	0.508	–	–	
D	25.019	–	25.273	
D1	24.130	–	24.333	Note 2
E	25.019	–	25.273	
E1	24.130	–	24.333	Note 2
D2/E2	22.606	–	23.622	
B	0.660	–	0.813	
B1	0.330	–	0.533	
e	1.270 TYP			

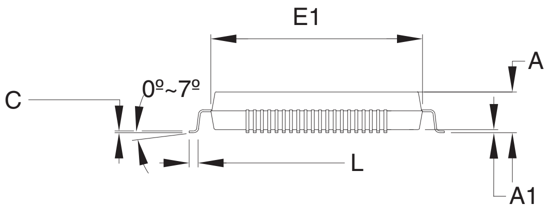
Notes:
1. This package conforms to JEDEC reference MS-018, Variation AE.
2. Dimensions D1 and E1 do not include mold protrusion. Allowable protrusion is .010"(0.254 mm) per side. Dimension D1 and E1 include mold mismatch and are measured at the extreme material condition at the upper or lower parting line.
3. Lead coplanarity is 0.004" (0.102 mm) maximum.

10/04/01

	TITLE	DRAWING NO.	REV.
2325 Orchard Parkway San Jose, CA 95131	**68J**, 68-lead, Plastic J-leaded Chip Carrier (PLCC)	68J	B

100Q1 – PQFP





COMMON DIMENSIONS
(Unit of Measure = mm)
JEDEC STANDARD MS-022, GC-1

SYMBOL	MIN	NOM	MAX	NOTE
A	–	3.04	3.4	
A1	0.25	0.33	0.5	
D	23.20 BSC			
E	17.20 BSC			
E1	14.00 BSC			
B	0.22	–	0.40	
D1	20 BSC			
L	0.73	–	1.03	
e	0.65 BSC			

09/10/2002

2325 Orchard Parkway San Jose, CA 95131	**TITLE** **100Q1**, 100-lead, 14 x 20 mm Body, 3.2 mm Footprint, 0.65 mm Pitch, Plastic Quad Flat Package (PQFP)	**DRAWING NO.** 100Q1	**REV.** B

Revision History

Revision	Comments
1409J	Green package options added.

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