Data Sheet No. PD-3.083

INTERNATIONAL RECTIFIER IOR

T-25-17

2N3091 SERIES

110 Amp RMS SCRs

A

Major Ratings and Characteristics

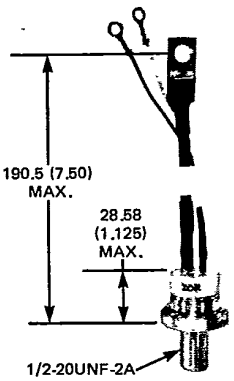
		2N3091-98	Units
$I_{T(RMS)}$		110	A
$I_{T(AV)}$		70*	A
@ Max. T_C		62*	°C
I_{TSM}	@ 50 Hz	955	A
	@ 60 Hz	1000*	
I^2t	@ 50 Hz	4550	A^2s
	@ 60 Hz	4150	
I_{GT}		110	mA
dv/dt		20*	V/μs
di/dt		300	A/μs
T_J		−40 to 125	°C
V_{RRM}, V_{DRM} range		600 to 1300	V

*JEDEC registered values.

Description/Features

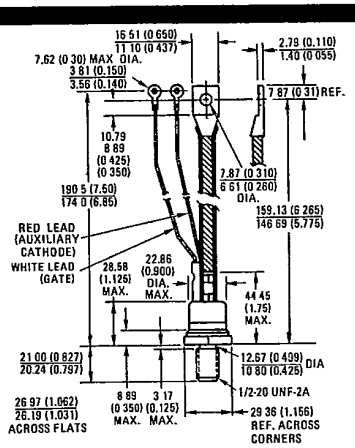
- Bulk Avalanche
- Can be supplied as JAN devices in accordance with MIL-S-19500/280A
- Forward and reverse ratings from 600 – 1300 volts.

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 Millimteres and (Inches)

2N3091 Series

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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°C to 125°C	T_J = 25°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			
$I_{T(RMS)}$	Max. RMS on-state current	110	A	
$I_{T(AV)}$	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^2s	t = 10 ms — Rated V_{RRM} applied following surge, initial T_J = 125°C
		4150		t = 8.3 ms
I^2t	Max. I^2t capability, for individual device fusing	6450	A^2s	t = 10 ms — V_{RRM} = 0 following surge, initial T_J = 125°C
		5900		t = 8.3 ms
$I^2\sqrt{t}$	Max. $I^2\sqrt{t}$ capability, for individual device fusing ③	64 500	$A^2\sqrt{s}$	V_{RRM} following surge = 0. Initial $T_J \leq 125°C$ t = 0.1 to 10ms.
V_{TM}	Max. peak on-state voltage	1.85*	V	T_J = 25°C, $I_{T(AV)}$ = 70A (220A peak)
I_H	Max. holding current	500	mA	T_C = 25°C, anode supply = 22V, initial I_T = 3A.
	BLOCKING			
dv/dt	Min. critical rate of rise of off-state voltage	20*	V/μs	T_J = 125°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 $t_x = I^2\sqrt{t} \cdot \sqrt{t_x}$.

* JEDEC registered values.

ELECTRICAL SPECIFICATIONS (Continued)

