

# 74HC4017; 74HCT4017

Johnson decade counter with 10 decoded outputs

Rev. 4 — 10 December 2013

Product data sheet

## 1. General description

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The 74HC4017; 74HCT4017 is a 5-stage Johnson decade counter with 10 decoded outputs ( $Q_0$  to  $Q_9$ ), an output from the most significant flip-flop ( $\overline{Q_5-9}$ ), two clock inputs ( $CP_0$  and  $\overline{CP_1}$ ) and an overriding asynchronous master reset input (MR). The counter is advanced by either a LOW-to-HIGH transition at  $CP_0$  while  $\overline{CP_1}$  is LOW or a HIGH-to-LOW transition at  $\overline{CP_1}$  while  $CP_0$  is HIGH. When cascading counters, the  $\overline{Q_5-9}$  output, which is LOW while the counter is in states 5, 6, 7, 8 and 9, can be used to drive the  $CP_0$  input of the next counter. A HIGH on MR resets the counter to zero ( $Q_0 = \overline{Q_5-9} =$  HIGH;  $Q_1$  to  $Q_9 =$  LOW) independent of the clock inputs ( $CP_0$  and  $\overline{CP_1}$ ). Automatic code correction of the counter is provided by an internal circuit: following any illegal code the counter returns to a proper counting mode within 11 clock pulses. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

## 2. Features and benefits

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- Wide supply voltage range from 2.0 V to 6.0 V
- Input levels:
  - ◆ For 74HC4017: CMOS level
  - ◆ For 74HCT4017: TTL level
- Complies with JEDEC standard no. 7 A
- ESD protection:
  - ◆ HBM JESD22-A114E exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and from  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$



### 3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
<b>74HC4017</b>				
74HC4017N	-40 °C to +125 °C	DIP16	plastic dual in-line package; 16 leads (300 mil)	SOT38-4
74HC4017D	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74HC4017DB	-40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1
74HC4017PW	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1
74HC4017BQ	-40 °C to +125 °C	DHVQFN16	plastic dual in-line compatible thermal-enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 × 3.5 × 0.85 mm	SOT763-1
<b>74HCT4017</b>				
74HCT4017N	-40 °C to +125 °C	DIP16	plastic dual in-line package; 16 leads (300 mil)	SOT38-4
74HCT4017D	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74HCT4017BQ	-40 °C to +125 °C	DHVQFN16	plastic dual in-line compatible thermal-enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 × 3.5 × 0.85 mm	SOT763-1

