87D 08578 D T-75-45-07

EFB7332

PCM LINE TRANSCEIVER

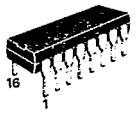
The EF 7332 provides the interface between a 2.048 or 1.544 Mbits/s PCM trunk and the switching equipment. The receiving side amplifies and reshapes the bipolar signals from a receive transformer and extracts from the signals the distant clock Hd. On the transmitting side it calibrates pulses in terms of duration and amplitude by means of transistor circuits directly coupled to the primary winding of a transmit transformer.

- NMOS technology.
- Operates from + 5 V supply.
- Digital technology throughout.
- Extracts distant clock transmitted by a PCM trunk.
- Can handle peak to peak jitter amplitude up to 0.25 bit for an 8-bit period.
- Integrated transmit and receive amplifiers.
- TTL-compatible input/ output.

NMOS

PCM LINE TRANSCEIVER

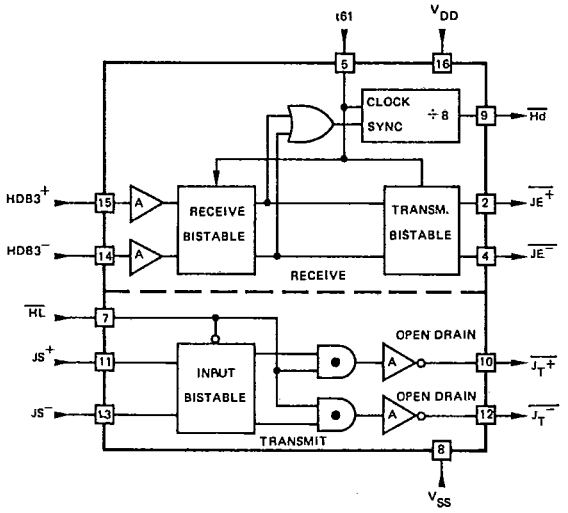
CASE CB-79



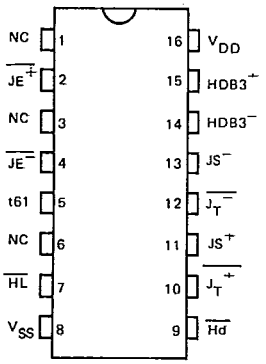
P SUFFIX
PLASTIC PACKAGE

C SUFFIX
CERAMIC PACKAGE

BLOCK DIAGRAM



PIN ASSIGNMENT



Réf. 05015

PIN DESCRIPTION

87D 08579 D T-75-45-07

Power supply

Name	Type	No	Function	Description
V_{SS}	S	8	Supply	Ground
V_{DD}	S	16		+5 V ± 5 %

Receive

t b1	I	5	-	16 384 kHz or 15 352 kHz clock (minimum high and low duration: 20 ns) Synchronises outputs $\overline{JE^+}$, $\overline{JE^-}$ and $\overline{Hd}$.
HDB 3+ HDB 3–	I I	15 14	Data data	Bipolar signals in HDB3 code are received from the receive transformer. The amplitude of these signals is between –5 V and +5 V. Each positive pulse on HDB3+ (HDB3–) resynchronises the circuit clock and is reconstitutedin calibrated form on output $\overline{JE^+}$ ($\overline{JE^-}$). Negative pulses have no effect on this circuit as the inputs are protected.
$\overline{JE+}$ $\overline{JE-}$	0 0	2 4	Data output (I/C trunk)	Received HDB3 signals are resynchronised with $\overline{Hd}$ and calibrated in terms of amplitude (TTL LS compatible levels). The distant clock is recovered from the signal on HDB3+, HBD3–.
$\overline{Hd}$	0	9	Distant clock output	The nominal frequency is 2 048 kHz or 1544 kHz in the absence of jitter.

Transmit

$\overline{H1}$	I	7	Clock	Local clock, nominal frequency 2048 kHz or 1544 kHz.
JS+ JS–	I I	11 13	Data input (O/G trunk)	The data is recognised on the falling edge of H1.
$\overline{JT+}$ $\overline{JT-}$	0 0	10 12	Data output (transmitted trunk)	These open drain outputs are connected to the windings of the transmit transformer. Recognition of a "1" on $\overline{JS^+}$ ($\overline{JS^-}$) grounds the winding of transformer connected to $\overline{JT^+}$ ($\overline{JT^-}$) for the duration of "1" level of H1. These outputs are protected against short-circuits by current limiting internal to the circuit.

FUNCTIONAL DESCRIPTION

87D 08580 D T-75-45-07

Receive path

The PCM Line Transceiver receives directly from the receive transformer on inputs HDB3+ and HDB3– data in HDB3 code. It synchronises this data by means of the clock on input t61 and converts it to voltage pulses of calibrated duration on outputs $\overline{JE+}$ and $\overline{JE-}$. To be recognised correctly by this circuit the received data must satisfy minimum and maximum duration conditions (Cf. page 4).

Distant clock $\overline{Hd}$ is provided by a counter which divides by 8 the frequency of the clock t61. This counter is resynchronised with the data of the PCM trunk on each positive-going edge at HDB3+ or HDB3–. The period 0.25 eb of $\overline{Hd}$ may vary by within a period of 8 eb without degradation of the phase relationships between $\overline{JE+}$ $\overline{JE-}$ and $\overline{Hd}$ (Cf. receive timing diagram No 1). If the variation occurs in an interval exceeding 4 eb but less than 8 eb the phase relationships between $\overline{JE+}$, $\overline{JE-}$ and $\overline{Hd}$ are modified (See receive timing diagrams 2 and 3).

In all cases outputs $\overline{JE+}$ and $\overline{JE-}$ remain stable on either side of the falling edge of $\overline{Hd}$ so as to be sampled correctly by the EF7333.

Transmit path

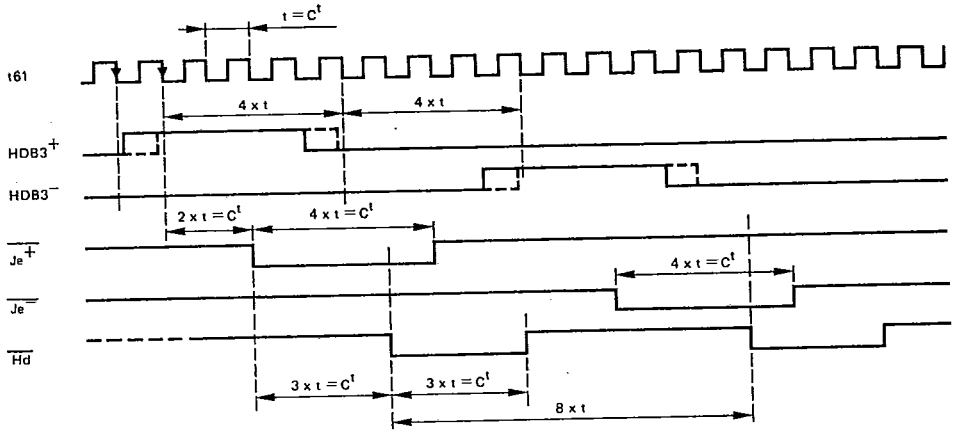
The signals JS+ and JS– to transmit are sampled on the falling edge of clock signal $\overline{HI}$ and calibrated by the duration for which this signal is high.

Open drain outputs $\overline{JT+}$ and $\overline{JT-}$ drive the primary windings of the transmit transformer directly. They are protected against overcurrents occurring should the secondary windings of this transformer be short-circuited, in which case the primary behaves as a very low resistance connecting the output to supply rail V_{DD}.

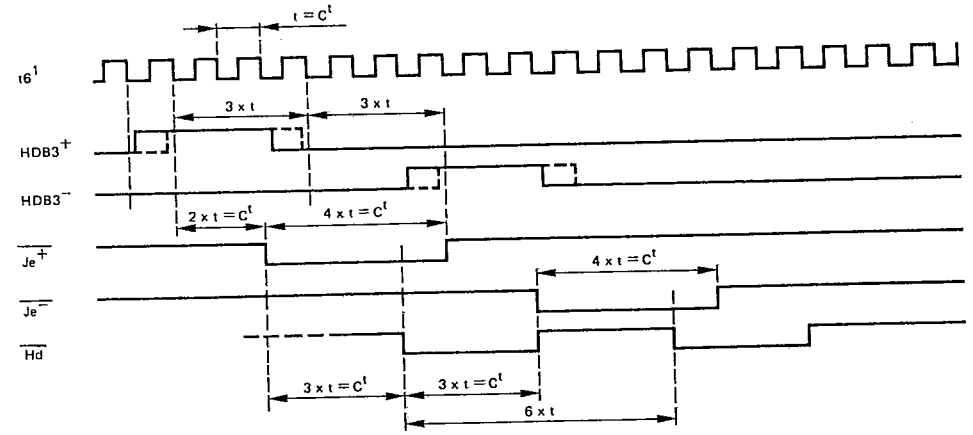
TIMING DIAGRAM

87D 08581 D T-75-45-07

1 – EXTERNAL SIGNALS WITH JITTER <0.25 BIT WITHIN 8-BIT PERIOD



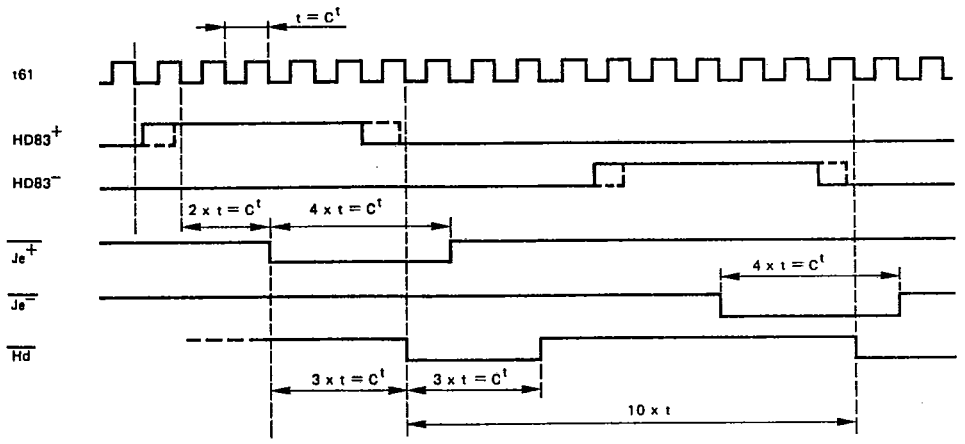
2 – EXTERNAL SIGNALS WITH HDB3+ AND HDB3 −SIGNAL PERIOD 6 x t



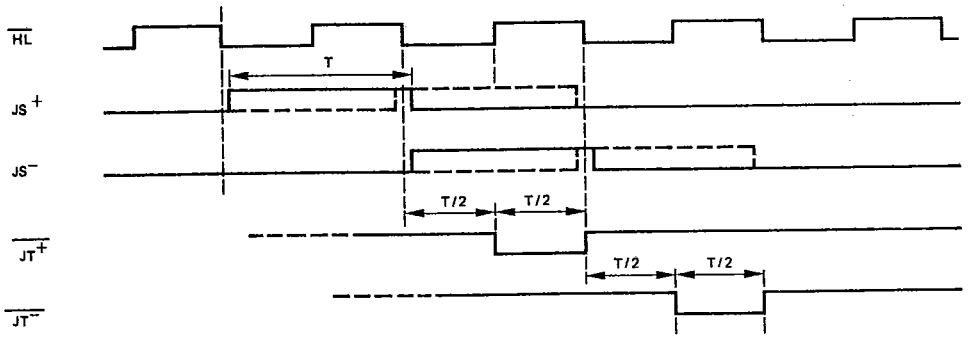
c^t = CONSTANT

3 – EXTERNAL SIGNALS WITH HDB3 + AND HDB3 – SIGNAL PERIOD 10 x t.

87D 08582 D T-75-45-07



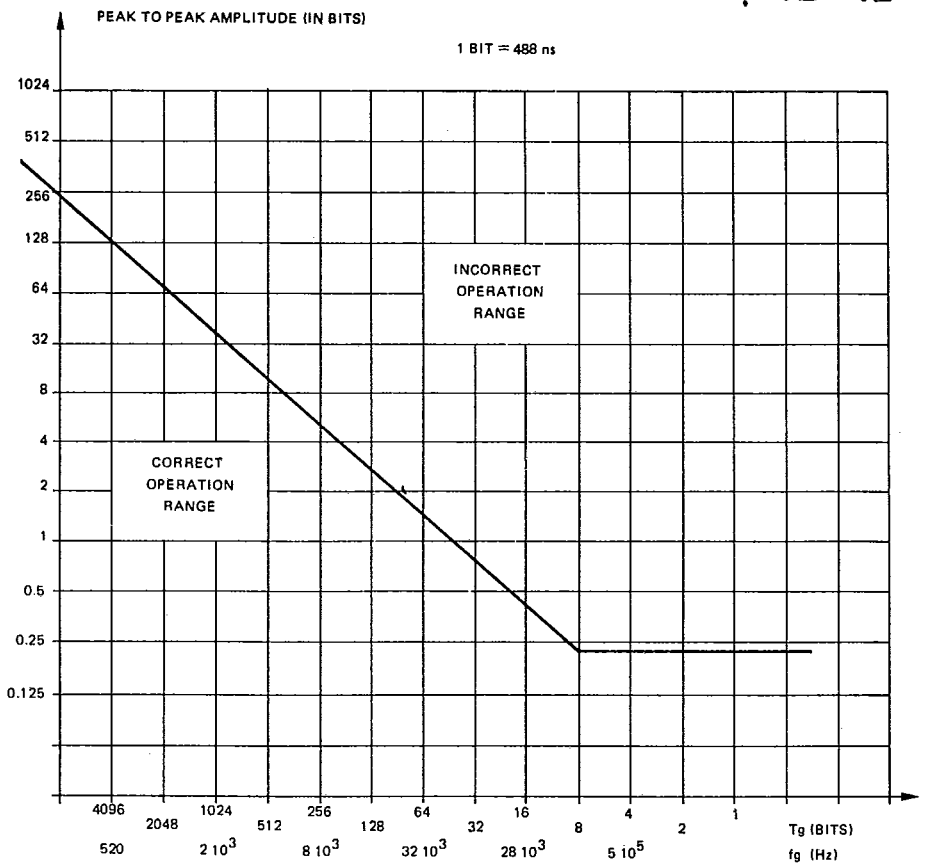
TRANSMIT



Ct = CONSTANT

EF7332 OPERATING RANGE AS A FUNCTION OF JITTER AND FREQUENCY

87D 08583 D T-75-45-07



Tg = « PERIOD » OF THE JITTER IN BITS

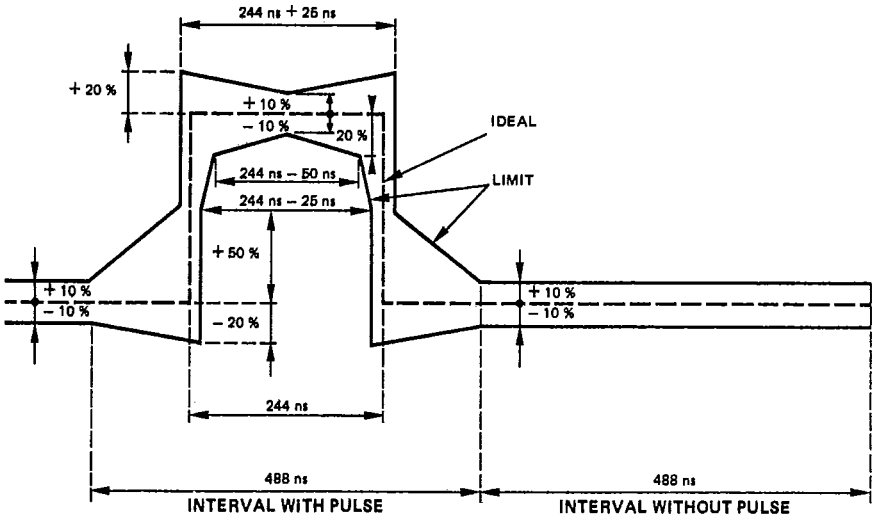
fg = « FREQUENCY » OF THE JITTER IN Hz

TRANSMIT PATH

87D 08584 D T-75-45-07

Pulse limiting curves for 2 048 kbit/s CEPT PCM trunk.

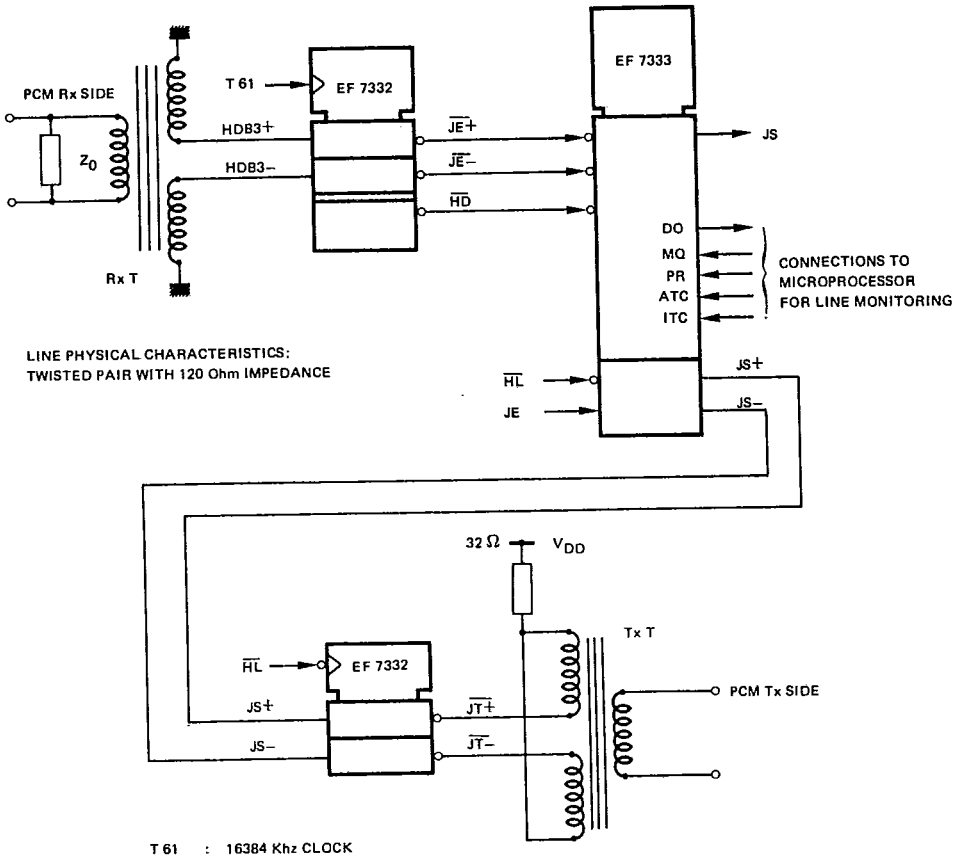
The limiting curves below are for a resistive load of 120 Ω connected across the secondary winding of the transmit transformer.



TYPICAL APPLICATION

87D 08585 D T-75-45-07

USING EF 7333 AND EF 7332 IN A 2048 Khz PCM LINE
FOR DATA TRANSMISSION/RECEPTION AND FRAME MONITORING



LINE PHYSICAL CHARACTERISTICS:
TWISTED PAIR WITH 120 Ohm IMPEDANCE

T 61 : 16384 Khz CLOCK
Rx T : LINE RECEIVE TRANSFORMER
Tx T : LINE TRANSMIT TRANSFORMER
$\overline{HL}$: LOCAL 2048 Khz CLOCK

NOTE : EF 7332 LAY OUT CONSIDERATIONS: FOR CORRECT OPERATION OF TRANSMISSION DRIVERS A 100 nF DECOUPLING CAPACITOR MUST BE CONNECTED TO VDD AND LOCATED AS CLOSE AS PRACTICAL

ABSOLUTE MAXIMUM RATINGS

87D 08586 D T-75-45-07

Rating	Symbol	Value	Unit
Supply voltage	$V_{DD} - V_{SS}$	$-0.3\ V \geq V_{DD}$ $-V_{SS} \geq 7\ V$	V
Input voltage range (except inputs HDB3 + and HBD3–)	V_E	$V_{SS} - 0.3\ V \geq V_I \geq V_{DD} + 0.3\ V$	V
Maximum power	P	$P_{max} = 250$ mW in 0°C to 70°C range	mW
Storage temperature range	T_{stg}	– 55°C to + 150°C	°C

STATIC ELECTRICAL CHARACTERISTICS - TYPICAL VALUES ET + 25°C

Ambient temperature range: 0°C to + 70°C.

Characteristic	Symbol	Min	Typ	Max	Unit
Positive power supply	V_{DD}	+ 4.75	+ 5	+ 5.25	V
Supply current	I_{DD}	+ 4.75	20	30	mA
Stray capacitance between one input and ground (outputs loaded with $C_L = 25$ pF)	–	–	5	10	pF

Inputs

Voltage at input HDB3⁺/ HDB3⁻					
when low	–	– 5	–	0.6	V
when high	–	2.2	–	5	V
Resistance at input HDB3⁺/ HDB3⁻ (inverse voltage)	–	–	10	–	kΩ
Voltage at input JS⁺/ JS⁻/ $\overline{H1}$ ($V_I = -5$ V)					
when low	–	– 0.3	–	0.6	V
when high	–	2.2	–	V_{DD}	V
Voltage at input t61					
when low	–	0	–	0.6	V
when high	–	2.6	–	V_{DD}	V

Output

Voltage at output $\overline{Hd}$/ $\overline{Je^+}$/ $\overline{Je^-}$					
when low ($I_{OL} = 0.4$ mA)	–	0	–	0.4	V
when high ($I_{OH} = -40$ µA)	–	2.6	–	V_{dd}	V
Voltage at output $\overline{JT^+}$/ $\overline{JT^-}$ when low ($R_L = 175\ \Omega$ to V_{DD})	–	250	450	750	mV
Current at output $\overline{JT^+}$/ $\overline{JT^-}$ when high ($V_{OH} = 12$ V9	–	–	–	100	µA
Current at output $\overline{JT^+}$1$\overline{JT^-}$ (output current limited)	–	–	–	35	mA

DYNAMIC CHARACTERISTICS

87D 08587 DT-75-45-07

Typical values at + 25°C (0°C < T_A < + 70°C)

Clocks

Characteristic	Symbol	Min	Typ	Max	Unit
Clock T61 (Fig. 1)	–	–	12 352	–	kHz
Duration	–	–	16 384	16 500	kHz
when low	t_{PLH}	20	–	–	nS
when high	t_{PHL}	20	–	–	nS
Clock $\overline{H1}$ (fig. 3)	–	–	1544	–	kHz
	–	–	2048	2200	kHz
Fall time	t_{THL}	–	–	30	nS
Rise time	t_{TLH}	–	–	30	nS

Inputs

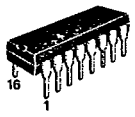
Inputs HDB3⁺/ HDB3⁻ (f = 12352 kHz, fig.2)	–	81	–	405	nS
Min. pulse duration (f = 16384 kHz)	t_{PHL}	61	–	–	nS
Max. pulse duration (f = 16384 kHz)	t_{PLH}	–	–	305	nS
Inputs JS⁺/ JS⁻ (fig. 3)					
Set up time	$t_{set\text{-}up}$	20	–	–	nS
Hold time	t_{hold}	30	–	–	nS

Outputs

Outputs $\overline{JE^+}$/ $\overline{JE^-}$ relative to $\overline{Hd}$ (C_L = 25 pF, fig. 4)					
Set up time	t Set-up	150	3 x t	–	nS
Hold time	t_{hold}	30	t	–	nS
Fall time	t_{THL}	–	15	–	nS
Rise time	t_{TLH}	–	20	–	nS
Outputs $\overline{JT^+}$/ $\overline{JT^-}$ (R_L = 175 Ω to V_{DD}, Fig. 5)					
Pulse duration (C_L = 25 pF)	t_{WM}	–	–	–	–
H_L = 2048 kHz	–	219	244	269	nS

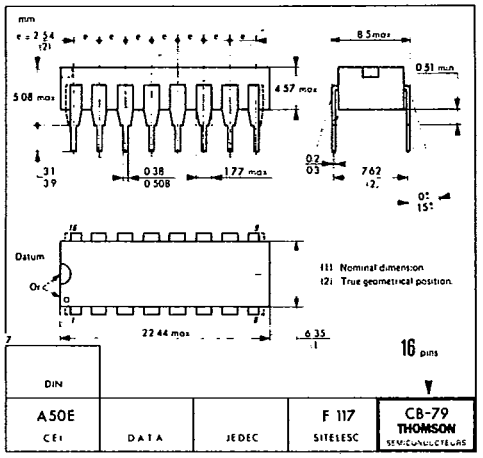
CASE CB-79

87D 08588 DT-75-45-07



C SUFFIX
CERAMIC PACKAGE

P SUFFIX
PLASTIC PACKAGE



These specifications are subject to change without notice.
Please inquire with our sales offices about the availability of the different packages.

87D 08589 DT-75-45-07

FIG. 1

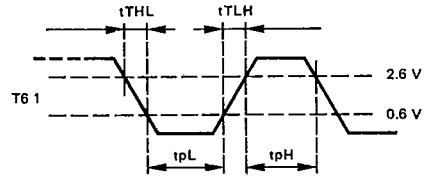


FIG. 2

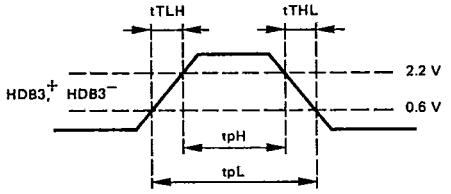


FIG. 3

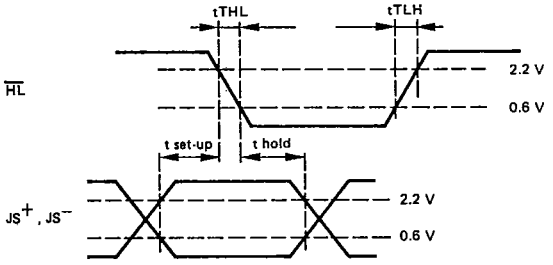


FIG. 4

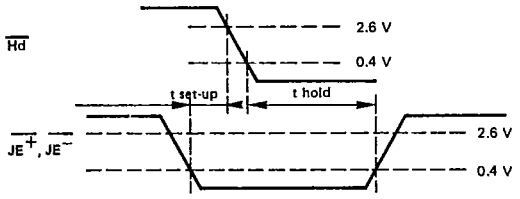
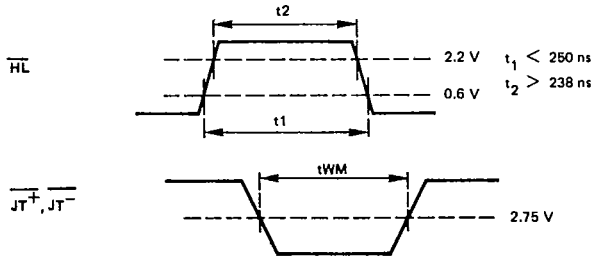


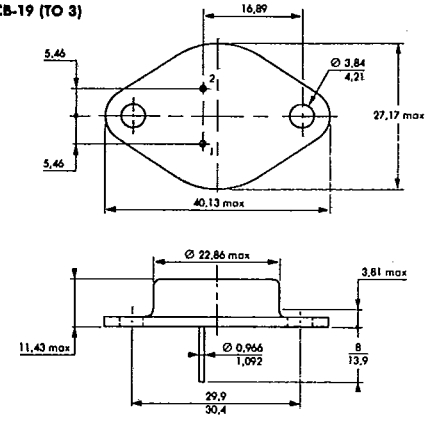
FIG. 5



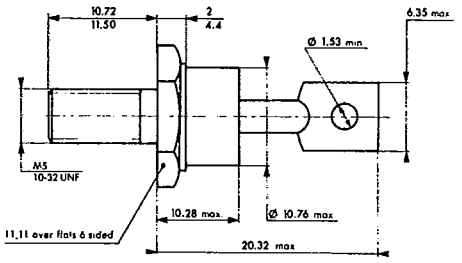
87D 09185 D T-75-11-33

case outlines

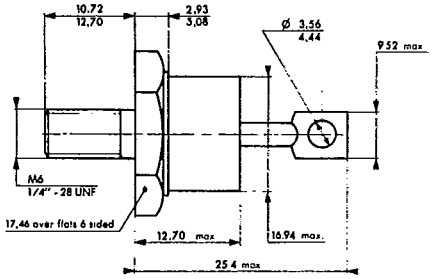
CB-19 (TO 3)



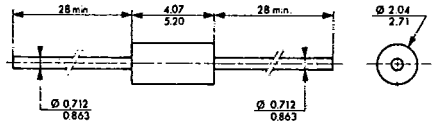
CB-33 (DO 4)



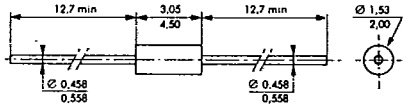
CB-34 (DO 5)



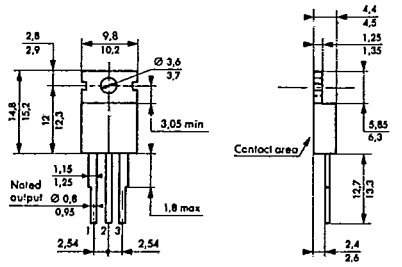
CB-101 (DO 41)



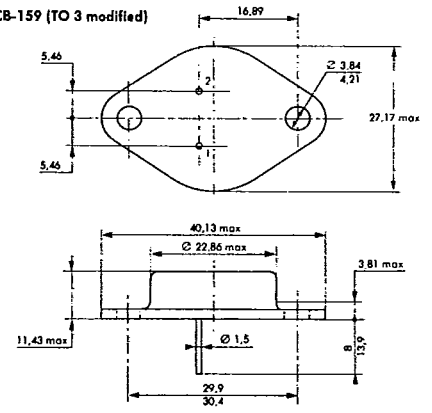
CB-102 (DO 35)



CB-117 (TO 220 AB) for power transistors



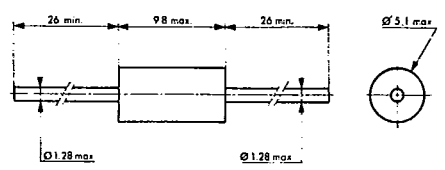
CB-159 (TO 3 modified)



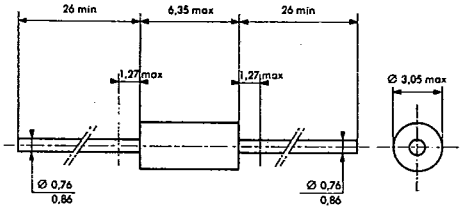
87D 09186 D T-75-11-33

case outlines

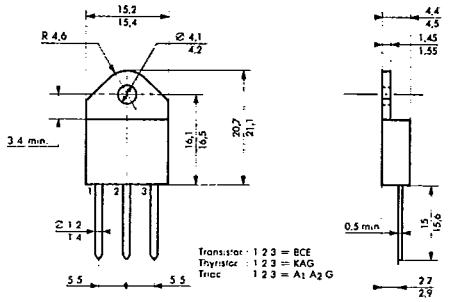
CB-197 (DO 27 A)



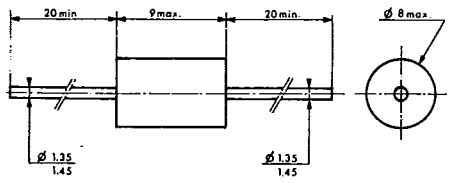
CB-210 (F 126)



CB-244 (TO 218 - TOP 3)



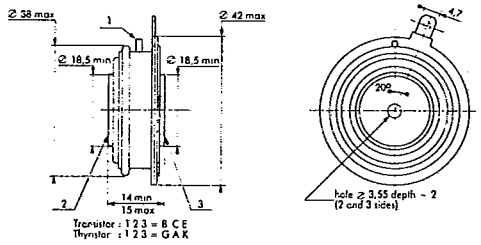
CB-257 (AG)



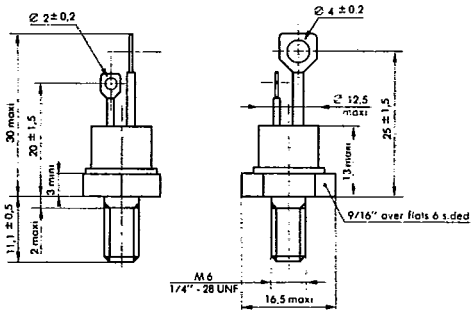
CB-263 (MU 86)

Transistor :
Base lead = Braid 2 mm²
Approx. length = 120 mm

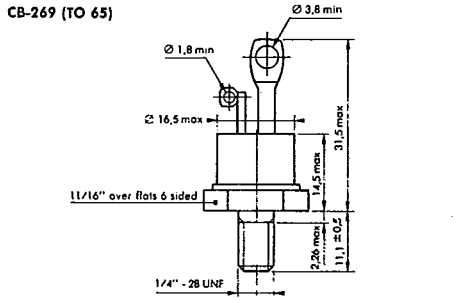
Thyristor :
Gate lead : white
Cathode lead : red
Approx. length = 200 mm



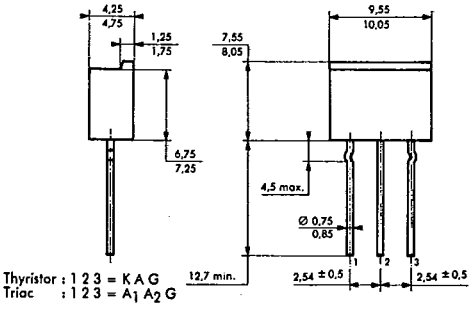
CB-267 (TO 48)



CB-269 (TO 65)



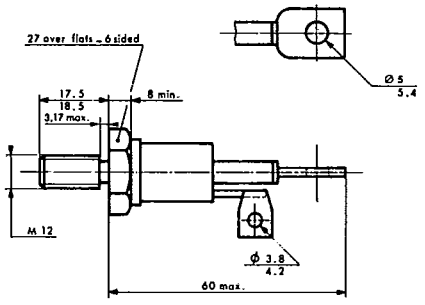
CB-274 (TL)



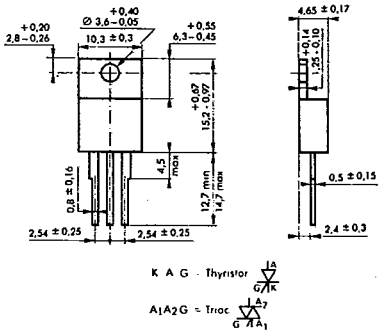
87D 09187 D T-75-11-33

case outlines

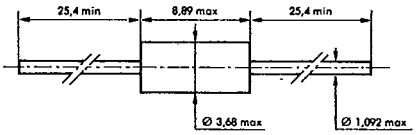
CB-338 (TO 83)



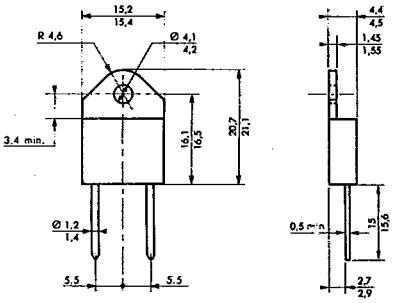
CB-415 (TO 220 AB) for thyristors and triacs



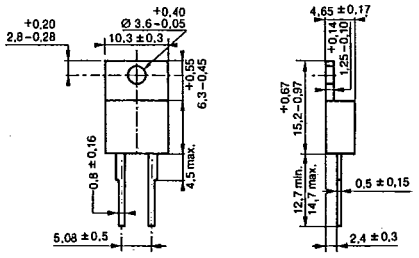
CB-417



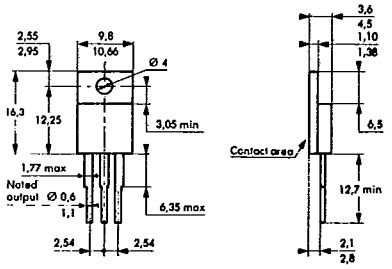
CB-425 (DOP 3)



CB-426 (DO 220 AB) for insulated types



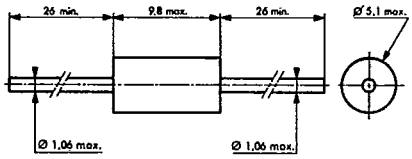
CB-428 (TO 220 AB) for duo diodes



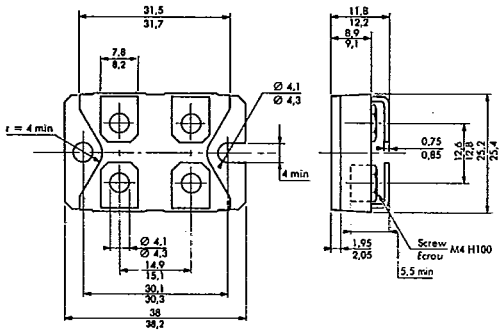
87D 09188 D T-75-11-33

case outlines

CB-429

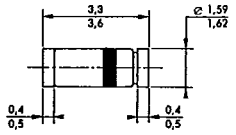


CB-452 (ISOTOP)

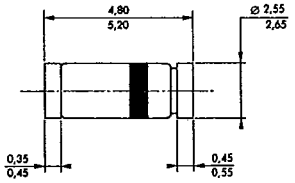


Pin B2 may be omitted for a transistor.

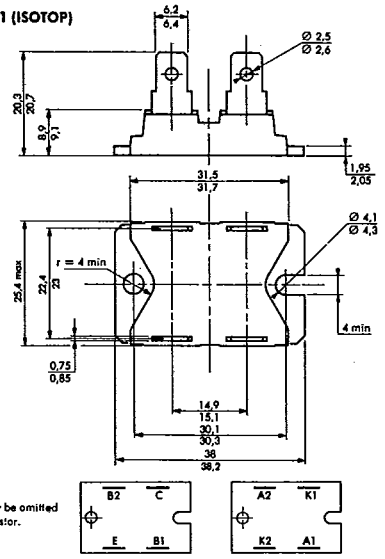
CB-465 (MINIMELF)



CB-466 (MELF)

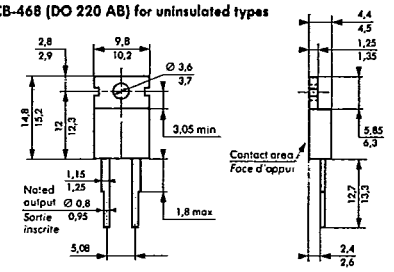


CB-451 (ISOTOP)

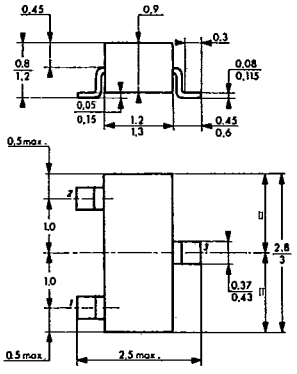


Pin B2 may be omitted for a transistor.

CB-468 (DO 220 AB) for uninsulated types



CB-474



Dimensions in millimeters