		2N3901-98	Units	Conditions
	SWITCHING			
t_d	Typical delay time	1		T_C = 25°C, rated V_{DRM}
t_r	Typical rise time	1	μs	I_{TM} = 50A resistive circuit, Gate pulse: 10V, 25Ω, t_p = 6μs
t_q	Typical turn-off time	50	μs	T_C = 125°C, I_{TM} = 50A, di/dt = 5A/μs, V_R = 50V, reapplied dv/dt = 20V/μs linear to rated V_{DRM}, Gate bias: 0V, 100Ω.
di/dt	Max. non-repetitive rate of rise of turned-on current = V_{RRM} = 500V to 600V	300	A/μs	T_C = 125°C, V_{VDM} = rated V_{DRM}. I_{TM} = (2 x di/dt) or (2 x rated $I_{T(AV)}$A (whichever is the greater), Gate pulse: 20V, 15Ω, t_p = 6 ms t_r = 0.1μs. Per JEDEC standard RS397, 5.2.2.6.
	= 700V to 1000V	225		
	= 1100V to 1400V	150		
	TRIGGERING			
P_{GM}	Max. peak gate power	5*	W	$t_p \leq$ 5 ms max.
$P_{G(AV)}$	Max. average gate power	0.5*	W	
$+I_{GM}$	Max. peak positive gate current	2	A	
$+V_{GM}$	Max. peak positive gate voltage	20*	V	
$-V_{GM}$	Max. peak negative gate voltage	5*	V	
I_{GT}	Max. required DC gate current to trigger	200*	mA	T_C = −40°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°C
		50	mA	T_C = 125°C
	Typical DC gate current to trigger	25	mA	T_C = 25°C +6V anode-to-cathode
V_{GT}	Max. required DC gate voltage to trigger	3*	V	T_C = −40°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°C
	Typical DC gate voltage to trigger	1	V	T_C = 25°C +6V anode-to-cathode
V_{GD}	Max. DC gate voltage not to trigger	0.20*	V	T_C = 125°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*	°C	
T_{stg}	Storage temperature range	−40* to 125*	°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)	N m (lbf-in)	Non-lubricated threads
	Max.	17.0 (150)		
	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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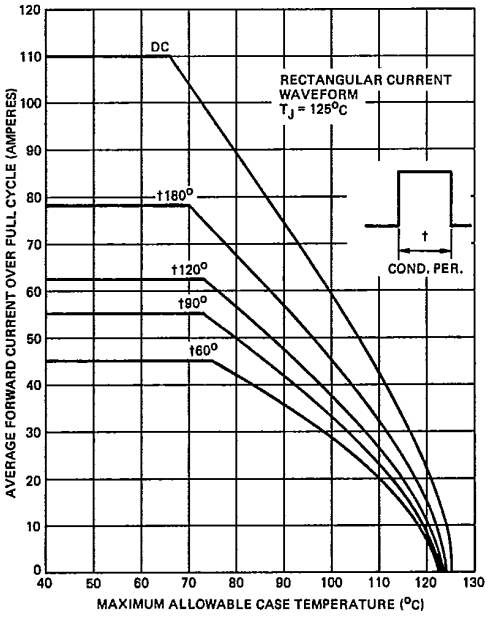

Fig. 1 – Average On-State Current Vs. Maximum Allowable Case Temperature (Sinusoidal Current Waveform, 50 to 400 Hz)

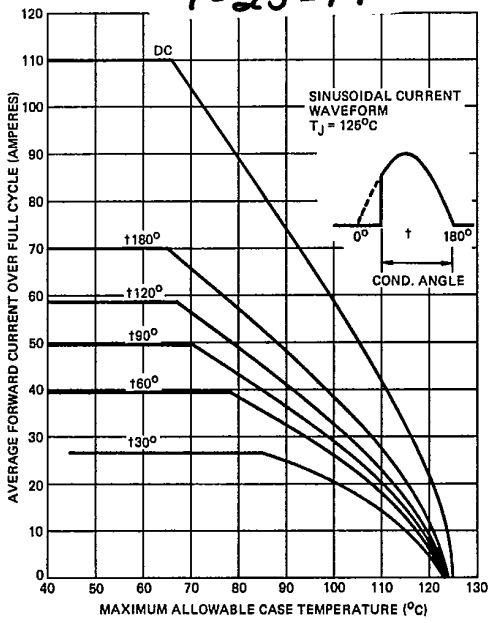

Fig. 2 – Average On-State Current Vs. Maximum Allowable Case Temperature (Rectangular Current Waveform, 50 to 400 Hz)

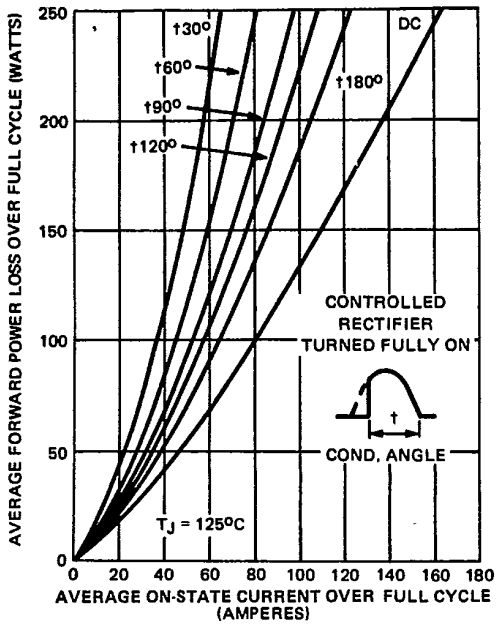

Fig. 3 – Maximum Low Level On-State Power Loss Vs. On-State Current (Sinusoidal Current Waveform)