### 4. Functional diagram

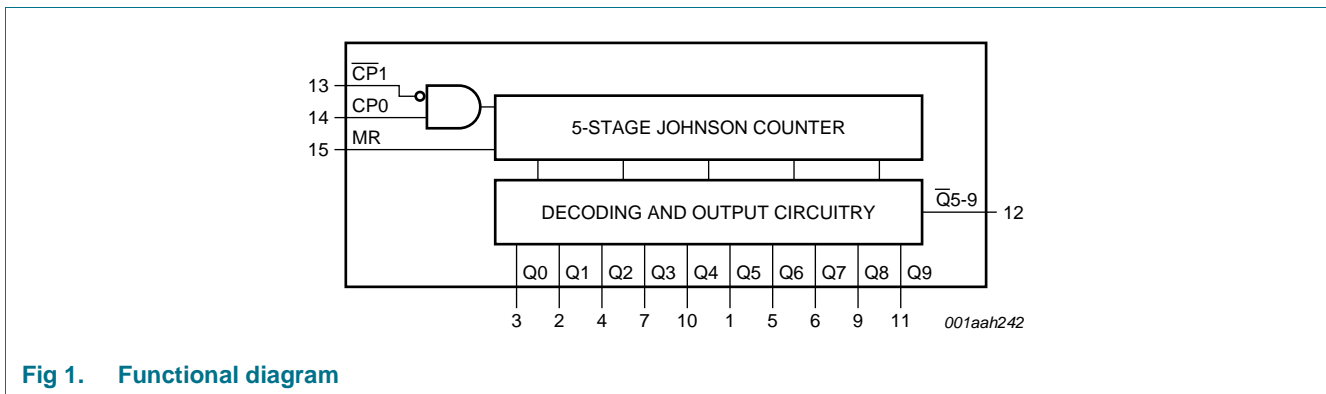


Fig 1. Functional diagram

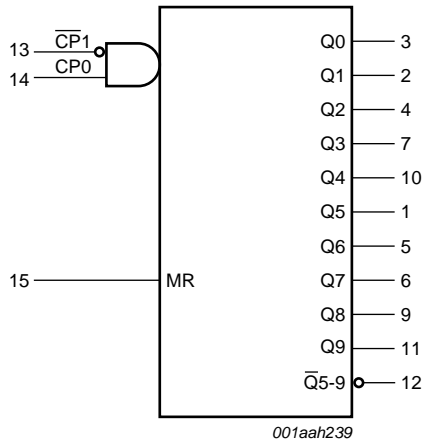


Fig 2. Logic symbol

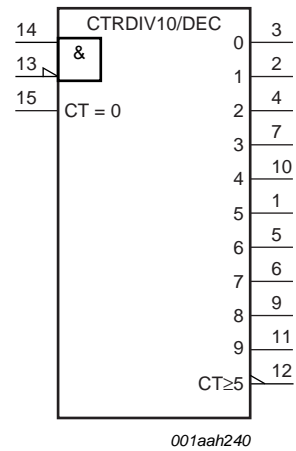


Fig 3. IEC logic symbol

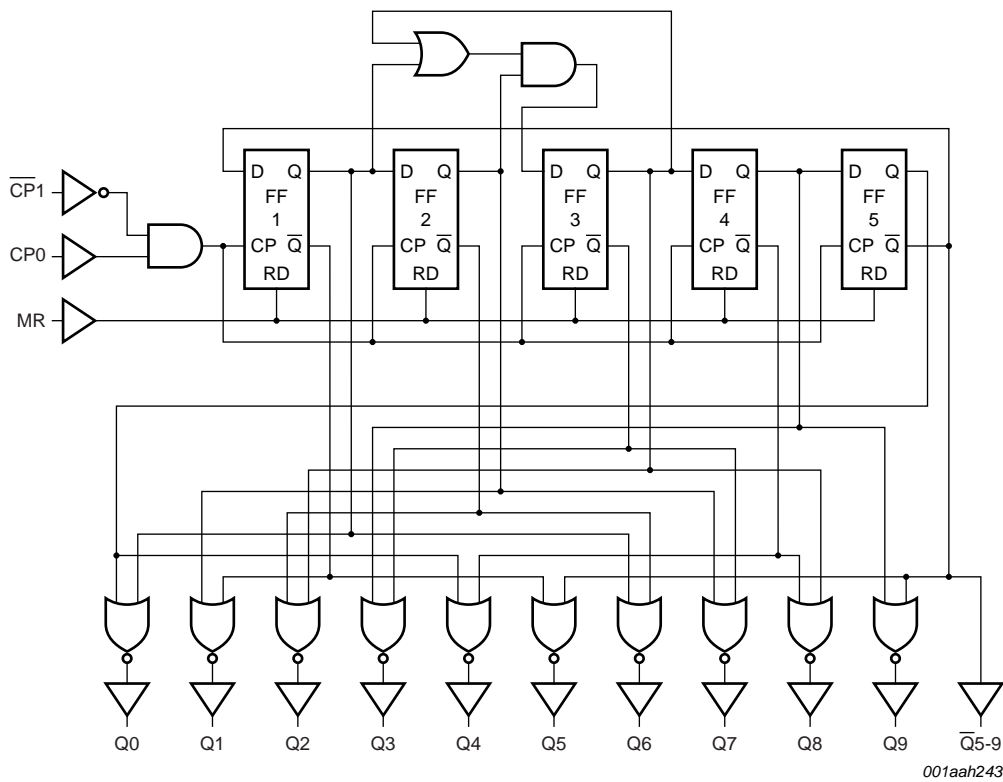
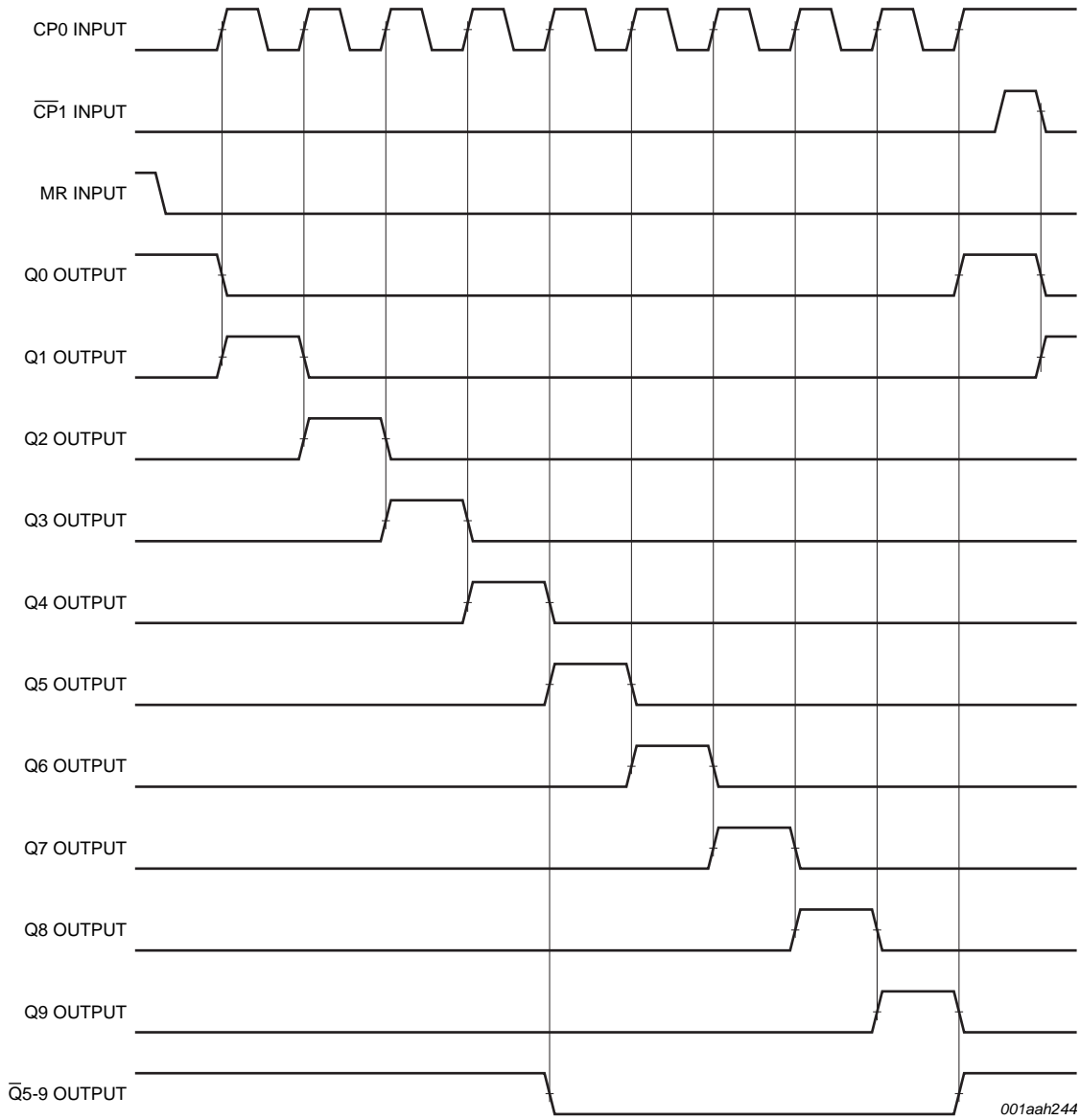


Fig 4. Logic diagram

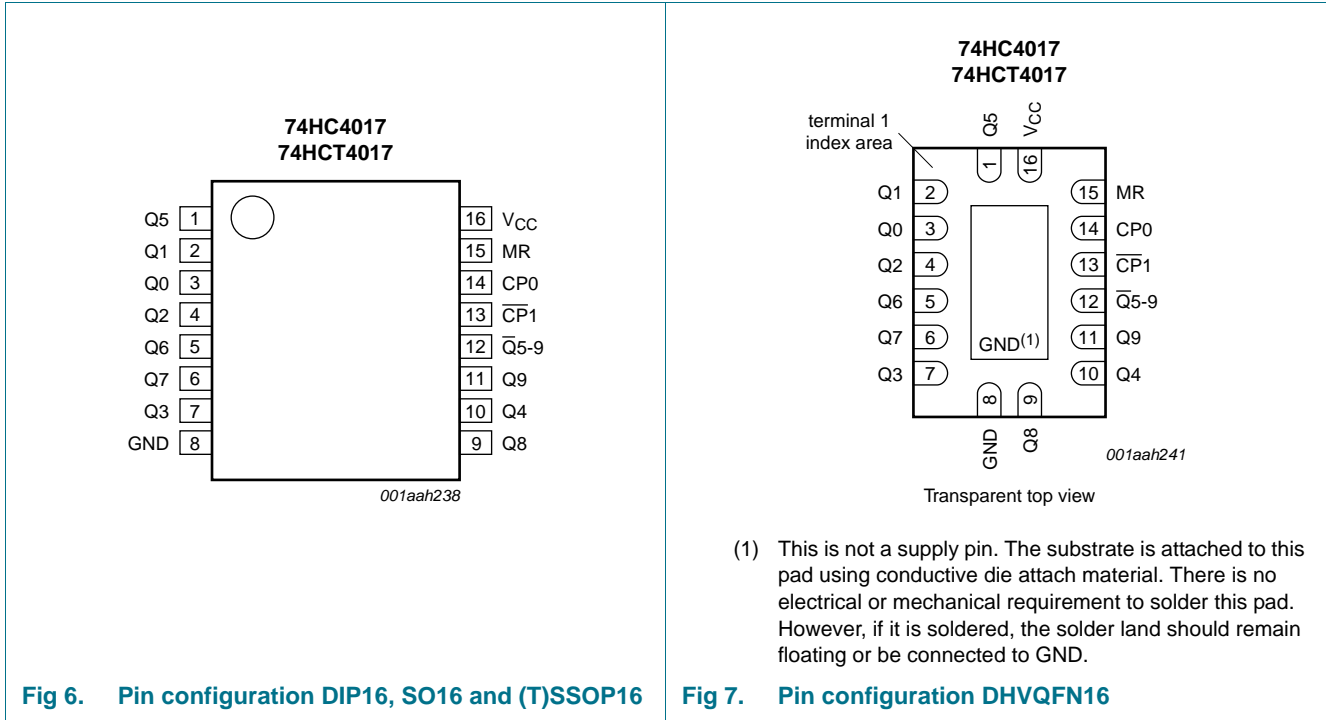


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Fig 5. Timing diagram

5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
Q[0:9]	3, 2, 4, 7, 10, 1, 5, 6, 9, 11	decoded output
GND	8	ground (0 V)
$\overline{Q}5-9$	12	carry output (active LOW)
$\overline{CP}1$	13	clock input (HIGH-to-LOW edge-triggered)
CP0	14	clock input (LOW-to-HIGH edge-triggered)
MR	15	master reset input (active HIGH)
V <sub>CC</sub>	16	supply voltage

## 6. Functional description

Table 3. Function table<sup>[1]</sup>

MR	CP0	CP1	Operation
H	X	X	Q0 = $\overline{Q5-9}$ = HIGH; Q1 to Q9 = LOW
L	H	↓	counter advances
L	↑	L	counter advances
L	L	X	no change
L	X	H	no change
L	H	↑	no change
L	↓	L	no change

