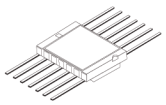
M54HCxxx, M54HCTxxx

Datasheet

Rad-hard high speed 2 to 6 V CMOS logic series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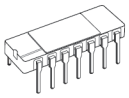
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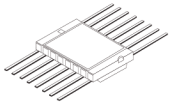
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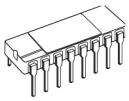
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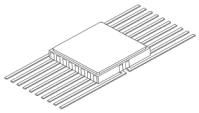
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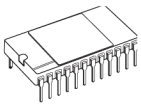
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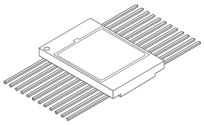
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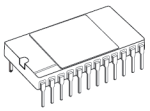

DIL-24

The upper metallic lid is floating

Product status link
M54HCxxx, M54HCTxxx

Features

- ESCC qualified
- 7 V Absolute maximum ratings
- 2 V to 6 V operating voltage for CMOS M54HCxxx series
- 4.5 V to 5.5 V operating voltage for TTL M54HCTxxx series
- Ceramic hermetic packages
- -55 °C to +125 °C operating temperature range
- Radiation hardness:
  - TID : 50 krad(Si)
  - SEL immune up to 125 MeV.cm²/mg
- ESCC qualified

Description

The M54HCxxx and M54HCTxxx series is composed of CMOS functions specifically designed to meet the radiation requirements of the aerospace industry. They include a large set of gates, flip-flops, multiplexers, counters, bus interface and several other functions.

The maximum operating frequency of the HC/HCT series varies between 20 to 55 MHz at 4.5 V and 25 °C depending on the products.

All types of the series feature a total dose hardness at 50 krad(Si), a high single event latch-up (SEL) immunity and a wide operating temperature range.

Housed in ceramic hermetic packages, all the products of the series are ESCC qualified, making them ideally suited for use in space and other harsh environmental conditions.

The complete specification of each type is available from the ESCC web site: https://escies.org using its ESCC part number.

Dedicated technical notes provide additional information on:

- TN1181: Engineering model quality level

- TN0873: Manufacturing and quality specification of products in die form

- TN1292: 100 krad(Si) versions

- TN0985: "Class S equivalent" flow specification, for use of ESCC products in a MIL-STD-883 environment.

1 Device summary

Table 1. **Device summary**

Part number	Description	F_{max} (1) [MHz]	TID [krad(Si)]	SEL/SET/SEU threshold [MeV.cm2/mg]	ESCC detail specification (2)	Package
HC Logic						
M54HC00	Quad 2-input NAND gate	55		125/15/-	9201/105	Flat-14E; DIL-14
M54HC02	Quad 2-input NOR gate	55		125/15/-	9201/113	Flat-14E; DIL-14
M54HC03	Quad 2-input NAND Open drain	40		125/15/-	9201/114	Flat-14E; DIL-14
M54HC04	Hex inverter	52		125/15/-	9401/033	Flat-14E; DIL-14
M54HC08	Quad 2-input AND gate	41		125/15/-	9201/106	Flat-14E; DIL-14
M54HC10	Triple 3-input NAND gate	50		125/15/-	9201/107	Flat-14E; DIL-14
M54HC11	Triple 3-input AND gate	40		125/15/-	9201/117	Flat-14E; DIL-14
M54HC14	Hex Schmitt inverter	35		125/18/-	9409/007	Flat-14E; DIL-14
M54HC27	Triple 3-input NOR gate	52		125/15/-	9201/109	Flat-14E; DIL-14
M54HC32	Quad 2-input OR gate	50		125/15/-	9201/111	Flat-14E; DIL-14
M54HC74	Dual D-type flip-flop with preset & clear	25		125/18/-	9203/050	Flat-14E; DIL-14
M54HC85	4-bit magnitude comparator	21		125/15/-	9209/004	Flat-16E; DIL-16
M54HC86	Quad exclusive OR gate	41		125/15/-	9201/119	Flat-14E; DIL-14
M54HC109	Dual J-K flip-flop with preset & clear	27		125/18/-	9306/048	Flat-16E; DIL-16
M54HC123	Dual retrig. monostable multivibrator with clear	15		125/18/-	9207/006	Flat-16E; DIL-16
M54HC125	Quad bus buffer 3-state	50		125/14/-	9401/039	Flat-14E; DIL-14
M54HC132	Quad 2-input Schmitt NAND gate	40		125/18/-	9201/120	Flat-14E; DIL-14
M54HC138	3-to-8 line decoder inverter	25	50	125/15/-	9408/046	Flat-16E; DIL-16
M54HC139	Dual 2-to-4 line decoder/demultiplexer	22		125/15/-	9205/017	Flat-16E; DIL-16
M54HC148	8-to-3 line priority encoder	21		125/15/-	9410/017	Flat-16E; DIL-16
M54HC151	8-channel multiplexer	23		125/15/-	9408/054	Flat-16E; DIL-16
M54HC153	Dual 4-channel multiplexer	34		125/15/-	9408/038	Flat-16E; DIL-16
M54HC154	4-to-16 line decoder/demultiplexer	25		125/15/-	9205/023	Flat-24E, DIL-24
M54HC157	Quad 2-channel multiplexer	40		125/15/-	9408/057	Flat-16E; DIL-16
M54HC160	Synchronous decade counter with async. clear	25		125/18/-	9205/062	Flat-16E; DIL-16
M54HC161	Synchronous binary counter with async. clear	25		125/18/-	9204/059	Flat-16E; DIL-16
M54HC164	8-bit SIPO shift register	25		125/18/-	9306/041	Flat-14E; DIL-14
M54HC165	8-bit PISO shift register	25		125/18/-	9306/042	Flat-16E; DIL-16
M54HC166	8-bit PISO shift register with clear	25		125/18/-	9306/043	Flat-16E; DIL-16
M54HC174	Hex D-type flip-flop with clear	27		125/18/-	9306/052	Flat-16E; DIL-16
M54HC175	Quad D-type flip-flop with clear	30		125/18/-	9203/052	Flat-16E; DIL-16
M54HC191	4-bit synchronous binary up/down counter	20		125/18/-	9204/066	Flat-16E; DIL-16
M54HC193	Synchronous up/down binary counter	16		125/18/-	9204/065	Flat-16E; DIL-16
M54HC237	3-to-8 line decoder latch	21		125/15/-	9205/021	Flat-16E; DIL-16
M54HC240	Octal bus buffer 3-state inverter	50		125/14/-	9401/034	Flat-20E; DIL-20

Part number	Description	F_{max} (1) [MHz]	TID [krad(Si)]	SEL/SET/SEU threshold [MeV.cm2/mg]	ESCC detail specification (2)	Package
M54HC244	Octal bus buffer 3-state	43	50	125/14/-	9401/048	Flat-20E; DIL-20
M54HC245	Octal bus transceiver 3-state	50		125/14/-	9405/013	Flat-20E; DIL-20
M54HC251	8-channel multiplexer 3-state	23		125/14/-	9408/048	Flat-16E; DIL-16
M54HC257	Quad 2-channel multiplexer 3-state	33		125/14/-	9408/047	Flat-16E
M54HC259	8-bit addressable latch	27		125/18/-	9203/073	Flat-16E
M54HC273	Octal D-type flip-flop with clear	27		125/18/-	9203/053	Flat-20E; DIL-20
M54HC373	Octal D-type latch 3-state	33		125/18/-	9203/059	Flat-20E; DIL-20
M54HC374	Octal D-type flip-flop 3-state	30		125/18/-	9203/060	Flat-20E; DIL-20
M54HC393	Dual binary counter	25		125/18/-	9204/074	Flat-14E; DIL-14
M54HC540	Octal bus buffer 3-state inverter	40		125/14/-	9401/049	Flat-20E
M54HC541	Octal bus buffer 3-state	40		125/14/-	9401/047	Flat-20E; DIL-20
M54HC573	Octal D-type latch 3-state	28		125/18/-	9202/072	Flat-20E; DIL-20
M54HC574	Octal D-type flip-flop 3-state	30		125/18/-	9203/054	Flat-20E; DIL-20
M54HC595	8-bit shift register output latch 3-state	27		125/18/-	9306/051	Flat-16E; DIL-16
M54HC597	8-bit latch/shift register	27		125/18/-	9306/054	Flat-16E; DIL-16
M54HC688	8-bit equality comparator	23		125/15/-	9209/005	Flat-20E; DIL-20
M54HC4020	14-stage binary counter	25		125/18/-	9204/070	Flat-16E; DIL-16
M54HC4040	12-stage binary counter	25		125/18/-	9204/069	Flat-16E; DIL-16
M54HC4049	Hex buffer/converter inverter	50		125/15/-	9401/037	Flat-16E; DIL-16
M54HC4050	Hex buffer/converter	50		125/15/-	9401/038	Flat-16E; DIL-16
M54HC4051	Single 8-channel analog mux/demux	83		125/15/-	9408/064	Flat-16E; DIL-16
M54HC4053	Triple 2-channel analog mux/demux	83		125/15/-	9408/065	Flat-16E; DIL-16
M54HC4060	14-stage binary counter/oscillator	20		125/18/-	9204/076	Flat-16E; DIL-16
M54HC4066	Quad bilateral switch	83		125/15/-	9408/052	Flat-14E; DIL-14
M54HC4094	8-bit SIPO shift register 3-state	20		125/18/-	9306/050	Flat-16E; DIL-16
M54HC4514	4-to-16 line decoder latch	18		125/18/-	9205/019	Flat-24E; DIL24
HCT Logic						
M54HCT74	Dual D-type flip-flop with preset & clear	25	50	125/18/-	9203/070	Flat-20E, DIL-20
M54HCT244	Octal bus buffer 3-state	36		125/14/-	9402/009	Flat-20E, DIL-20
M54HCT245	Octal bus transceiver 3-state	36		125/14/-	9405/014	Flat-20E, DIL-20

1. *Maximum frequency at 4.5 V / 25 °C as per JESD7a, provided for guidance only. Neither simulated, nor characterized in the successive fab transfers. Not tested in production.*

   JESD7a derating rules, also provided for guidance only, neither simulated, characterized nor tested in production are:

   at 2.0 V / 25 °C : multiply Fmax @ 4.5 V by 0.2;