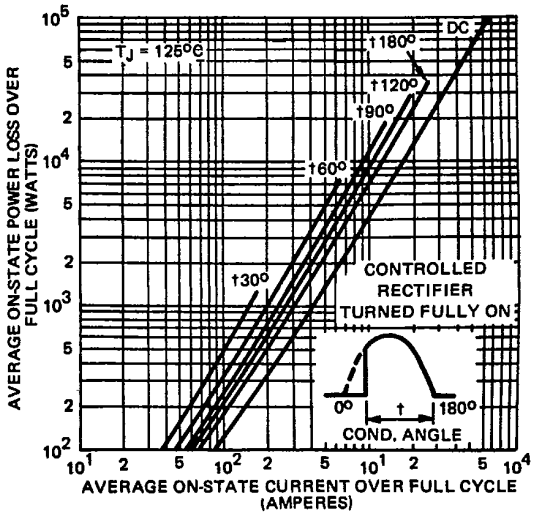

Fig. 4 – Maximum High Level On-State Power Loss Vs. On-State Current (Sinusoidal Current Waveform)

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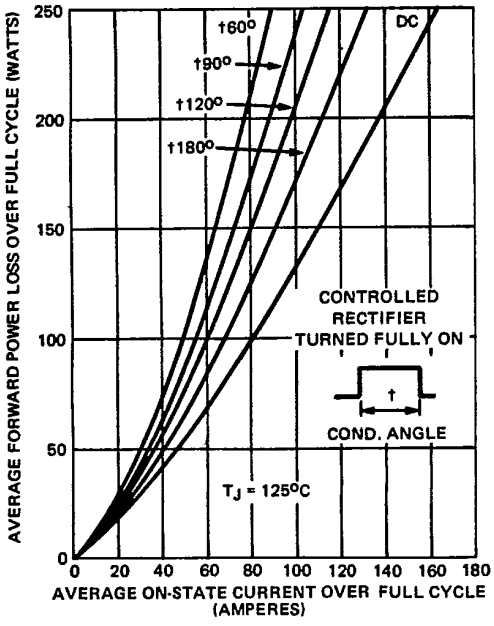

Fig. 5 – Maximum Low Level On-State Power Loss Vs. On-State Current (Rectangular Current Waveform)

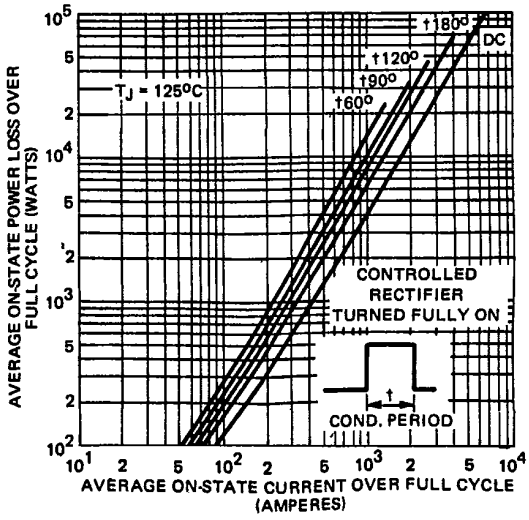

Fig. 6 – Maximum High Level On-State Power Loss Vs. On-State Current (Rectangular Current Waveform)

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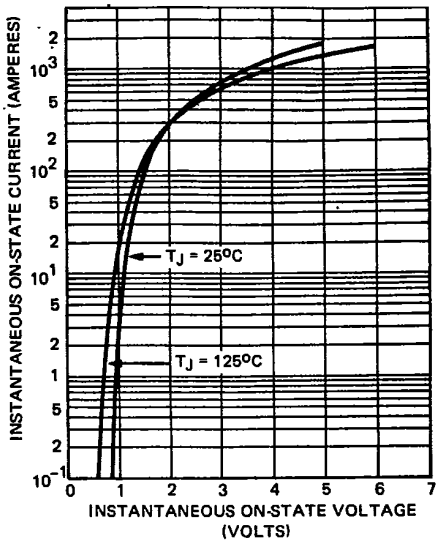

Fig. 7 – Maximum Instantaneous On-State Voltage Vs. Instantaneous On-State Current

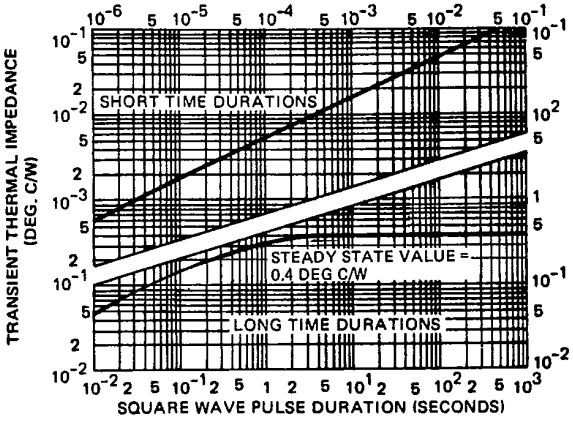

Fig. 8 – Maximum Transient Thermal Impedance, Junction to Case Vs. Pulse Duration

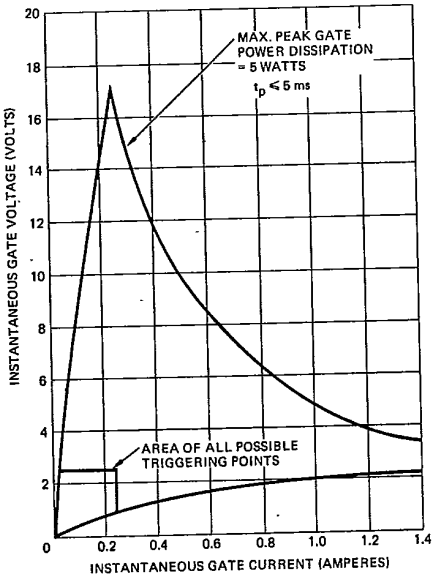

Fig. 9 — Gate Characteristics

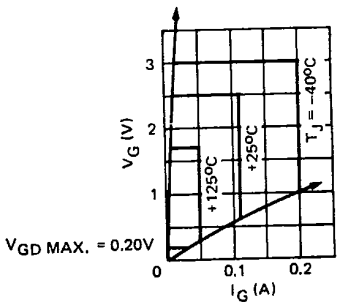

Fig. 9a — Area of All Possible Triggering Points

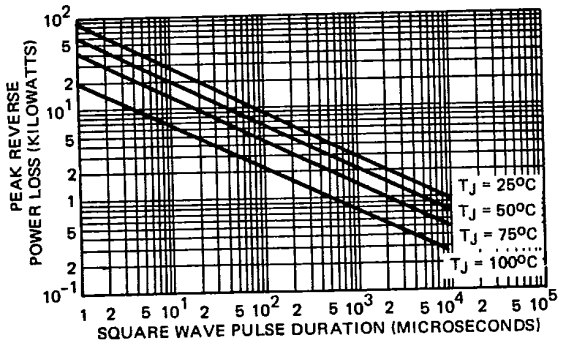

Fig. 10 — Maximum Allowable Reverse Power Dissipation Vs. Pulse Duration

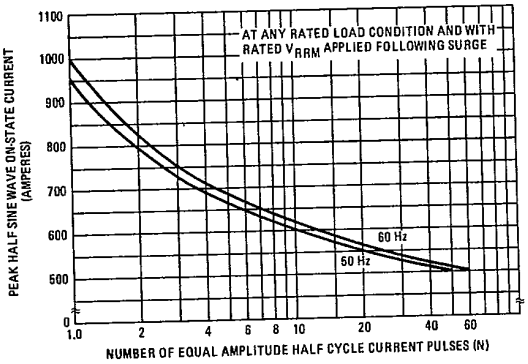

Fig. 11 — Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses