

**DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE**

Symbol	Parameter	Limits		Test Conditions (Note 1)	Units
		Min.	Typ.		
$V_{T+}$	Positive-Going Threshold Voltage	1.5	1.8	$V_{CC} = 5.0V$	V
$V_{T-}$	Negative-Going Threshold Voltage	0.6	0.95	$V_{CC} = 5.0V$	V
$V_{T+}-V_{T-}$	Hysteresis	0.4	0.8	$V_{CC} = 5.0V$	V
$V_{CD}$	Input Clamp Diode Voltage	-0.65	-1.5	$V_{CC} = \text{MIN}, I_{IN} = -18mA$	V
$V_{OH}$	Output HIGH Voltage	54	2.5	$V_{CC} = \text{MIN}, I_{OH} = -400\mu A, V_{IN} = 0.5V$	V
		74	2.7		
$V_{OL}$	Output LOW Voltage	54, 74	0.25	$V_{CC} = \text{MIN}, V_{IN} = 1.9V$	V
		74	0.35		
$I_{T+}$	Input Current at Positive-Going Threshold	-0.14		$V_{CC} = 5.0V, V_{IN} = V_{T+}$	mA
				$V_{CC} = 5.0V, V_{IN} = V_{T-}$	mA
$I_{T-}$	Input Current at Negative-Going Threshold	-0.18		$V_{CC} = 5.0V, V_{IN} = V_{T-}$	mA
$I_{IH}$	Input HIGH Current	1.0		$V_{CC} = \text{MAX}, V_{IN} = 2.7V$	$\mu A$
$I_{IL}$	Input LOW Current	-0.4		$V_{CC} = \text{MAX}, V_{IN} = 0.4V$	mA
$I_{OS}$	Output Short Circuit Current (Note 2)	-20		$V_{CC} = \text{MAX}, V_{OUT} = 0V$	mA
$I_{CH}$	Supply Current HIGH	3		$V_{CC} = \text{MAX}, V_{IN} = 0V$	mA
$I_{CL}$	Supply Current LOW	4		$V_{CC} = \text{MAX}, V_{IN} = 4.5V$	mA

**AC CHARACTERISTICS: ( $T_A = 25^\circ C$ )**

Symbol	Parameter	Limits		Test Conditions	Units
		Min.	Typ.		
$t_{PLH}$	Turn Off Delay, Input to Output	15		$V_{CC} = 5.0V$ $C_L = 15pF$	ns
$t_{PHL}$	Turn On Delay, Input to Output	18			

Notes:  
 1) For conditions shown as MIN or MAX, use the appropriate value specified under guaranteed operating ranges.  
 2) Not more than one output should be shorted at a time.  
 3) Typical values are at  $V_{CC} = 5.0V, T_A = 25^\circ C$ .