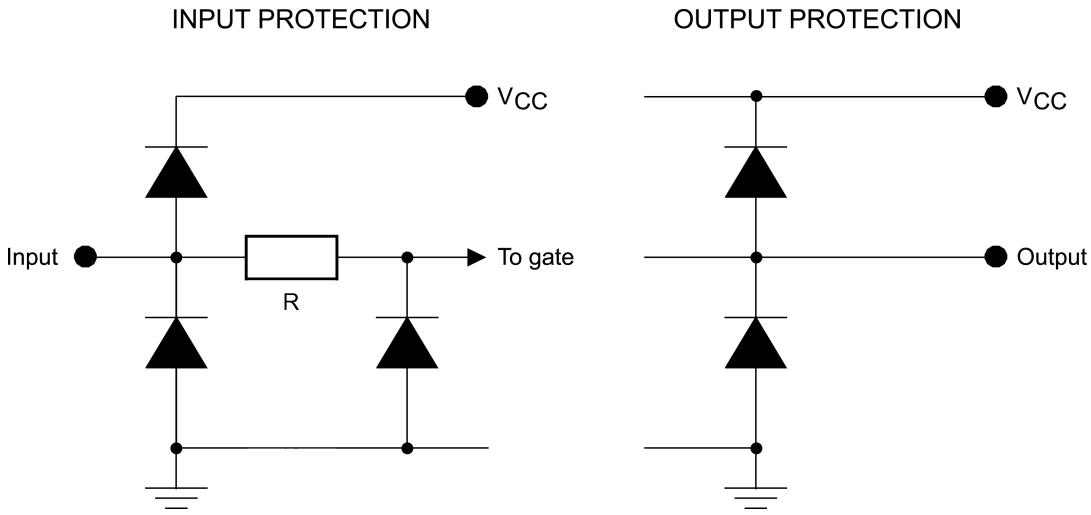
   at 6.0 V / 25 °C: multiply Fmax @ 4.5 V by 1.18;

   Over -55 to 125 °C : multiply Fmax @ 25 °C by 0.67 (worst case at 125 °C).

2. *The ESCC specifications of each product can be obtained from the ESCIES search engine at https://escies.org/specfamily/view using the xxxx/xxx format provided in the table.*

2 Input equivalent circuit diagram

Figure 1. Inputand equivalent circuit diagram



Note: For the 54HC4049 and the 54HC4050 input equivalent circuit, there is no diode connected to VCC.

3 Absolute maximum ratings

Table 2. Absolute maximum ratings - M54HC and M54HCT series

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	-0.5 to + 7 (1)	V
V_I	DC input voltage	-0.5 to V_{CC} + 0.5 (2)	V
V_O	DC output voltage	-0.5 to V_{CC} + 0.5	V
I_{IK}	DC input diode current	± 20	mA
I_{OK}	DC output diode current	± 20	mA
I_O	DC output current	± 25	mA
I_{CC} or I_{GND}	DC VCC or ground current	± 50	mA
P_D (3)	Power dissipation	300	mW
T_j	Maximum junction temperature	150	°C
T_{stg}	Storage temperature	-65 to +150	°C
T_L	Lead temperature (10 sec.)	265	°C

1. *M54HC4066 : -0.5 to 13.0*
2. *For HC4049 and HC4050, the V_{CC} side diodes are designed to allows an absolute max rating of +15 V on the inputs.*
3. *500 mW: ≤ 65 °C derate to 300 mW by 10 mW/°C: 65 °C to 85 °C.*

Table 3. Recommended operating conditions M54HC series

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	2 to 6	V
V_I	Input voltage	0 to V_{CC}	V
V_O	Output voltage	0 to V_{CC}	V
T_{op}	Operating temperature	-55 to 125	°C
t_r, t_f	Input rise and fall time (V_{CC} = 4.5 to 5.5 V)	0 to 500	ns

Table 4. Recommended operating conditions M54HCT series

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	4.5 to 5.5	V
V_I	Input voltage	0 to V_{CC}	V
V_O	Output voltage	0 to V_{CC}	V
T_{op}	Operating temperature	-55 to 125	°C
t_r, t_f	Input rise and fall time (V_{CC} = 4.5 to 5.5 V)	0 to 500	ns

Table 5. Thermal resistance

Device	Detail Specification	R_{thj-c} (1) °C/W	Device	Detail Specification	R_{thj-c} (1) °C/W
M54HC00	9201/105	49	**M54HC191**	9204/066	24
M54HC02	9201/113	41	**M54HC193**	9204/065	30
M54HC03	9201/114	57	**M54HC237**	9205/021	37
M54HC04	9401/033	40	**M54HC240**	9401/034	22
M54HC08	9201/106	49	**M54HC244**	9401/048	22
M54HC10	9201/107	45	**M54HCT244**	9402/009	20
M54HC11	9201/117	44	**M54HC245**	9405/013	15
M54HC14	9409/007	34	**M54HCT245**	9405/014	14
M54HC27	9201/109	43	**M54HC251**	9408/048	47
M54HC32	9201/111	46	**M54HC257**	9408/047	39
M54HC74	9203/050	35	**M54HC259**	9203/073	35
M54HCT74	9203/070	35	**M54HC273**	9203/053	25
M54HC85	9209/004	42	**M54HC373**	9203/059	22
M54HC86	9201/119	35	**M54HC374**	9203/060	22
M54HC109	9306/048	44	**M54HC393**	9204/074	24
M54HC123	9207/006	32	**M54HC540**	9401/049	23
M54HC125	9401/039	32	**M54HC541**	9401/047	23
M54HC132	9201/120	35	**M54HC573**	9202/072	20
M54HC138	9408/046	42	**M54HC574**	9203/054	20
M54HC139	9205/017	47	**M54HC595**	9306/051	23
M54HC148	9410/017	34	**M54HC597**	9306/054	31
M54HC151	9408/054	47	**M54HC688**	9209/005	31
M54HC153	9408/038	41	**M54HC4020**	9204/070	26
M54HC154	9205/023	24	**M54HC4040**	9204/069	27
M54HC157	9408/057	44	**M54HC4049**	9401/037	43
M54HC160	9204/062	36	**M54HC4050**	9401/038	39
M54HC161	9204/059	36	**M54HC4051**	9408/064	22
M54HC164	9306/041	28	**M54HC4053**	9408/065	31
M54HC165	9306/042	51	**M54HC4060**	9204/076	28
M54HC166	9306/043	39	**M54HC4066**	9408/052	27
M54HC174	9306/052	43	**M54HC4094**	9306/050	29
M54HC175	9203/052	37	**M54HC4514**	9205/019	21

1. *Calculated typical values for the Flat versions of the products, with the package top as cold plate (reference temperature), as per JESD51 best practice guideline to provide worst case data (in all the product of the series, the die is mounted on the package bottom. Lower Rthj-c must therefore be expected.)*

4 Radiation data

4.1 Total ionization dose

All the products of the series are ESCC qualified at 50 krad(Si) as per ESCC 22900, on 10 pieces, 5 biased and 5 unbiased, at low dose rate (210 rad(Si)/hour).

Each wafer lot is in addition submitted to wafer lot qualification on 5 pieces in the conditions identified during the qualification as worst case, biased, at the same dose rate and with the same test method.

Some products of the series are available upon request at 100 krad(Si), supported by a dedicated wafer qualification as per ESCC 22900, at high dose rate (20 krad(Si)/hour), on 5 pieces, biased as per the detail specification of each product. See TN1292 for details.

4.2 Heavy ions

4.2.1 Test strategy

The HC series is characterized under heavy ions as per ESCC25100 through 6 test vehicles covering the whole series by similarity, the M54HC00, M54HC14, M54HC245 , M54HC597, M54HC688 and M54HC4066, using dice from the latest AMK6 6'' diffusion line.

This characterization applies by similarity to parts using dice from the previous AMK5 5'' wafer line, both lines using the same wafer fab, the same technology and mostly the same equipment. Furthermore, an ESA characterization performed in 1997 has validated the similarities using the then applicable test method (biased only…) on 5 test vehicles covering the whole family by similarity, the M54HC08, M54HC157, M54HC273, M54HC4040, M54HC4053. These additional test reports are available upon request.

The products of the series still manufactured with dice from ST legacy Carrollton 4'' fab have been SEE qualified through radiation test made using the then applicable test method -Iodine Ion, 70° tilt, biased only, no SET…) on 5 test vehicles covering the whole series by similarity, the M54HC00, M54HC138, M54HC174 and M54HC390. The test results are available upon request.

4.2.2 AMK6 SEE test results summary

The table below provides the AMK6 SEE test results.

Device type	SEL @ 6V	SET @ 2 V		SEU	
		LETth	σ	LETth	σ
M54HC00	Free up to 125 MeV.cm²/mg	15	$3.0 . 10^{-4}$	Not applicable	Not applicable
M54HC14		18	$1.5 . 10^{-4}$		
M54HC245		14	$2.4 . 10^{-3}$		
M54HC597		18	$2.2 .10^{-4}$		

Note: The test of the M54HC688 and M54HC4066 are not yet available.

Note: The change of state of flip-flops or register cells of the M54HC597 and all the sequential products is accounted as SET.

4.2.3 AMK6 SEE test vehicle coverage

The table below provides for each parts number the applicable AMK6 SEE **test vehicle**.

