

4855452 INTERNATIONAL RECTIFIER

55C 04829 D

Data Sheet No. PD-3.083

INTERNATIONAL RECTIFIER **IR**

T-25-17

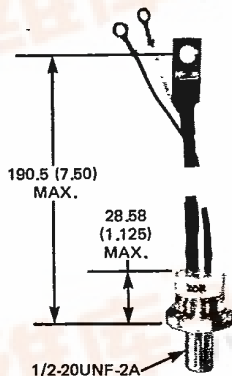
**2N3091
SERIES****110 Amp RMS SCRs****Major Ratings and Characteristics**

	2N3091-98	Units
$I_T(\text{RMS})$	110	A
$I_T(\text{AV})$	70*	A
@ Max. T_C	62*	°C
I_{TSM} @ 50 Hz	955	A
@ 60 Hz	1000*	
I^2_t @ 50 Hz	4550	
@ 60 Hz	4150	A ² s
I_{GT}	110	mA
dv/dt	20*	V/ μ s
di/dt	300	A/ μ s
T_J	-40 to 125	°C
V_{RRM}, V_{DRM} range	600 to 1300	V

*JEDEC registered values.

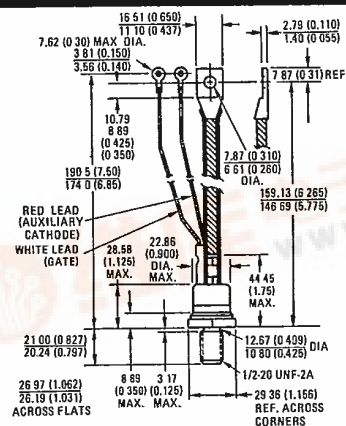
Description/Features

- Bulk Avalanche
- Can be supplied as JAN devices in accordance with MIL-S-19500/280A
- Forward and reverse ratings from 600 – 1300 volts.

A**CASE STYLE AND DIMENSIONS**

Case style (ceramic) A-11 furnished when part is rated 1000V or higher. A-13 (glass) for parts below 1000V.

JAN and/or JAN/TX types available.



IR Case Style A-11
Conforms to JEDEC Outline TO-209AC (TO-94)
All Dimensions in Millimeters and (Inches)

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VOLTAGE RATINGS (Applied gate voltage zero or negative)

Part Number ①	$V_{RRM} - V_{DRM}$ Max. Repetitive Peak Reverse and Off-State Voltage (V) ②	$V_{(BR)R}$ Min. Reverse Avalanche Voltage
	$T_J = -40^\circ\text{C to } 125^\circ\text{C}$	$T_J = 25^\circ\text{C}$
2N3091	600*	700*
2N3092	700*	800*
2N3093	800*	900*
2N3094	900*	1000*
2N3095	1000*	1100*
2N3096	1100*	1200*
2N3097	1200*	1300*
2N3098	1300*	1400*

ELECTRICAL SPECIFICATIONS

	2N3091-98	Units	Conditions
ON-STATE			
$I_T(\text{RMS})$ Max. RMS on-state current	110	A	
$I_T(\text{AV})$ Max. average on-state current @ Max. $T_C =$	70*	A	180° half sine wave conduction
	62*	°C	
I_{TSM} Max. peak one cycle, non-repetitive surge current	955	A	50 Hz half cycle sine wave or 6 ms rectangular pulse Following any rated load condition, and with rated V_{RRM} applied following surge. SCR turned fully on.
	1000*		60 Hz half cycle sine wave or 5 ms rectangular pulse
	1150	A	50 Hz half cycle sine wave or 6 ms rectangular pulse Same conditions as above except with V_{RRM} applied following surge = 0.
	1200		60 Hz half cycle sine wave or 5 ms rectangular pulse
I^2t Max. I^2t capability, for fusing	4550	A ² s	$t = 10$ ms Rated V_{RRM} applied following surge, Initial $T_J = 125^\circ\text{C}$
	4150		$t = 8.3$ ms
I^2t Max. I^2t capability, for individual device fusing	6450	A ² s	$t = 10$ ms $V_{RRM} = 0$ following surge, Initial $T_J = 125^\circ\text{C}$
	5900		$t = 8.3$ ms
$I^2\sqrt{t}$ Max. $I^2\sqrt{t}$ capability, for individual device fusing ③	64 500	A ² √s	V_{RRM} following surge = 0. Initial $T_J \leq 125^\circ\text{C}$ $t = 0.1$ to 10ms.
V_{TM} Max. peak on-state voltage	1.85*	V	$T_J = 25^\circ\text{C}$, $I_T(\text{AV}) = 70\text{A}$ (220A peak)
I_H Max. holding current	500	mA	$T_C = 25^\circ\text{C}$, anode supply = 22V, initial $I_T = 3\text{A}$.
BLOCKING			
dv/dt Min. critical rate of rise of off-state voltage	20*	V/μs	$T_J = 125^\circ\text{C}$. Exponential to 100% rated V_{DRM} ; gate open circuited
I_{RM} & I_{DM} Max. peak reverse and off-state current 300V – 600V	5*	mA	Max. rated T_J , rated V_{RRM} , gate open circuited.