$V_O$  - OUTPUT VOLTAGE - VOLTS

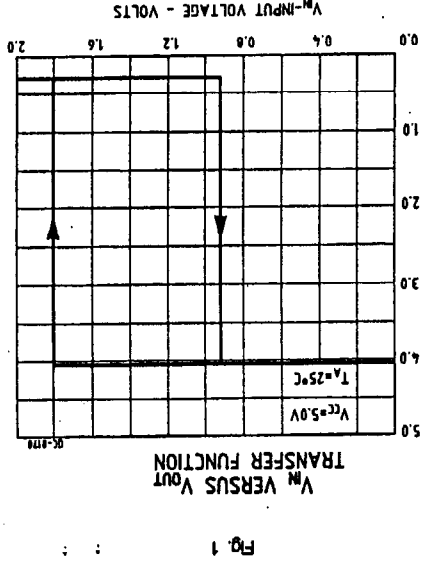


Fig 1

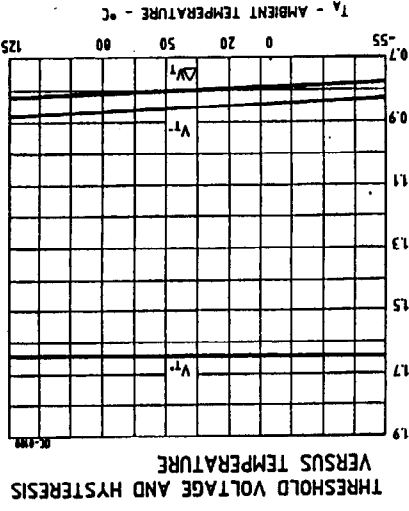


Fig 3

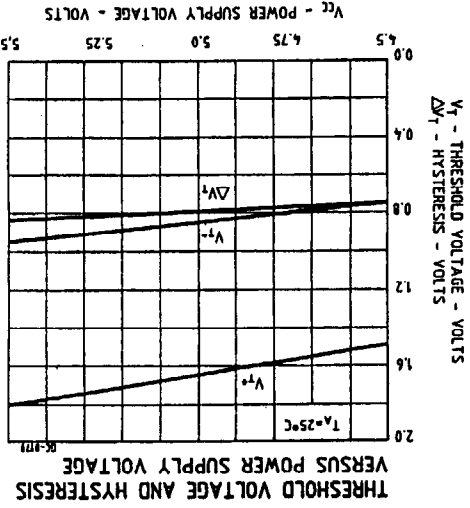


Fig 2

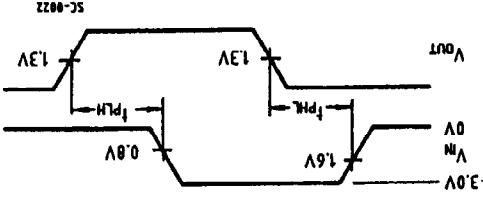


Fig 4





TS4LS247/248  
TT4LS247/248

**BCD-TO-SEVEN-SEGMENT  
DECODER/DRIVES**

**DESCRIPTION**

The TS4LS/TT4LS247/248 are BCD-to-seven segment Decoder/Drivers. They compose the and with the falls. The LS247 has active low outputs for direct drive of indicators, while the LS248 has active - high outputs for driving lamp buffers. Both types feature a lamp test input and full ripple blanking input/output controls. An automatic leading and/or trailing edge zero-blanking control (RBI and RBO) is incorporated. An over-riding blanking input (BI) may be used to control the lamp intensity. Display pattern for BCD input counts above 9 are unique symbols to authenticate input conditions.

- OPEN-COLLECTOR OUTPUTS DRIVE INDICATORS DIRECTLY
  - LAMP-TEST PROVISION
  - LEADING/TRAILING ZERO SUPPRESSION
- LS247**
- OPEN-COLLECTOR OUTPUTS DRIVE INDICATORS DIRECTLY
  - LAMP-TEST PROVISION
  - LEADING/TRAILING ZERO SUPPRESSION
- LS248**
- INTERNAL PULL-UPS ELIMINATE NEED FOR EXTERNAL RESISTORS
  - LAMP-TEST PROVISION
  - LEADING/TRAILING ZERO SUPPRESSION

**PIN NAMES**

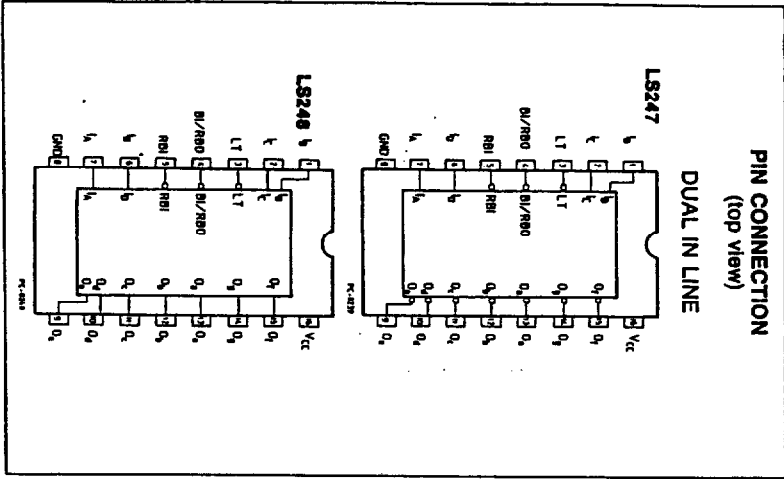
A,B,C,D	Inputs
a,b,c,d,e,f,g	Outputs
LT	Lamp Test
RBO	Rubout Outputs
RBI	Rubout Inputs
BI	Blanking Inputs

**PRELIMINARY DATA**

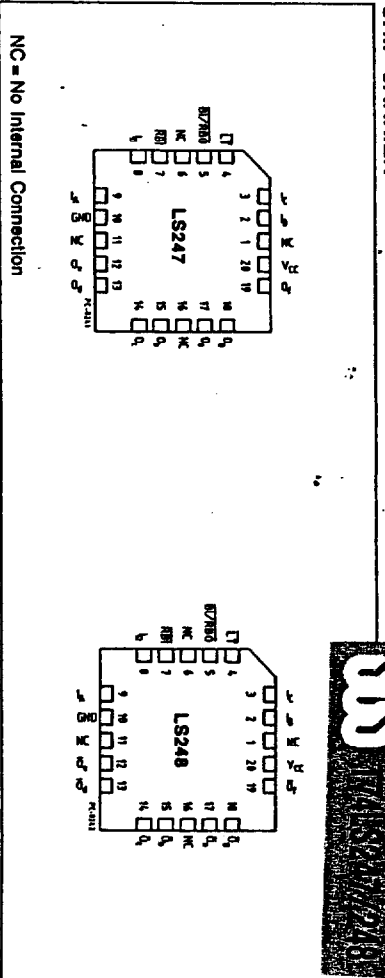
Plastic Package B1  
Ceramic Package D1/D2  
Micro Package M1  
Plastic Chip Carrier C1

ORDERING NUMBERS:  
TS4LSXXX D2  
TT4LSXXX D1  
TS4LSXXX B1  
TT4LSXXX B1

**PIN CONNECTION  
(top view)**



**CHIP CARRIER**



**ALL CIRCUIT TYPES FEATURE LAMP INTENSITY MODULATION CAPABILITY**

TYPE	DRIVER OUTPUTS				TYPICAL POWER DISSIPATION
	ACTIVE LEVEL	CONFIGURATION	SINK CURRENT	MAX VOLTAGE	
TS4LS247	low	open-collector	12 mA	15 V	35 mW
TS4LS248	high	2-KΩ pull-up	2.0 mA	5.5 V	125 mW
TT4LS247	low	open-collector	24 mA	15 V	35 mW
TT4LS248	high	2-KΩ pull-up	6.0 mA	5.5 V	125 mW

**ABSOLUTE MAXIMUM RATINGS**

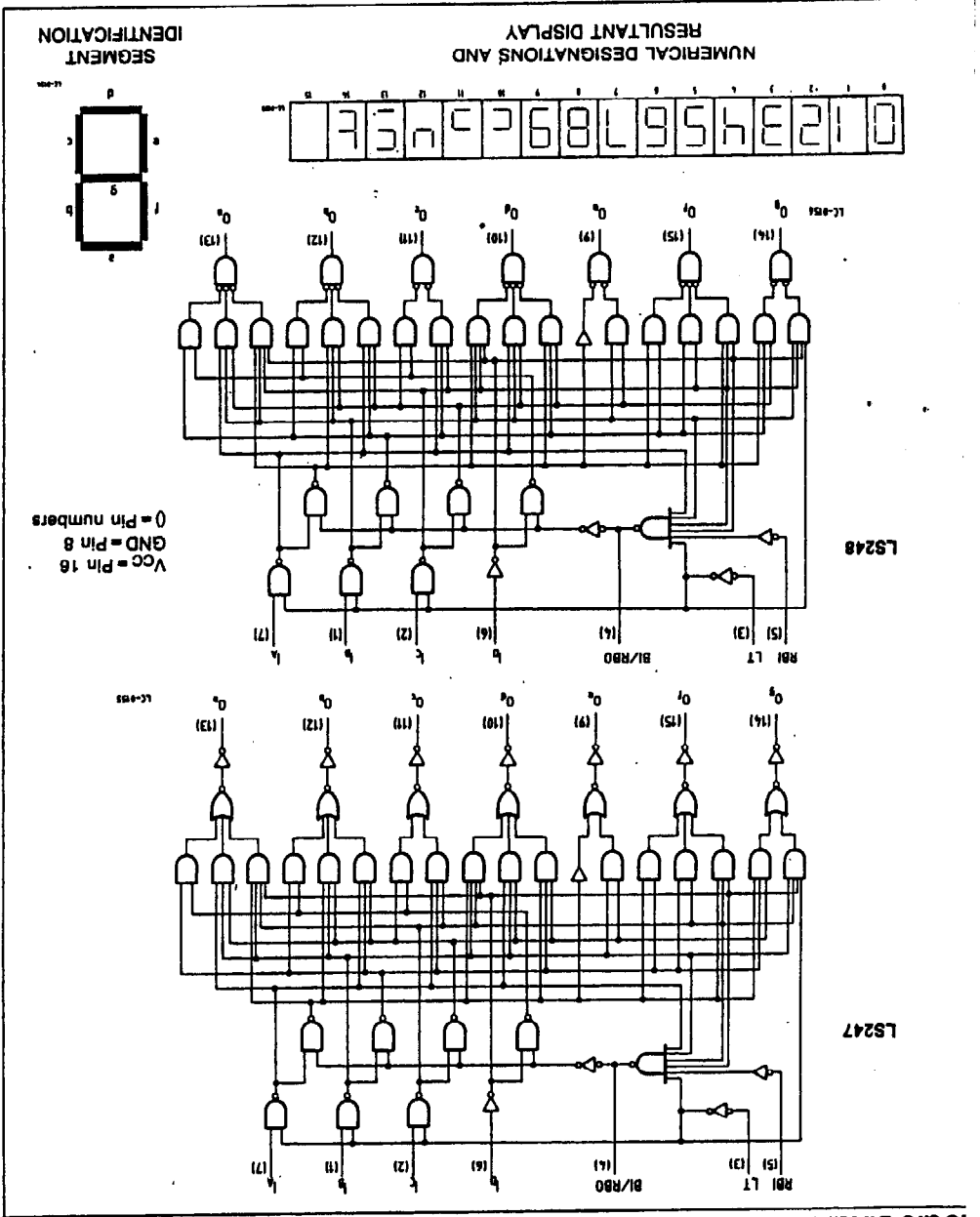
Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	-0.5 to 7	V
V <sub>I</sub>	Input Voltage, Applied to Input	-0.5 to 15	V
V <sub>O</sub>	Output Voltage, Applied to Output	0 to 10	V
I <sub>I</sub>	Input Current, Into Inputs	-30 to 5	mA
I <sub>O</sub>	Output Current, Into Outputs	50	mA

Stresses in excess of 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 in excess of 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.

**GUARANTEED OPERATING RANGES**

Part Numbers	Supply Voltage		Temperature	
	Min	Typ	Max	
TS4LS247/248D2	4.5 V	5.0 V	5.5 V	-55°C to +125°C
TT4LS247/248XX	4.75 V	5.0 V	5.25 V	0°C to +70°C

XX = package type.



LS247 TRUTH TABLE

DECIMAL OR FUNCTION	INPUTS				B/RBO*	OUTPUTS				NOTE
	LT	RBI	D	C		A	B	C	D	
0	H	H	L	L	L	H	H	H	H	OFF
1	H	H	L	L	L	H	H	H	H	OFF
2	H	H	L	L	L	H	H	H	H	OFF
3	H	H	L	L	L	H	H	H	H	OFF
4	H	H	L	L	L	H	H	H	H	OFF
5	H	H	L	L	L	H	H	H	H	OFF
6	H	H	L	L	L	H	H	H	H	OFF
7	H	H	L	L	L	H	H	H	H	OFF
8	H	H	L	L	L	H	H	H	H	OFF
9	H	H	L	L	L	H	H	H	H	OFF
10	H	H	L	L	L	H	H	H	H	OFF
11	H	H	L	L	L	H	H	H	H	OFF
12	H	H	L	L	L	H	H	H	H	OFF
13	H	H	L	L	L	H	H	H	H	OFF
14	H	H	L	L	L	H	H	H	H	OFF
15	H	H	L	L	L	H	H	H	H	OFF
16	H	H	L	L	L	H	H	H	H	OFF
17	H	H	L	L	L	H	H	H	H	OFF
18	H	H	L	L	L	H	H	H	H	OFF
19	H	H	L	L	L	H	H	H	H	OFF
20	H	H	L	L	L	H	H	H	H	OFF
21	H	H	L	L	L	H	H	H	H	OFF
22	H	H	L	L	L	H	H	H	H	OFF
23	H	H	L	L	L	H	H	H	H	OFF
24	H	H	L	L	L	H	H	H	H	OFF
25	H	H	L	L	L	H	H	H	H	OFF
26	H	H	L	L	L	H	H	H	H	OFF
27	H	H	L	L	L	H	H	H	H	OFF
28	H	H	L	L	L	H	H	H	H	OFF
29	H	H	L	L	L	H	H	H	H	OFF
30	H	H	L	L	L	H	H	H	H	OFF
31	H	H	L	L	L	H	H	H	H	OFF
32	H	H	L	L	L	H	H	H	H	OFF
33	H	H	L	L	L	H	H	H	H	OFF
34	H	H	L	L	L	H	H	H	H	OFF
35	H	H	L	L	L	H	H	H	H	OFF
36	H	H	L	L	L	H	H	H	H	OFF
37	H	H	L	L	L	H	H	H	H	OFF
38	H	H	L	L	L	H	H	H	H	OFF
39	H	H	L	L	L	H	H	H	H	OFF
40	H	H	L	L	L	H	H	H	H	OFF
41	H	H	L	L	L	H	H	H	H	OFF
42	H	H	L	L	L	H	H	H	H	OFF
43	H	H	L	L	L	H	H	H	H	OFF
44	H	H	L	L	L	H	H	H	H	OFF
45	H	H	L	L	L	H	H	H	H	OFF
46	H	H	L	L	L	H	H	H	H	OFF
47	H	H	L	L	L	H	H	H	H	OFF
48	H	H	L	L	L	H	H	H	H	OFF
49	H	H	L	L	L	H	H	H	H	OFF
50	H	H	L	L	L	H	H	H	H	OFF
51	H	H	L	L	L	H	H	H	H	OFF
52	H	H	L	L	L	H	H	H	H	OFF
53	H	H	L	L	L	H	H	H	H	OFF
54	H	H	L	L	L	H	H	H	H	OFF
55	H	H	L	L	L	H	H	H	H	OFF
56	H	H	L	L	L	H	H	H	H	OFF
57	H	H	L	L	L	H	H	H	H	OFF
58	H	H	L	L	L	H	H	H	H	OFF
59	H	H	L	L	L	H	H	H	H	OFF
60	H	H	L	L	L	H	H	H	H	OFF
61	H	H	L	L	L	H	H	H	H	OFF
62	H	H	L	L	L	H	H	H	H	OFF
63	H	H	L	L	L	H	H	H	H	OFF
64	H	H	L	L	L	H	H	H	H	OFF
65	H	H	L	L	L	H	H	H	H	OFF
66	H	H	L	L	L	H	H	H	H	OFF
67	H	H	L	L	L	H	H	H	H	OFF
68	H	H	L	L	L	H	H	H	H	OFF
69	H	H	L	L	L	H	H	H	H	OFF
70	H	H	L	L	L	H	H	H	H	OFF
71	H	H	L	L	L	H	H	H	H	OFF
72	H	H	L	L	L	H	H	H	H	OFF
73	H	H	L	L	L	H	H	H	H	OFF
74	H	H	L	L	L	H	H	H	H	OFF
75	H	H	L	L	L	H	H	H	H	OFF
76	H	H	L	L	L	H	H	H	H	OFF
77	H	H	L	L	L	H	H	H	H	OFF
78	H	H	L	L	L	H	H	H	H	OFF
79	H	H	L	L	L	H	H	H	H	OFF
80	H	H	L	L	L	H	H	H	H	OFF
81	H	H	L	L	L	H	H	H	H	OFF
82	H	H	L	L	L	H	H	H	H	OFF
83	H	H	L	L	L	H	H	H	H	OFF
84	H	H	L	L	L	H	H	H	H	OFF
85	H	H	L	L	L	H	H	H	H	OFF
86	H	H	L	L	L	H	H	H	H	OFF
87	H	H	L	L	L	H	H	H	H	OFF
88	H	H	L	L	L	H	H	H	H	OFF
89	H	H	L	L	L	H	H	H	H	OFF
90	H	H	L	L	L	H	H	H	H	OFF
91	H	H	L	L	L	H	H	H	H	OFF
92	H	H	L	L	L	H	H	H	H	OFF
93	H	H	L	L	L	H	H	H	H	OFF
94	H	H	L	L	L	H	H	H	H	OFF
95	H	H	L	L	L	H	H	H	H	OFF
96	H	H	L	L	L	H	H	H	H	OFF
97	H	H	L	L	L	H	H	H	H	OFF
98	H	H	L	L	L	H	H	H	H	OFF
99	H	H	L	L	L	H	H	H	H	OFF
100	H	H	L	L	L	H	H	H	H	OFF

H = HIGH Level, L = LOW Voltage Level, X = Don't Care

NOTES: 1. The Blanking input (BI) must be open or held at a high logic level when output functions 0 through 15 are desired. The ripple-blanking input (RBI) must be open or held at a decimal zero is not desired.  
 2. When a low logic level is applied directly to the blanking input (BI), all segment outputs are off regardless of the level of any other input.  
 3. When ripple-blanking input (RBI) and inputs A, B, C, and D are at a low level with the lamp test input high, all segment outputs go off and the ripple-blanking output (B/RBO) is open or held high and a low is applied to the lamp-test input, all segment outputs are on.  
 4. When the blanking input/ripple blanking output (B/RBO) is open or held high and a low is applied to the lamp-test input, all segment outputs are on.  
 \* B/RBO is wire-AND logic serving as blanking input (BI) and/or ripple-blanking output (RBO).

DECIMAL OR FUNCTION	INPUTS				B/RBO*	OUTPUTS				NOTE
	LT	RBI	D	C		A	B	C	D	
0	H	H	L	L	L	H	H	H	H	1
1	H	H	L	L	L	H	H	H	H	1
2	H	H	L	L	L	H	H	H	H	1
3	H	H	L	L	L	H	H	H	H	1
4	H	H	L	L	L	H	H	H	H	1
5	H	H	L	L	L	H	H	H	H	1
6	H	H	L	L	L	H	H	H	H	1
7	H	H	L	L	L	H	H	H	H	1
8	H	H	L	L	L	H	H	H	H	1
9	H	H	L	L	L	H	H	H	H	1
10	H	H	L	L	L	H	H	H	H	1
11	H	H	L	L	L	H	H	H	H	1
12	H	H	L	L	L	H	H	H	H	1
13	H	H	L	L	L	H	H	H	H	1
14	H	H	L	L	L	H	H	H	H	1
15	H	H	L	L	L	H	H	H	H	1
16	L	X	X	X	X	L	L	L	L	4 a 2
17	L	X	X	X	X	L	L	L	L	4 a 2
18	L	X	X	X	X	L	L	L	L	4 a 2
19	L	X	X	X	X	L	L	L	L	4 a 2
20	L	X	X	X	X	L	L	L	L	4 a 2
21	L	X	X	X	X	L	L	L	L	4 a 2
22	L	X	X	X	X	L	L	L	L	4 a 2
23	L	X	X	X	X	L	L	L	L	4 a 2
24	L	X	X	X	X	L	L	L	L	4 a 2
25	L	X	X	X	X	L	L	L	L	4 a 2
26	L	X	X	X	X	L	L	L	L	4 a 2
27	L	X	X	X	X	L	L	L	L	4 a 2
28	L	X	X	X	X	L	L	L	L	4 a 2
29	L	X	X	X	X	L	L	L	L	4 a 2
30	L	X	X	X	X	L	L	L	L	4 a 2
31	L	X	X	X	X	L	L	L	L	4 a 2
32	L	X	X	X	X	L	L	L	L	4 a 2
33	L	X	X	X	X	L	L	L	L	4 a 2
34	L	X	X	X	X	L	L	L	L	4 a 2
35	L	X	X	X	X	L	L	L	L	4 a 2
36	L	X	X	X	X	L	L	L	L	4 a 2
37	L	X	X	X	X	L	L	L	L	4 a 2
38	L	X	X	X	X	L	L	L	L	4 a 2
39	L	X	X	X	X	L	L	L	L	4 a 2
40	L	X	X	X	X	L	L	L	L	4 a 2
41	L	X	X	X	X	L	L	L	L	4 a 2
42	L	X	X	X	X	L	L	L	L	4 a 2
43	L	X	X	X	X	L	L	L	L	4 a 2
44	L	X	X	X	X	L	L	L	L	4 a 2
45	L	X	X	X	X	L	L	L	L	4 a 2
46	L	X	X	X	X	L	L	L	L	4 a 2
47	L	X	X	X	X	L	L	L	L	4 a 2
48	L	X	X	X	X	L	L	L	L	4 a 2
49	L	X	X	X	X	L	L	L	L	4 a 2
50	L	X	X	X	X	L	L	L	L	4 a 2
51	L	X	X	X	X	L	L	L	L	4 a 2
52	L	X	X	X	X	L	L	L	L	4 a 2
53	L	X	X	X	X	L	L	L	L	4 a 2
54	L	X	X	X	X	L	L	L	L	4 a 2
55	L	X	X	X	X	L	L	L	L	4 a 2
56	L	X	X	X	X	L	L	L	L	4 a 2
57	L	X	X	X	X	L	L	L	L	4 a 2
58	L	X	X	X	X	L	L	L	L	4 a 2
59	L	X	X	X	X	L	L	L	L	4 a 2
60	L	X	X	X	X	L	L	L	L	4 a 2
61	L	X	X	X	X	L	L	L	L	4 a 2
62	L	X	X	X	X	L	L	L	L	4 a 2
63	L	X	X	X	X	L	L	L	L	4 a 2
64	L	X	X	X	X	L	L	L	L	4 a 2
65	L	X	X	X	X	L	L	L	L	4 a 2
66	L	X	X	X	X	L	L	L	L	4 a 2
67	L	X	X	X	X	L	L	L	L	4 a 2
68	L	X	X	X	X	L	L	L	L	4 a 2
69	L	X	X	X	X	L	L	L	L	4 a 2
70	L	X	X	X	X	L	L	L	L	4 a 2
71	L	X	X	X	X	L	L	L	L	4 a 2
72	L	X	X	X	X	L	L	L	L	4 a 2
73	L	X	X	X	X	L	L	L	L	4 a 2
74	L	X	X	X	X	L	L	L	L	4 a 2
75	L	X	X	X	X	L	L	L	L	4 a 2
76	L	X	X	X	X	L	L	L	L	4 a 2
77	L	X	X	X	X	L	L	L	L	4 a 2
78										

## LED

(d'après Hewlett Packard)

**DEL rouges standard  $\varnothing$  5 mm ( $T = 1 \frac{3}{4}$ ) (H.P.)**  
 HLMP 3000 - HLMP 3001 - Boîtier A  
 HLMP 3002 - HLMP 3050 - Boîtier B

Faible prix, nombreuses applications  
 Longue durée de vie  
 Faible puissance : 20 mA sous 1,6 V  
 Tension inverse typique :  $V_R = 10$  V  
 Temps de réponse : 10 ns  
 Intensité lumineuse :  $I_V$  ( $I_F = 20$  mA)  
 3000 = 2 mcd  
 3001 = 4 mcd  
 3002 = 3 mcd  
 3050 = 2,5 mcd  
 Angle du faisceau ( $I_F = 20$  mA)  
 3000, 3001, 3002 =  $90^\circ$   
 3050 =  $24^\circ$

**Dimensions des boîtiers**

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**DEL ultralumineuses (H.P.)**  
 $\varnothing$  5 mm ( $T = 1 \frac{3}{4}$ ) HLMP 3750, 3850, 3950  
 Profil bas - HLMP 3390, 3490, 3590  
 $\varnothing$  3 mm ( $T = 1$ ) HLMP 1340, 1440, 1540

3 couleurs au choix :  
 — Rouge : haut rendement  
 — Jaune : super lumineux  
 — Vert : hautes performances

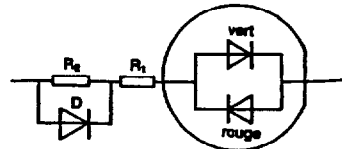
**Caractéristiques optiques et électriques des DEL ultralumineuses ( $T_A = 25^\circ\text{C}$ )**

Référence HLMP	Description (Taille)	Couleur	$I_V$ (mcd) à 20 mA mini	Angle du faisceau	$V_F$ (V) $I_F = 20$ mA	Commutation $T_s$ (ns)	Boîtier type
3750 3850 3950	$\varnothing$ 5 mm ( $T = 1 \frac{3}{4}$ )	Rouge	80	$24^\circ$	2,2	90	A
Jaune		2,2					
Vert		2,3			500		
3390 3490 3590	$\varnothing$ 5 mm ( $T = 1 \frac{3}{4}$ ) profil bas	Rouge	35	$32^\circ$	2,2	90	C
Jaune		2,2					
Vert		2,3			500		
1340 1440 1540	$\varnothing$ 3 mm ( $T = 1$ )	Rouge	24	$45^\circ$	2,2	90	D
Jaune		2,2					
Vert		2,3			500		

**DEL bicolore  $\varnothing$  5 mm ( $T = 1 \frac{3}{4}$ ) MV5491A**

(d'après General Instrument)

Deux dans un même boîtier  
 — Rouge :  $I_V = 1,5$  mcd -  $V_F = 1,65$  V  
 — Vert :  $I_V = 0,5$  mcd -  $V_F = 2,2$  V  
 $I_F = 20$  mA pour rouge ou vert



**DEL clignotantes rouges  $\varnothing$  8 et 10 mm**

Circuit oscillateur série intégré permettant une utilisation clignotante de fréquence 2,5 Hz sans composants extérieurs.

DESCRIPTION	I LUM. (mcd)	$I_F$ NOM.	$V_F$ MIN. MAX.	$V_F$ MAX.	ANGLE DE DIFFUSION	$\lambda$ (nm)
Led diamètre 8 mm	800	40 mA	3,5 à 15 V	0,5 V	$40^\circ$	660
Led diamètre 10 mm	800	40 mA	3,5 à 15 V	0,5 V	$40^\circ$	660