Device	Detail Specification	Class		Device	Detail Specification	Class
M54HC00	9201/105	Combinational		M54HC193	9204/065	Sequential
M54HC02	9201/113	Combinational		M54HC194	9306/047	Sequential
M54HC03	9201/114	Combinational		M54HC237	9205/021	Combinational
M54HC04	9401/033	Combinational		M54HC240	9401/034	3-state
M54HC08	9201/106	Combinational		M54HC244	9401/048	3-state
M54HC10	9201/107	Combinational		M54HCT244	9402/009	3-state
M54HC11	9201/117	Combinational		**M54HC245**	**9405/013**	**3-state**
M54HC14	**9409/007**	**Schmitt trigger**		M54HCT245	9405/014	3-state
M54HC20	9201/118	Combinational		M54HC251	9408/048	3-state
M54HC21	9201/108	Combinational		M54HC257	9408/047	3-state
M54HC27	9201/109	Combinational		M54HC259	9203/073	Sequential
M54HC30	9201/110	Combinational		M54HC273	9203/053	Sequential
M54HC32	9201/111	Combinational		M54HC283	9202/075	Combinational
M54HC74	9203/050	Sequential		M54HC367	9401/044	3-state
M54HCT74	9203/070	Sequential		M54HC373	9203/059	Sequential
M54HC85	9209/004	Combinational		M54HCT373	9203/064	Sequential
M54HC86	9201/119	Combinational		M54HC374	9203/060	Sequential
M54HC109	9306/048	Sequential		M54HC393	9204/074	Sequential
M54HC123	9207/006	Sequential		M54HC540	9401/049	3-state
M54HC125	9401/039	3-state		M54HC541	9401/047	3-state
M54HC132	9201/120	Schmitt trigger		M54HC573	9202/072	Sequential
M54HC137	9205/013	Sequential		M54HC574	9203/054	Sequential
M54HC138	9408/046	Combinational		M54HC590	9204/071	Sequential
M54HC139	9205/017	Combinational		M54HC595	9306/051	Sequential
M54HC148	9410/017	Combinational		**M54HC597**	**9306/054**	**Sequential**
M54HC151	9408/054	Combinational		**M54HC688**	**9209/005**	**Comparator**
M54HC153	9408/038	Combinational		M54HC4020	9204/070	Sequential
M54HC154	9205/023	Combinational		M54HC4040	9204/069	Sequential
M54HC157	9408/057	Combinational		M54HC4049	9401/037	Combinational
M54HC158	9408/059	Combinational		M54HC4050	9401/038	Combinational
M54HC160	9204/062	Sequential		M54HC4051	9408/064	Combinational
M54HC161	9204/059	Sequential		M54HC4053	9408/065	Combinational
M54HC164	9306/041	Sequential		M54HC4060	9204/076	Oscillator
M54HC165	9306/042	Sequential		**M54HC4066**	**9408/052**	**Switch**
M54HC166	9306/043	Sequential		M54HC4078	9201/123	Combinational
M54HC174	9306/052	Sequential		M54HC4094	9306/050	Sequential
M54HC175	9203/052	Sequential		M54HC4514	9205/019	Sequential
M54HC191	9204/066	Sequential				

5 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

5.1 Ceramic Flat-14E package information

Figure 2. **Ceramic Flat-14E package outline**

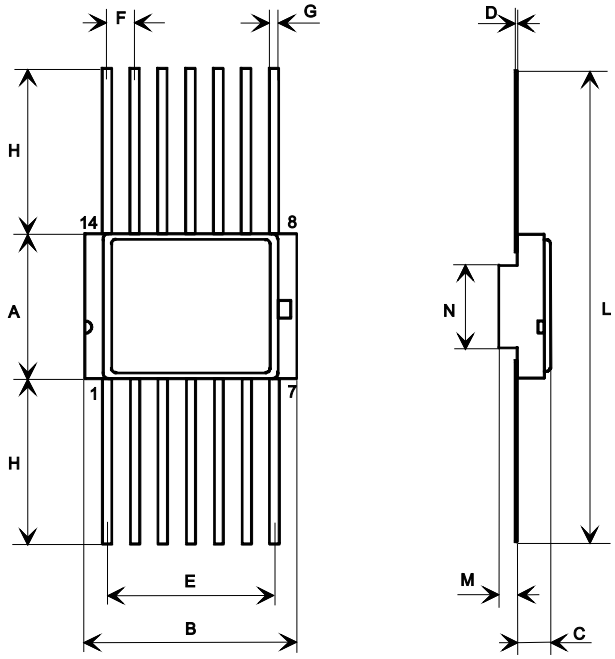


Table 6. **Ceramic Flat-14E mechanical data**

Symbol	Dimensions (mm)			Dimensions (inches)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	6.75	6.91	7.06	0.266	0.272	0.278
B	9.76	9.95	10.14	0.384	0.392	0.399
C	1.49		1.95	0.059		0.077
D	0.10	0.127	0.15	0.004	0.005	0.006
E	7.50	7.62	7.75	0.295	0.300	0.305
F		1.27			0.050	
G	0.38	0.43	0.48	0.015	0.017	0.019
H	6			0.236		
L	18.75		22.00	0.738		0.866
M	0.33	0.38	0.43	0.013	0.015	0.017
N		4.31			0.170	

Lead finishing is provided below. It is compliant with ECSS23500 iss8.
- Gold finish : Gold plating. Minimum thickness : 60 mils
- Solder dip finish : Sn63Pb37 plating. Minimum thickness : 100 mils

5.2 Ceramic Flat-16E package information

Figure 3. **Ceramic Flat-16E package outline**

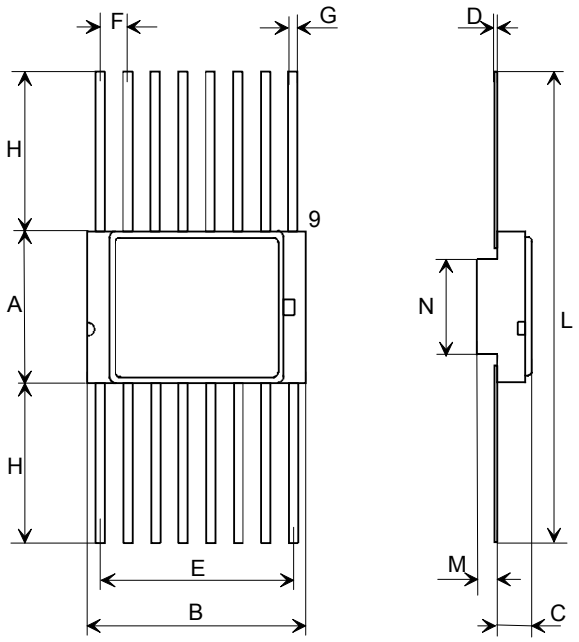


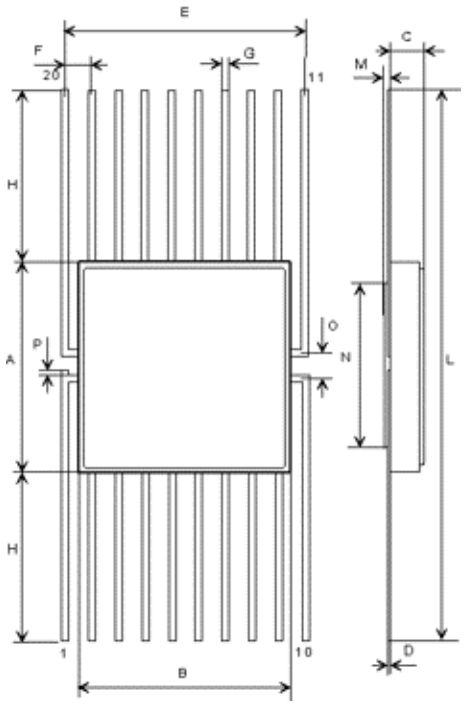
Table 7. **Ceramic Flat-16E package mechanical data**

Symbol	Dimensions (mm)			Dimensions (inches)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	6.75	6.91	7.06	0.266	0.272	0.278
B	9.76	9.94	10.14	0.384	0.391	0.399
C	1.49		1.95	0.059		0.077
D	0.102	0.127	0.152	0.004	0.005	0.006
E	8.76	8.89	9.01	0.345	0.350	0.355
F		1.27			0.050	
G	0.38	0.43	0.48	0.015	0.017	0.019
H	6.0			0.236		
L	18.75		22.0	0.738		0.866
M	0.33	0.38	0.43	0.013	0.015	0.017
N		4.31			0.170	

Lead finishing is provided below. It is compliant with ECSS23500 iss8.
- Gold finish : Gold plating. Minimum thickness : 60 mils
- Solder dip finish : Sn63Pb37 plating. Minimum thickness : 100 mils

5.3 Ceramic Flat-20E package information

Figure 4. Ceramic Flat-20E package outline



Note: Pin 1 is identified by the 0.18 mm / 0.007 inch extra growth of its lead identified by the letter "P" in the dimension table.

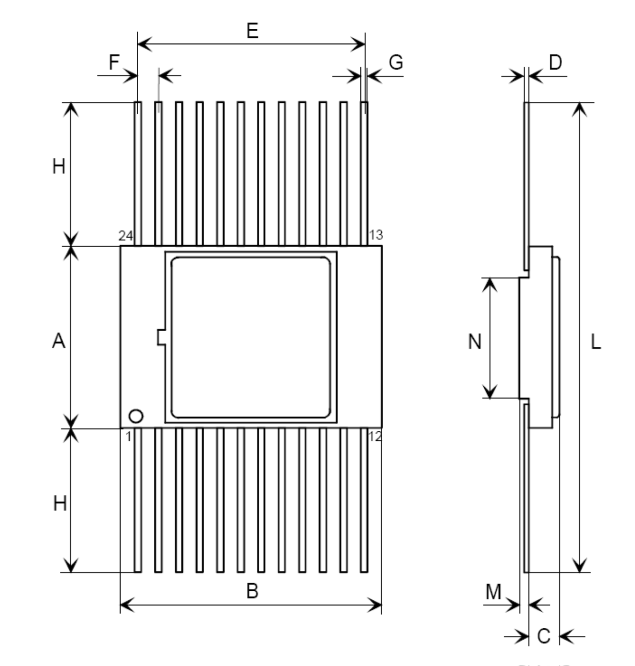
Table 8. Ceramic Flat-20E package mechanical data

Symbol	Dimensions (mm)			Dimensions (inches)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	9.98	10.16	10.34	0.393	0.400	0.407
B	9.98	10.16	10.34	0.393	0.400	0.407
C	1.45	1.61	1.78	0.057	0.0635	0.070
D	0.10	0.127	0.18	0.004	0.005	0.007
E	11.30	11.43	11.56	0.445	0.450	0.455
F		1.27			0.050	
G	0.38	0.43	0.48	0.015	0.017	0.019
H	7.24		8.16	0.285		0.320
L	24.46		26.67	0.963		1.050
M	0.45	0.50	0.55	0.018	0.020	0.022
N		7.87			0.310	
O	1.14	1.27	1.40	0.045	0.050	0.055
P	0.10	0.18	0.25	0.004	0.007	0.010

Lead finishing is provided below. It is compliant with ECSS23500 iss8.
- Gold finish : Gold plating. Minimum thickness : 60 mils
- Solder dip finish : Sn63Pb37 plating. Minimum thickness : 100 mils

5.4 Ceramic Flat-24 package information

Figure 5. Ceramic Flat-24 package outline



1. The upper metallic lid is not electrically connected to any pins, nor to the IC die inside the package. Connecting unused pins or metal lid to ground or to the power supply does not affect the electrical characteristics.

