

**THOMSON-CSF**

DIVISION SEMICONDUCTEURS DISCRETS

SUPERSWITCH

**ESM 244-50, (R)****ESM 244-600, (R)**

FAST RECOVERY RECTIFIER DIODES

DIODES DE REDRESSEMENT RAPIDES

59C 02316 DT-03-21

## FAST RECOVERY SUPERSWITCH RECTIFIERS

- \* FAST RECOVERY TIME
- \* AVAILABLE UP TO 600 VOLTS
- \* LOW FORWARD RECOVERY TIME

**APPLICATIONS**

- DC and AC motor control
- Switchmode power supply
- High frequency choppers
- High frequency rectifiers

- \* FAIBLE TEMPS DE RECOUVREMENT
- \* DISPONIBLE JUSQU'A 600 VOLTS
- \* FAIBLE TEMPS D'ETABLISSEMENT

**APPLICATIONS**

- Commandes de moteurs continus et alternatifs
- Alimentation à découpage
- Hacheurs à fréquence élevée
- Redresseurs à haute fréquence

VRRM 50 → 600 V

I<sub>F</sub> (AV) (T<sub>case</sub> 90°C) 60 At<sub>rr</sub> (max) 200 nsCase DO 5 (CB 34)  
Boîtier

Type number : Cathode is connected to case  
Type number + suffix R : anode is connected to case

| ABSOLUTE RATINGS (LIMITING VALUES)<br>VALEURS LIMITEES ABSOLUES D'UTILISATION |                                                                             | ESM 244<br>50, (R) | ESM 244<br>100, (R) | ESM 244<br>200, (R) | ESM 244<br>300, (R) | ESM 244<br>400, (R) | ESM 244<br>500, (R) | ESM 244<br>600, (R) |                       |
|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|-----------------------|
| DC reverse voltage<br>Tension inverse continue                                | V <sub>R</sub>                                                              | 50                 | 100                 | 200                 | 300                 | 400                 | 500                 | 600                 | V                     |
| Peak reverse voltage<br>Tension inverse de crête                              | V <sub>RWM</sub>                                                            | 50                 | 100                 | 200                 | 300                 | 400                 | 500                 | 600                 | V                     |
| Repetitive peak reverse voltage<br>Tension inverse de pointe répétitive       | V <sub>RRM</sub>                                                            | 50                 | 100                 | 200                 | 300                 | 400                 | 500                 | 600                 | V                     |
| Average forward current (1)<br>Courant direct moyen (1)                       | T <sub>case</sub> 90°C<br>S = 0,5<br>I <sub>F</sub> (AV)                    | 60                 | 60                  | 60                  | 60                  | 60                  | 60                  | 60                  | A                     |
| Surge non repetitive forward current<br>Courant direct de pointe de surcharge | t <sub>p</sub> = 10 ms<br>sinusoidal<br>I <sub>FSM</sub><br>I <sub>2t</sub> | 800<br>3200        | 800<br>3200         | 800<br>3200         | 800<br>3200         | 800<br>3200         | 800<br>3200         | 800<br>3200         | A<br>A <sup>2</sup> s |
| Junction temperature<br>Température de jonction                               | T <sub>j</sub> (°C)                                                         | - 65<br>+ 165      | - 65<br>+ 165       | - 65<br>+ 165       | - 65<br>+ 165       | - 65<br>+ 165       | - 65<br>+ 165       | - 65<br>+ 165       | °C                    |
| Junction thermal resistance<br>Résistance thermique jonction boîtier          | R <sub>th(j-c)</sub> max                                                    | 0,7                | 0,7                 | 0,7                 | 0,7                 | 0,7                 | 0,7                 | 0,7                 | °C/W                  |

(1) See also figure 3,  
(1) Voir aussi figure 3,

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**THOMSON**  
COMPOSANTS

ESM 244 - 50

ESM 244 - 600

59C 02317

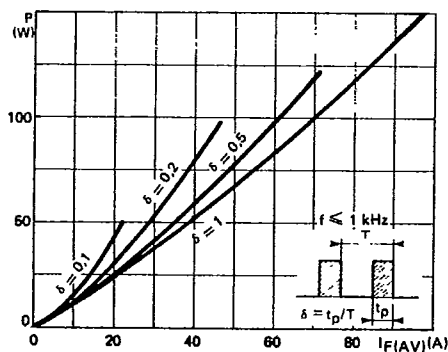
D T-03-21

| ELECTRICAL CHARACTERISTICS<br>CARACTÉRISTIQUES ÉLECTRIQUES | Test conditions<br>Conditions de mesure                                                                       |          | typ | max |    |
|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|----------|-----|-----|----|
| Maximum reverse current<br>Courant inverse de fuite        | $V = V_{RWM}$<br>$T_{(vj)} = 100^\circ\text{C}$                                                               | $I_R$    |     | 6   | mA |
| Forward voltage drop<br>Chute de tension directe           | $I_F = 60\text{ A}$<br>$T_{(vj)} = 25^\circ\text{C}$<br>$I_F = 60\text{ A}$<br>$T_{(vj)} = 100^\circ\text{C}$ | $V_F$    | 1,2 | 1,5 | V  |
| Forward recovery time<br>Temps d'établissement             | $I_F = 60\text{ A}$<br>$di_F/dt = 60\text{ A}/\mu\text{s}$<br>$T_{(vj)} = 150^\circ\text{C}$                  | $t_{fr}$ | 200 |     | ns |

RECOVERY CHARACTERISTICS See figures from 11 to 17.  
CARACTÉRISTIQUES DE RECOUVREMENT Voir figures 11 à 17.  $T_{(vj)} = 25^\circ\text{C}$

|                                                                                         |                                                                                                                                                           |              |     |     |                  |
|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----|-----|------------------|
| Reverse recovery time<br>Temps de recouvrement inverse                                  | JEDEC method<br>Méthode JEDEC<br>$I_F = 1\text{ A}$<br>$V_R = 30\text{ V}$<br>$di_F/dt = 15\text{ A}/\mu\text{s}$                                         | $t_{rr}$     |     | 200 | ns               |
| Maximum reverse recovery current<br>Courant inverse maximal de recouvrement             |                                                                                                                                                           | $I_{RM}$     |     | 3   | A                |
| Rate of decrease of recovery current<br>Vitesse d'extinction du courant de recouvrement |                                                                                                                                                           | $di_{rr}/dt$ | 50  | 75  | A/ $\mu\text{s}$ |
|                                                                                         |                                                                                                                                                           | $Q_R$        |     | 0,3 | $\mu\text{C}$    |
| Recovered charge<br>Charge recouvrée                                                    | Pulse method<br>See figures from 11 to 17<br>Méthode impulsionnelle<br>Voir figures 11 à 17<br>$I_F = 60\text{ A}$<br>$di_F/dt = 50\text{ A}/\mu\text{s}$ | $Q_R$        | 2,7 |     | $\mu\text{C}$    |

