



Application Specific Discretes  
A.S.D.™

**RBO08-40G/T**

**REVERSED BATTERY AND  
OVERVOLTAGE PROTECTION**

#### FEATURES

- 8A DIODE TO GUARD AGAINST BATTERY REVERSAL.
- NEGATIVE OVERVOLTAGE PROTECTION BY CLAMPING.
- COMPLIANT WITH ISO/DTR 7637 STANDARD FOR PULSES 1, 2, 3a and 3b.
- SUITABLE FOR AUTOPROTECTED ALTERNATOR ENVIRONMENT.
- BREAKDOWN VOLTAGE : 24 V min.
- CLAMPING VOLTAGE :  $\pm 40$  V max.
- MONOLITHIC STRUCTURE FOR GREATER RELIABILITY.

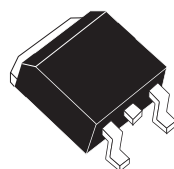
#### DESCRIPTION

Designed to protect against battery reversal and overvoltages in automotive applications, this monolithic component offers multiple functions in the same package :

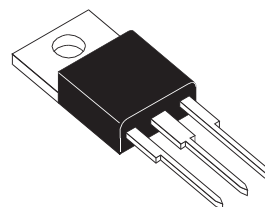
D1 : reversed battery protection

T1 : clamping against negative overvoltages

T2 : Transil function for overvoltage protection.

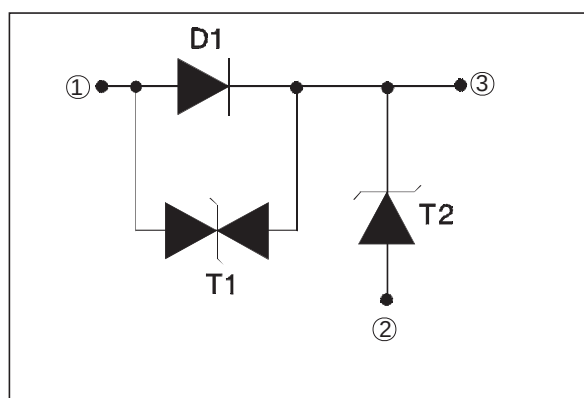


**D<sup>2</sup>PAK  
RBO08-40G**



**TO220-AB  
RBO08-40T**

#### FUNCTIONAL DIAGRAM



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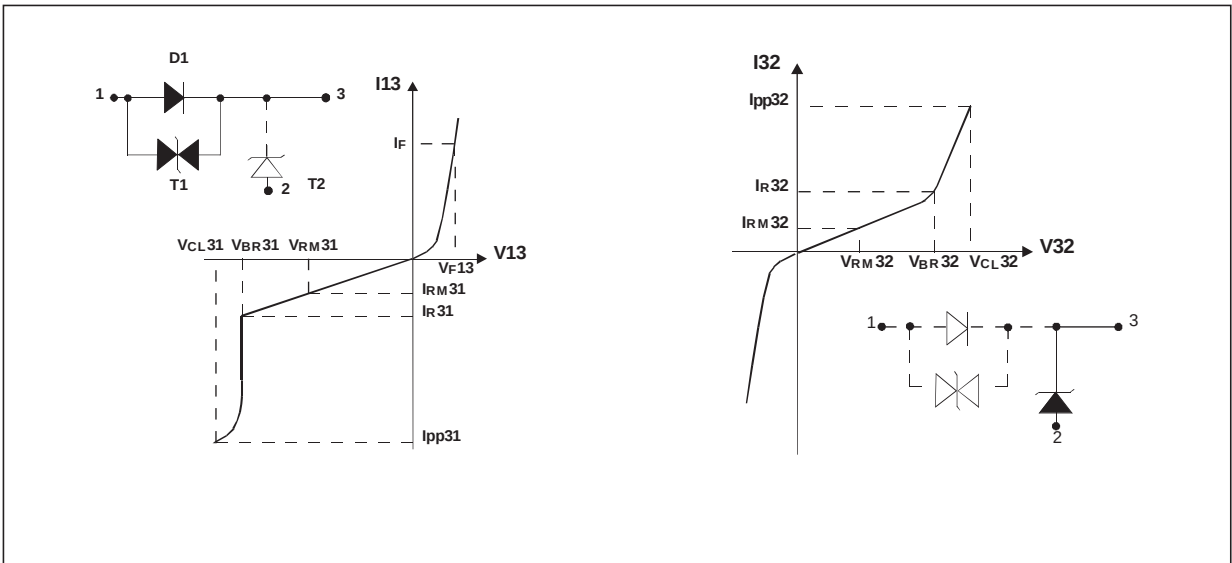
ABSOLUTE MAXIMUM RATINGS

| Symbol             | Parameter                                                                                                 |                          | Value                | Unit             |
|--------------------|-----------------------------------------------------------------------------------------------------------|--------------------------|----------------------|------------------|
| $I_{FSM}$          | Non repetitive surge peak forward current (Diode D1)                                                      | $t_p = 10\text{ ms}$     | 80                   | A                |
| $I_F$              | DC forward current (Diode D1)                                                                             | $T_c = 75^\circ\text{C}$ | 8                    | A                |
| $P_{PP}$           | Peak pulse power between Input and Output (Transil T1) see note 1 $T_j\text{ initial} = 25^\circ\text{C}$ | 10/1000 $\mu\text{s}$    | 600                  | W                |
| $P_{PP}$           | Peak pulse power between Pins 3 and 2 (10/1000 $\mu\text{s}$ )                                            |                          | 1500                 | W                |
| $T_{stg}$<br>$T_j$ | Storage temperature range<br>Maximum junction temperature                                                 |                          | - 40 to + 150<br>150 | $^\circ\text{C}$ |
| $T_L$              | Maximum lead temperature for soldering during 10 s<br>at 4.5mm from case for TO220-AB                     |                          | 260                  | $^\circ\text{C}$ |

**Note 1 :** for a surge greater than the maximum value, the device will fail in short-circuit..

THERMAL RESISTANCE

| Symbol        | Parameter        |                        | Value      | Unit               |
|---------------|------------------|------------------------|------------|--------------------|
| $R_{th(j-c)}$ | Junction to case | RBO08-40M<br>RBO08-40T | 2.4<br>2.4 | $^\circ\text{C/W}$ |



| Symbol              | Parameter                                  |
|---------------------|--------------------------------------------|
| $V_{RM31}/V_{RM32}$ | Stand-off voltage Transil T1 / Transil T2. |
| $V_{BR31}/V_{BR32}$ | Breakdown voltage Transil T1 / Transil T2. |
| $I_{R31}/I_{R32}$   | Leakage current Transil T1 / Transil T2.   |
| $V_{CL31}/V_{CL32}$ | Clamping voltage Transil T1 / Transil T2.  |
| $V_{F13}$           | Forward voltage drop Diode D1.             |
| $I_{PP}$            | Peak pulse current.                        |
| $\alpha T$          | Temperature coefficient of $V_{BR}$ .      |
| $C_{31}/C_{32}$     | Capacitance Transil T1 / Transil T2.       |

**ELECTRICAL CHARACTERISTICS : DIODE D1** (- 40°C < T<sub>amb</sub> < + 85°C)

| Symbol   | Test Conditions                                  |           | Value |      |      | Unit |
|----------|--------------------------------------------------|-----------|-------|------|------|------|
|          |                                                  |           | Min.  | Typ. | Max. |      |
| $V_F 13$ | $I_F = 8\text{ A}$                               | RBO08-40G |       |      | 1.5  | V    |
|          |                                                  | RBO08-40T |       |      | 1.7  | V    |
|          | $I_F = 8\text{ A @ } T_{amb} = 25^\circ\text{C}$ |           |       |      | 1.45 | V    |
| $V_F 13$ | $I_F = 4\text{ A}$                               | RBO08-40G |       |      | 1.3  | V    |
|          |                                                  | RBO08-40T |       |      | 1.35 | V    |
|          | $I_F = 4\text{ A @ } T_{amb} = 25^\circ\text{C}$ |           |       |      | 1.2  | V    |
| $V_F 13$ | $I_F = 1\text{ A}$                               |           |       |      | 1.1  | V    |
|          | $I_F = 1\text{ A @ } T_{amb} = 25^\circ\text{C}$ |           |       |      | 1.0  | V    |
|          | $I_F = 1\text{ A @ } T_j = 85^\circ\text{C}$     |           |       |      | 0.9  | V    |

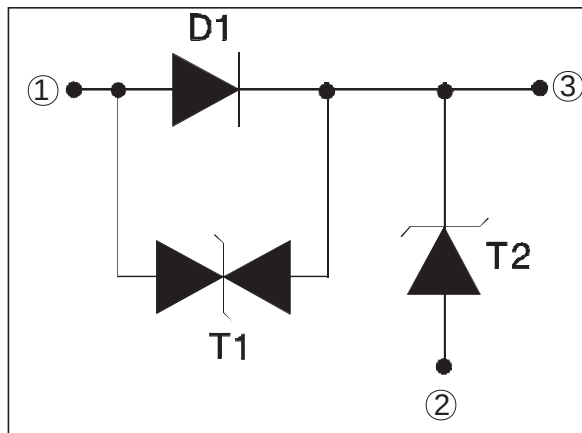
**ELECTRICAL CHARACTERISTICS : TRANSIL T1** (- 40°C < T<sub>amb</sub> < + 85°C)

| Symbol      | Test Conditions                                                |                       | Value |      |      | Unit                     |
|-------------|----------------------------------------------------------------|-----------------------|-------|------|------|--------------------------|
|             |                                                                |                       | Min.  | Typ. | Max. |                          |
| $V_{BR 31}$ | $I_R = 1\text{ mA}$                                            |                       | 22    |      | 35   | V                        |
| $V_{BR 31}$ | $I_R = 1\text{ mA}, T_{amb} = 25^\circ\text{C}$                |                       | 24    |      | 32   | V                        |
| $I_{RM 31}$ | $V_{RM} = 20\text{ V}$                                         |                       |       |      | 50   | $\mu\text{A}$            |
| $I_{RM 31}$ | $V_{RM} = 20\text{ V}, T_{amb} = 25^\circ\text{C}$             |                       |       |      | 10   | $\mu\text{A}$            |
| $V_{CL 31}$ | $I_{PP} = 15\text{ A}, T_j \text{ initial} = 25^\circ\text{C}$ | 10/1000 $\mu\text{s}$ |       |      | 40   | V                        |
| $\alpha T$  | Temperature coefficient of $V_{BR}$                            |                       |       |      | 9    | $10^{-4}/^\circ\text{C}$ |
| $C_{31}$    | $F = 1\text{ MHz} \quad V_R = 0\text{ V}$                      |                       |       | 1000 |      | pF                       |

**ELECTRICAL CHARACTERISTICS : TRANSIL T2** (- 40°C < T<sub>amb</sub> < + 85°C)

| Symbol      | Test Conditions                                    |                       | Value |      |      | Unit                     |
|-------------|----------------------------------------------------|-----------------------|-------|------|------|--------------------------|
|             |                                                    |                       | Min.  | Typ. | Max. |                          |
| $V_{BR 32}$ | $I_R = 1\text{ mA}$                                |                       | 22    |      | 35   | V                        |
| $V_{BR 32}$ | $I_R = 1\text{ mA}, T_{amb} = 25^\circ\text{C}$    |                       | 24    |      | 32   | V                        |
| $I_{RM 32}$ | $V_{RM} = 20\text{ V}$                             |                       |       |      | 50   | $\mu\text{A}$            |
| $I_{RM 32}$ | $V_{RM} = 20\text{ V}, T_{amb} = 25^\circ\text{C}$ |                       |       |      | 10   | $\mu\text{A}$            |
| $V_{CL 32}$ | $I_{PP} = 37.5\text{ A}$                           | 10/1000 $\mu\text{s}$ |       |      | 40   | V                        |
| $\alpha T$  | Temperature coefficient of $V_{BR}$                |                       |       |      | 8.5  | $10^{-4}/^\circ\text{C}$ |

## PRODUCT DESCRIPTION



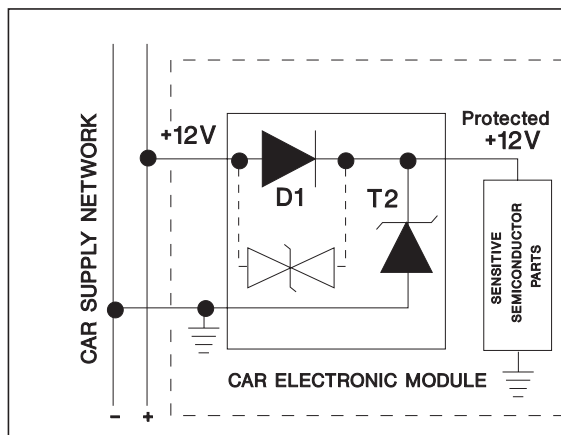
The RBO has 3 functions integrated on the same chip.

D1 : "Diode function" in order to protect against reversed battery operation.

T2 : "Transil function" in order to protect against positive surge generated by electric systems (ignition, relay. ...).

T1 : Protection against negative surges such as inductive overvoltages (see motor application below).

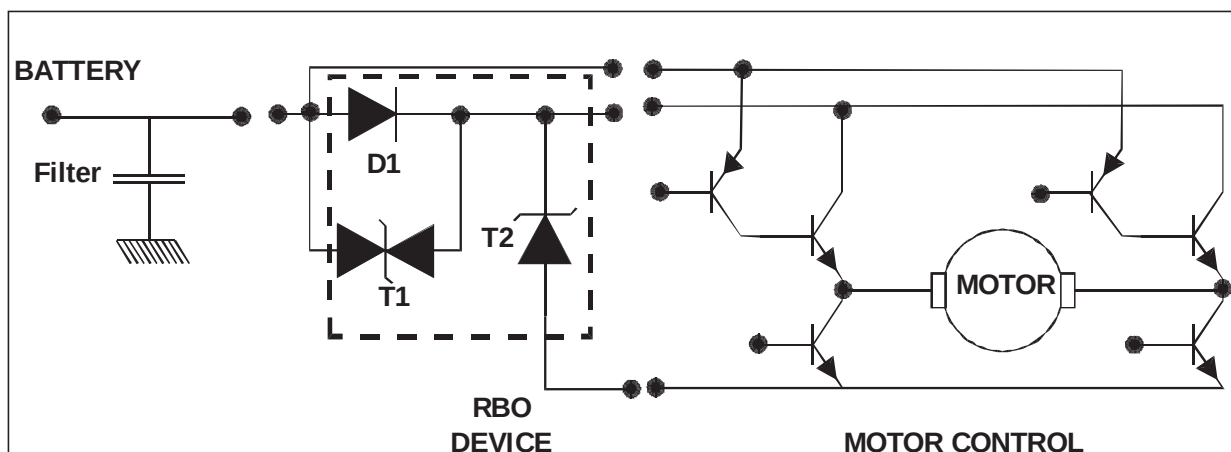
## BASIC APPLICATION



\* The monolithic multi-function protection (RBO) has been developed to protect sensitive semiconductors in car electronic modules against both overvoltage and battery reverse.

\* In addition, the RBO circuit prevents overvoltages generated by the module from affecting the car supply network.

## MOTOR DRIVER APPLICATION



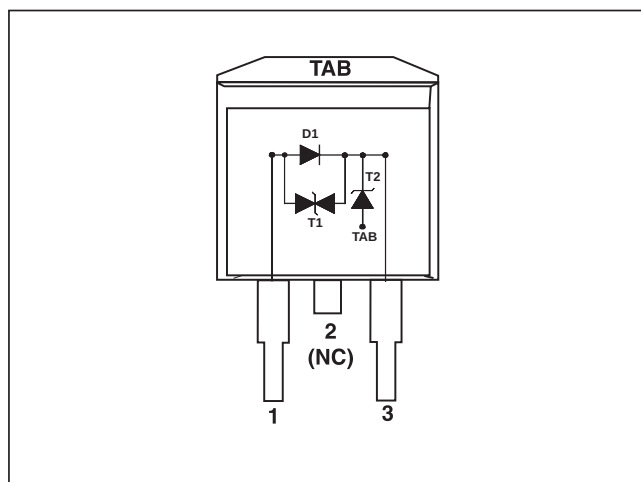
In this application, one half of the motor drive circuit is supplied through the "RBO" and is thus protected as per its basic function application.

The second part is connected directly to the "car supply network" and is protected as follows :

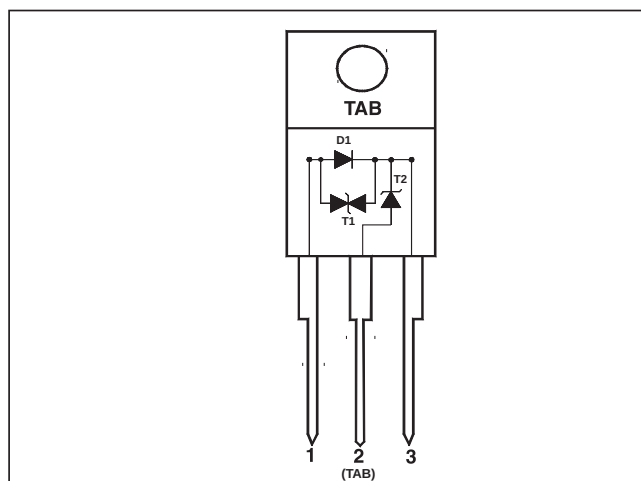
- For positive surges : T2 (clamping phase) and D1 in forward-biased.
- For negative surges : T1 (clamping phase) and T2 in forward-biased.

**PINOUT configuration in D<sup>2</sup>PAK :**

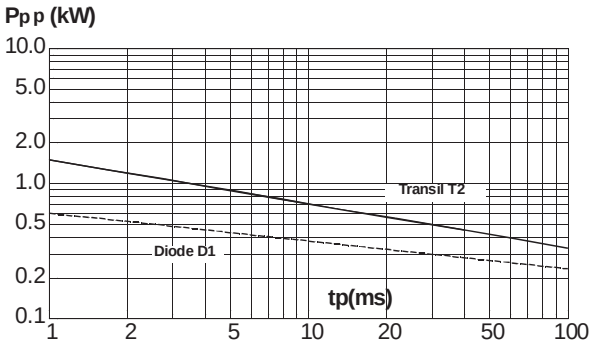
- Input (1) : Pin 1
- Output (3) : Pin 3
- Gnd (2) : Connected to base Tab

**PINOUT configuration in TO220AB :**

- Input (1) : Pin 1
- Output (3) : Pin 3
- GND (2) : Connected to base Tab

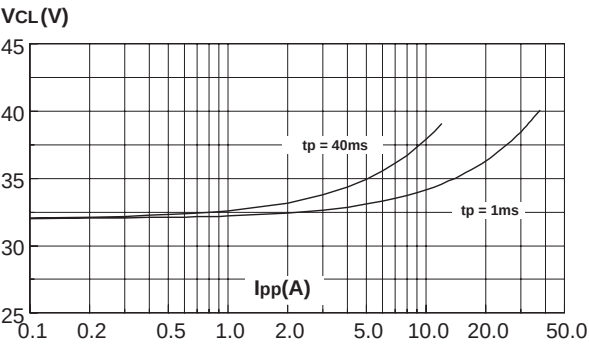


**Fig. 1 :** Peak pulse power versus exponential pulse duration ( $T_j$  initial = 85°C).



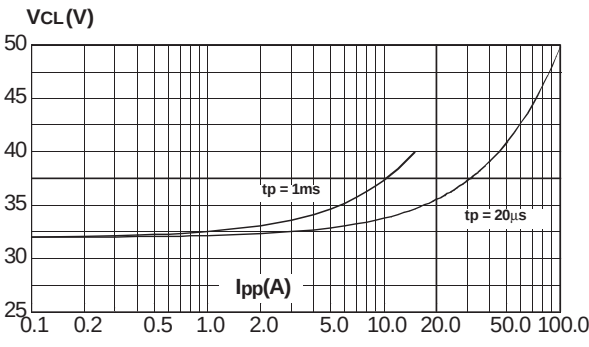
**Fig. 2-1 :** Clamping voltage versus peak pulse current ( $T_j$  initial = 85°C).

Exponential waveform  $t_p = 40$  ms and  $t_p = 1$  ms (TRANSIL T2).

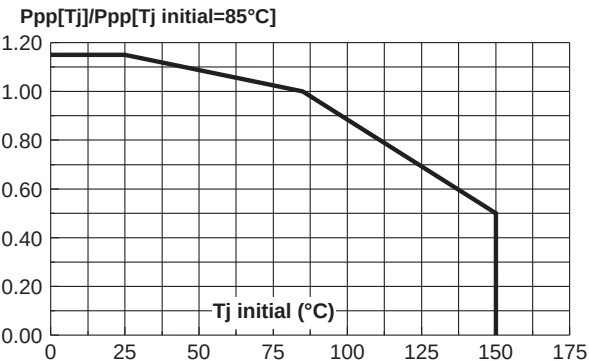


**Fig. 2-2 :** Clamping voltage versus peak pulse current ( $T_j$  initial = 85°C).

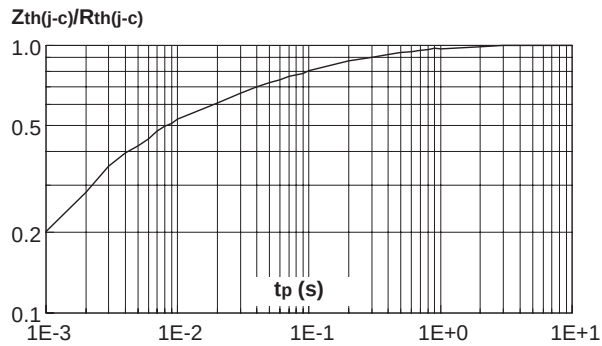
Exponential waveform  $t_p = 1$  ms and  $t_p = 20$   $\mu$ s (TRANSIL T1).



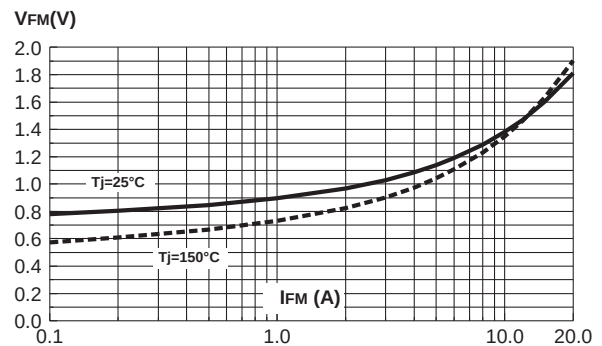
**Fig. 3 :** Relative variation of peak pulse power versus junction temperature.



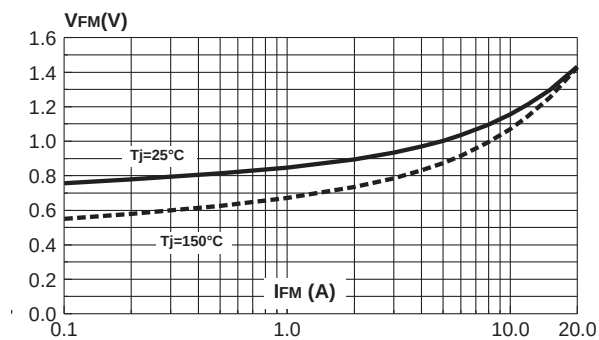
**Fig. 4 :** Relative variation of thermal impedance junction to case versus pulse duration.



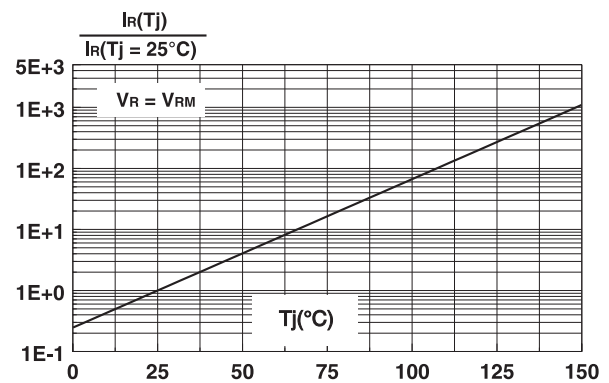
**Fig. 5-1 :** Peak forward voltage drop versus peak forward current (typical values) - (TRANSIL T2).



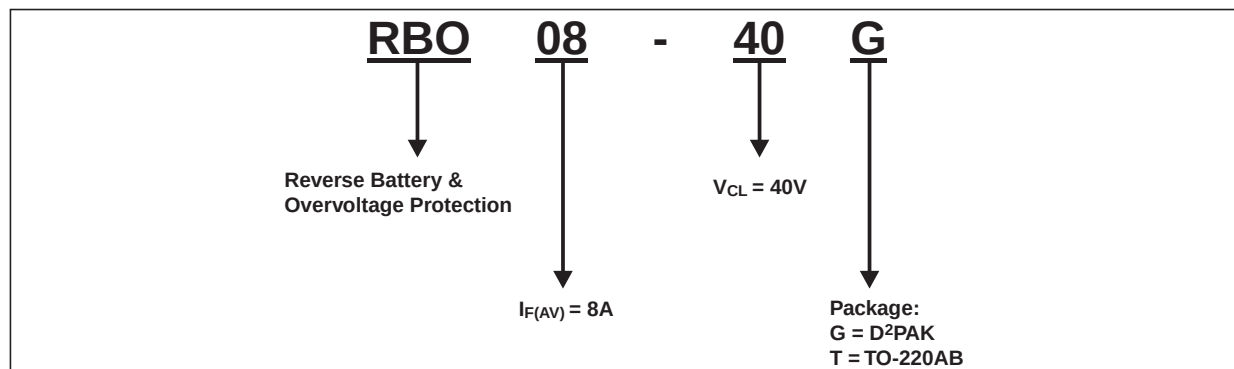
**Fig. 5-2 :** Peak forward voltage drop versus peak forward current (typical values) - (DIODE D1).



**Fig. 6 :** Relative variation of leakage current versus junction temperature.

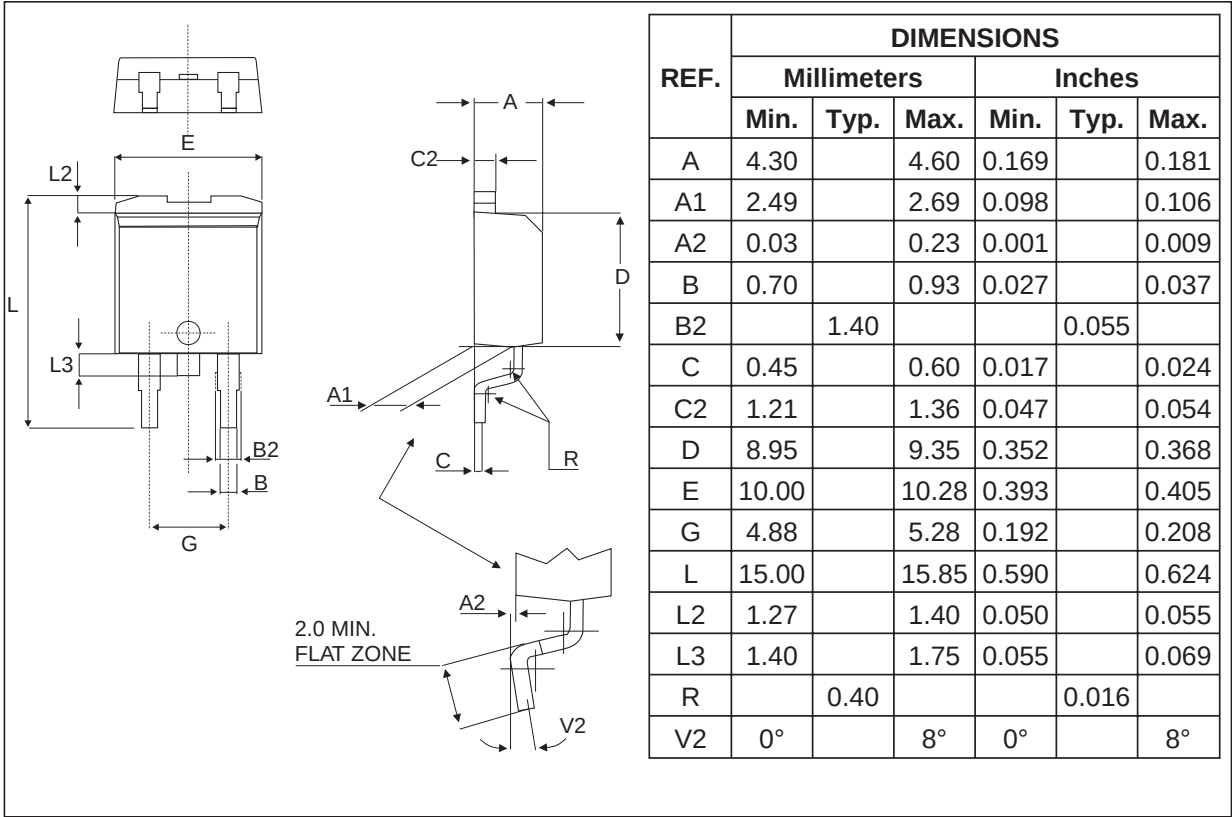


## ORDERING INFORMATION

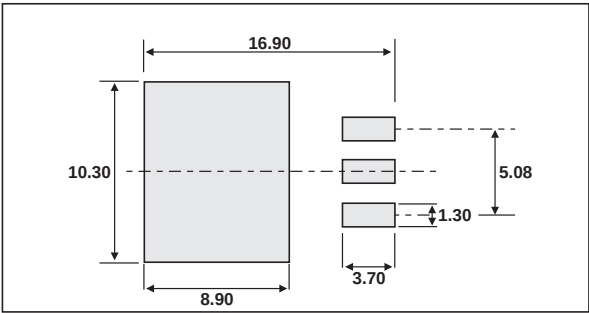


PACKAGE MECHANICAL DATA

D<sup>2</sup>PAK Plastic



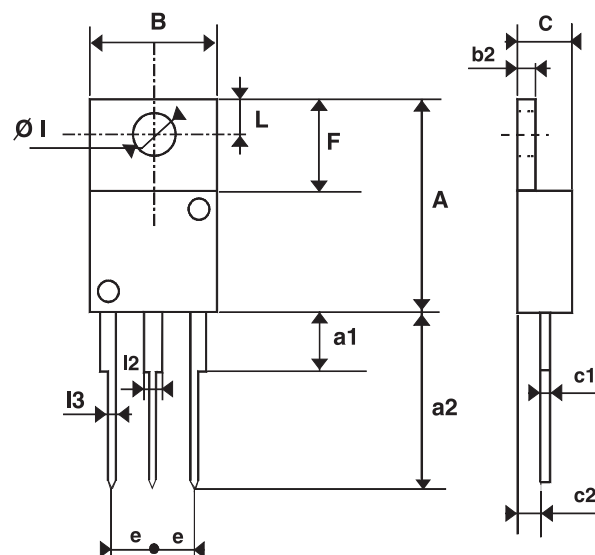
FOOT-PRINT D<sup>2</sup>PAK





**PACKAGE MECHANICAL DATA**

TO-220AB Plastic



| REF. | DIMENSIONS  |       |        |       |
|------|-------------|-------|--------|-------|
|      | Millimeters |       | Inches |       |
|      | Min.        | Max.  | Min.   | Max.  |
| A    | 14.23       | 15.87 | 0.560  | 0.625 |
| a1   |             | 4.50  |        | 0.177 |
| a2   | 12.70       | 14.70 | 0.500  | 0.579 |
| B    | 10.20       | 10.45 | 0.402  | 0.411 |
| b1   | 0.64        | 0.96  | 0.025  | 0.038 |
| b2   | 1.15        | 1.39  | 0.045  | 0.055 |
| C    | 4.48        | 4.82  | 0.176  | 0.190 |
| c1   | 0.35        | 0.65  | 0.020  | 0.026 |
| c2   | 2.10        | 2.70  | 0.083  | 0.106 |
| e    | 2.29        | 2.79  | 0.090  | 0.110 |
| F    | 5.85        | 6.85  | 0.230  | 0.270 |
| I    | 3.55        | 4.00  | 0.140  | 0.157 |
| L    | 2.54        | 3.00  | 0.100  | 0.118 |
| I2   | 1.45        | 1.75  | 0.057  | 0.069 |
| I3   | 0.80        | 1.20  | 0.031  | 0.047 |

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