Table 9. Ceramic Flat-24 package mechanical data

Symbol	Dimensions (mm)		
	Min.	Typ.	Max.
A	10.70	11.00	11.30
B	15.30	15.49	15.70
C	1.45		1.90
D	0.23	0.254	0.30
E	13.84	13.97	14.10
F	1.22	1.27	1.32
G	0.45	0.508	0.55
H	7.25		8.25
L	25.00		28.00
M	0.45	0.508	0.55
N		7.01	

Lead finishing is provided below. It is compliant with ECSS23500 iss8.
- Gold finish : Gold plating. Minimum thickness : 60 mils
- Solder dip finish : Sn63Pb37 plating. Minimum thickness : 100 mils

5.5 Ceramic DIL-14 package information

Figure 6. **Ceramic DIL-14 package outline**

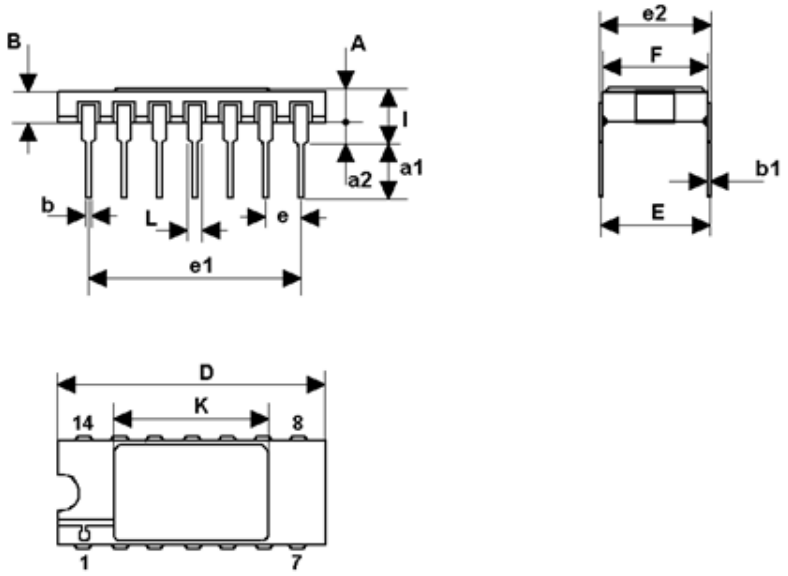


Table 10. **Ceramic DIL-14 package mechanical data**

Symbol	Dimensions (mm)			Dimensions (inches)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.1		2.54	0.083		0.100
a1	3.00		3.70	0.118		0.146
a2	0.63	0.88	1.14	0.025	0.035	0.045
B	1.82	2.03	2.39	0.072	0.080	0.094
b	0.40	0.45	0.50	0.016	0.018	0.020
b1	0.20	0.254	0.30	0.008	0.010	0.012
D	18.79	19.00	19.20	0.740	0.748	0.756
E	7.36	7.62	7.87	0.290	0.300	0.310
e		2.54			0.100	
e1	15.11	15.24	15.37	0.595	0.600	0.605
e2	7.62	7.87	8.12	0.300	0.310	0.320
F	7.11		7.75	0.280		0.305
I			3.70			0.146
K	10.90		12.1	0.429		0.476
L	1.14	1.27	1.5	0.045	0.050	0.059

Lead finishing is provided below. It is compliant with ECSS23500 iss8.
- Gold finish : Gold plating. Minimum thickness : 60 mils
- Solder dip finish : Sn63Pb37 plating. Minimum thickness : 100 mils

5.6 Ceramic DIL-16 package information

Figure 7. **Ceramic DIL-16 package outline**

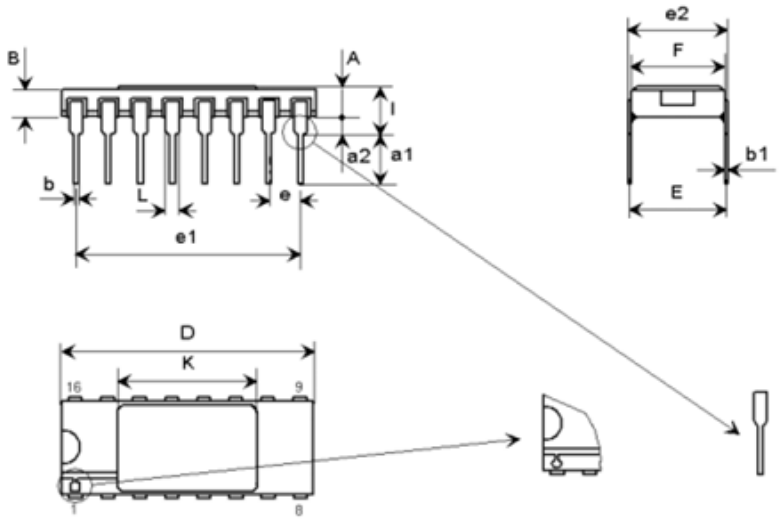


Table 11. **Ceramic DIL-16 package mechanical data**

Symbol	Dimensions(mm)			Dimensions (inches)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.71	0.083		0.107
a1	3.00		3.70	0.118		0.146
a2	0.63	0.88	1.14	0.025	0.035	0.045
B	1.82		2.39	0.072		0.094
b	0.40	0.45	0.50	0.016	0.018	0.020
b1	0.20	0.254	0.30	0.008	0.010	0.012
D	20.06	20.32	20.58	0.790	0.800	0.810
E	7.36	7.62	7.87	0.290	0.300	0.310
e		2.54			0.100	
e1	17.65	17.78	17.90	0.695	0.700	0.705
e2	7.62	7.87	8.12	0.300	0.310	0.320
F	7.29	7.49	7.70	0.287	0.295	0.303
I			3.83			0.151
K	10.90		12.10	0.429		0.476
L	1.14		1.50	0.045		0.059

Lead finishing is provided below. It is compliant with ECSS23500 iss8.
- Gold finish : Gold plating. Minimum thickness : 60 mils
- Solder dip finish : Sn63Pb37 plating. Minimum thickness : 100 mils

5.7 Ceramic DIL-20 package information

Figure 8. **Ceramic DIL-20 package outline**

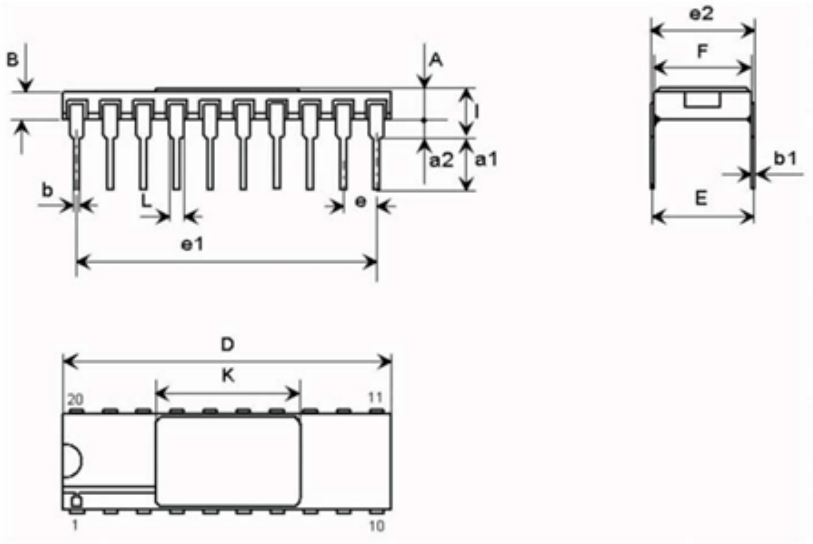


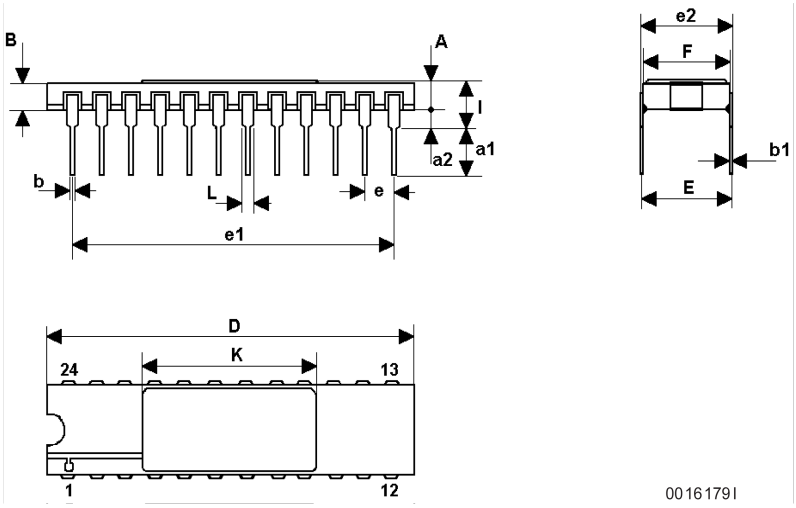
Table 12. **Ceramic DIL-20 package mechanical data**

Symbol	Dimensions (mm)			Dimensions (inches)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.1		2.72	0.083		0.107
a1	3		3.7	0.118		0.146
a2	0.63	0.88	1.14	0.025	0.035	0.045
B	1.93	2.03	2.23	0.076	0.080	0.088
b	0.4	0.45	0.5	0.016	0.018	0.020
b1	0.2	0.254	0.3	0.008	0.010	0.012
D	25.14	25.4	25.65	0.990	1.000	1.010
E	7.36	7.62	7.87	0.290	0.300	0.310
e		2.54			0.100	
e1	22.73	22.86	22.99	0.895	0.900	0.905
e2	7.62	7.87	8.12	0.300	0.310	0.320
F	7.29	7.49	7.62	0.287	0.295	0.300
I			3.86			0.152
K	11.3		11.56	0.445		0.455
L	1.14	1.27	1.4	0.045	0.050	0.055

Lead finishing is provided below. It is compliant with ECSS23500 iss8.
- Gold finish : Gold plating. Minimum thickness : 60 mils
- Solder dip finish : Sn63Pb37 plating. Minimum thickness : 100 mils

5.8 Ceramic DIL-24 package information

Figure 9. Ceramic DIL-20 package outline



1. The upper metallic lid is not electrically connected to any pins, nor to the IC die inside the package. Connecting unused pins or metal lid to ground or to the power supply does not affect the electrical characteristics.

Table 13. Ceramic DIL-24 package mechanical data

Symbol	Dimensions (mm)		
	Min.	Typ.	Max.
A	2.159	1.931	2.387
a1	1.270	1.016	1.524
a2	.307	.274	.340
B	1.270		
b1	0.457	0.407	0.507
b2	.254	0.229	0.304
C	2.466	2.205	2.727
D	30.48	30.17	30.78
E	15.24	14.98	15.49
e	2.540	2.410	2.670
e3	27.94	27.81	28.06
F	15.11	14.85	15.36
K	12.80	12.60	13.00
K1	12.80	12.60	13.00
L	3.300	3.300	3.800

Lead finishing is provided below. It is compliant with ECSS23500 iss8.
- Gold finish : Gold plating. Minimum thickness : 60 mils
- Solder dip finish : Sn63Pb37 plating. Minimum thickness : 100 mils

6 Order codes

Table 14. **Ordering information**

ST Part Number (1)	ESCC part number	Quality Level	Package (2)	Finishing	Marking (3)	Packing	Mass g
M54HC00K1	-	Engineering Model	Flat-14E	Gold	M54HC00K1	Strip Pack	
M54HC00KG	920110501F	ESCC	Flat-14E	Gold	920110501F	Strip Pack	0.70
M54HC00KT	920110502F	ESCC	Flat-14E	Solder Dip	920110502F	Strip Pack	
M54HC00DG	920110503F	ESCC	DIL-14	Gold	920110503F	Strip Pack	2.20
M54HC00DT	920110504F	ESCC	DIL-14	Solder Dip	920110504F	Strip Pack	
M54HC02K1	-	Engineering Model	Flat-14E	Gold	M54HC02K1	Strip Pack	
M54HC02KG	920111301F	ESCC	Flat-14E	Gold	920111301F	Strip Pack	0.70
M54HC02KT	920111302F	ESCC	Flat-14E	Solder Dip	920111302F	Strip Pack	
M54HC02DG	920111303F	ESCC	DIL-14	Gold	920111303F	Strip Pack	2.20
M54HC02DT	920111304F	ESCC	DIL-14	Solder Dip	920111304F	Strip Pack	
M54HC03K1	-	Engineering Model	Flat-14E	Gold	M54HC03K1	Strip Pack	
M54HC03KG	920111401F	ESCC	Flat-14E	Gold	920111401F	Strip Pack	0.70
M54HC03KT	920111402F	ESCC	Flat-14E	Solder Dip	920111402F	Strip Pack	
M54HC03DG	920111403F	ESCC	DIL-14	Gold	920111403F	Strip Pack	2.20
M54HC03DT	920111404F	ESCC	DIL-14	Solder Dip	920111404F	Strip Pack	
M54HC04K1	-	Engineering Model	Flat-14E	Gold	M54HC04K1	Strip Pack	
M54HC04KG	940103301F	ESCC	Flat-14E	Gold	940103301F	Strip Pack	0.70
M54HC04KT	940103302F	ESCC	Flat-14E	Solder Dip	940103302F	Strip Pack	
M54HC04DG	940103303F	ESCC	DIL-14	Gold	940103303F	Strip Pack	2.20
M54HC04DT	940103304F	ESCC	DIL-14	Solder Dip	940103304F	Strip Pack	
M54HC08K1	-	Engineering Model	Flat-14E	Gold	M54HC08K1	Strip Pack	
M54HC08KG	920110601F	ESCC	Flat-14E	Gold	920110601F	Strip Pack	0.70
M54HC08KT	920110602F	ESCC	Flat-14E	Solder Dip	920110602F	Strip Pack	
M54HC08DG	920110603F	ESCC	DIL-14	Gold	920110603F	Strip Pack	2.20
M54HC08DT	920110604F	ESCC	DIL-14	Solder Dip	920110604F	Strip Pack	
M54HC10K1	-	Engineering Model	Flat-14E	Gold	M54HC10K1	Strip Pack	
M54HC10KG	920110701F	ESCC	Flat-14E	Gold	920110701F	Strip Pack	0.70
M54HC10KT	920110702F	ESCC	Flat-14E	Solder Dip	920110702F	Strip Pack	
M54HC10DG	920110703F	ESCC	DIL-14	Gold	920110703F	Strip Pack	2.20
M54HC10DT	920110704F	ESCC	DIL-14	Solder Dip	920110704F	Strip Pack	
M54HC11K1	-	Engineering Model	Flat-14E	Gold	M54HC11K1	Strip Pack	
M54HC11KG	920111701F	ESCC	Flat-14E	Gold	920111701F	Strip Pack	0.70
M54HC11KT	920111702F	ESCC	Flat-14E	Solder Dip	920111702F	Strip Pack	
M54HC11DG	920111703F	ESCC	DIL-14	Gold	920111703F	Strip Pack	2.20
M54HC11DT	920111704F	ESCC	DIL-14	Solder Dip	920111704F	Strip Pack	
M54HC14K1	-	Engineering Model	Flat-14E	Gold	M54HC14K1	Strip Pack	0.70
M54HC14KG	940900701F	ESCC	Flat-14E	Gold	940900701F	Strip Pack	

ST Part Number (1)	ESCC part number	Quality Level	Package (2)	Finishing	Marking (3)	Packing	Mass g
M54HC14KT	940900702F	ESCC	Flat-14E	Solder Dip	940900702F	Strip Pack	0.70
M54HC14DG	940900703F	ESCC	DIL-14	Gold	940900703F	Strip Pack	2.20
M54HC14DT	940900704F	ESCC	DIL-14	Solder Dip	940900704F	Strip Pack	
M54HC27K1	-	Engineering Model	Flat-14E	Gold	M54HC27K1	Strip Pack	0.70
M54HC27KG	920110901F	ESCC	Flat-14E	Gold	920110901F	Strip Pack	
M54HC27KT	920110902F	ESCC	Flat-14E	Solder Dip	920110902F	Strip Pack	
M54HC27DG	920110903F	ESCC	DIL-14	Gold	920110903F	Strip Pack	2.20
M54HC27DT	920110904F	ESCC	DIL-14	Solder Dip	920110904F	Strip Pack	
M54HC32K1	-	Engineering Model	Flat-14E	Gold	M54HC32K1	Strip Pack	0.70
M54HC32KG	920111101F	ESCC	Flat-14E	Gold	920111101F	Strip Pack	
M54HC32KT	920111102F	ESCC	Flat-14E	Solder Dip	920111102F	Strip Pack	
M54HC32DG	920111103F	ESCC	DIL-14	Gold	920111103F	Strip Pack	2.20
M54HC32DT	920111104F	ESCC	DIL-14	Solder Dip	920111104F	Strip Pack	
M54HC74K1	-	Engineering Model	Flat-14E	Gold	M54HC74K1	Strip Pack	0.70
M54HC74KG	920305001F	ESCC	Flat-14E	Gold	920305001F	Strip Pack	
M54HC74KT	920305002F	ESCC	Flat-14E	Solder Dip	920305002F	Strip Pack	
M54HC74DG	920305003F	ESCC	DIL-14	Gold	920305003F	Strip Pack	2.20
M54HC74DT	920305004F	ESCC	DIL-14	Solder Dip	920305004F	Strip Pack	
M54HCT74K1	-	Engineering Model	Flat-14E	Gold	M54HCT74K1	Strip Pack	0.70
M54HCT74KG	920307001F	ESCC	Flat-14E	Gold	920307001F	Strip Pack	
M54HCT74KT	920307002F	ESCC	Flat-14E	Solder Dip	920307002F	Strip Pack	
M54HCT74DG	920307003F	ESCC	DIL-14	Gold	920307003F	Strip Pack	2.20
M54HCT74DT	920307004F	ESCC	DIL-14	Solder Dip	920307004F	Strip Pack	
M54HC85K1	-	Engineering Model	Flat-16E	Gold	M54HC85K1	Strip Pack	0.50
M54HC85KG	920900401F	ESCC	Flat-16E	Gold	920900401F	Strip Pack	
M54HC85KT	920900402F	ESCC	Flat-16E	Solder Dip	920900402F	Strip Pack	
M54HC85DG	920900410F	ESCC	DIL-16	Gold	920900410F	Strip Pack	2.20
M54HC85DT	920900411F	ESCC	DIL-16	Solder Dip	920900411F	Strip Pack	
M54HC86K1	-	Engineering Model	Flat-14E	Gold	M54HC86K1	Strip Pack	0.70
M54HC86KG	920111901F	ESCC	Flat-14E	Gold	920111901F	Strip Pack	
M54HC86KT	920111902F	ESCC	Flat-14E	Solder Dip	920111902F	Strip Pack	
M54HC86DG	920111903F	ESCC	DIL-14	Gold	920111903F	Strip Pack	2.20
M54HC86DT	920111904F	ESCC	DIL-14	Solder Dip	920111904F	Strip Pack	
M54HC109K1	-	Engineering Model	Flat-16E	Gold	M54HC109K1	Strip Pack	0.50
M54HC109KG	930604801F	ESCC	Flat-16E	Gold	930604801F	Strip Pack	
M54HC109KT	930604802F	ESCC	Flat-16E	Solder Dip	930604802F	Strip Pack	
M54HC109DG	930604810F	ESCC	DIL-16	Gold	930604810F	Strip Pack	2.20
M54HC109DT	930604811F	ESCC	DIL-16	Solder Dip	930604811F	Strip Pack	
M54HC123K1	-	Engineering Model	Flat-16E	Gold	M54HC123K1	Strip Pack	0.50
M54HC123KG	920700601F	ESCC	Flat-16E	Gold	920700601F	Strip Pack	
M54HC123KT	920700602F	ESCC	Flat-16E	Solder Dip	920700602F	Strip Pack	

