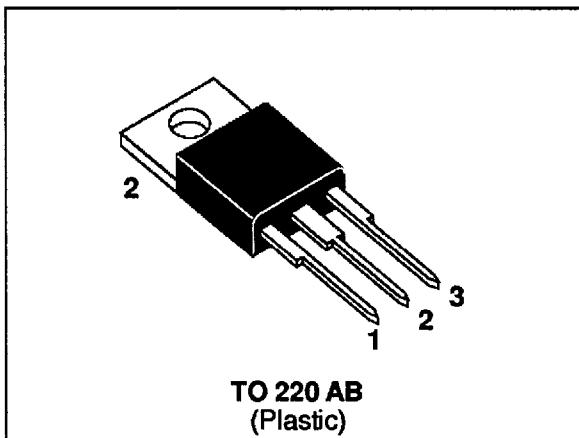


FEATURES

- PROTECTION AGAINST "LOAD DUMP" EFFECT
- DIODE TO GUARD AGAINST BATTERY REVERSAL
- MONOLITHIC STRUCTURE FOR GREATER RELIABILITY
- NEGATIVE OVERVOLTAGE PROTECTION BY CLAMPING (COMPONENT T1)
- BREAKDOWN VOLTAGE : 24 V min
- CLAMPING VOLTAGE : ± 40 V max
- AVERAGE FORWARD DIODE CURRENT : 40 A

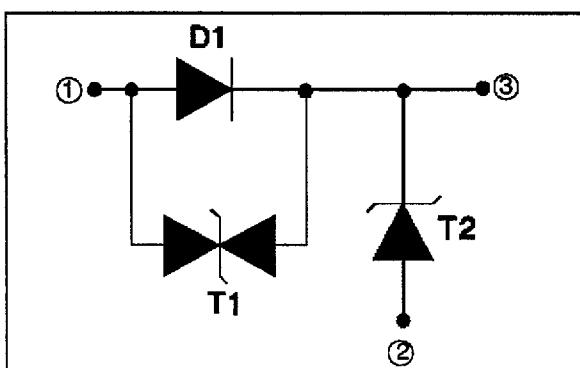

DESCRIPTION

Designed to protect against battery reversal and load dump 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 against "load dump" effect

FUNCTIONAL DIAGRAM

ABSOLUTE MAXIMUM RATINGS (- 40°C < T_{amb} < + 85°C)

Symbol	Parameter	Value	Unit
I _{FSM}	Non repetitive surge peak forward current between pins 1 and 3	t _p = 10µs	A
		t _p = 10ms	120
I _{F(AV)}	Average forward current between pins 1 and 3	T _c = 75°C	A
V _{PP}	Peak load dump voltage (see note 1 and 2)		V
P _P	Peak pulse power between pins 3 and 1	10/1000µs	W
P	Total power dissipation	T _c = 75°C	W
T _{stg} T _j	Storage temperature range Maximum operating junction temperature	- 40 to + 150 150	°C
T _l	Maximum lead temperature for soldering during 10s at 4.5 mm from case	260	°C

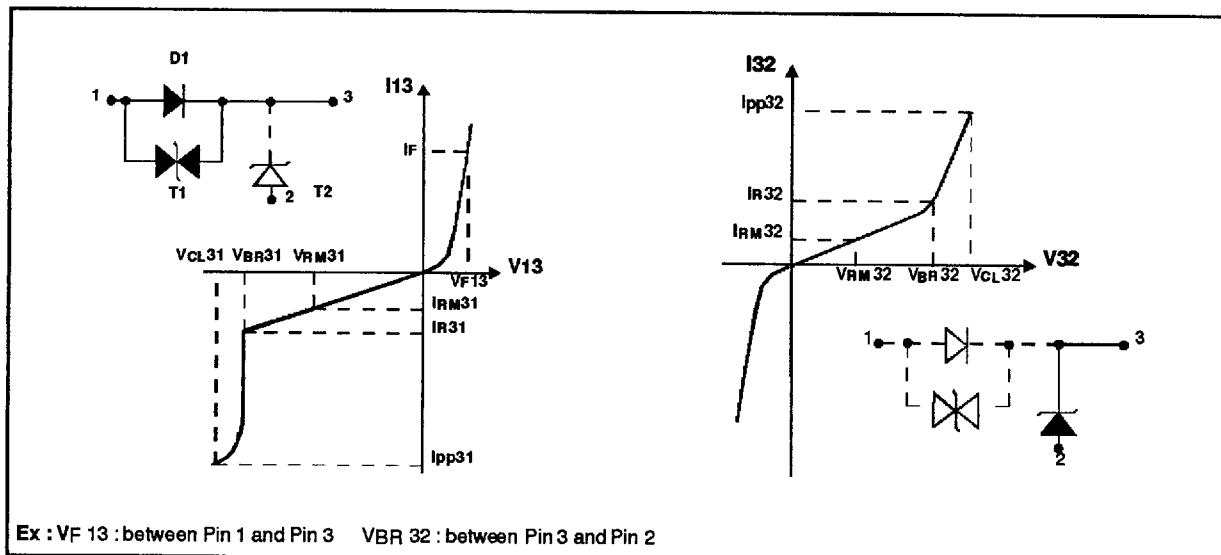
Note 1 : for a surge greater than the maximum value, the device will fail in short circuit.

Note 2 : see load dump test generator circuit (page 3/7)

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THERMAL RESISTANCES

Symbol	Parameter	Value	Unit
$R_{th(j-c)}$	Junction to case	1	°C/W
$R_{th(j-a)}$	Junction to ambient	60	°C/W



ELECTRICAL CHARACTERISTICS : DIODE D1 (-40°C < Tamb < +85°C) (note 1)

Symbol	Test Conditions	Value			Unit
		Min.	Typ.	Max.	
V_{F13}	Forward voltage @ $I_F = 40\text{ A}$ $t_p = 380\text{ }\mu\text{s}$			1.9	V
V_{F13}	Forward voltage @ $I_F = 20\text{ A}$ $t_p = 380\text{ }\mu\text{s}$			1.45	V
V_{F13}	Forward voltage @ $I_F = 1\text{ A}$ $t_p = 380\text{ }\mu\text{s}$			1	V
V_{F13}	Forward voltage @ $I_F = 100\text{ mA}$ $t_p = 380\text{ }\mu\text{s}$			0.95	V
C_{13}	Capacitance at 0 V		3000		pF

Note 1 : "13", "31" and "32" suffixes :

ELECTRICAL CHARACTERISTICS : TRANSIL T1 (-40°C < Tamb < +85°C) (note 1)

V_{BR31}	Breakdown voltage @ $I_R = 1\text{ mA}$	22		35	V
V_{BR31}	Breakdown voltage @ $I_R = 1\text{ mA}$ $T_{amb} = 25^\circ\text{C}$	24		32	V
I_{RM31}	Leakage current @ $V_{RM} = 20\text{ V}$			300	μA
I_{RM31}	Leakage current @ $V_{RM} = 20\text{ V}$ $T_{amb} = 25^\circ\text{C}$			50	μA
V_{CL31}	Clamping voltage @ $I_{PP} = 37.5\text{ A}$ $10/1000\mu\text{s}$			40	V
αT	Temperature coefficient		8.5		$10^{-4}/^\circ\text{C}$

Note 1 : "13", "31" and "32" suffixes :

ELECTRICAL CHARACTERISTICS : TRANSIL T2 (- 40°C < Tamb < +85°C) (note 1)

VBR 32	Breakdown voltage @ $I_R = 1 \text{ mA}$	22	35	V
VBR 32	Breakdown voltage @ $I_R = 1 \text{ mA} \text{ Tamb} = 25^\circ\text{C}$	24	32	V
$I_{RM\ 32}$	Leakage current @ $V_{RM} = 20 \text{ V}$		100	μA
$I_{RM\ 32}$	Leakage current @ $V_{RM} = 20 \text{ V} \text{ Tamb} = 25^\circ\text{C}$		10	μA
V _{CL} 32	Clamping voltage @ $IPP = 20 \text{ A}$ (note 2)		40	V
$\alpha\ T$	Temperature coefficient	8.5		$10^{-4}/^\circ\text{C}$
C ₃₂	Capacitance at 0 V	8000		pF

Note 1 : "13", "31" and "32" suffixes :

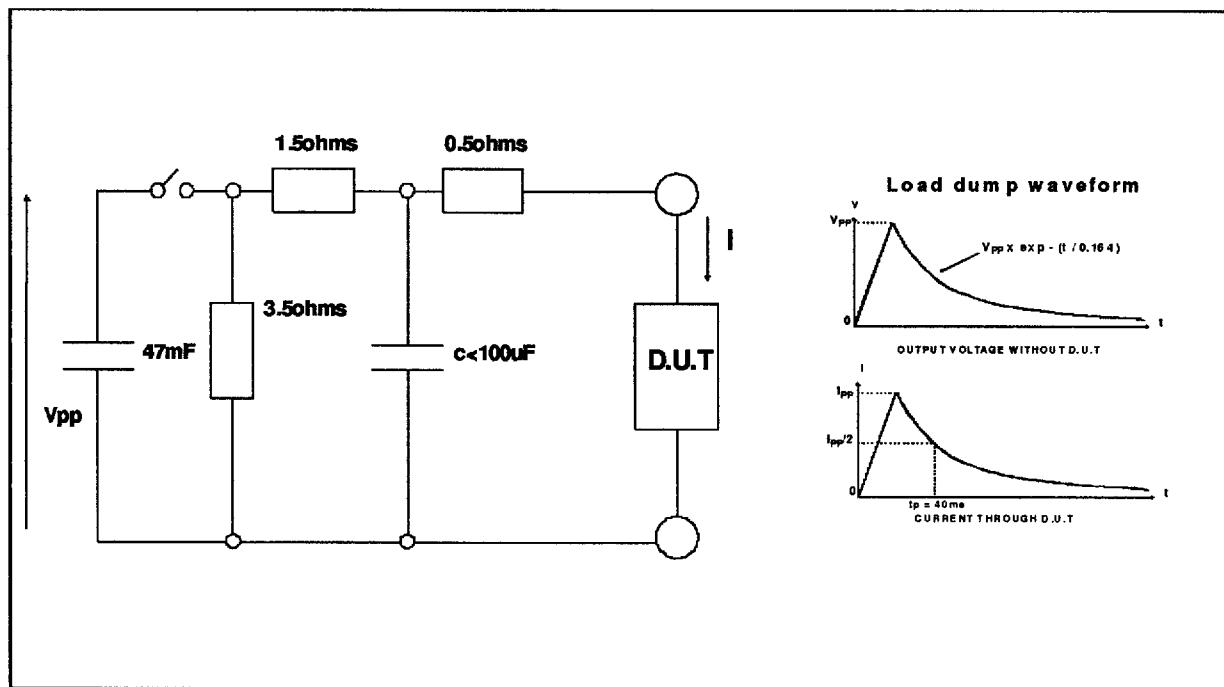
13 = between pin 1 and pin 3.

31 = between pin 3 and pin 1.

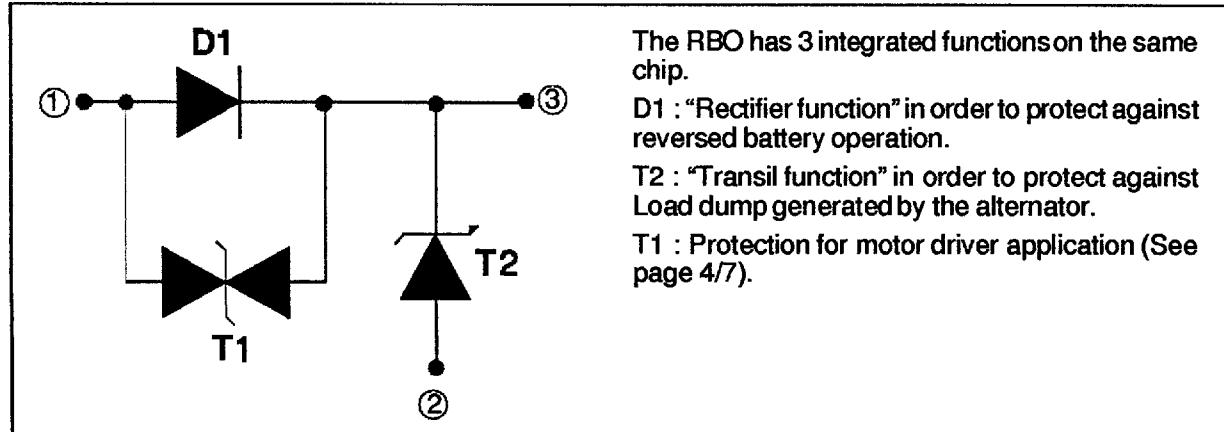
32 = between pin 3 and pin 2.

Note 2 : see below load dump test generator circuit .

LOAD DUMP TEST GENERATOR CIRCUIT (SCHAFFNER NSG 506C)

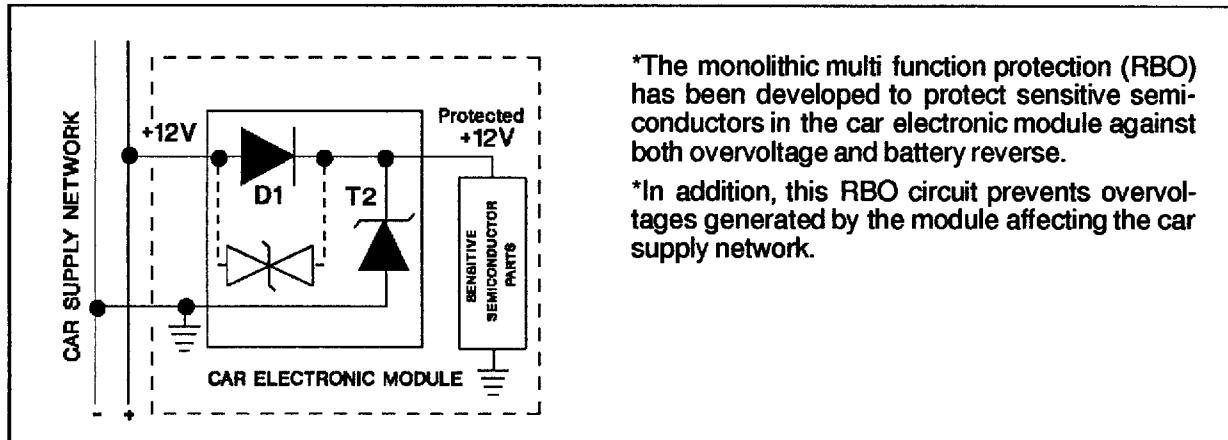


PRODUCT DESCRIPTION



RBO40-40T

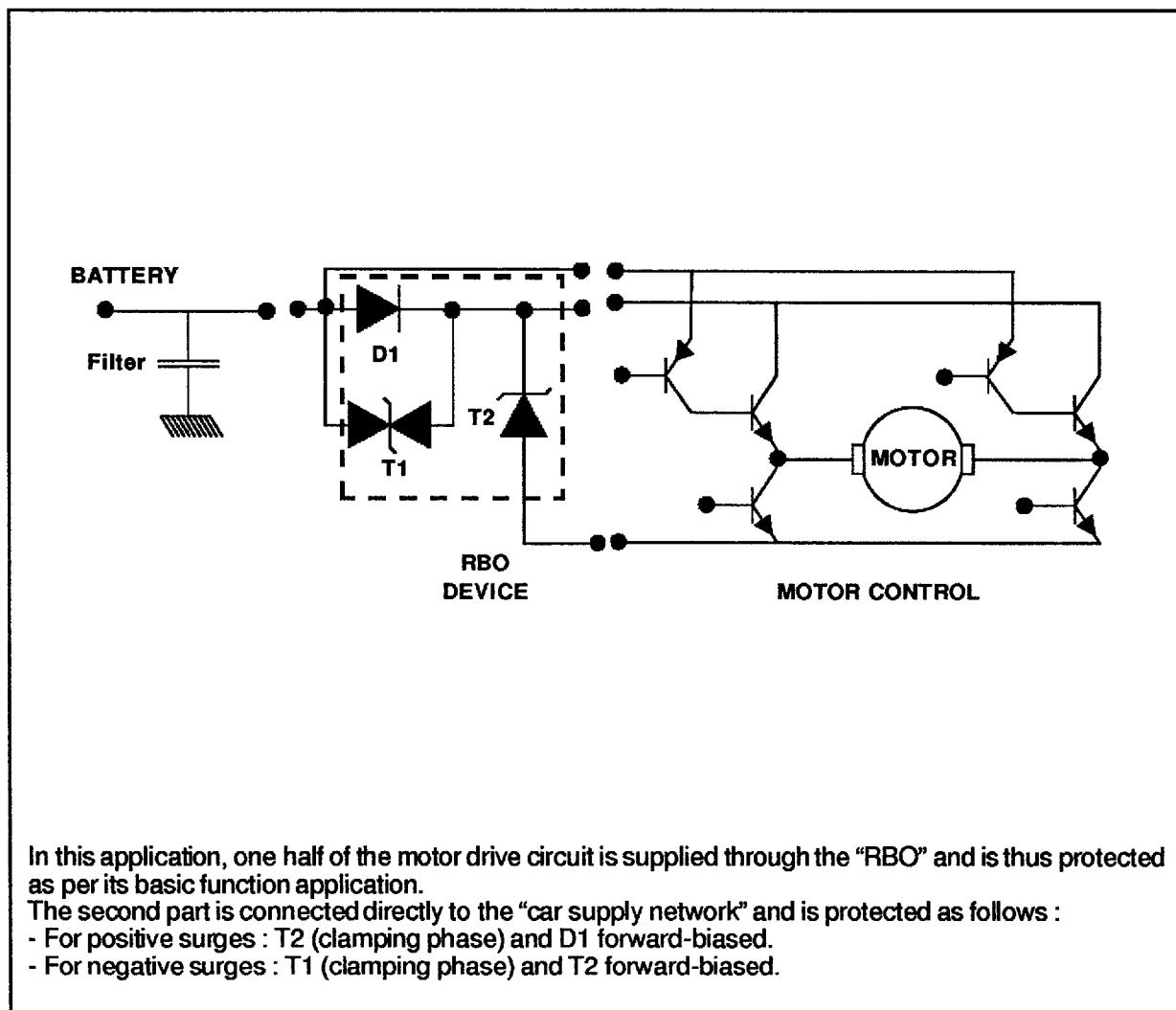
BASIC APPLICATION



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

*In addition, this RBO circuit prevents overvoltages generated by the module 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 forward-biased.
- For negative surges : T1 (clamping phase) and T2 forward-biased.

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

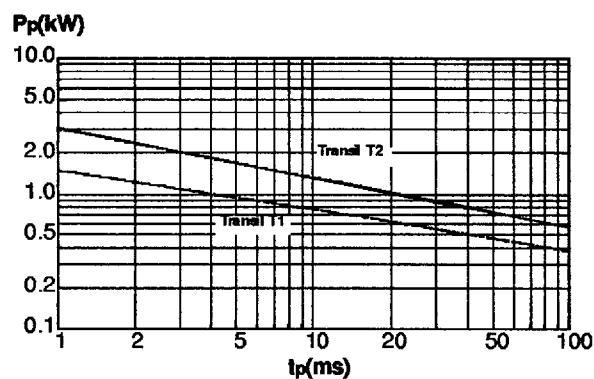


Fig. 2-1 : Clamping voltage versus peak pulse current (T_j initial = 85°C).

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

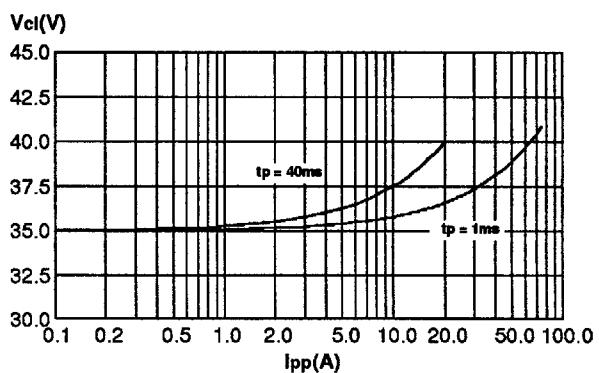


Fig. 2-2 : Clamping voltage versus peak pulse current (T_j initial = 85°C).

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

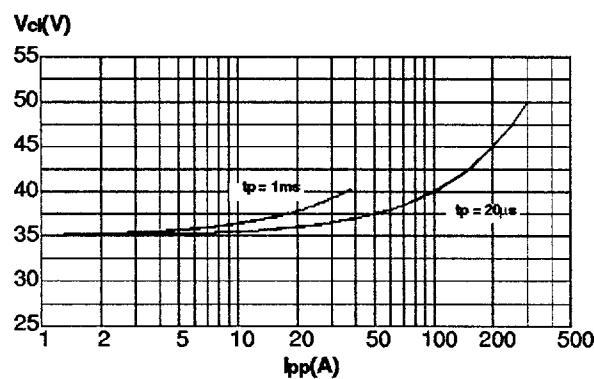
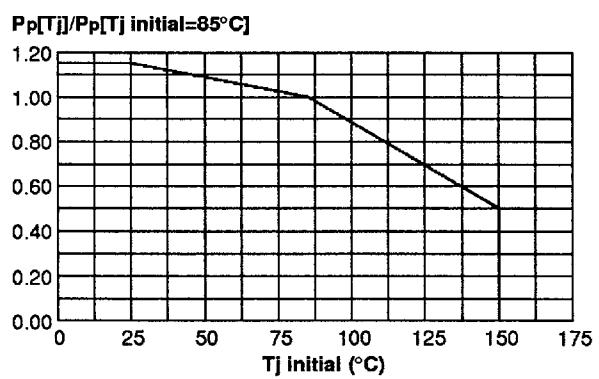


Fig. 3 : Relative variation of peak pulse power versus junction temperature.



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

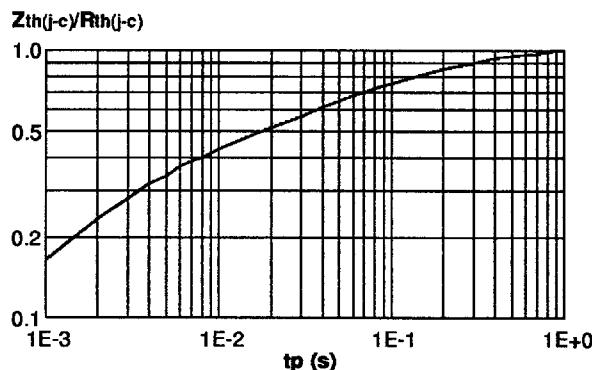


Fig. 5-1 : Peak forward voltage drop versus peak forward current (typical values) - (TRANSIL T2).

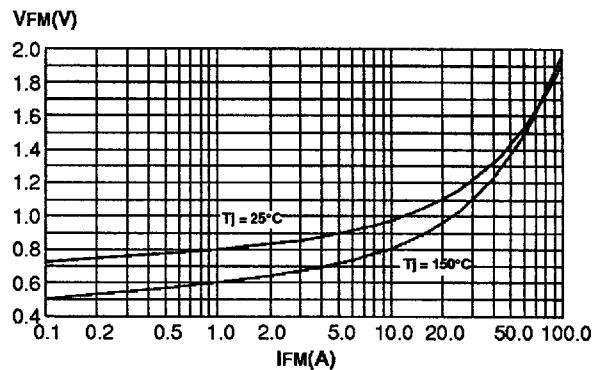
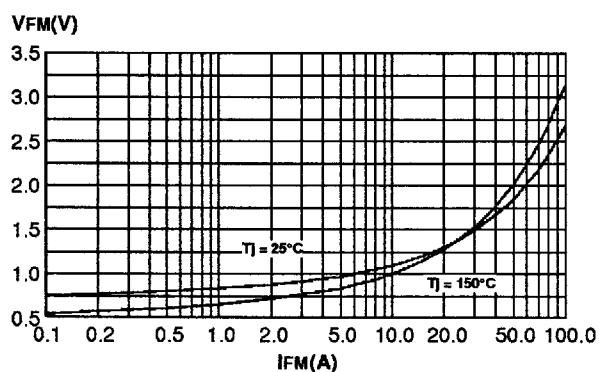
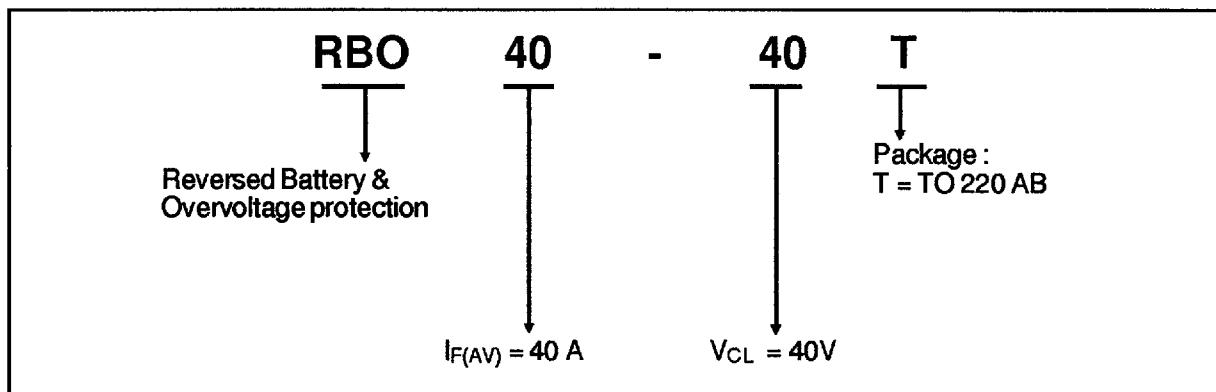


Fig. 5-2 : Peak forward voltage drop versus peak forward current (typical values) - (DIODE D1).



ORDERING INFORMATION

PACKAGE MECHANICAL DATA
TO220AB Plastic

The diagram shows a top-down view of a TO220AB plastic package. It features two metal leads (A) at the top, a central body (B), and two vertical heat sinks (C). The leads are labeled with dimensions: A (width), B (height), C (depth), D (lead thickness), E (lead gap), F (lead pitch), G (lead height), H (heat sink width), I (heat sink height), J (heat sink thickness), L (heat sink lead gap), M (heat sink lead thickness), and N (heat sink lead length). The leads are angled downwards at 15° from the vertical.

REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	10.20	10.50	0.401	0.413
B	14.23	15.87	0.560	0.625
C	12.70	14.70	0.500	0.579
D	5.85	6.85	0.230	0.270
E			4.50	0.178
F			2.54	0.100
G			3.00	0.119
H	4.48	4.82	0.176	0.190
I	3.55	4.00	0.140	0.158
J	1.15	1.39	0.045	0.055
L	0.35	0.65	0.013	0.026
M	2.10	2.70	0.082	0.107
N	4.58	5.58	0.18	0.22
O	0.80	1.20	0.031	0.048
P	0.64	0.96	0.025	0.038

Cooling method : C

Marking : type number

Weight : 2 g

Polarity : N A

Stud torque : N A

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