① Meets MIL-S-19500/280A when ordered as JAN2N - - - -

② Units may be broken over without damage if di/dt does not exceed 20 A/μs.③ I^2t for time $t_x = I^2\sqrt{t} \sqrt{t_x}$

* JEDEC registered values.

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ELECTRICAL SPECIFICATIONS (Continued)

	2N3901-98	Units	Conditions
SWITCHING			
t_d Typical delay time	1		$T_C = 25^\circ\text{C}$, rated V_{DRM}
t_r Typical rise time	1	μs	$I_{\text{TM}} = 50\text{A}$ resistive circuit, Gate pulse: 10V, 25 Ω , $t_p = 6\mu\text{s}$
t_q Typical turn-off time	50	μs	$T_C = 125^\circ\text{C}$, $I_{\text{TM}} = 50\text{A}$, $di/dt = 5\text{A}/\mu\text{s}$, $V_R = 50\text{V}$, reapplied $dv/dt = 20\text{V}/\mu\text{s}$ linear to rated V_{DRM} , Gate bias: 0V, 100 Ω .
di/dt Max. non-repetitive rate of rise of turned-on current = V_{RRM} = 500V to 600V = 700V to 1000V = 1100V to 1400V	300 225 150	$\text{A}/\mu\text{s}$	$T_C = 125^\circ\text{C}$, $V_{\text{VDM}} = \text{rated } V_{\text{DRM}}$, $I_{\text{TM}} = (2 \times di/dt)$ or $(2 \times \text{rated } I_{\text{T(AV)}})$ (whichever is the greater), Gate pulse: 20V, 15 Ω , $t_p = 6\text{ms}$, $t_r = 0.1\mu\text{s}$. Per JEDEC standard RS397, 5.2.2.6.
TRIGGERING			
P_{GM} Max. peak gate power	5*	W	$t_p \leq 5\text{ms max.}$
$P_{\text{G(AV)}}$ Max. average gate power	0.5*	W	
$+I_{\text{GM}}$ Max. peak positive gate current	2	A	
$+V_{\text{GM}}$ Max. peak positive gate voltage	20*	V	
$-V_{\text{GM}}$ Max. peak negative gate voltage	5*	V	
I_{GT} Max. required DC gate current to trigger	200*	mA	$T_C = -40^\circ\text{C}$. Max. required gate trigger voltage is the lowest value which will trigger all units with +6V anode-to-cathode.
	110	mA	$T_C = 25^\circ\text{C}$
	50	mA	$T_C = 125^\circ\text{C}$
Typical DC gate current to trigger	25	mA	$T_C = 25^\circ\text{C}$ +6V anode-to-cathode
V_{GT} Max. required DC gate voltage to trigger	3*	V	$T_C = -40^\circ\text{C}$. Max. required gate trigger voltage is the lowest value which will trigger all units with +6V anode-to-cathode.
	2.5	V	$T_C = 25^\circ\text{C}$
Typical DC gate voltage to trigger	1	V	$T_C = 25^\circ\text{C}$ +6V anode-to-cathode
V_{GD} Max. DC gate voltage not to trigger	0.20*	V	$T_C = 125^\circ\text{C}$. Max. gate voltage not to trigger is the maximum value which will not trigger any unit with rated V_{DRM} anode-to-cathode.

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THERMAL-MECHANICAL SPECIFICATIONS

	2N3901-98	Units	Conditions
T_J Operating junction temperature range	-40° to 125°	$^\circ\text{C}$	
T_{stg} Storage temperature range	-40° to 125°	$^\circ\text{C}$	
R_{thJC} Max. internal thermal resistance, junction to case	0.4*	K/W	DC operation
R_{thCS} Thermal resistance, case to sink	0.1	K/W	Mounting surface smooth, flat and greased.
T Mounting torque	Min. 14.5 (125) Max. 17.0 (150)	N m (lbf-in)	Non-lubricated threads
Max. torque on screw in flag terminal	1.4 (12)	N m (lbf-in)	Non-lubricated threads. TO-208AD case only.
wt Approximate weight	100 (3.5)	g (oz)	
Case Style	TO-209AC (TO-94) (IR case Style A-11)		JEDEC

*JEDEC registered values.

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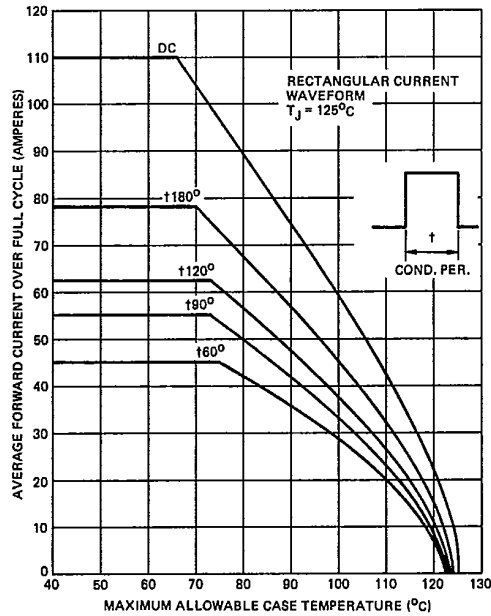


Fig. 1 - Average On-State Current Vs. Maximum Allowable Case Temperature (Sinusoidal Current Waveform, 50 to 400 Hz)

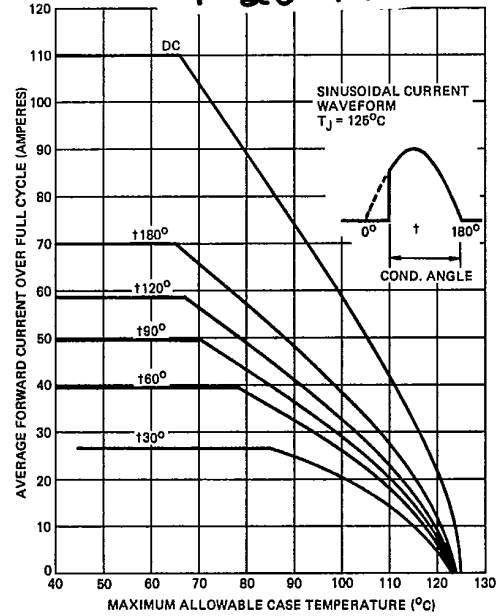


Fig. 2 - Average On-State Current Vs. Maximum Allowable Case Temperature (Rectangular Current Waveform, 50 to 400 Hz)

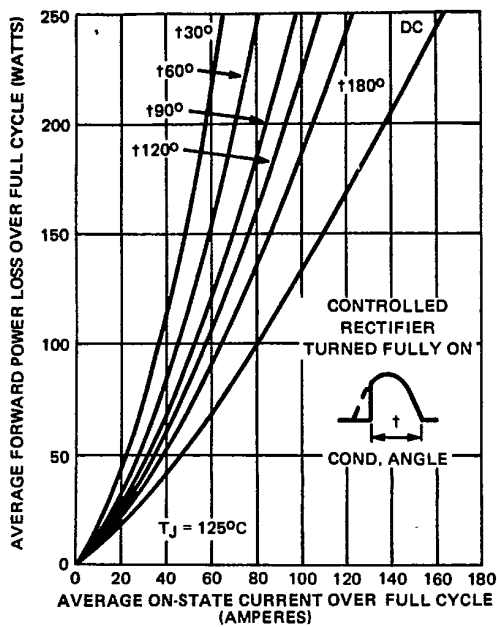


Fig. 3 - Maximum Low Level On-State Power Loss Vs. On-State Current (Sinusoidal Current Waveform)

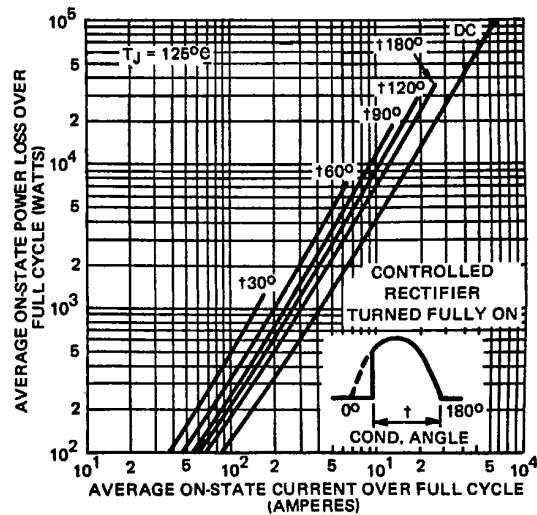


Fig. 4 - Maximum High Level On-State Power Loss Vs. On-State Current (Sinusoidal Current Waveform)

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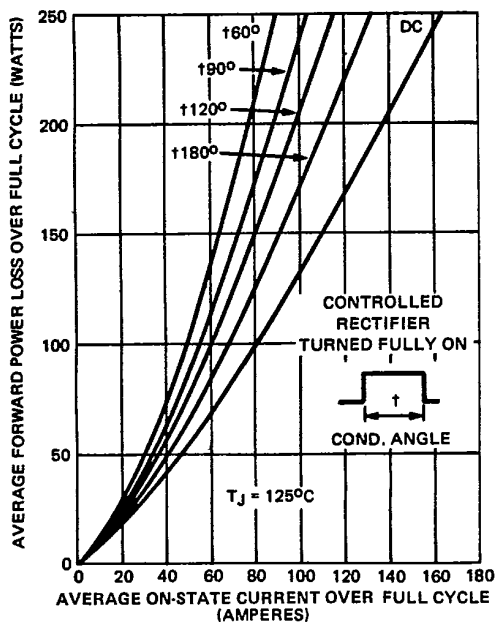
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Fig. 5 - Maximum Low Level On-State Power Loss Vs. On-State Current (Rectangular Current Waveform)

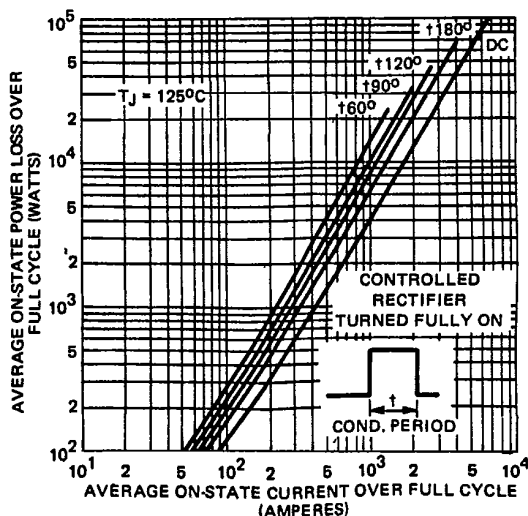


Fig. 6 - Maximum High Level On-State Power Loss Vs. On-State Current (Rectangular Current Waveform)

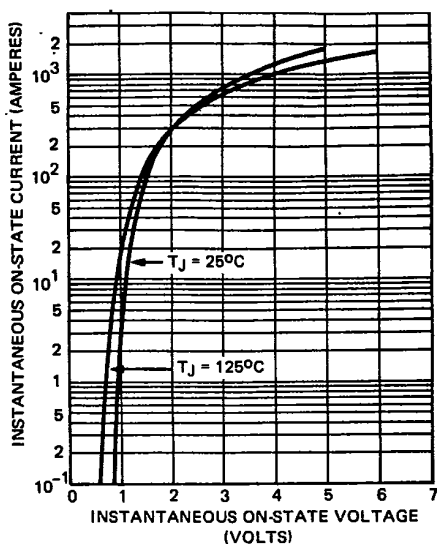


Fig. 7 - Maximum Instantaneous On-State Voltage Vs. Instantaneous On-State Current