ST Part Number (1)	ESCC part number	Quality Level	Package (2)	Finishing	Marking (3)	Packing	Mass g
M54HC123DG	920700610F	ESCC	DIL-16	Gold	920700610F	Strip Pack	2.20
M54HC123DT	920700611F	ESCC	DIL-16	Solder Dip	920700611F	Strip Pack	
M54HC125K1	-	Engineering Model	Flat-14E	Gold	M54HC125K1	Strip Pack	0.70
M54HC125KG	940103901F	ESCC	Flat-14E	Gold	940103901F	Strip Pack	
M54HC125KT	940103902F	ESCC	Flat-14E	Solder Dip	940103902F	Strip Pack	
M54HC132K1	-	Engineering Model	Flat-14E	Gold	M54HC132K1	Strip Pack	0.70
M54HC132KG	920112001F	ESCC	Flat-14E	Gold	920112001F	Strip Pack	
M54HC132KT	920112002F	ESCC	Flat-14E	Solder Dip	920112002F	Strip Pack	
M54HC132DG	920112003F	ESCC	DIL-14	Gold	920112003F	Strip Pack	2.20
M54HC132DT	920112004F	ESCC	DIL-14	Solder Dip	920112004F	Strip Pack	
M54HC138K1	-	Engineering Model	Flat-16E	Gold	M54HC138K1	Strip Pack	0.50
M54HC138KG	940804601F	ESCC	Flat-16E	Gold	940804601F	Strip Pack	
M54HC138KT	940804602F	ESCC	Flat-16E	Solder Dip	940804602F	Strip Pack	
M54HC138DG	940804610F	ESCC	DIL-16	Gold	940804610F	Strip Pack	2.20
M54HC138DT	940804611F	ESCC	DIL-16	Solder Dip	940804611F	Strip Pack	
M54HC139K1	-	Engineering Model	Flat-16E	Gold	M54HC139K1	Strip Pack	0.50
M54HC139KG	920501701F	ESCC	Flat-16E	Gold	920501701F	Strip Pack	
M54HC139KT	920501702F	ESCC	Flat-16E	Solder Dip	920501702F	Strip Pack	
M54HC139DG	920501710F	ESCC	DIL-16	Gold	920501710F	Strip Pack	2.20
M54HC139DT	920501711F	ESCC	DIL-16	Solder Dip	920501711F	Strip Pack	
M54HC148K1	-	Engineering Model	Flat-16E	Gold	M54HC148K1	Strip Pack	0.50
M54HC148KG	941001701F	ESCC	Flat-16E	Gold	941001701F	Strip Pack	
M54HC148KT	941001702F	ESCC	Flat-16E	Solder Dip	941001702F	Strip Pack	
M54HC148DG	941001710F	ESCC	DIL-16	Gold	941001710F	Strip Pack	2.20
M54HC148DT	941001711F	ESCC	DIL-16	Solder Dip	941001711F	Strip Pack	
M54HC151K1	-	Engineering Model	Flat-16E	Gold	M54HC151K1	Strip Pack	0.50
M54HC151KG	940805401F	ESCC	Flat-16E	Gold	940805401F	Strip Pack	
M54HC151KT	940805402F	ESCC	Flat-16E	Solder Dip	940805402F	Strip Pack	
M54HC151DG	940805410F	ESCC	DIL-16	Gold	940805410F	Strip Pack	2.20
M54HC151DT	940805411F	ESCC	DIL-16	Solder Dip	940805411F	Strip Pack	
M54HC153K1	-	Engineering Model	Flat-16E	Gold	M54HC153K1	Strip Pack	0.50
M54HC153KG	940803801F	ESCC	Flat-16E	Gold	940803801F	Strip Pack	
M54HC153KT	940803802F	ESCC	Flat-16E	Solder Dip	940803802F	Strip Pack	
M54HC153DG	940803810F	ESCC	DIL-16	Gold	940803810F	Strip Pack	2.20
M54HC153DT	940803811F	ESCC	DIL-16	Solder Dip	940803811F	Strip Pack	
M54HC154K1	-	Engineering Model	Flat-24	Gold	M54HC154K1	Strip Pack	1.70
M54HC154KG	920502301F	ESCC	Flat-24	Gold	920502301F	Strip Pack	
M54HC154KT	920502302F	ESCC	Flat-24	Solder Dip	920502302F	Strip Pack	
M54HC154DG	920502303F	ESCC	DIL-24	Gold	920502303F	Strip Pack	5.20
M54HC154DT	920502304F	ESCC	DIL-24	Solder Dip	920502304F	Strip Pack	
M54HC157K1	-	Engineering Model	Flat-16E	Gold	M54HC157K1	Strip Pack	0.50

ST Part Number (1)	ESCC part number	Quality Level	Package (2)	Finishing	Marking (3)	Packing	Mass g
M54HC157KG	940805701F	ESCC	Flat-16E	Gold	940805701F	Strip Pack	0.50
M54HC157KT	940805702F	ESCC	Flat-16E	Solder Dip	940805702F	Strip Pack	
M54HC157DG	940805710F	ESCC	DIL-16	Gold	940805710F	Strip Pack	2.20
M54HC157DT	940805711F	ESCC	DIL-16	Solder Dip	940805711F	Strip Pack	
M54HC160K1	-	Engineering Model	Flat-16E	Gold	M54HC160K1	Strip Pack	0.50
M54HC160KG	920406201F	ESCC	Flat-16E	Gold	920406201F	Strip Pack	
M54HC160KT	920406202F	ESCC	Flat-16E	Solder Dip	920406202F	Strip Pack	
M54HC160DG	920406210F	ESCC	DIL-16	Gold	920406210F	Strip Pack	2.20
M54HC160DT	920406211F	ESCC	DIL-16	Solder Dip	920406211F	Strip Pack	
M54HC161K1	-	Engineering Model	Flat-16E	Gold	M54HC161K1	Strip Pack	0.50
M54HC161KG	920405901F	ESCC	Flat-16E	Gold	920405901F	Strip Pack	
M54HC161KT	920405902F	ESCC	Flat-16E	Solder Dip	920405902F	Strip Pack	
M54HC161DG	920405910F	ESCC	DIL-16	Gold	920405910F	Strip Pack	2.20
M54HC161DT	920405911F	ESCC	DIL-16	Solder Dip	920405911F	Strip Pack	
M54HC164K1	-	Engineering Model	Flat-14E	Gold	M54HC164K1	Strip Pack	0.70
M54HC164KG	930604101F	ESCC	Flat-14E	Gold	930604101F	Strip Pack	
M54HC164KT	930604102F	ESCC	Flat-14E	Solder Dip	930604102F	Strip Pack	
M54HC164DG	930604103F	ESCC	DIL-14	Gold	930604103F	Strip Pack	2.20
M54HC164DT	930604104F	ESCC	DIL-14	Solder Dip	930604104F	Strip Pack	
M54HC165K1	-	Engineering Model	Flat-16E	Gold	M54HC165K1	Strip Pack	0.50
M54HC165KG	930604201F	ESCC	Flat-16E	Gold	930604201F	Strip Pack	
M54HC165KT	930604202F	ESCC	Flat-16E	Solder Dip	930604202F	Strip Pack	
M54HC165DG	930604210F	ESCC	DIL-16	Gold	930604210F	Strip Pack	2.20
M54HC165DT	930604211F	ESCC	DIL-16	Solder Dip	930604211F	Strip Pack	
M54HC166K1	-	Engineering Model	Flat-16E	Gold	M54HC166K1	Strip Pack	0.50
M54HC166KG	930604301F	ESCC	Flat-16E	Gold	930604301F	Strip Pack	
M54HC166KT	930604302F	ESCC	Flat-16E	Solder Dip	930604302F	Strip Pack	
M54HC166DG	930604310F	ESCC	DIL-16	Gold	930604310F	Strip Pack	2.20
M54HC166DT	930604311F	ESCC	DIL-16	Solder Dip	930604311F	Strip Pack	
M54HC174K1	-	Engineering Model	Flat-16E	Gold	M54HC174K1	Strip Pack	0.50
M54HC174KG	930605201F	ESCC	Flat-16E	Gold	930605201F	Strip Pack	
M54HC174KT	930605202F	ESCC	Flat-16E	Solder Dip	930605202F	Strip Pack	
M54HC174DG	930605210F	ESCC	DIL-16	Gold	930605210F	Strip Pack	2.20
M54HC174DT	930605211F	ESCC	DIL-16	Solder Dip	930605211F	Strip Pack	
M54HC175K1	-	Engineering Model	Flat-16E	Gold	M54HC175K1	Strip Pack	0.50
M54HC175KG	920305201F	ESCC	Flat-16E	Gold	920305201F	Strip Pack	
M54HC175KT	920305202F	ESCC	Flat-16E	Solder Dip	920305202F	Strip Pack	
M54HC175DG	920305210F	ESCC	DIL-16	Gold	920305210F	Strip Pack	2.20
M54HC175DT	920305211F	ESCC	DIL-16	Solder Dip	920305211F	Strip Pack	
M54HC191K1	-	Engineering Model	Flat-16E	Gold	M54HC191K1	Strip Pack	0.50
M54HC191KG	920406601F	ESCC	Flat-16E	Gold	920406601F	Strip Pack	

ST Part Number (1)	ESCC part number	Quality Level	Package (2)	Finishing	Marking (3)	Packing	Mass g
M54HC191KT	920406602F	ESCC	Flat-16E	Solder Dip	920406602F	Strip Pack	0.50
M54HC191DG	920406610F	ESCC	DIL-16	Gold	920406610F	Strip Pack	2.20
M54HC191DT	920406611F	ESCC	DIL-16	Solder Dip	920406611F	Strip Pack	
M54HC193K1	-	Engineering Model	Flat-16E	Gold	M54HC193K1	Strip Pack	0.50
M54HC193KG	920406501F	ESCC	Flat-16E	Gold	920406501F	Strip Pack	
M54HC193KT	920406502F	ESCC	Flat-16E	Solder Dip	920406502F	Strip Pack	
M54HC193DG	920406510F	ESCC	DIL-16	Gold	920406510F	Strip Pack	2.20
M54HC193DT	920406511F	ESCC	DIL-16	Solder Dip	920406511F	Strip Pack	
M54HC237K1	-	Engineering Model	Flat-16E	Gold	M54HC237K1	Strip Pack	0.50
M54HC237KG	920502101F	ESCC	Flat-16E	Gold	920502101F	Strip Pack	
M54HC237KT	920502102F	ESCC	Flat-16E	Solder Dip	920502102F	Strip Pack	
M54HC237DG	920502110F	ESCC	DIL-16	Gold	920502110F	Strip Pack	2.20
M54HC237DT	920502111F	ESCC	DIL-16	Solder Dip	920502111F	Strip Pack	
M54HC240K1	-	Engineering Model	Flat-20E	Gold	M54HC240K1	Strip Pack	0.90
M54HC240KG	940103401F	ESCC	Flat-20E	Gold	940103401F	Strip Pack	
M54HC240KT	940103402F	ESCC	Flat-20E	Solder Dip	940103402F	Strip Pack	
M54HC240DG	940103403F	ESCC	DIL-20	Gold	940103403F	Strip Pack	3.20
M54HC240DT	940103404F	ESCC	DIL-20	Solder Dip	940103404F	Strip Pack	
M54HC244K1	-	Engineering Model	Flat-20E	Gold	M54HC244K1	Strip Pack	0.90
M54HC244KG	940104801F	ESCC	Flat-20E	Gold	940104801F	Strip Pack	
M54HC244KT	940104802F	ESCC	Flat-20E	Solder Dip	940104802F	Strip Pack	
M54HC244DG	940104803F	ESCC	DIL-20	Gold	940104803F	Strip Pack	3.20
M54HC244DT	940104804F	ESCC	DIL-20	Solder Dip	940104804F	Strip Pack	
M54HCT244K1	-	Engineering Model	Flat-20E	Gold	M54HCT244K1	Strip Pack	0.90
M54HCT244KG	940200901F	ESCC	Flat-20E	Gold	940200901F	Strip Pack	
M54HCT244KT	940200902F	ESCC	Flat-20E	Solder Dip	940200902F	Strip Pack	
M54HCT244DG	940200903F	ESCC	DIL-20	Gold	940200903F	Strip Pack	3.20
M54HCT244DT	940200904F	ESCC	DIL-20	Solder Dip	940200904F	Strip Pack	
M54HC245K1	-	Engineering Model	Flat-20E	Gold	M54HC245K1	Strip Pack	0.90
M54HC245KG	940501301F	ESCC	Flat-20E	Gold	940501301F	Strip Pack	
M54HC245KT	940501302F	ESCC	Flat-20E	Solder Dip	940501302F	Strip Pack	
M54HC245DG	940501303F	ESCC	DIL-20	Gold	940501303F	Strip Pack	3.20
M54HC245DT	940501304F	ESCC	DIL-20	Solder Dip	940501304F	Strip Pack	
M54HCT245K1	-	Engineering Model	Flat-20E	Gold	M54HCT245K1	Strip Pack	0.90
M54HCT245KG	940501401F	ESCC	Flat-20E	Gold	940501401F	Strip Pack	
M54HCT245KT	940501402F	ESCC	Flat-20E	Solder Dip	940501402F	Strip Pack	
M54HCT245DG	940501403F	ESCC	DIL-20	Gold	940501403F	Strip Pack	3.20
M54HCT245DT	940501404F	ESCC	DIL-20	Solder Dip	940501404F	Strip Pack	
M54HC251K1	-	Engineering Model	Flat-16E	Gold	M54HC251K1	Strip Pack	0.50
M54HC251KG	940804801F	ESCC	Flat-16E	Gold	940804801F	Strip Pack	
M54HC251KT	940804802F	ESCC	Flat-16E	Solder Dip	940804802F	Strip Pack	

ST Part Number (1)	ESCC part number	Quality Level	Package (2)	Finishing	Marking (3)	Packing	Mass g
M54HC251DG	940804810F	ESCC	DIL-16	Gold	940804810F	Strip Pack	2.20
M54HC251DT	940804811F	ESCC	DIL-16	Solder Dip	940804811F	Strip Pack	
M54HC257K1	-	Engineering Model	Flat-16E	Gold	M54HC257K1	Strip Pack	0.50
M54HC257KG	940804701F	ESCC	Flat-16E	Gold	940804701F	Strip Pack	
M54HC257KT	940804702F	ESCC	Flat-16E	Solder Dip	940804702F	Strip Pack	
M54HC259K1	-	Engineering Model	Flat-16E	Gold	M54HC259K1	Strip Pack	0.50
M54HC259KG	920307301F	ESCC	Flat-16E	Gold	920307301F	Strip Pack	
M54HC259KT	920307302F	ESCC	Flat-16E	Solder Dip	920307302F	Strip Pack	
M54HC259DG	920307310F	ESCC	DIL-16	Gold	920307310F	Strip Pack	2.20
M54HC259DT	920307311F	ESCC	DIL-16	Solder Dip	920307311F	Strip Pack	
M54HC273K1	-	Engineering Model	Flat-20E	Gold	M54HC273K1	Strip Pack	0.90
M54HC273KG	920305301F	ESCC	Flat-20E	Gold	920305301F	Strip Pack	
M54HC273KT	920305302F	ESCC	Flat-20E	Solder Dip	920305302F	Strip Pack	
M54HC273DG	920305303F	ESCC	DIL-20	Gold	920305303F	Strip Pack	3.20
M54HC273DT	920305304F	ESCC	DIL-20	Solder Dip	920305304F	Strip Pack	
M54HC373K1	-	Engineering Model	Flat-20E	Gold	M54HC373K1	Strip Pack	0.90
M54HC373KG	920305901F	ESCC	Flat-20E	Gold	920305901F	Strip Pack	
M54HC373KT	920305902F	ESCC	Flat-20E	Solder Dip	920305902F	Strip Pack	
M54HC373DG	920305903F	ESCC	DIL-20	Gold	920305903F	Strip Pack	3.20
M54HC373DT	920305904F	ESCC	DIL-20	Solder Dip	920305904F	Strip Pack	
M54HC374K1	-	Engineering Model	Flat-20E	Gold	M54HC374K1	Strip Pack	0.90
M54HC374KG	920306001F	ESCC	Flat-20E	Gold	920306001F	Strip Pack	
M54HC374KT	920306002F	ESCC	Flat-20E	Solder Dip	920306002F	Strip Pack	
M54HC374DG	920306003F	ESCC	DIL-20	Gold	920306003F	Strip Pack	3.20
M54HC374DT	920306004F	ESCC	DIL-20	Solder Dip	920306004F	Strip Pack	
M54HC393K1	-	Engineering Model	Flat-14E	Gold	M54HC393K1	Strip Pack	0.70
M54HC393KG	920407401F	ESCC	Flat-14E	Gold	920407401F	Strip Pack	
M54HC393KT	920407402F	ESCC	Flat-14E	Solder Dip	920407402F	Strip Pack	
M54HC393DG	920407403F	ESCC	DIL-14	Gold	920407403F	Strip Pack	2.20
M54HC393DT	920407404F	ESCC	DIL-14	Solder Dip	920407404F	Strip Pack	
M54HC540K1	-	Engineering Model	Flat-20E	Gold	M54HC540K1	Strip Pack	0.90
M54HC540KG	940104901F	ESCC	Flat-20E	Gold	940104901F	Strip Pack	
M54HC540KT	940104902F	ESCC	Flat-20E	Solder Dip	940104902F	Strip Pack	
M54HC540DG	940104903F	ESCC	DIL-20	Gold	940104903F	Strip Pack	3.20
M54HC540DT	940104904F	ESCC	DIL-20	Solder Dip	940104904F	Strip Pack	
M54HC541K1	-	Engineering Model	Flat-20E	Gold	M54HC541K1	Strip Pack	0.90
M54HC541KG	940104701F	ESCC	Flat-20E	Gold	940104701F	Strip Pack	
M54HC541KT	940104702F	ESCC	Flat-20E	Solder Dip	940104702F	Strip Pack	
M54HC541DG	940104703F	ESCC	DIL-20	Gold	940104703F	Strip Pack	3.20
M54HC541DT	940104704F	ESCC	DIL-20	Solder Dip	940104704F	Strip Pack	
M54HC573K1	-	Engineering Model	Flat-20E	Gold	M54HC573K1	Strip Pack	0.90

ST Part Number (1)	ESCC part number	Quality Level	Package (2)	Finishing	Marking (3)	Packing	Mass g
M54HC573KG	920207201F	ESCC	Flat-20E	Gold	920207201F	Strip Pack	0.90
M54HC573KT	920207202F	ESCC	Flat-20E	Solder Dip	920207202F	Strip Pack	
M54HC573DG	920207203F	ESCC	DIL-20	Gold	920207203F	Strip Pack	3.20
M54HC573DT	920207204F	ESCC	DIL-20	Solder Dip	920207204F	Strip Pack	
M54HC574K1	-	Engineering Model	Flat-20E	Gold	M54HC574K1	Strip Pack	0.90
M54HC574KG	920305401F	ESCC	Flat-20E	Gold	920305401F	Strip Pack	
M54HC574KT	920305402F	ESCC	Flat-20E	Solder Dip	920305402F	Strip Pack	
M54HC574DG	920305403F	ESCC	DIL-20	Gold	920305403F	Strip Pack	3.20
M54HC574DT	920305404F	ESCC	DIL-20	Solder Dip	920305404F	Strip Pack	
M54HC595K1	-	Engineering Model	Flat-16E	Gold	M54HC595K1	Strip Pack	0.50
M54HC595KG	930605101F	ESCC	Flat-16E	Gold	930605101F	Strip Pack	
M54HC595KT	930605102F	ESCC	Flat-16E	Solder Dip	930605102F	Strip Pack	
M54HC595DG	930605110F	ESCC	DIL-16	Gold	930605110F	Strip Pack	2.20
M54HC595DT	930605111F	ESCC	DIL-16	Solder Dip	930605111F	Strip Pack	
M54HC597K1	-	Engineering Model	Flat-16E	Gold	M54HC597K1	Strip Pack	0.50
M54HC597KG	930605401F	ESCC	Flat-16E	Gold	930605401F	Strip Pack	
M54HC597KT	930605402F	ESCC	Flat-16E	Solder Dip	930605402F	Strip Pack	
M54HC597DG	930605410F	ESCC	DIL-16	Gold	930605410F	Strip Pack	2.20
M54HC597DT	930605411F	ESCC	DIL-16	Solder Dip	930605411F	Strip Pack	
M54HC688K1	-	Engineering Model	Flat-20E	Gold	M54HC688K1	Strip Pack	0.90
M54HC688KG	920900501F	ESCC	Flat-20E	Gold	920900501F	Strip Pack	
M54HC688KT	920900502F	ESCC	Flat-20E	Solder Dip	920900502F	Strip Pack	
M54HC688DG	920900503F	ESCC	DIL-20	Gold	920900503F	Strip Pack	3.20
M54HC688DT	920900504F	ESCC	DIL-20	Solder Dip	920900504F	Strip Pack	
M54HC4020K1	-	Engineering Model	Flat-16E	Gold	M54HC4020K1	Strip Pack	0.50
M54HC4020KG	920407001F	ESCC	Flat-16E	Gold	920407001F	Strip Pack	
M54HC4020KT	920407002F	ESCC	Flat-16E	Solder Dip	920407002F	Strip Pack	
M54HC4020DG	920407010F	ESCC	DIL-16	Gold	920407010F	Strip Pack	2.20
M54HC4020DT	920407011F	ESCC	DIL-16	Solder Dip	920407011F	Strip Pack	
M54HC4040K1	-	Engineering Model	Flat-16E	Gold	M54HC4040K1	Strip Pack	0.50
M54HC4040KG	920406901F	ESCC	Flat-16E	Gold	920406901F	Strip Pack	
M54HC4040KT	920406902F	ESCC	Flat-16E	Solder Dip	920406902F	Strip Pack	
M54HC4040DG	920406910F	ESCC	DIL-16	Gold	920406910F	Strip Pack	2.20
M54HC4040DT	920406911F	ESCC	DIL-16	Solder Dip	920406911F	Strip Pack	
M54HC4049K1	-	Engineering Model	Flat-16E	Gold	M54HC4049K1	Strip Pack	0.50
M54HC4049KG	940103701F	ESCC	Flat-16E	Gold	940103701F	Strip Pack	
M54HC4049KT	940103702F	ESCC	Flat-16E	Solder Dip	940103702F	Strip Pack	
M54HC4049DG	940103710F	ESCC	DIL-16	Gold	940103710F	Strip Pack	2.20
M54HC4049DT	940103711F	ESCC	DIL-16	Solder Dip	940103711F	Strip Pack	
M54HC4050K1	-	Engineering Model	Flat-16E	Gold	M54HC4050K1	Strip Pack	0.50
M54HC4050KG	940103801F	ESCC	Flat-16E	Gold	940103801F	Strip Pack	

ST Part Number [1]	ESCC part number	Quality Level	Package [2]	Finishing	Marking [3]	Packing	Mass g
M54HC4050KT	940103802F	ESCC	Flat-16E	Solder Dip	940103802F	Strip Pack	0.50
M54HC4050DG	940103810F	ESCC	DIL-16	Gold	940103810F	Strip Pack	2.20
M54HC4050DT	940103811F	ESCC	DIL-16	Solder Dip	940103811F	Strip Pack	
M54HC4051K1	-	Engineering Model	Flat-16E	Gold	M54HC4051K1	Strip Pack	0.50
M54HC4051KG	940806401F	ESCC	Flat-16E	Gold	940806401F	Strip Pack	
M54HC4051KT	940806402F	ESCC	Flat-16E	Solder Dip	940806402F	Strip Pack	
M54HC4051DG	940806410F	ESCC	DIL-16	Gold	940806410F	Strip Pack	2.20
M54HC4051DT	940806411F	ESCC	DIL-16	Solder Dip	940806411F	Strip Pack	
M54HC4053K1	-	Engineering Model	Flat-16E	Gold	M54HC4053K1	Strip Pack	0.50
M54HC4053KG	940806501F	ESCC	Flat-16E	Gold	940806501F	Strip Pack	
M54HC4053KT	940806502F	ESCC	Flat-16E	Solder Dip	940806502F	Strip Pack	
M54HC4053DG	940806510F	ESCC	DIL-16	Gold	940806510F	Strip Pack	2.20
M54HC4053DT	940806511F	ESCC	DIL-16	Solder Dip	940806511F	Strip Pack	
M54HC4060K1	-	Engineering Model	Flat-16E	Gold	M54HC4060K1	Strip Pack	0.50
M54HC4060KG	920407601F	ESCC	Flat-16E	Gold	920407601F	Strip Pack	
M54HC4060KT	920407602F	ESCC	Flat-16E	Solder Dip	920407602F	Strip Pack	
M54HC4060DG	920407610F	ESCC	DIL-16	Gold	920407610F	Strip Pack	2.20
M54HC4060DT	920407611F	ESCC	DIL-16	Solder Dip	920407611F	Strip Pack	
M54HC4066K1	-	Engineering Model	Flat-14E	Gold	M54HC4066K1	Strip Pack	0.70
M54HC4066KG	940805201F	ESCC	Flat-14E	Gold	940805201F	Strip Pack	
M54HC4066KT	940805202F	ESCC	Flat-14E	Solder Dip	940805202F	Strip Pack	
M54HC4066DG	940805203F	ESCC	DIL-14	Gold	940805203F	Strip Pack	2.20
M54HC4066DT	940805204F	ESCC	DIL-14	Solder Dip	940805204F	Strip Pack	
M54HC4094K1	-	Engineering Model	Flat-16E	Gold	M54HC4094K1	Strip Pack	0.50
M54HC4094KG	930605001F	ESCC	Flat-16E	Gold	930605001F	Strip Pack	
M54HC4094KT	930605002F	ESCC	Flat-16E	Solder Dip	930605002F	Strip Pack	
M54HC4094DG	930605010F	ESCC	DIL-16	Gold	930605010F	Strip Pack	2.20
M54HC4094DT	930605011F	ESCC	DIL-16	Solder Dip	930605011F	Strip Pack	
M54HC4514K1	-	Engineering Model	Flat-24	Gold	M54HC4514K1	Strip Pack	1.70
M54HC4514KG	920501901F	ESCC	Flat-24	Gold	920501901F	Strip Pack	
M54HC4514KT	920501902F	ESCC	Flat-24	Solder Dip	920501902F	Strip Pack	
M54HC4514DG	920501903F	ESCC	DIL-24	Gold	920501903F	Strip Pack	5.20
M54HC4514DT	920501904F	ESCC	DIL-24	Solder Dip	920501904F	Strip Pack	

1. *Refer to the technical notes listed in page 1 for information about the part numbers and specific conditions for other versions including product in die form, 100 krad(Si) versions available on selected products and packages, parts up-screened to a flow similar to class S, and the availability of DIL versions not listed in the table.*
2. *The upper metallic lid is floating.*
3. *Specific marking only. See section X for complete marking.*

7 Other information

7.1 Product marking and traceability

Figure 10. **Product marking outline, flight model top view**

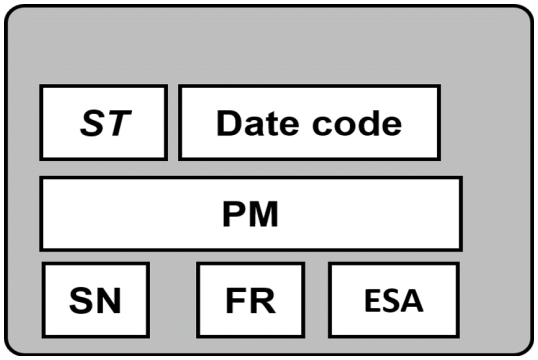


Figure 11. **Product marking outline, engineering model top view**

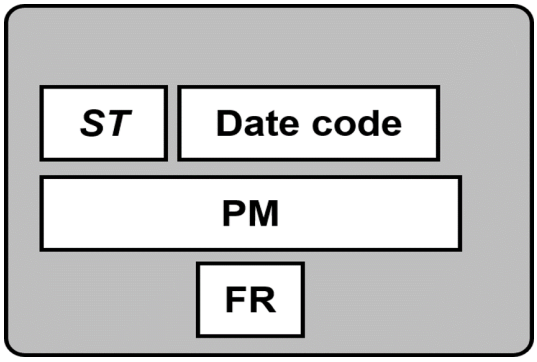


Table 15. **Product marking description**

Field	Model	Description
ST	Engineering and flight	Standard ST logo
PM	Engineering	Product part number
	Flight	ESCC part number
Datecode	Engineering	3yywwN (1)
	Flight	yywwN (2)
SN	Flight	Serialization number
ESA	Flight	ESA logo
FR	Engineering and flight	Country of origin

1. *yy = year ; ww = week ; N = alfa-numeric digit for lot of week; 3 = EM type*
2. *yy = year ; ww = week ; N = alfa-numeric for lot of week*

Note: Black dot marks terminal 1 position underneath.

7.2 Product documentation

Produt documentation

Products are delivered with their default documentation and possibly separately ordered optional documentation. The documentation is provided on on CD-ROMs shipped in an envelope placed in the shipment box of the parts. An additional paper copy of the certificate of conformance is provided in the envelope.

The documentation, depends on the quality level of the parts, as described in the table below:

Table 16. Product documentation

Quality level	Documentation
Engineering model	Certificate of conformance including: • Customer name • Customer purchase order number • ST sales order number and item • ST commercial product code • Quantity delivered • Date code • Reference data sheet • Reference to TN1181 on engineering models • ST Rennes assembly lot ID
ESCC Flight	Certificate of conformance including: • Customer name • Customer purchase order number • ST sales order number and item • ST commercial product code • Quantity delivered • Date code • Serial numbers • Wafer diffusion plant location and wafer size • Wafer diffusion lot ID number and wafer ID number • Reference of the applicable ESCC Qualification maintenance lot • Reference to the ESCC detail specification • ST Rennes assembly lot ID • Radiation verification test number • Lead finish : Sn63Pb37 (solder dipped parts only)

Revision history

Table 17. **Document revision history**

Date	Version	Changes
14-Apr-2010	1	Initial release.
02-Aug-2011	2	Added Note: on page 14, 1. on page 14, 1. on page 15, 1. on page 16, 1. on page 19, 1. on page 20 and in the “Pin connections” diagram on the coverpage
29-May-2013	3	Updated Flat-24 package in figure on page 1. Updated Section 2: Input and output equivalent circuit diagram (updated titles - added “output”, updated Figure 1, added note 1. below Figure 1). Updated Table 1 (removed M54HCU04, M54HC163, M54HC238, M54HC241, M54HC253, M54HC365, M54HCT374, M54HC390, M54HC4002, M54HC4072, and M54HC4075 device). Updated note 1. below Table 1 (removed “QML-Q versions”). Added note 2. below Table 3, renumbered notes below Table 3. Added tr,tf symbols, parameters, values and units to Table 4. Updated Section 5: Package information (added Figure 6 and Figure 7, Table 11 and Table 12, reversed order of Figure 2 to Figure 5, Figure 8 and Figure 9, Table 8 to Table 10, Table 13 and Table 14, corrected typ. dimension for symbol “L” in Table 9). Updated Table 15 (removed M54HCU04K/D, M54HC163K/D, M54HC238K/D, M54HC241K/D, M54HC253K/D, M54HC365K/D, M54HCT374K/D, M54HC390K/D, M54HC4002K/D, M54HC4072K/D, and M54HC4075K/D device). Added note 2. below Table 15, updated note 1. (removed “QML-Q versions”), renumbered notes below Table 15. Added Section 7: Other information. Minor corrections throughout document.
01-Apr-2014	4	Table 15: Ordering information: All order codes changed to the new ST ordering code scheme, updated footnote 2.
05-Nov-2020	5	Updated cover page. Removed "Device summary" and "Maximum ratings" sections. Updated Order codes and Section 4 Other information.
17-Oct-2023	6	Updated features and description on the cover page, Section 5.1, Section 5.3, Section 6 and Section 7. Added Section 1, Section 3, Section 4.1, Section 4.2, Section 4.2.1, Section 4.2.2 and Section 4.2.3.

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