FIGURE 1



Low frequency power losses versus average current

ESM 244 - 50

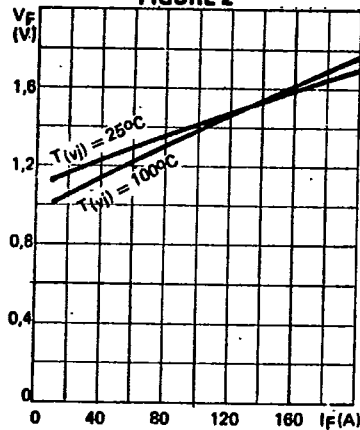
ESM 244 - 600

59C 02318

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FORWARD CHARACTERISTICS  
CARACTÉRISTIQUES DIRECTES

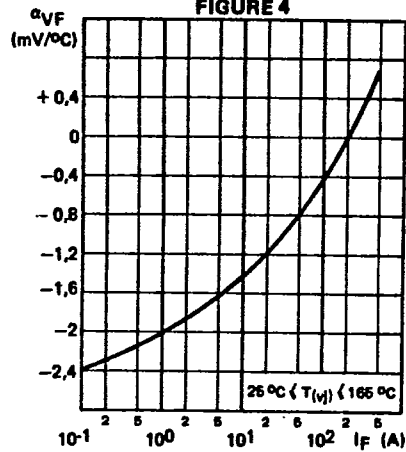
FIGURE 2



Typical values  
Forward voltage drop vs forward current

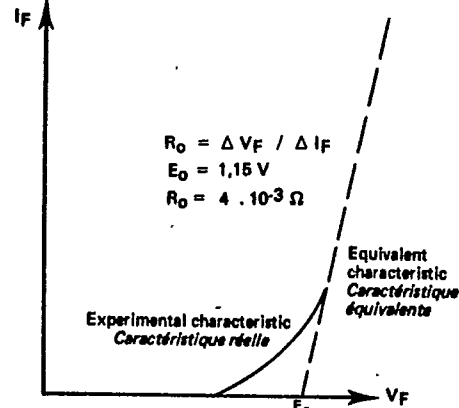
Valeurs typiques  
Chute de tension directe en fonction du courant direct

FIGURE 4



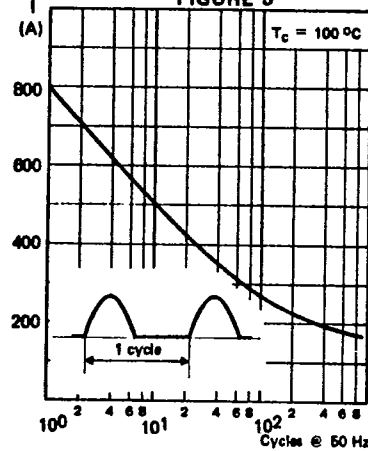
Typical values  
Forward voltage drop variation with temperature vs. forward current  
Variation de la chute de tension directe avec la température en fonction du courant direct

FIGURE 3



Equivalent forward characteristic  
For the purpose of calculating power losses, the forward characteristic can be approximated by the linear curve  
Caractéristique directe équivalente  
Pour le calcul des pertes de puissance, la caractéristique directe de la diode est assimilable à la droite :  
 $V_F = E_0 + R_O I_F$  at  $T(V_j) = 100^\circ\text{C}$

FIGURE 5



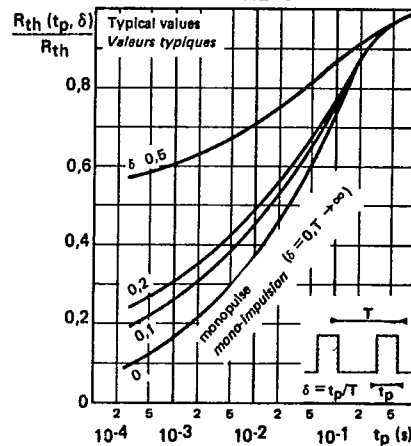
Limiting values - Accidental peak surge current vs. cycles applied at 50 Hz  
Valeurs limites - Courant crête de surcharge accidentelle en fonction du nombre de cycles appliqués à 50 Hz.

ESM 244 - 50  
ESM 244 - 600

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TRANSIENT THERMAL CHARACTERISTICS  
CARACTÉRISTIQUES THERMIQUES TRANSITOIRES

FIGURE 6

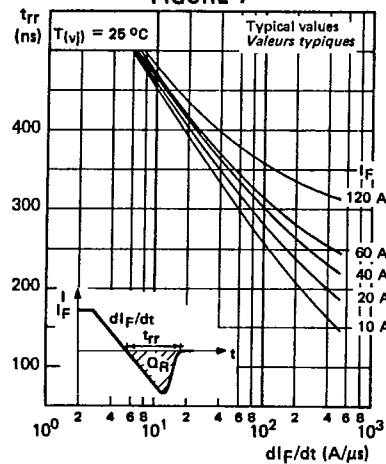


Change in apparent junction to case thermal impedance  $R_{th}(t_p, \delta)$  vs. pulse width ( $t_p$ ) and duty cycle ( $\delta$ )

Variation relative de l'impédance thermique apparente jonction-boîtier  $R_{th}(t_p, \delta)$  en fonction de la durée d'impulsion  $t_p$  et du rapport cyclique  $\delta$

REVERSE RECOVERY TIME (TYPICAL VALUES)  
TEMPS DE RECOUVREMENT INVERSE (VALEURS TYPIQUES)