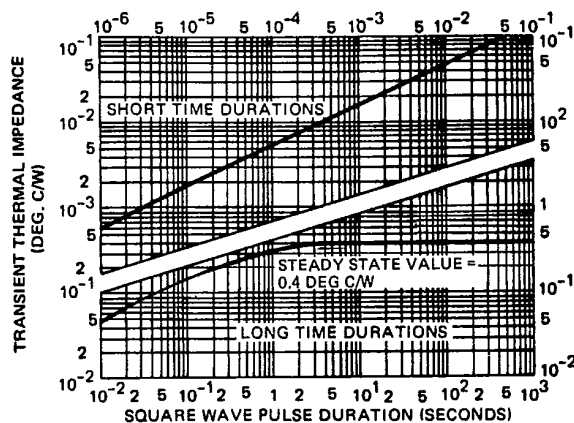


Fig. 8 - Maximum Transient Thermal Impedance, Junction to Case Vs. Pulse Duration

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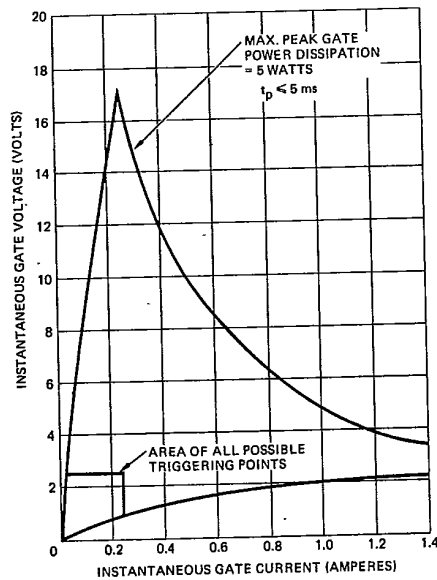


Fig. 9 - Gate Characteristics

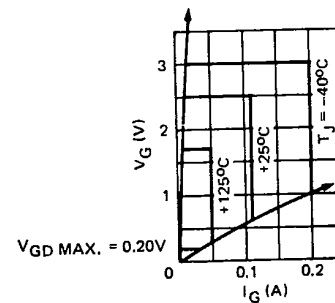


Fig. 9a - Area of All Possible Triggering Points

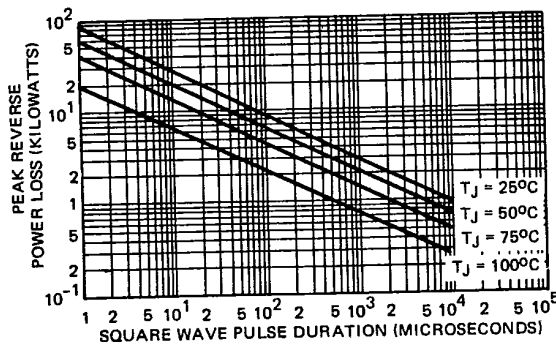


Fig. 10 - Maximum Allowable Reverse Power Dissipation Vs. Pulse Duration

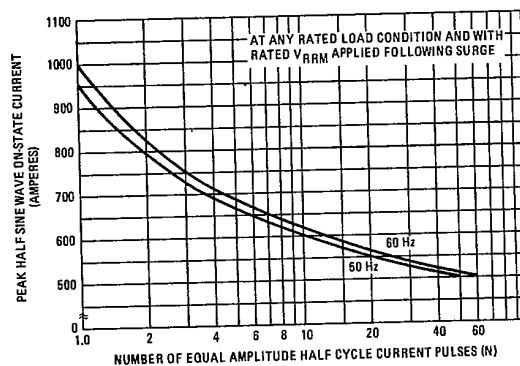


Fig. 11 - Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses