

**LITEON****8522  
LTM- 8529 SERIES  
8530****0.56 INCH 7-SEGMENT  
NUMERIC DISPLAY WITH MOS I.C. DRIVER****LITE-ON INC**

31E D ■ 5536367 0002290 0 ■ LTN

**FEATURES**

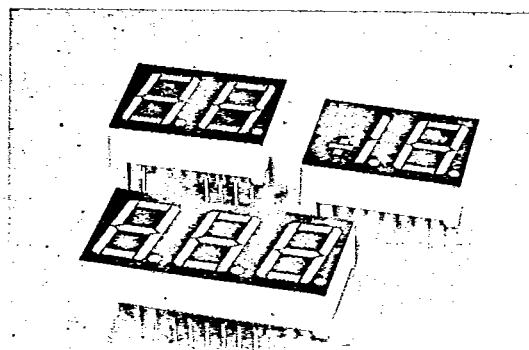
- 0.56 INCH (14.22mm) DIGIT HEIGHT.
- WIDE SUPPLY VOLTAGE OPERATION.
- SERIAL DATA INPUT.
- CONSTANT CURRENT DRIVERS.
- CONTINUOUS BRIGHTNESS CONTROL.
- SOLID STATE RELIABILITY-LONG OPERATION LIFE.
- WIDE VIEWING ANGLE.
- CHOICE OF SIX BRIGHT COLORS-RED/BRIGHT RED / GREEN / YELLOW / ORANGE / HIGH EFFICIENCY RED.

**DESCRIPTION**

The LTM-8522/8529/8530 series are 0.56 inch (14.22mm) height numeric display modules, and a built-in M5450 MOS integrated circuits. The integrated circuit contains series data input, 35 bit shift register, 34 LED driver output and brightness control.

The red devices utilized LED chips which are made from GaAsP on a GaAs substrate. The bright red and green devices utilized LED chips which are made from GaP on a transparent GaP substrate. The orange and high efficiency red devices utilized LED chips which are made from GaAsP on a transparent GaP substrate. The MOS integrated circuits produced with N-channel silicon gate technology.

Red and bright red displays have black face and red segment color. Green and yellow displays have gray face and white segment color. Orange displays have orange face and orange segment color. High efficiency red displays have red face and red segment color.

**PROGRAMMABLE DISPLAY & LED  
DISPLAYS WITH DRIVER IC BUILT-IN****DEVICES**

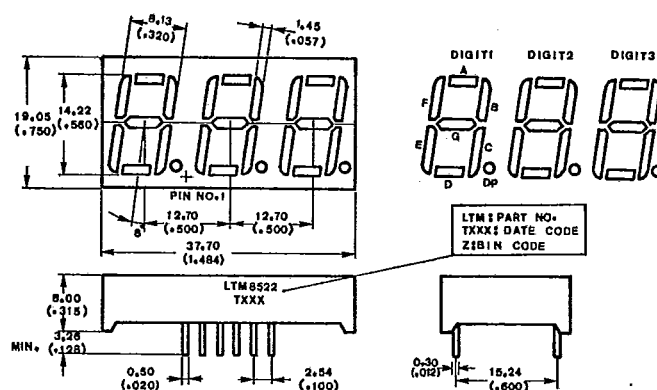
PART NO. LTM-						DESCRIPTION	PACKAGE DIMENSION
RED	BRIGHT RED	GREEN	YELLOW	ORANGE	HI.-EFF. RED		
8522R	8522P	8522G	8522Y	8522E	8522HR	3 Digit, Rt. Hand Decimal	A
8529R	8529P	8529G	8529Y	8529E	8529HR	1 1/2 Digit, Rt. Hand Decimal	B
8530R	8530P	8530G	8530Y	8530E	8530HR	2 Digit, Rt. Hand Decimal	C

4-24

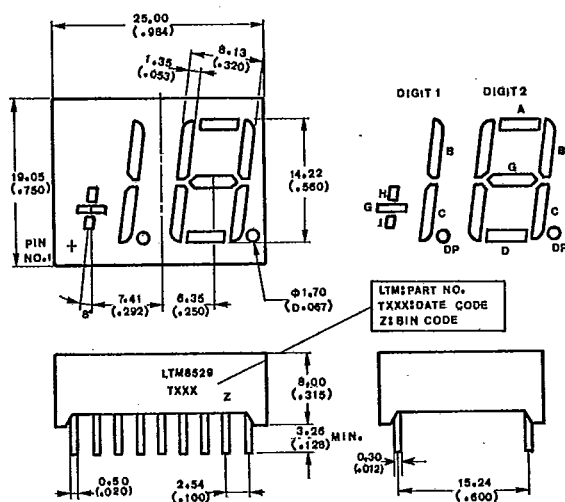
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## PACKAGE DIMENSIONS

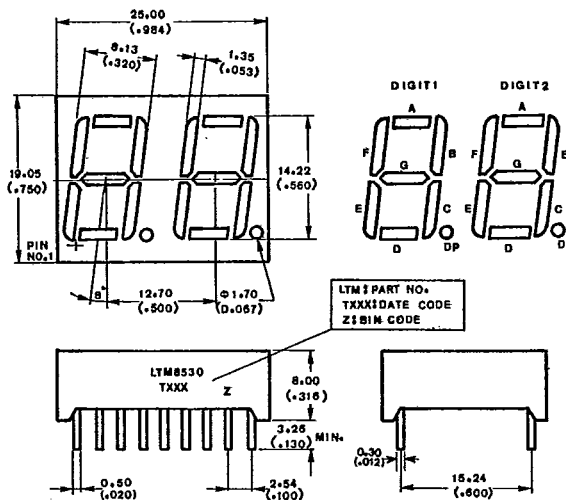
## A. LTM-8522



## B. LTM-8529



## C. LTM-8530



NOTE: All dimensions are in  $\frac{\text{millimeters}}{(\text{inches})}$  tolerance are:

1. Lead length (from seating plane): minimum value  $\frac{+1.00}{-0.00} \text{ mm}$   $\frac{+0.040''}{-0.000''}$  2.  $\frac{\pm 0.25 \text{ mm}}{(0.010'')}$  unless otherwise noted.

T-41-37

## PIN CONNECTION

PIN NO.	CONNECTION		
	LTM-8522	LTM-8529	LTM-8530
1	V <sub>SS</sub>	V <sub>SS</sub>	V <sub>SS</sub>
2	VLED	VLED	VLED
3	VLED	NO PIN	NO PIN
4	Bit 25 Output	NO PIN	NO PIN
5	Bit 25 Output	NO PIN	NO PIN
6	Bit 27 Output	Bit 15 Output	Bit 17 Output
7	Bit 28 Output	Bit 16 Output	Bit 18 Output
8	Bit 29 Output	Bit 17 Output	Bit 19 Output
9	Bit 30 Output	Bit 18 Output	Bit 20 Output
10	Bit 31 Output	Bit 19 Output	Bit 21 Output
11	Bit 32 Output	Bit 20 Output	Bit 22 Output
12	Bit 33 Output	Bit 21 Output	Bit 23 Output
13	Bit 34 Output	Bit 22 Output	Bit 24 Output
14	Data Enable	Data Enable	Data Enable
15	Data Input	Data Input	Data Input
16	Clock Input	Clock Input	Clock Input
17	VDD	VDD	VDD
18	BRT. Control	BRT. Control	BRT. Control

PROGRAMMABLE DISPLAY & LED  
DISPLAYS WITH DRIVER IC-BUILT IN

ABSOLUTE MAXIMUM RATING AT T<sub>A</sub> = 25°C

PARAMETER	SYMBOL	MIN.	MAX.	UNITS
Supply Voltage *1	V <sub>DD</sub>	-0.3	15	V
Input Voltage	V <sub>I</sub>	-0.3	15	V
Off State Output Voltage	V <sub>O</sub> (off)		15	V
LED Supply Voltage	VLED	2.8	3.5	V
Power Dissipation of IC *2	PD (IC)		350	mW
Supply Current	I <sub>DD</sub>		7	mA
Operating Temperature Range	T <sub>OP</sub>	-20	+60	°C
Storage Temperature Range	T <sub>STG</sub>	-20	+60	°C
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C				

NOTES: 1. All voltages are with respect to V<sub>SS</sub> (GND)

2. Power dissipation of IC is given by  $P_D = (V_{LED} - V_F) \cdot (I_F) \cdot (\text{No. of Segment} + (7\text{mA}) V_{DD})$

\*V<sub>F</sub> is LED forward voltage.

RECOMMENDED OPERATING CONDITION AT  $T_A = 25^\circ\text{C}$ 

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Supply Voltage	$V_{DD}$	4.75		13.2	V	
Input Voltage	$V_I$			0.8	V	$\pm 10\mu\text{A}$ Input Bias
Logical "0" Level		-0.3		$V_{DD}$	V	$4.75\text{V} < V_{DD} < 5.25\text{V}$
Logical "1" Level		2.2		$V_{DD}$	V	$V_{DD} > 5.25\text{V}$
Logical "1" Level		$V_{DD} - 2$		$V_{DD}$	V	
Brightness Input Current	$I_B$	0		0.75	mA	
Brightness Input Voltage	$V_B$	3		4.3	V	Input Current = $750\mu\text{A}$
Off State Voltage	$V_o$ (off)			13.2	V	
Output Sink Current				10	$\mu\text{A}$	$I_B = 0\mu\text{A}$
Segment Off			3	mA	mA	$I_B = 100\mu\text{A}$
Segment On			6	mA	mA	$I_B = 200\mu\text{A}$
Input Clock Frequency	$F_{\text{CLOCK}}$	0		0.5	MHZ	
Output Matching	$I_o$			$\pm 20$	%	

ELECTRICAL/OPTICAL CHARACTERISTICS AT  $T_A = 25^\circ\text{C}$ 

## LTM-8522R/8529R/8530R

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	$I_v$	200	500		$\mu\text{cd}$	$I_B = 0.4\text{mA}$
Peak Emission Wavelength	$\lambda_p$		655		nm	$I_B = 0.4\text{mA}$
Spectral Line Half-Width	$\Delta\lambda$		24		nm	$I_B = 0.4\text{mA}$
Luminous Intensity Matching Ratio	$I_{v-m}$			2:1		$I_B = 0.4\text{mA}$

## LTM-8522P/8529P/8530P

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	$I_v$	300	700		$\mu\text{cd}$	$I_B = 0.4\text{mA}$
Peak Emission Wavelength	$\lambda_p$		700		nm	$I_B = 0.4\text{mA}$
Spectral Line Half-Width	$\Delta\lambda$		90		nm	$I_B = 0.4\text{mA}$
Luminous Intensity Matching Ratio	$I_{v-m}$			2:1		$I_B = 0.4\text{mA}$

## LTM-8522G/8529G/8530G

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I <sub>v</sub>	800	2000		μcd	I <sub>B</sub> = 0.4 mA
Peak Emission Wavelength	λ <sub>p</sub>		565		nm	I <sub>B</sub> = 0.4 mA
Spectral Line Half-Width	Δλ		30		nm	I <sub>B</sub> = 0.4 mA
Luminous Intensity Matching Ratio	I <sub>v-m</sub>			2:1		I <sub>B</sub> = 0.4 mA

PROGRAMMABLE DISPLAY & TEST  
DISPLAYS WITH DRIVER TERMINAL

## LTM-8522Y/8529Y/8530Y

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I <sub>v</sub>	700	1700		μcd	I <sub>B</sub> = 0.4 mA
Peak Emission Wavelength	λ <sub>p</sub>		585		nm	I <sub>B</sub> = 0.4 mA
Spectral Line Half-Width	Δλ		35		nm	I <sub>B</sub> = 0.4 mA
Luminous Intensity Matching Ratio	I <sub>v-m</sub>			2:1		I <sub>B</sub> = 0.4 mA

## LTM-8522E/8529E/8530E

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I <sub>v</sub>	800	2000		μcd	I <sub>B</sub> = 0.4 mA
Peak Emission Wavelength	λ <sub>p</sub>		630		nm	I <sub>B</sub> = 0.4 mA
Spectral Line Half-Width	Δλ		40		nm	I <sub>B</sub> = 0.4 mA
Luminous Intensity Matching Ratio	I <sub>v-m</sub>			2:1		I <sub>B</sub> = 0.4 mA

## LTM-8522HR/8529HR/8530HR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I <sub>v</sub>	800	2000		μcd	I <sub>B</sub> = 0.4 mA
Peak Emission Wavelength	λ <sub>p</sub>		635		nm	I <sub>B</sub> = 0.4 mA
Spectral Line Half-Width	Δλ		40		nm	I <sub>B</sub> = 0.4 mA
Luminous Intensity Matching Ratio	I <sub>v-m</sub>			2:1		I <sub>B</sub> = 0.4 mA

## FUNCTION DESCRIPTION

Series data transfer from the data source to the display driver is accomplished with 2 signals serial data and clock. Using a format of a leading "1" following by the 35 data bits allows data transfer without an additional load signal. The 35 data bits are latched after the 36th bit is complet, thus providing nonmultiplexed, direct drive to the display. Outputs change only if the serial data bits differ from the previous time.

Brightness of display is determined by control the output current of LED display. A 1nF capacitor should be connected to brightness control, Pin 18 to prevent possible oscillations. The output current is typically 25 times greater than the current into Pin 18 which is set by an external variable resistor. There is an internal limiting resistor of 400Ω nominal value. Figure 2 shows the input data format. A start bit of logical "1" precede the 35 bits of data. At the 36th clock, a LOAD signal is generated synchronously with

the high state of the clock, which loads the 35 bits of the shift registers into the latches. At the low state of the clock a RESET signal is generated which clears all the shift registers for the next set of data. The shift registers are static master-slave configuration. There is no clear for master portion of the first register, thus allowing continuous operation.

There must be a complete set of 36 clocks or the shift registers won't clear. When power is first applied to the chip an internal power ON reset signal is generated which reset all registers and all latches. The START bit and first clock return the chip on its normal operation. Bit 1 is the first following the start bit and it will appear on the segment A of the digit 1. A logical "1" at the input will turn on the appropriate LED. Figure 3 shows the timing relationship between data, clock, and DATA ENABLE. A max. clock frequency of 0.5 MHz is assumed.

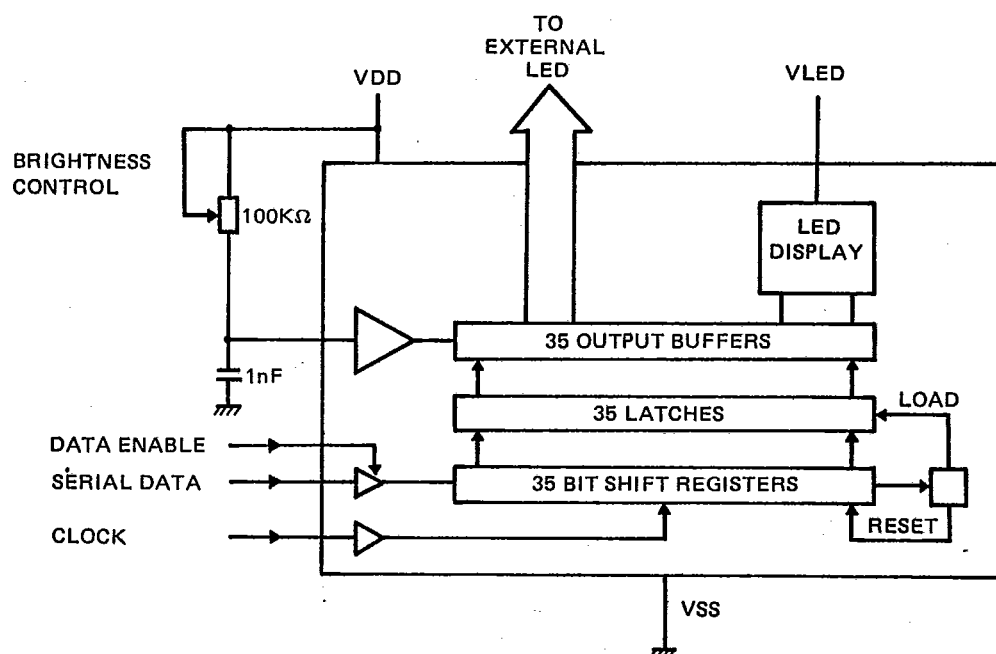


FIGURE 1. Internal Block Diagram

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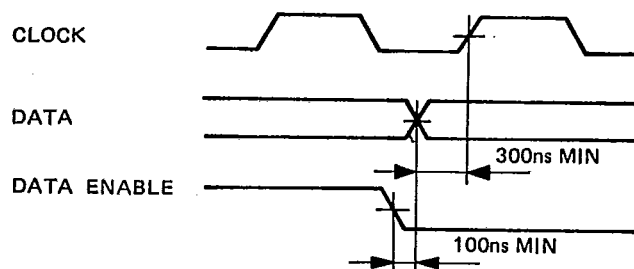


FIGURE 2. Input Data Format

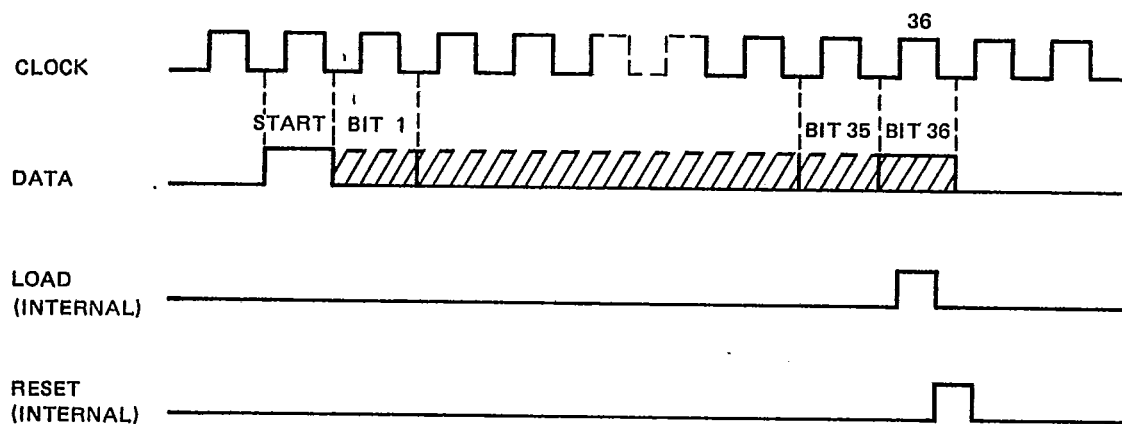


FIGURE 3. Timing Relationship.

TABLE I SERIAL DAT INPUT SEQUENCE

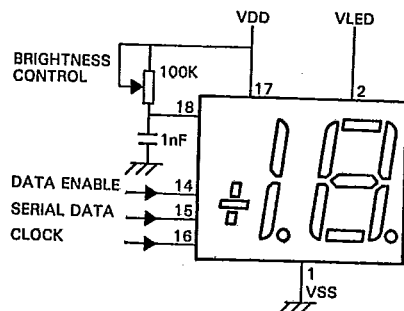
BIT	LTM-8522		LTM-8529		LTM-8530	
	DIGIT	SEGMENT	DIGIT	SEGMENT	DIGIT	SEGMENT
1	1	A	1	B	1	A
2	1	B	1	C	1	B
3	1	C	1	G	1	C
4	1	D	1	H	1	D
5	1	E	1	J	1	E
6	1	F	1	D.P.	1	F
7	1	G	2	A	1	G
8	1	D.P.	2	B	1	D.P.
9	2	A	2	C	2	A
10	2	B	2	D	2	B
11	2	C	2	E	2	C
12	2	D	2	F	2	D
13	2	E	2	G	2	E
14	2	F	2	D.P.	2	F
15	2	G		PIN 6	2	G
16	2	D.P.		PIN 7	2	D.P.
17	3	A		PIN 8		PIN 6
18	3	B		PIN 9		PIN 7
19	3	C		PIN 10		PIN 8
20	3	D		PIN 11		PIN 9
21	3	E		PIN 12		PIN 10
22	3	F		PIN 13		PIN 11
23	3	G		NO CONNECTION		PIN 12
24	3	D.P.		NO CONNECTION		PIN 13
25		PIN 4		NO CONNECTION		NO CONNECTION
26		PIN 5		NO CONNECTION		NO CONNECTION
27		PIN 6		NO CONNECTION		NO CONNECTION
28		PIN 7		NO CONNECTION		NO CONNECTION
29		PIN 8		NO CONNECTION		NO CONNECTION
30		PIN 9		NO CONNECTION		NO CONNECTION
31		PIN 10		NO CONNECTION		NO CONNECTION
32		PIN 11		NO CONNECTION		NO CONNECTION
33		PIN 12		NO CONNECTION		NO CONNECTION
34		PIN 13		NO CONNECTION		NO CONNECTION



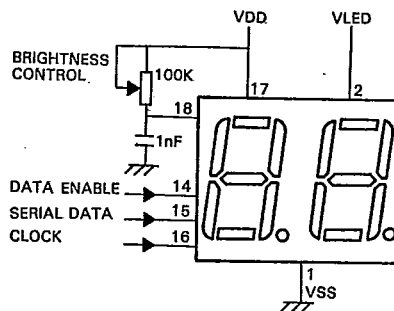
T-41-37

## TYPICAL APPLICATION

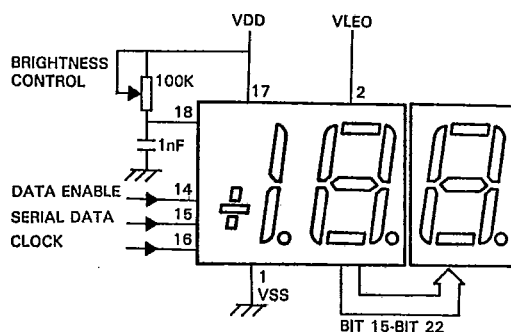
## A. 1½ DIGIT DISPLAY



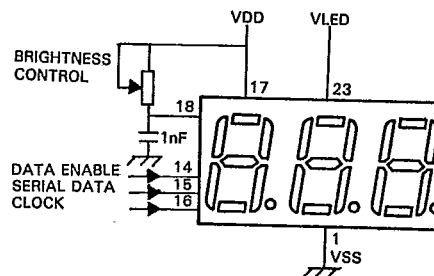
## B. 2 DIGIT DISPLAY



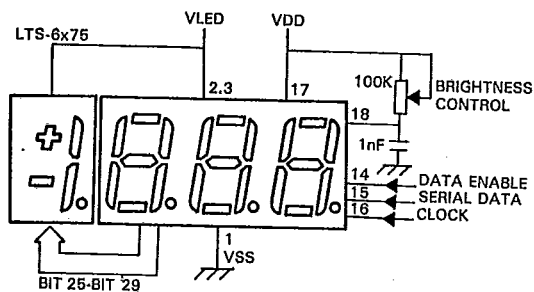
## C. 2½ DIGIT DISPLAY



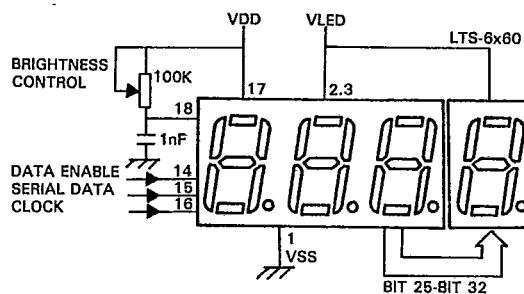
## D. 3 DIGIT DISPLAY



## E. 3½ DIGIT DISPLAY



## F. 4 DIGIT DISPLAY

PROGRAMMABLE DISPLAY & LED  
DISPLAYS WITH 7-SERIES

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T-41-37

- NOTES: 1. Clean only in water, isopropanol, ethanol, freon TF (or equivalent).  
2. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commission International De L'Eclairage) eye-response curve.

# PACKAGING

T-90-20

## Reel Packaging (Axial Lead Units)

DEVICE TYPE	COMPONENT SPACE (MM) "A"	TAPE SPACE (MM) "B"	REEL DIA (MM) "D"	QUANTITY (EA)		CARTON	
				REEL	CARTON	SIZE (MM)	WEIGHT (KG)
DO-41 DO-41L	5±0.5	52.4±1.5	326~336	5000	20K	355 x 355 x 355	10.5
DO-201AD	10±0.5	52.4±1.5	326~336	1200	4.8K	355 x 355 x 355	9.0
P6(Aleg)	10±0.5	52.4±1.5	326~336	700	2.8K	355 x 355 x 355	8.8

The C dimension of Fig. 3 is between 3.17mm and 635mm greater than the length of the component involved.

FIG. 1

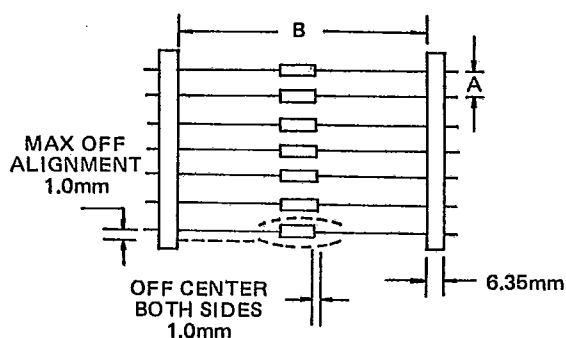


FIG. 2

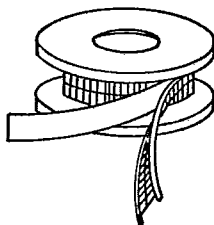
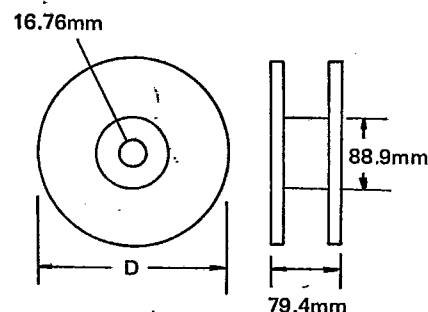


FIG. 3

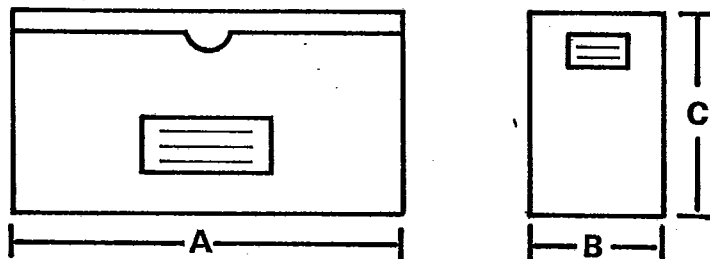


## Bulk Packaging (Axial Lead Devices and Bridge Rectifiers)

DEVICE TYPE	PACKAGING SIZE (MM)		QUANTITY (EA)		APPROX GROSS WEIGHT (KG)	
	BOX	CARTON	BOX	CARTON	BOX	CARTON
DO-41 DO-41L	196 x 84 x 20	450 x 210 x 250	1000	50K	0.38	20
DO-201AD	305 x 93 x 59	355 x 355 x 355	1000	20K	1.35	28
P6(Aleg)	305 x 93 x 59	355 x 355 x 355	500	10K	1.2	24.5
PBM	357 x 125 x 60	530 x 360 x 340	1000	20K	1.5	32.3
PBDF	495 x 155 x 145	500 x 325 x 305	5000	20K	5.1	21.5
PBP	357 x 125 x 60	530 x 360 x 340	500	10K	1.5	31.5
PBL	375 x 220 x 155	470 x 385 x 455	1000	5K	5.7	30.5
PBPC-6	357 x 125 x 60	560 x 360 x 340	250	5K	1.1	22
PBPC-8	357 x 125 x 60	560 x 360 x 340	250	5K	1.7	35
KBPC	375 x 220 x 365	470 x 390 x 385	500	1K	15.1	31.5
KBPC-W	375 x 220 x 365	470 x 390 x 385	500	1K	14.5	30.0

## AMMO BOX PACKAGING

## BOX SIZE



Unit:m. m.

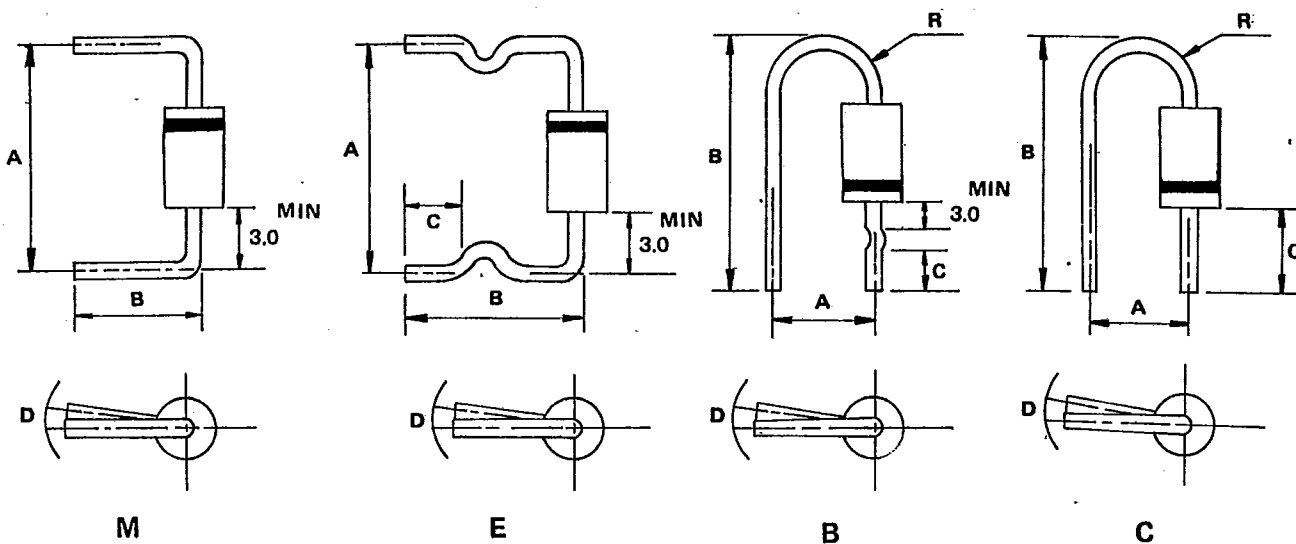
Packaging	Products Outline	Dimension *A*	Dimension *B*	Dimension *C*	Q'ty per BOX
26MM Horizontal Ammo Pack	DO-41 DO-41L(0.6mm Lead)	255	50	95	3K
					3K
52MM Horizontal Ammo Pack	DO-41and DO-41L DO 201AD	250	75	92	3K
					0.8K

## CARTON SIZE

Unit:m. m.

Packaging	Products Outline	length	Width	High	Q'ty Per Carton
26MM Horizontal Ammo Pack	DO-41 DO-41L(0.6mm Lead)	330	310	268	42K
					48K
52MM Horizontal Ammo Pack	DO-41and DO-41L DO 201AD	355	355	340	12K
					12K

# PREFORMED LEAD DRAWING



Case type	Preformed type	A (mm)		B (mm)		C (mm)		D (mm)		R (mm)	
		range	tolerance	range	tolerance	range	tolerance	range	tolerance	range	tolerance
D041	M	9.0-20.0	1.0	8.0-22.0	±0.5	—	—	1.5	max	—	—
	E	11.0-20.0	±1.0	11.0-16.0	±1.0	4.0-5.0	±0.5	1.5	max	—	—
	B	7.5	±0.5	19.0-22.0	±0.5	7.5	±0.5	1.5	max	2.5-4.0	Typ
	C	4.5	±0.8	18.0-19.0	±0.5	9.0	±0.5	1.5	max	2.5-4.0	Typ
D0201AD	M	15.0-20.0	±1.0	8.0-22.0	±1.0	—	—	2.0	max	—	—
	E	15.0-20.0	±1.0	10.0-22.0	±1.0	3.0-15.0	±0.5	2.0	max	—	—
P6(Aleg)	M	15.0-20.0	±1.0	8.0-22.0	±1.0	—	—	2.0	max	—	—