- [1] H = HIGH voltage level;  
 L = LOW voltage level;  
 X = don't care;  
 ↑ = LOW-to-HIGH transition;  
 ↓ = HIGH-to-LOW transition;

## 7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CC</sub>	supply voltage		-0.5	+7	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < -0.5 V or V <sub>I</sub> > V <sub>CC</sub> + 0.5 V	[1] -	±20	mA
I <sub>OK</sub>	output clamping current	V <sub>O</sub> < -0.5 V or V <sub>O</sub> > V <sub>CC</sub> + 0.5 V	[1] -	±20	mA
I <sub>O</sub>	output current	-0.5 V < V <sub>O</sub> < V <sub>CC</sub> + 0.5 V	-	±25	mA
I <sub>CC</sub>	supply current		-	50	mA
I <sub>GND</sub>	ground current		-50	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = -40 °C to +125 °C			
	DIP16 package		[2] -	750	mW
	SO16 package		[3] -	500	mW
	(T)SSOP16 package		[4] -	500	mW
	DHVQFN16 package		[5] -	500	mW

- [1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
 [2] P<sub>tot</sub> derates linearly with 12 mW/K above 70 °C.  
 [3] P<sub>tot</sub> derates linearly with 8 mW/K above 70 °C.  
 [4] P<sub>tot</sub> derates linearly with 5.5 mW/K above 60 °C.  
 [5] P<sub>tot</sub> derates linearly with 4.5 mW/K above 60 °C.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>74HC4017</b>						
V <sub>CC</sub>	supply voltage		2.0	5.0	6.0	V
V <sub>I</sub>	input voltage		0	-	V <sub>CC</sub>	V
V <sub>O</sub>	output voltage		0	-	V <sub>CC</sub>	V
Δt/ΔV	input transition rise and fall rate	V <sub>CC</sub> = 2.0 V	-	-	625	ns/V
		V <sub>CC</sub> = 4.5 V	-	1.67	139	ns/V
		V <sub>CC</sub> = 6.0 V	-	-	83	ns/V
T <sub>amb</sub>	ambient temperature		-40	-	+125	°C
<b>74HCT4017</b>						
V <sub>CC</sub>	supply voltage		4.5	5.0	5.5	V
V <sub>I</sub>	input voltage		0	-	V <sub>CC</sub>	V
V <sub>O</sub>	output voltage		0	-	V <sub>CC</sub>	V
Δt/ΔV	input transition rise and fall rate	V <sub>CC</sub> = 4.5 V	-	1.67	139	ns/V
T <sub>amb</sub>	ambient temperature		-40	-	+125	°C

## 9. Static characteristics

**Table 6. Static characteristics**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
<b>74HC4017</b>										
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	V
		V <sub>CC</sub> = 4.5 V	3.15	2.4	-	3.15	-	3.15	-	V
		V <sub>CC</sub> = 6.0 V	4.2	3.2	-	4.2	-	4.2	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 2.0 V	-	0.8	0.5	-	0.5	-	0.5	V
		V <sub>CC</sub> = 4.5 V	-	2.1	1.35	-	1.35	-	1.35	V
		V <sub>CC</sub> = 6.0 V	-	2.8	1.8	-	1.8	-	1.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>								
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 6.0 V	5.9	6.0	-	5.9	-	5.9	-	V
		I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 4.5 V	3.98	4.32	-	3.84	-	3.7	-	V
	I <sub>O</sub> = -5.2 mA; V <sub>CC</sub> = 6.0 V	5.48	5.81	-	5.34	-	5.2	-	V	

**Table 6. Static characteristics ...continued**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>								
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
		I <sub>O</sub> = 5.2 mA; V <sub>CC</sub> = 6.0 V	-	0.16	0.26	-	0.33	-	0.4	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±0.1	-	±1.0	-	±1.0	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 6.0 V	-	-	8.0	-	80	-	160	μA
C <sub>I</sub>	input capacitance		-	3.5	-	-	-	-	-	pF
<b>74HCT4017</b>										
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	2.0	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	-	1.2	0.8	-	0.8	-	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V								
		I <sub>O</sub> = -20 μA	4.4	4.5	-	4.4	-	4.4	-	V
		I <sub>O</sub> = -4 mA	3.98	4.32	-	3.84	-	3.7	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V								
		I <sub>O</sub> = 20 μA	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 4.0 mA	-	0.15	0.26	-	0.33	-	0.4	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V	-	-	±0.1	-	±1.0	-	±1.0	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V; I <sub>O</sub> = 0 A	-	-	8.0	-	80	-	160	μA
ΔI <sub>CC</sub>	additional supply current	per input pin; V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> = 4.5 V to 5.5 V; I <sub>O</sub> = 0 A								
		CP0 input	-	25	90	-	113	-	123	μA
		CP1 input	-	40	144	-	180	-	196	μA
		MR input	-	50	180	-	225	-	245	μA
C <sub>I</sub>	input capacitance		-	3.5	-	-	-	-	-	pF



## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

$GND = 0\text{ V}$ ;  $t_r = t_f = 6\text{ ns}$ ;  $C_L = 50\text{ pF}$ ; see [Figure 11](#).

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit	
			Min	Typ	Max	Min	Max	Min	Max		
<b>74HC4017</b>											
$t_{pd}$	propagation delay	CP0 to Qn; CP0 to $\overline{Q}5-9$ ; see <a href="#">Figure 10</a>	<a href="#">[1]</a>								
		$V_{CC} = 2.0\text{ V}$	-	63	230	-	290	-	345	ns	
		$V_{CC} = 4.5\text{ V}$	-	23	46	-	58	-	69	ns	
		$V_{CC} = 5.0\text{ V}$ ; $C_L = 15\text{ pF}$	-	20	-	-	-	-	-	ns	
		$V_{CC} = 6.0\text{ V}$	-	18	39	-	49	-	59	ns	
		$\overline{CP}1$ to Qn; $\overline{CP}1$ to $\overline{Q}5-9$ ; see <a href="#">Figure 10</a>									
		$V_{CC} = 2.0\text{ V}$	-	61	250	-	315	-	375	ns	
		$V_{CC} = 4.5\text{ V}$	-	22	50	-	63	-	75	ns	
	$V_{CC} = 5.0\text{ V}$ ; $C_L = 15\text{ pF}$	-	20	-	-	-	-	-	ns		
	$V_{CC} = 6.0\text{ V}$	-	18	43	-	54	-	64	ns		
$t_{PHL}$	HIGH to LOW propagation delay	MR to Q[1:9]; see <a href="#">Figure 10</a>									
		$V_{CC} = 2.0\text{ V}$	-	52	230	-	290	-	345	ns	
		$V_{CC} = 4.5\text{ V}$	-	19	46	-	58	-	69	ns	
	$V_{CC} = 6.0\text{ V}$	-	15	39	-	49	-	59	ns		
$t_{PLH}$	LOW to HIGH propagation delay	MR to $\overline{Q}5-9$ , Q0; see <a href="#">Figure 10</a>									
		$V_{CC} = 2.0\text{ V}$	-	55	230	-	290	-	345	ns	
		$V_{CC} = 4.5\text{ V}$	-	20	46	-	58	-	69	ns	
	$V_{CC} = 6.0\text{ V}$	-	16	39	-	49	-	59	ns		
$t_t$	transition time	see <a href="#">Figure 10</a>	<a href="#">[2]</a>								
		$V_{CC} = 2.0\text{ V}$	-	19	75	-	95	-	110	ns	
		$V_{CC} = 4.5\text{ V}$	-	7	15	-	19	-	22	ns	
	$V_{CC} = 6.0\text{ V}$	-	6	13	-	16	-	19	ns		
$t_w$	pulse width	CP0 and $\overline{CP}1$ (HIGH or LOW); see <a href="#">Figure 9</a>									
		$V_{CC} = 2.0\text{ V}$	80	17	-	100	-	120	-	ns	
		$V_{CC} = 4.5\text{ V}$	16	6	-	20	-	24	-	ns	
		$V_{CC} = 6.0\text{ V}$	14	5	-	17	-	20	-	ns	
		MR (HIGH); see <a href="#">Figure 9</a>									
		$V_{CC} = 2.0\text{ V}$	80	19	-	100	-	120	-	ns	
		$V_{CC} = 4.5\text{ V}$	16	7	-	20	-	24	-	ns	
	$V_{CC} = 6.0\text{ V}$	14	6	-	17	-	20	-	ns		

**Table 7. Dynamic characteristics ...continued**  
*GND = 0 V;  $t_r = t_f = 6$  ns;  $C_L = 50$  pF; see [Figure 11](#).*

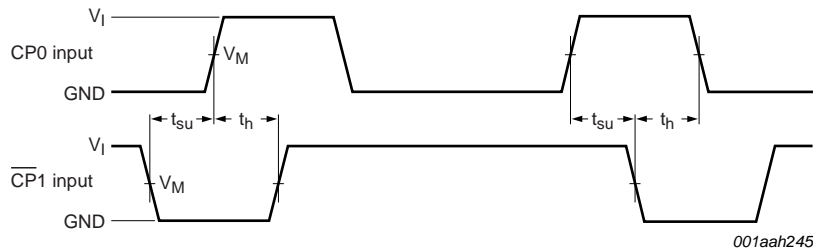
Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
$t_{su}$	set-up time	$\overline{CP1}$ to CP0; CP0 to $\overline{CP1}$ ; see <a href="#">Figure 8</a>								
		$V_{CC} = 2.0$ V	50	-8	-	65	-	75	-	ns
		$V_{CC} = 4.5$ V	10	-3	-	13	-	15	-	ns
		$V_{CC} = 6.0$ V	9	-2	-	11	-	13	-	ns
$t_h$	hold time	$\overline{CP1}$ to CP0; CP0 to $\overline{CP1}$ ; see <a href="#">Figure 8</a>								
		$V_{CC} = 2.0$ V	50	17	-	65	-	75	-	ns
		$V_{CC} = 4.5$ V	10	6	-	13	-	15	-	ns
		$V_{CC} = 6.0$ V	9	5	-	11	-	13	-	ns
$t_{rec}$	recovery time	MR to CP0 and MR to $\overline{CP1}$ ; see <a href="#">Figure 9</a>								
		$V_{CC} = 2.0$ V	5	-17	-	5	-	5	-	ns
		$V_{CC} = 4.5$ V	5	-6	-	5	-	5	-	ns
		$V_{CC} = 6.0$ V	5	-5	-	5	-	5	-	ns
$f_{max}$	maximum frequency	CP0 or $\overline{CP1}$ ; see <a href="#">Figure 9</a>								
		$V_{CC} = 2.0$ V	6.0	23	-	4.8	-	4.0	-	MHz
		$V_{CC} = 4.5$ V	30	70	-	24	-	20	-	MHz
		$V_{CC} = 5.0$ V; $C_L = 15$ pF	-	77	-	-	-	-	-	MHz
		$V_{CC} = 6.0$ V	25	83	-	28	-	24	-	MHz
$C_{PD}$	power dissipation capacitance	$V_I = GND$ to $V_{CC}$ ; $V_{CC} = 5$ V; $f_i = 1$ MHz	[3]	-	35	-	-	-	-	pF
<b>74HCT4017</b>										
$t_{pd}$	propagation delay	CP0 to Qn; CP0 to $\overline{Q5-9}$ ; see <a href="#">Figure 10</a>								
		$V_{CC} = 4.5$ V	-	25	46	-	58	-	69	ns
		$V_{CC} = 5.0$ V; $C_L = 15$ pF	-	21	-	-	-	-	-	ns
		$\overline{CP1}$ to Qn; $\overline{CP1}$ to $\overline{Q5-9}$ ; see <a href="#">Figure 10</a>								
		$V_{CC} = 4.5$ V	-	25	50	-	63	-	75	ns
		$V_{CC} = 5.0$ V; $C_L = 15$ pF	-	21	-	-	-	-	-	ns
$t_{PHL}$	HIGH to LOW propagation delay	MR to Q[1:9]; see <a href="#">Figure 10</a>								
		$V_{CC} = 4.5$ V	-	22	46	-	58	-	69	ns
$t_{PLH}$	LOW to HIGH propagation delay	MR to $\overline{Q5-9}$ , Q0; see <a href="#">Figure 10</a>								
		$V_{CC} = 4.5$ V	-	20	46	-	58	-	69	ns

**Table 7. Dynamic characteristics ...continued**  
*GND = 0 V;  $t_r = t_f = 6$  ns;  $C_L = 50$  pF; see [Figure 11](#).*

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
$t_t$	transition time	see <a href="#">Figure 10</a> [2]								
		$V_{CC} = 4.5$ V	-	7	15	-	19	-	22	ns
$t_w$	pulse width	CP0 and $\overline{CP1}$ (HIGH or LOW); see <a href="#">Figure 9</a>								
		$V_{CC} = 4.5$ V	16	7	-	20	-	24	-	ns
		MR (HIGH); see <a href="#">Figure 9</a>								
$t_{su}$	set-up time	$\overline{CP1}$ to CP0; CP0 to $\overline{CP1}$ ; see <a href="#">Figure 8</a>								
		$V_{CC} = 4.5$ V	10	-3	-	13	-	15	-	ns
$t_h$	hold time	$\overline{CP1}$ to CP0; CP0 to $\overline{CP1}$ ; see <a href="#">Figure 8</a>								
		$V_{CC} = 4.5$ V	10	6	-	13	-	15	-	ns
$t_{rec}$	recovery time	MR to CP0 and MR to $\overline{CP1}$ ; see <a href="#">Figure 9</a>								
		$V_{CC} = 4.5$ V	5	-5	-	5	-	5	-	ns
$f_{max}$	maximum frequency	CP0 or $\overline{CP1}$ ; see <a href="#">Figure 9</a>								
		$V_{CC} = 4.5$ V	30	61	-	24	-	20	-	MHz
		$V_{CC} = 5.0$ V; $C_L = 15$ pF	-	67	-	-	-	-	-	MHz
$C_{PD}$	power dissipation capacitance	$V_I = GND$ to $V_{CC} - 1.5$ V; <a href="#">[3]</a> $V_{CC} = 5$ V; $f_i = 1$ MHz	-	36	-	-	-	-	-	pF

- [1]  $t_{pd}$  is the same as  $t_{PHL}$  and  $t_{PLH}$ .
- [2]  $t_t$  is the same as  $t_{THL}$  and  $t_{TLH}$ .
- [3]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu$ W):  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times V_{CC}^2 \times f_o)$  where:  
 $f_i$  = input frequency in MHz;  
 $f_o$  = output frequency in MHz;  
 $C_L$  = output load capacitance in pF;  
 $V_{CC}$  = supply voltage in V;  
 $N$  = number of inputs switching;  
 $\sum(C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

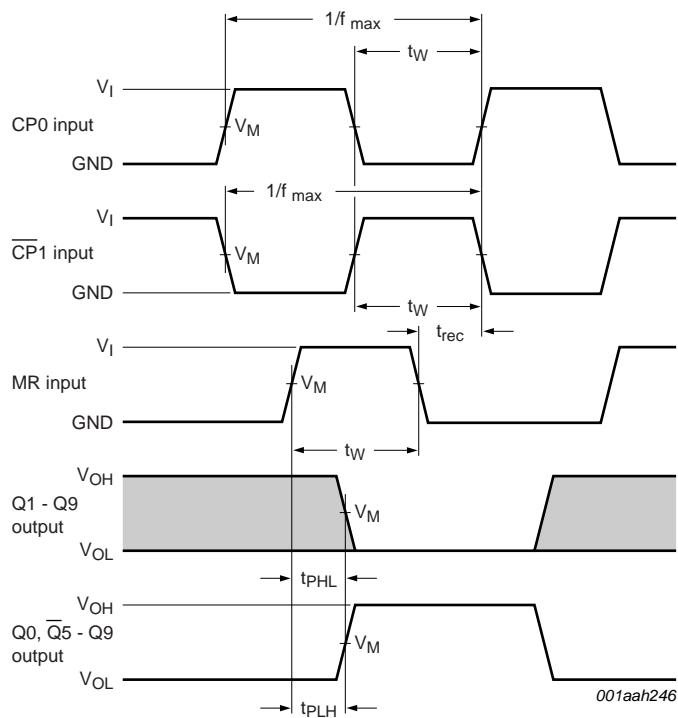
### 11. Waveforms



Measurement points are given in [Table 8](#).

$V_{OL}$  and  $V_{OH}$  are typical voltage output levels that occur with the output load.

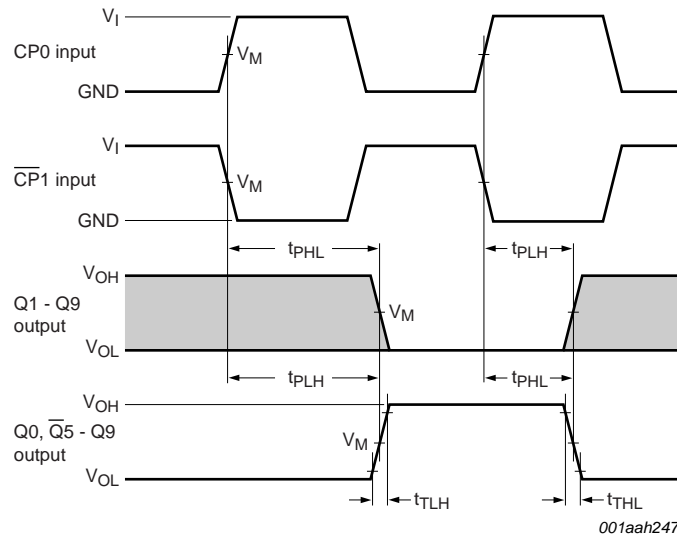
**Fig 8. Waveforms showing the set-up and hold times for CP0 to CP1 and CP1 to CP0**



Measurement points are given in [Table 8](#).

$V_{OL}$  and  $V_{OH}$  are typical voltage output levels that occur with the output load.

**Fig 9. Waveforms showing the minimum pulse width for CP0, CP1 and MR input; the maximum frequency for CP0 and CP1 input; the recovery time for MR and the MR input to Qn and Q5-9 output propagation delays**



Measurement points are given in [Table 8](#).

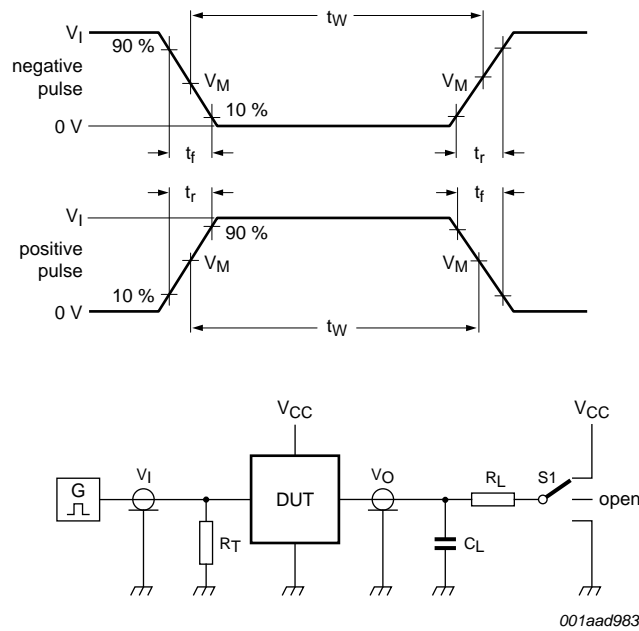
$V_{OL}$  and  $V_{OH}$  are typical voltage output levels that occur with the output load.

Conditions:  $\overline{CP1}$  = LOW while CP0 is triggered on a LOW-to-HIGH transition and CP0 = HIGH, while  $\overline{CP1}$  is triggered on a HIGH-to-LOW transition.

**Fig 10. Waveforms showing the propagation delays for CP0,  $\overline{CP1}$  to Qn,  $\overline{Q5-9}$  outputs and the output transition times**

**Table 8. Measurement points**

Type	Input	Output
	$V_M$	$V_M$
74HC4017	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
74HCT4017	1.3 V	1.3 V



Test data is given in [Table 9](#).

Definitions test circuit:

$R_T$  = Termination resistance should be equal to output impedance  $Z_o$  of the pulse generator.

$C_L$  = Load capacitance including jig and probe capacitance.

$R_L$  = Load resistance.

S1 = Test selection switch.

**Fig 11. Load circuitry for measuring switching times**

**Table 9. Test data**

Type	Input		Load		S1 position		
	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PHL}, t_{PLH}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
74HC4017	$V_{CC}$	6 ns	15 pF, 50 pF	1 k $\Omega$	open	GND	$V_{CC}$
74HCT4017	3 V	6 ns	15 pF, 50 pF	1 k $\Omega$	open	GND	$V_{CC}$

## 12. Application information

Some examples of applications for the 74HC4017; 74HCT4017 are:

- Decade counter with decimal decoding
- 1 out of n decoding counter (when cascaded)
- Sequential controller
- Timer

[Figure 12](#) shows a technique for extending the number of decoded output states for the 74HC4017; 74HCT4017. Decoded outputs are sequential within each stage and from stage to stage, with no dead time (except propagation delay).

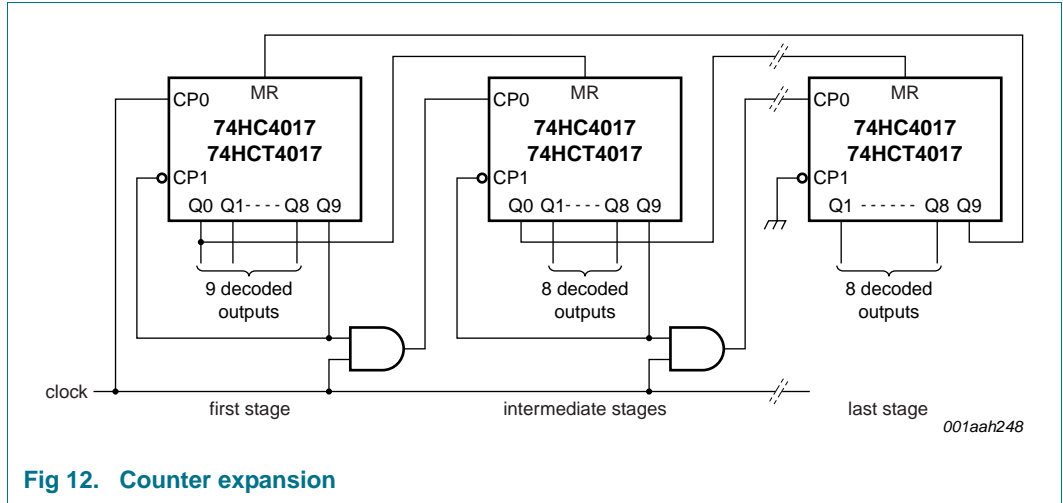


Fig 12. Counter expansion

**Remark:** It is essential not to enable the counter on  $\overline{CP1}$  when CP0 is HIGH, or on CP0 when CP1 is LOW, as this would cause an extra count.

Figure 13 shows an example of a divide-by 2 through divide-by 10 circuit using one 74HC4017; 74HCT4017. Since the 74HC4017; 74HCT4017 has an asynchronous reset, the output pulse widths are narrow (minimum expected pulse width is 6 ns). The output pulse widths can be enlarged by inserting an RC network at the MR input.