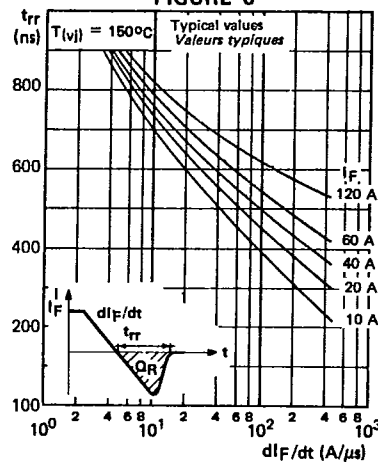
FIGURE 7



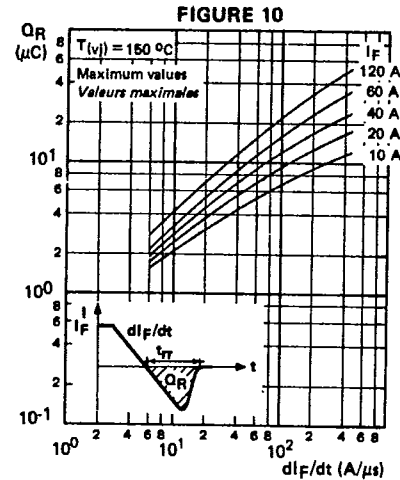
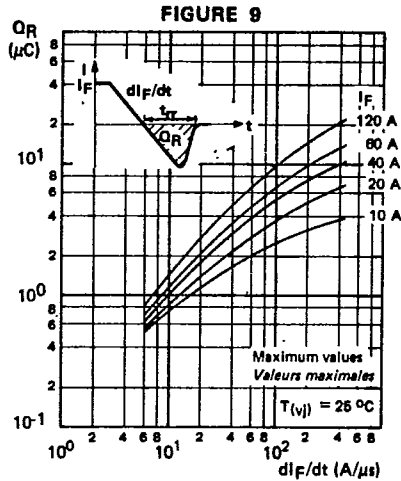
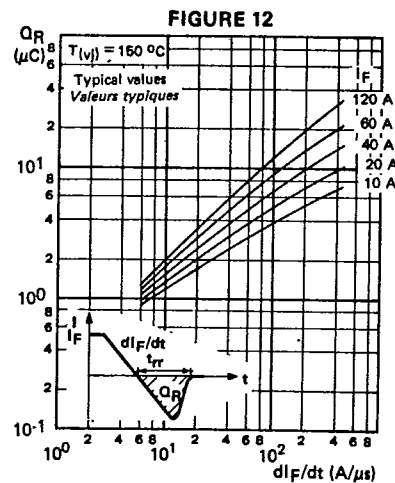
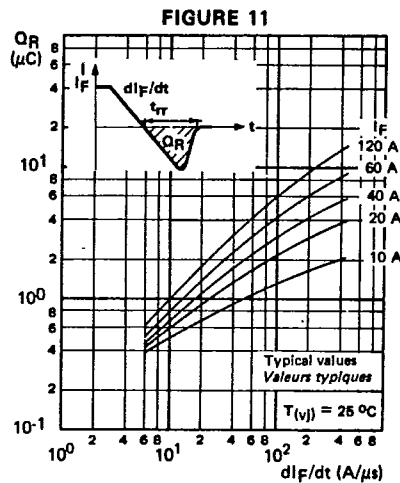
Recovery time ( $t_{rr}$ ) vs.  $di_F/dt$  for various current levels (the reverse current is not circuit limited)

Temps de recouvrement ( $t_{rr}$ ) en fonction de  $di_F/dt$  à différents niveaux de courant  $I_F$  (le courant inverse n'est pas limité par le circuit)

FIGURE 8



59C 02320 D T-03-21

ESM 244 - 50  
ESM 244 - 600RECOVERED CHARGE (MAXIMUM VALUES)  
CHARGE RECOUVREE (VALEURS MAXIMALES)RECOVERED CHARGE (TYPICAL VALUES)  
CHARGE RECOUVREE (VALEURS TYPIQUES)

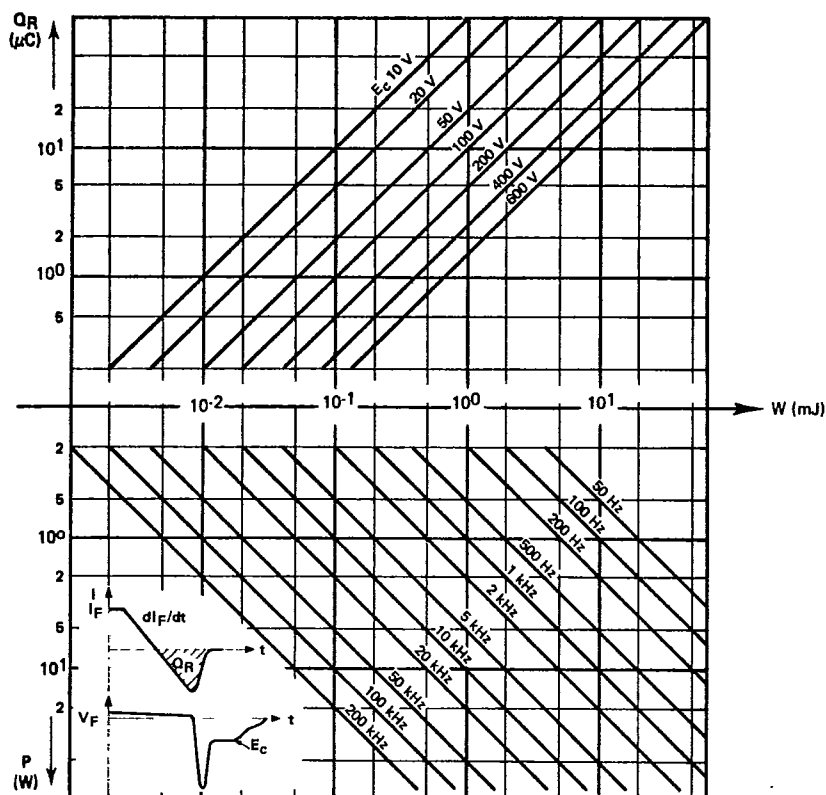
Recovered charge ( $Q_R$ ) vs.  $diF/dt$ , for various current levels  $I_F$ . Recovered charge is a linear function of temperature.  
 Charge recouvrée  $Q_R$  en fonction de  $diF/dt$  à différents niveaux de courant  $I_F$  à  $T(vj) = 25$  et  $150\text{ }^{\circ}\text{C}$  (la charge recouvrée varie linéairement avec la température).

ESM 244 - 50  
ESM 244 - 600

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RECOVERY CHARACTERISTICS  
CARACTÉRISTIQUES DE RECOUVREMENT

FIGURE 13



Recovery switching losses vs. recovered charge ( $Q_R$ ) for various reverse voltages ( $E_c$ ) applied to various frequencies  
 Pertes de commutation de recouvrement en fonction de la charge recouvrée  $Q_R$  pour différentes tensions inverses appliquées  $E_c$  et à différentes fréquences de fonctionnement.

$$P = Q_R \times E_c \times f$$

Recovered charge  $Q_R$  Charge recouvrée

Reverse voltage applied to the diode just after transient state  $E_c$  Tension inverse appliquée à la diode juste après le régime transitoire

Recovery phenomenon frequency  $f$  Fréquence du phénomène de recouvrement

Dissipated energy during each switching  $W$  Energie dissipée à chaque commutation

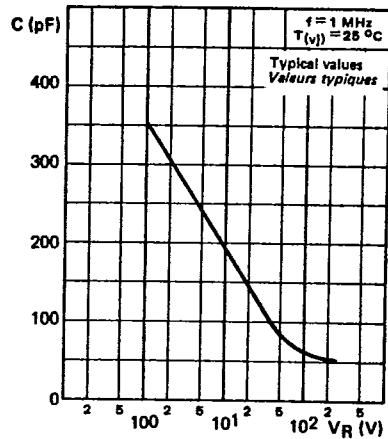
59C 02322

D T-03-21

ESM 244 - 50

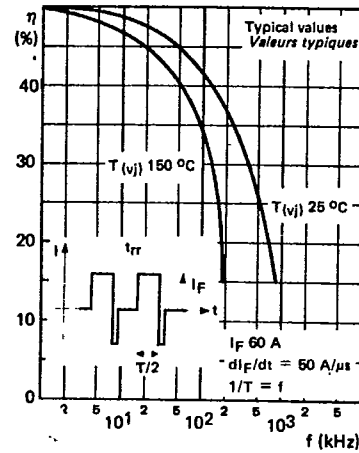
ESM 244 - 600

FIGURE 14



Capacitance (C) vs. reverse voltage ( $V_R$ )  
applied  
Capacité C en fonction de la tension in-  
verse  $V_R$  appliquée

FIGURE 15



Rectifying efficiency ( $\eta$ ) vs. frequency

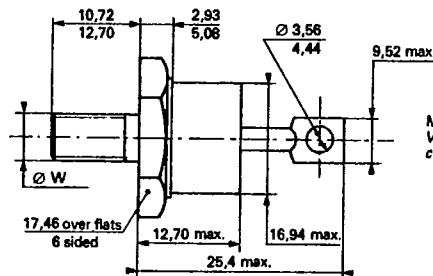
$$\eta = \frac{I_{2 \text{ mov}}}{I_{2 \text{ eff}}} \times 100$$

Efficacité de redressement  $\eta$  en fonction  
de la fréquence

## CASE OUTLINE

$\varnothing W = 1/4 - 28 \text{ UNF}$   
ISO thread on request

Recommended torque value  
Valeur recommandée du  
couple de serrage 250 cm.N



Maximum torque value  
Valeur maximale du  
couple de serrage 310 cm.N

DO-5 (CB-34)

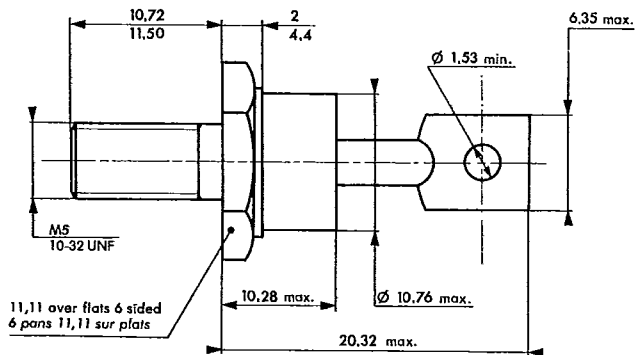
59C 02357

D

T-33-01

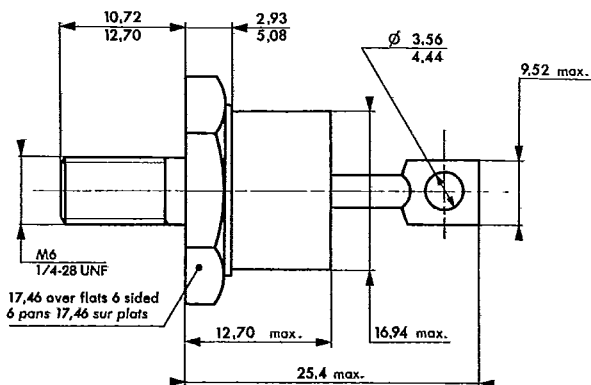
## DO 4 (CB-33)

CB-33 M →  $\phi W = M 5$   
 U →  $\phi W = 10-32 \text{ UNF}$

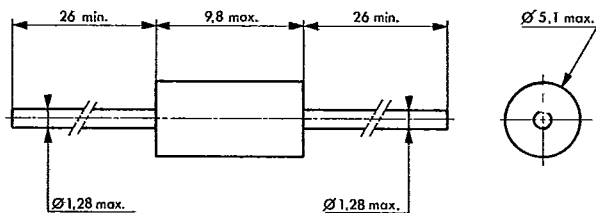


## DO 5 (CB-34)

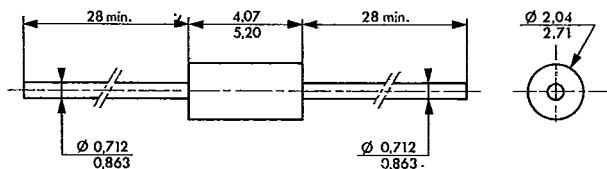
CB-34 M →  $\phi W = M 6$   
 U →  $\phi W = 1/4-28 \text{ UNF}$

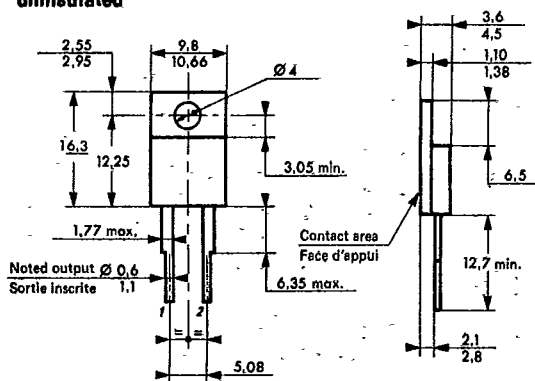
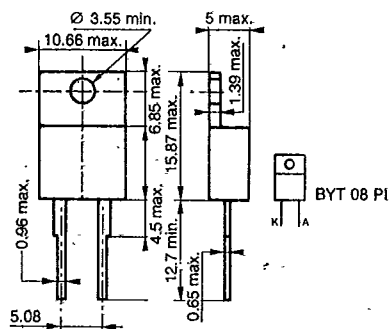
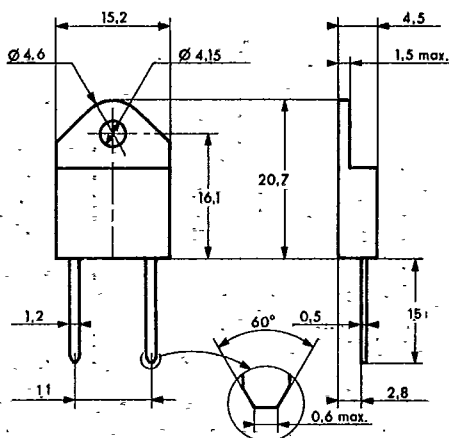
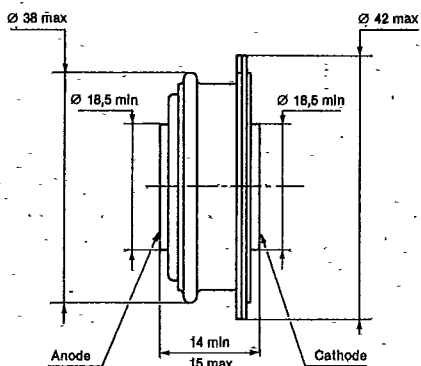
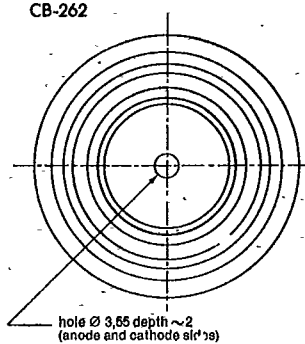


## DO 27 A (CB-197)



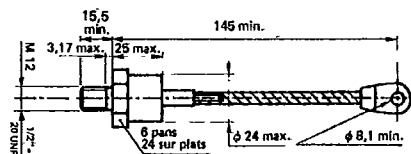
## DO 41 (CB-101)



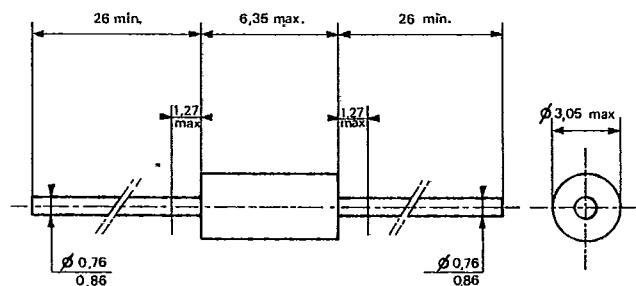
**DO 220 AB (CB-227)**  
uninsulated**DO 220 AB (CB-426)**  
insulated**DOP 3 (CB-425)****M 771**  
(CB-262)**CB-262**

M 771 CASE OUTLINE

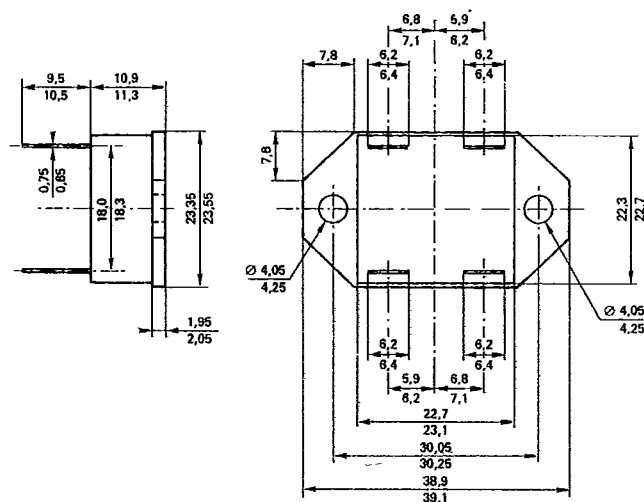
F62 m (CB-252)



F 126 (CB-210)



CB-427



|   |   |
|---|---|
| 1 | 2 |
| 4 | 3 |

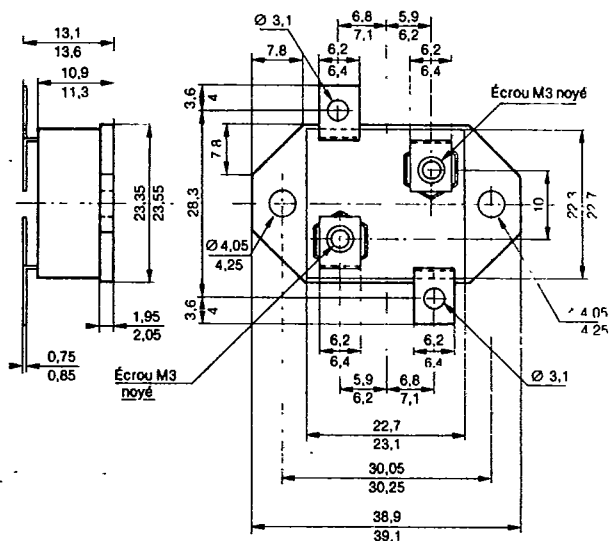
Marking : clear  
Marquage : en clairNote : Pin 3 may be omitted  
La broche 3 peut être omise

CB-434

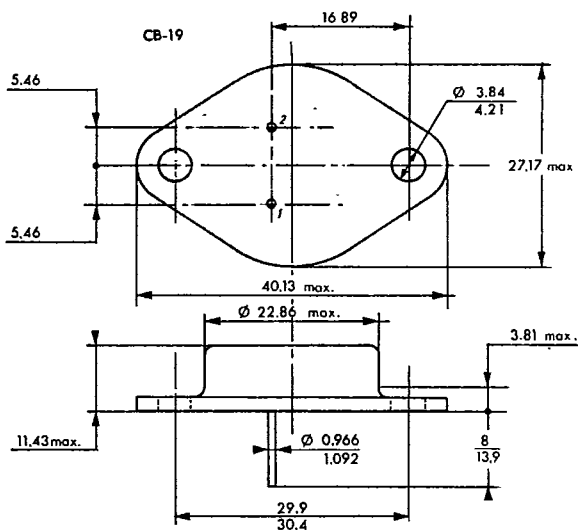
59C 02360

D

T-33-01

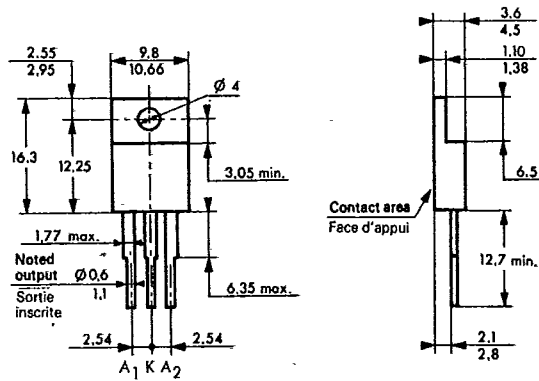


TO 3 modified (CB-19)



**TO 220 AB (CB-428)**  
**for duo-diodes**

T-33-01

**CB-244 (TOP 3 - TO 218)**