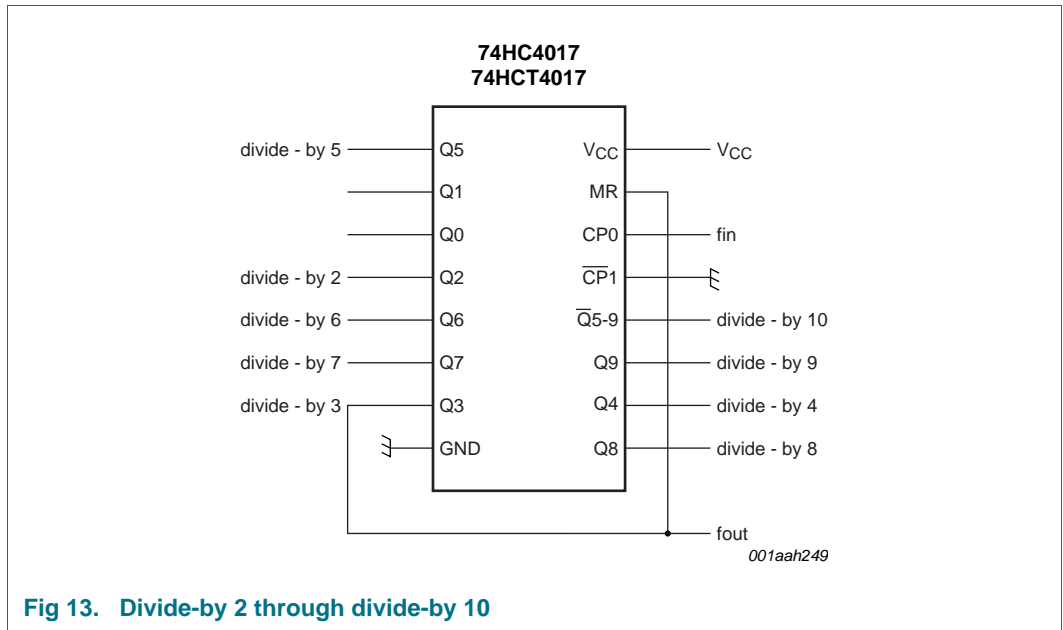


Fig 13. Divide-by 2 through divide-by 10

13. Package outline

DIP16: plastic dual in-line package; 16 leads (300 mil)

SOT38-4

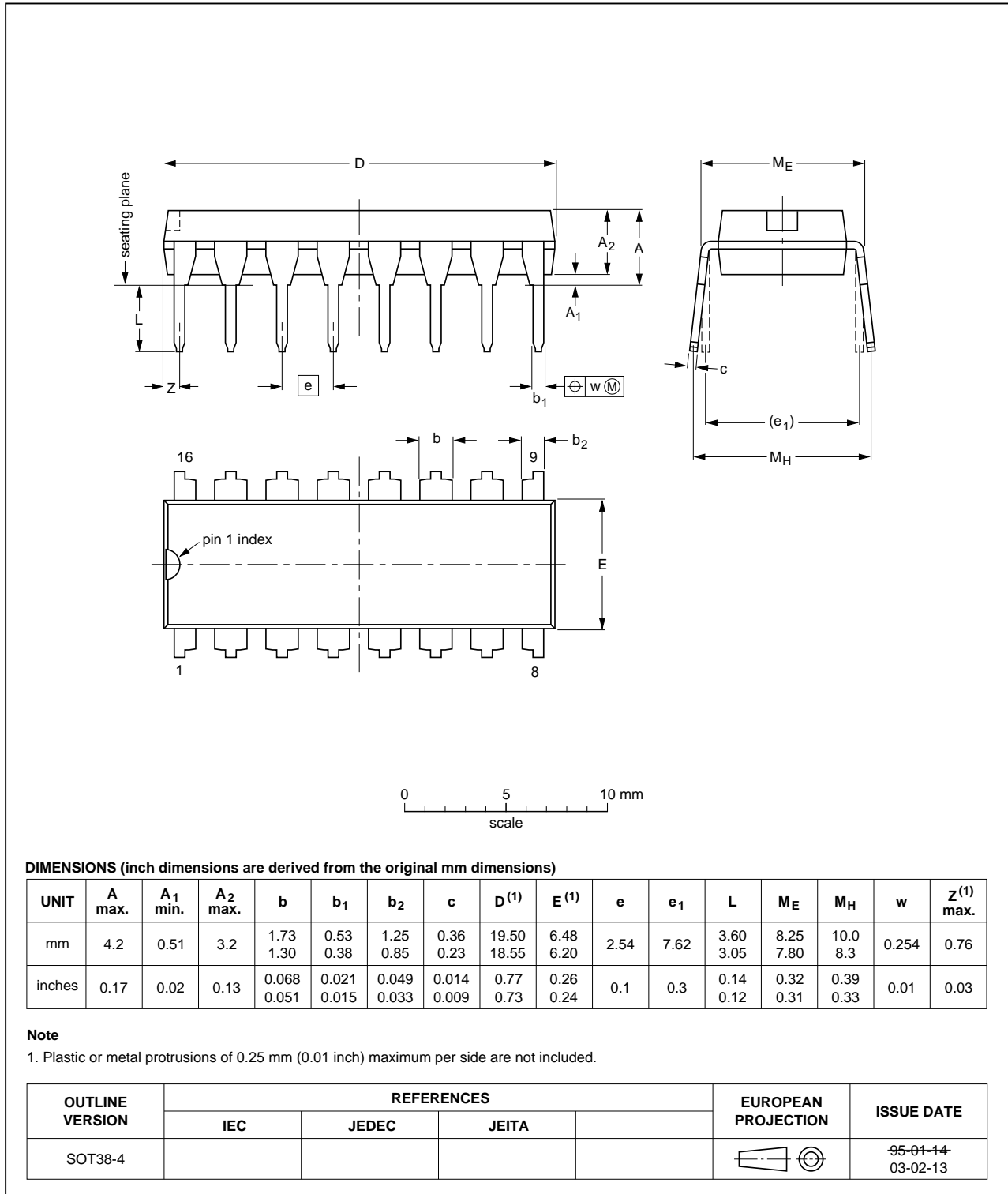


Fig 14. Package outline SOT38-4 (DIP16)



SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1

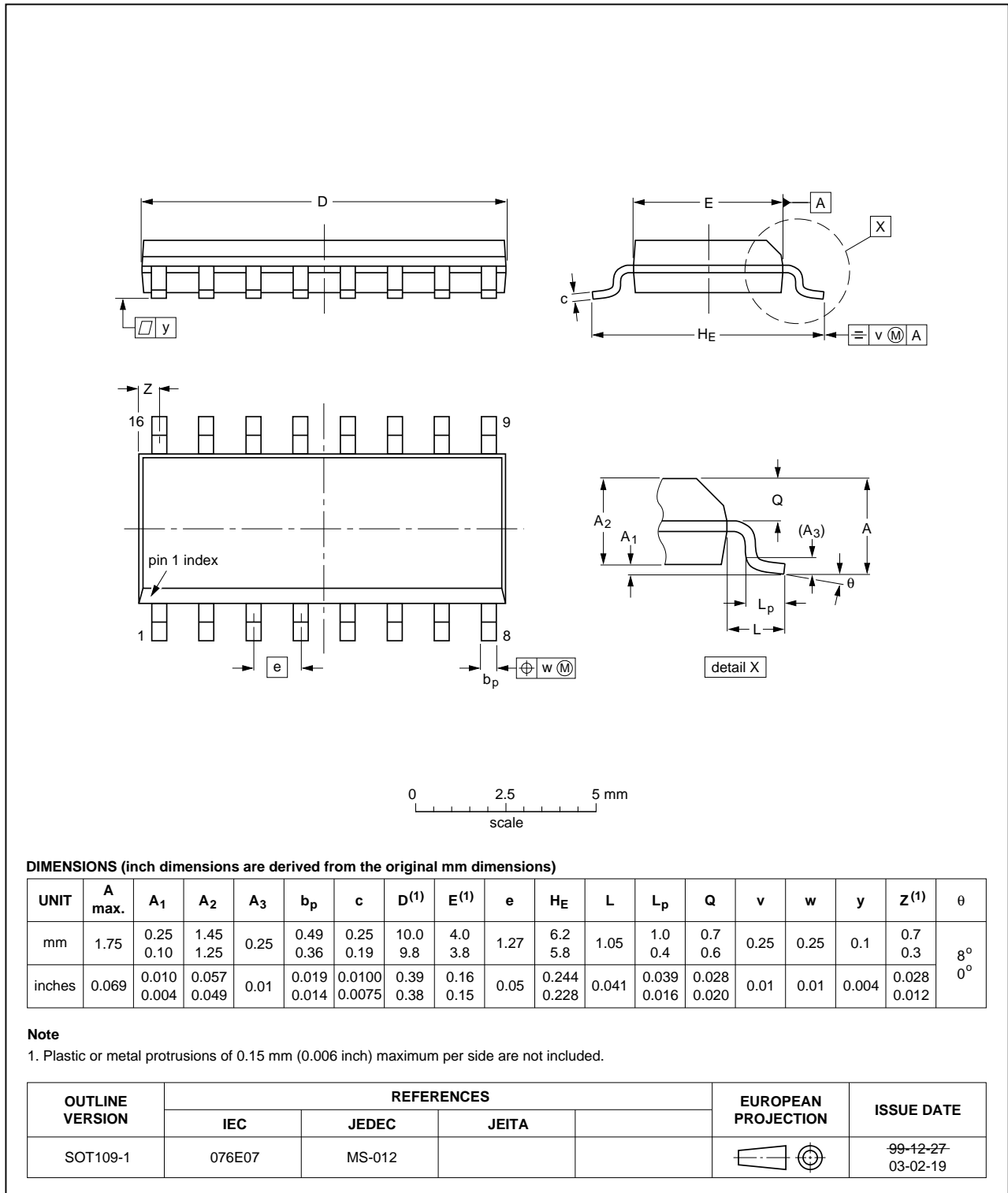


Fig 15. Package outline SOT109-1 (SO16)

SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm

SOT338-1

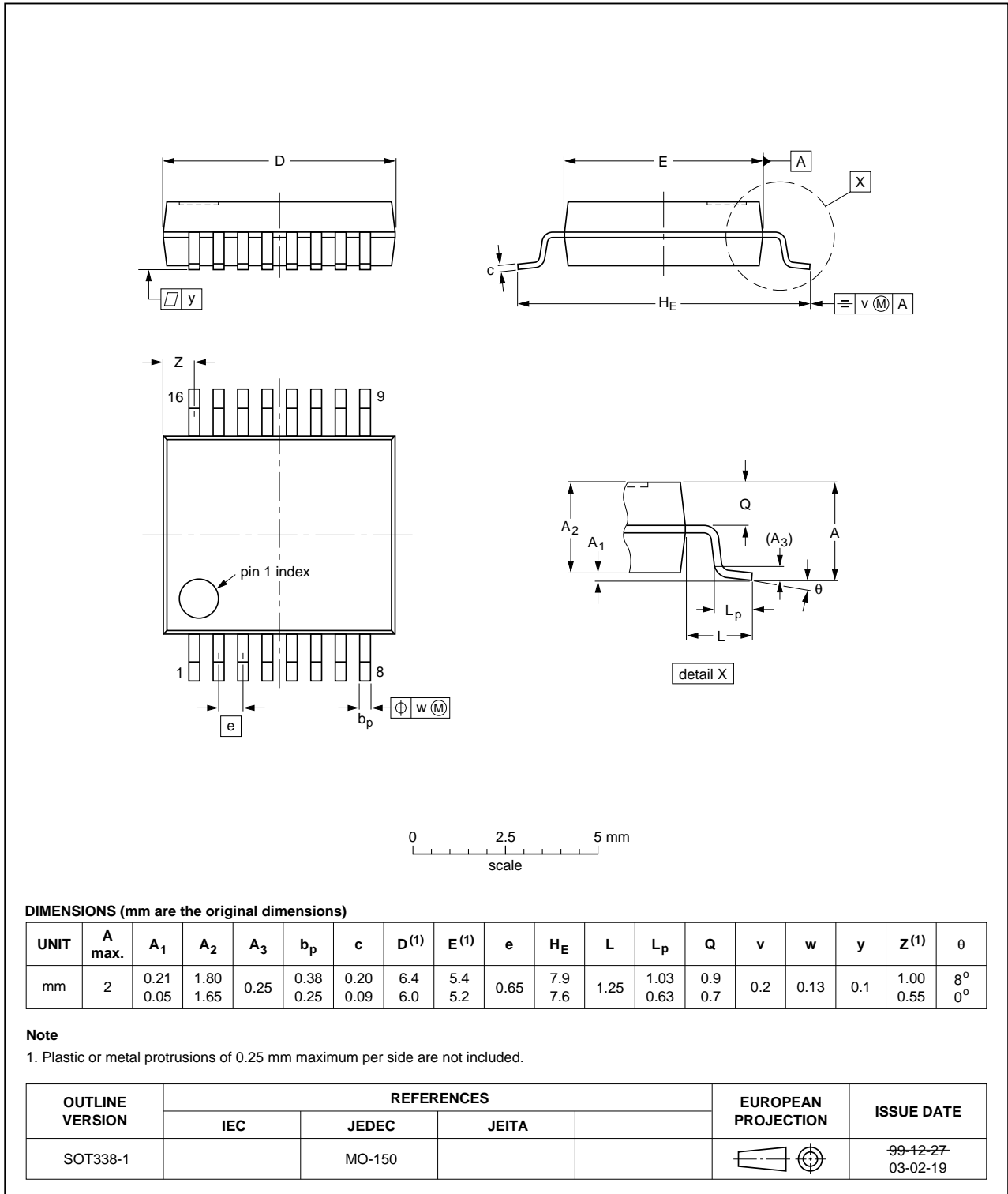


Fig 16. Package outline SOT338-1 (SSOP16)

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1

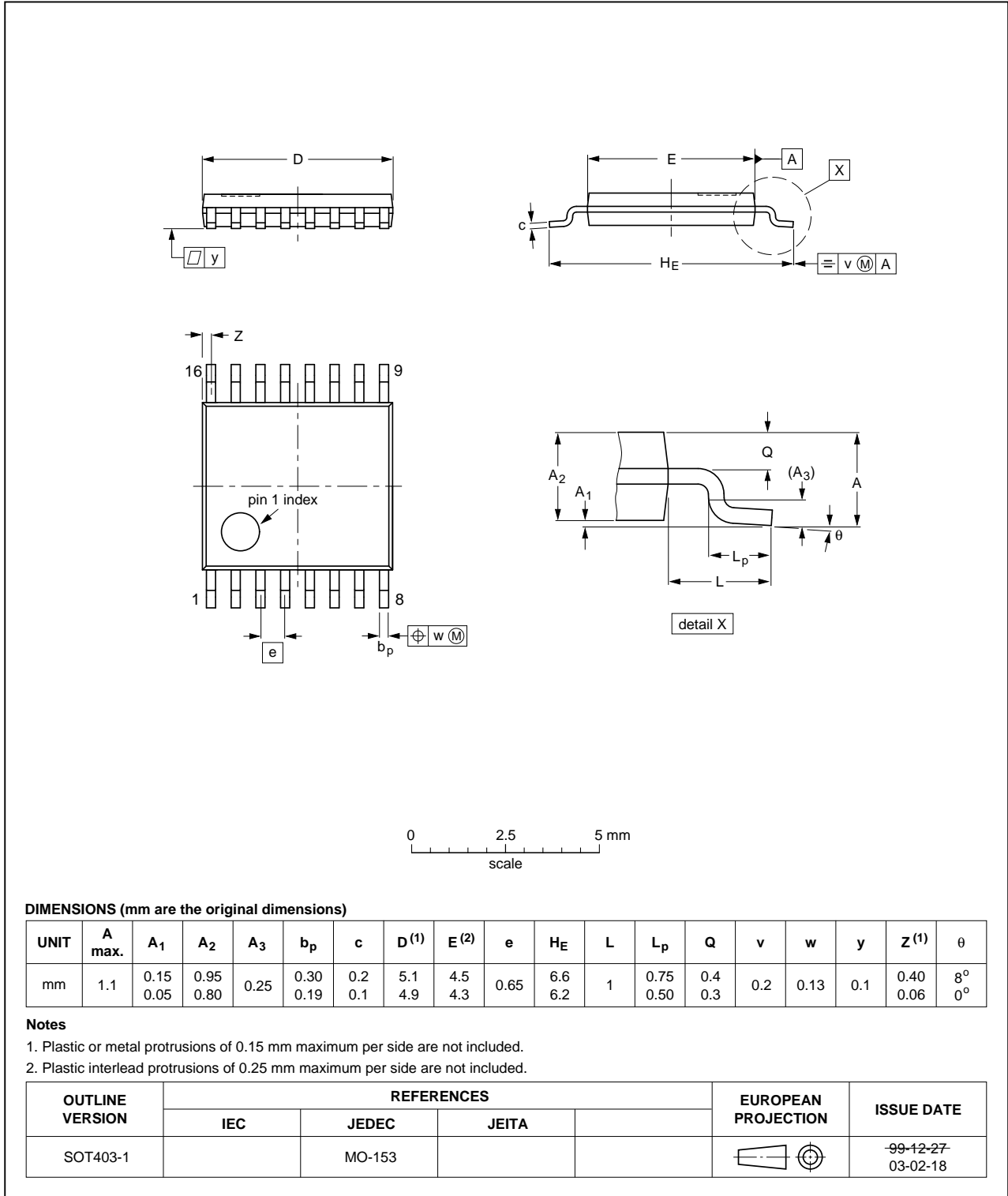


Fig 17. Package outline SOT403-1 (TSSOP16)

DHVQFN16: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 x 3.5 x 0.85 mm

SOT763-1

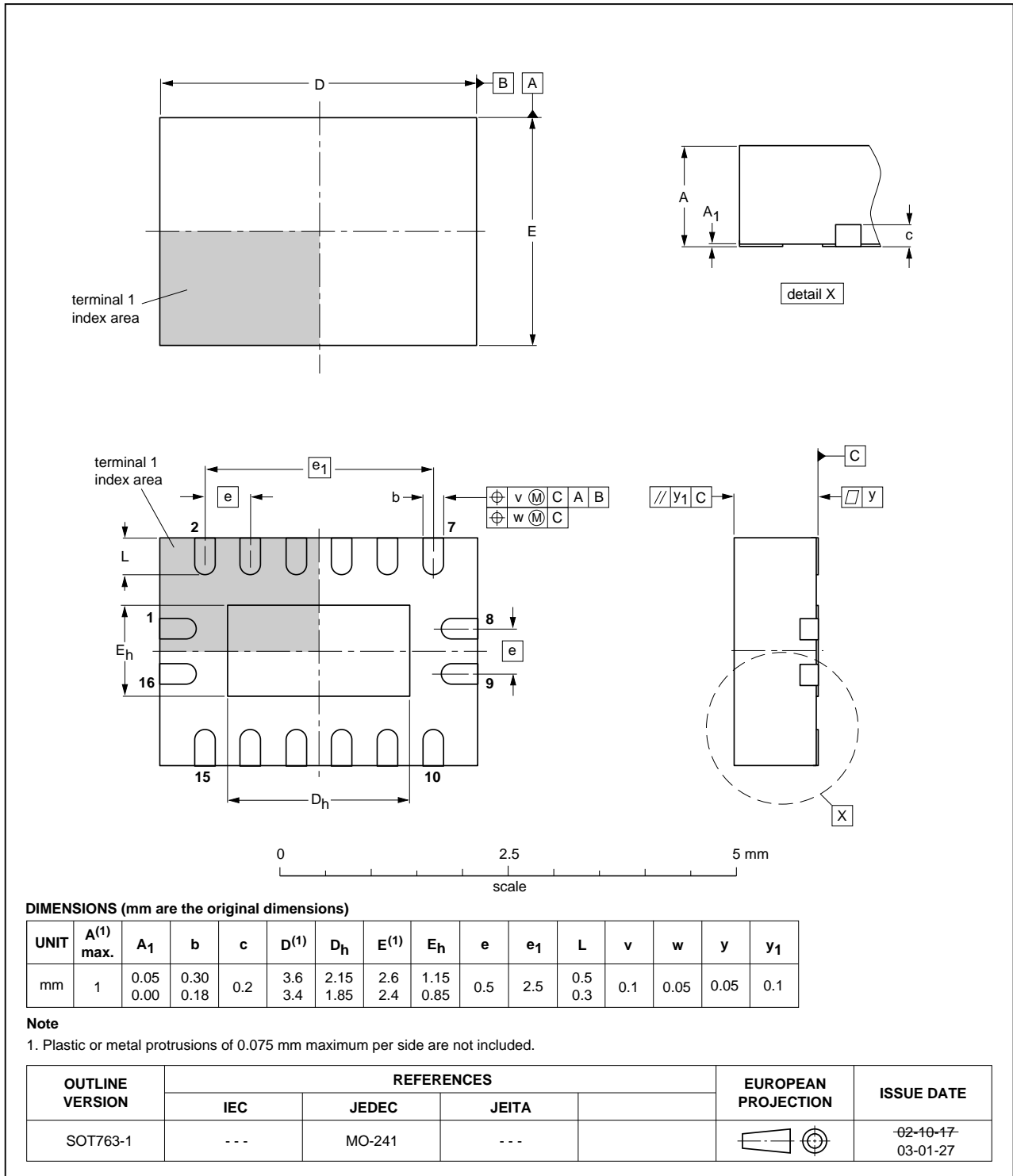


Fig 18. Package outline SOT763-1 (DHVQFN16)

## 14. Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

## 15. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT4017 v.4	20131210	Product data sheet	-	74HC_HCT4017 v.3
Modifications:	<ul style="list-style-type: none"> <li>• General description updated.</li> </ul>			
74HC_HCT4017 v.3	20080108	Product data sheet	-	74HC_HCT4017_CNV v.2
Modifications:	<ul style="list-style-type: none"> <li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>• Legal texts have been adapted to the new company name where appropriate.</li> <li>• <a href="#">Section 3</a>: DHVQFN16 package added.</li> <li>• <a href="#">Section 7</a>: derating values added for DHVQFN16 package.</li> <li>• <a href="#">Section 13</a>: outline drawing added for DHVQFN16 package.</li> </ul>			
74HC_HCT4017_CNV v.2	19970829	Product specification	-	-

## 16. Legal information

### 16.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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**18. Contents**

**1 General description . . . . . 1**

**2 Features and benefits . . . . . 1**

**3 Ordering information . . . . . 2**

**4 Functional diagram . . . . . 2**

**5 Pinning information . . . . . 5**

5.1 Pinning . . . . . 5

5.2 Pin description . . . . . 5

**6 Functional description . . . . . 6**

**7 Limiting values . . . . . 6**

**8 Recommended operating conditions . . . . . 7**

**9 Static characteristics . . . . . 7**

**10 Dynamic characteristics . . . . . 9**

**11 Waveforms . . . . . 12**

**12 Application information . . . . . 14**

**13 Package outline . . . . . 16**

**14 Abbreviations . . . . . 21**

**15 Revision history . . . . . 21**

**16 Legal information . . . . . 22**

16.1 Data sheet status . . . . . 22

16.2 Definitions . . . . . 22

16.3 Disclaimers . . . . . 22

16.4 Trademarks . . . . . 23

**17 Contact information . . . . . 23**

**18 Contents . . . . . 24**

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