

4855452 INTERNATIONAL RECTIFIER

55C 05077 D

Data Sheet No. PD-2.033C

INTERNATIONAL RECTIFIER **IR**

T-03-19

20FQ, 1N6095 & 96 SERIES

27.5 and 30 Amp Schottky Power Rectifiers

Major Ratings and Characteristics

Characteristic	20FQ	1N6095 & 96	Units
$I_F(AV)$			
@ 180° Rectangular	30	27.5	A
@ 180° Half Sine Wave	27	25*	
I_{FSM}			
@ 50 Hz	645	380	A
@ 60 Hz	675	400*	
I^2t			
@ 50 Hz	2,100	730	A^2s
@ 60 Hz	1,900	665	
$I^2\sqrt{t}$	29,500	10,500	$A^2\sqrt{s}$
V_{RWM} ①	20 to 45	30* & 40*	V
$C_t @ -5V$	2,000	6,000*†	pF
T_J	-65 to 150	-65* to 125*	°C

*JEDEC registered value. ① $V_{RWM} = V_{RRM}$ for 1N6095 & 96
† $V_R = 1V$.

Description/Features

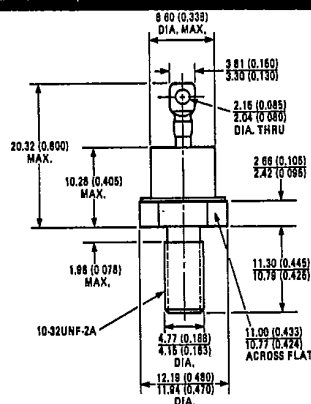
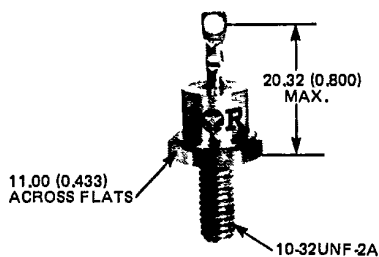
The 20FQ and the 1N6095-96 Schottky rectifier series are both designed to operate at maximum rated junction temperature without any voltage derating. In addition to improved performance characteristics, the 20FQ series offers a 20% safety margin for repetitive short pulses over the working peak reverse voltage rating to protect against voltage transients. Both series are provided with guard ring construction to protect against reverse energy transients.

Applications for the 20FQ and 1N6095-96 Schottky rectifiers include both existing and new switching power supply designs.

- Extremely low V_F
- Excellent parameter stability over the operating range
- No derating on reverse voltage to maximum operating temperature
- A guaranteed non-repetitive peak reverse voltage capability which is 20% above V_{RWM} to protect against voltage transients
- Industry-preferred DO-203AA (DO-4) package
- Can be supplied to meet stringent military, aerospace and other high-reliability requirements.

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CASE STYLE AND DIMENSIONS



Conforms to JEDEC Outline DO-203AA (DO-4)
All Dimensions in Millimeters and (Inches)

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VOLTAGE RATINGS

Part Numbers		V _{RWM} - Max. Working Peak Reverse Voltage (V) ① ④	V _{RRM} - Max. Repetitive Peak Reverse Voltage (V) ① ③ (t _p = 200 ns max.) ④	V _R - Max. Direct Reverse Voltage (V) ①
20FQ020	—	20	24	20
20FQ030	1N6095	30*	36*	30*
20FQ035	—	35	42	35
20FQ040	1N6096	40*	48*	40*
20FQ045	—	45	54	45

ELECTRICAL SPECIFICATIONS

	20FQ	1N6095 & 96	Units	Conditions
I _{F(AV)} Max. average forward current	30	27.5	A	180° conduction @ T _C = -65°C to 92°C (20FQ); -65°C to 71.5°C (1N6095 & 96). Rectangular waveform
	27	25*		180° conduction @ T _C = -65°C to 91°C (20FQ); -65°C to 70°C (1N6095 & 96). Sinusoidal waveform
I _{FSM} Max. peak one cycle non-repetitive surge current	645	—	A	50 Hz supply Half cycle, sine wave or 6 ms rectangular pulse, following any rated load condition, and with rated V _{RWM} applied following surge. ④
	—	380		60 Hz supply Half cycle, sine wave or 5 ms rectangular pulse, following any rated load condition, and with rated V _{RWM} applied following surge. ④
	675	—		50 Hz supply Initial T _J = 150°C (20FQ), 125°C (1N6095 & 96). 60 Hz supply V _{RWM} = 0 following surge. ④
	—	400*		
	765	455		
I ² t Max. I ² t for fusing	2100	730	A ² s	t = 10 ms Initial T _J = 150°C (20FQ), 125°C (1N6095 & 96). t = 8.3 ms Rated V _{RWM} applied following surge. ④
	1900	665		
Max. I ² t for individual device fusing	2950	1050	A ² s	t = 10 ms Initial T _J = 150°C (for 20FQ), 125°C (for 1N6095 & 96). V _{RWM} applied following surge = 0.
	2700	940		t = 8.3 ms
I _{√t} Max. I _{√t} for individual device fusing ⑦	29,500	10,500	A√s	t = 0.1 to 10 ms. Initial T _J = 150°C for 20FQ and 125°C for 1N6095 & 96. V _{RWM} applied following surge = 0.
V _{FM} Max. peak forward voltage	—	0.60*	V	T _C = 25°C, I _{FM} = 5A
	0.53	0.64		T _J = 25°C, I _{FM} = 30A
	0.68	—		T _J = 25°C
	—	0.86*		Rated I _{F(AV)} 180° conduction (20FQ): Rectangular waveform, 60A peak; 1N6095 & 96: Half sine wave, 80A peak)
	0.65	—		T _C = 70°C
I _{RM} Max. peak reverse current	55	60	mA	T _J = 25°C
	180	250*		T _J = 125°C Max. rated V _{RWM} ④
I _{RRM} Max. repetitive peak reverse current	2.0	2.0	A	T _C = 25°C, f = 1 kHz, see fig. 16 for test circuit
C _t Max. capacitance	2000	6000*	pF	T _C = 25°C, V _R = 5 Vdc (20FQ); 1V (1N6095 & 96) Test signal in the range of 100 kHz to 1 MHz
dv/dt Max. rate of reverse voltage application	1000	1000	V/μs	T _C = 25°C, V _{RM} = Rated V _{RWM} ④

THERMAL-MECHANICAL SPECIFICATIONS

T _J Operating junction temperature range	-65 to 150	-65* to 125*	°C	
T _{stg} Storage temperature range	-65 to 150	-65* to 125*	°C	
R _{thJC} Max. thermal resistance, junction-to-case		2.0*	deg C/W	
R _{thCS} Max. thermal resistance, case-to-sink		0.50	deg C/W	Mounting surface flat, smooth and greased
T Mounting torque	Min.	1.35 (12)	Nm	Non-lubricated threads
	Max.	1.70 (15)	(lbf in)	
wt Approximate weight		5.7 (0.2)	g (oz)	
Case style		DO-203AA (DO-4)		JEDEC

① T_C = -65°C to 136°C (20FQ), to 120°C* (1N6095 & 96), 180° conduction.② T_C = 0°C to 136°C (20FQ), to 120°C* (1N6095 & 96), 180° conduction.③ T_C = -65°C to 99°C (20FQ), to 105°C* (1N6095 & 96)④ V_{RWM} = V_{RRM} for 1N6095 & 96⑤ V_{RRM} = V_{RSM} for 1N6095 & 96

⑥ Applicable to 20FQ only.

⑦ I²t for time t_x = I²√t_x • √t_x.

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20FQ Series

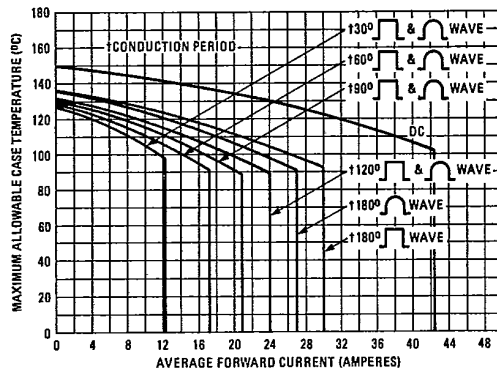


Fig. 1 - Average Forward Current Vs. Case Temperature

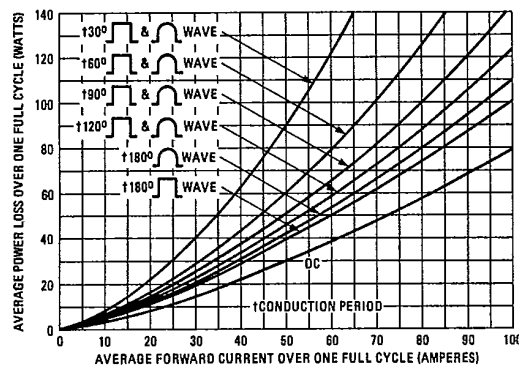


Fig. 2 - Maximum Average Forward Power Loss Vs. Average Forward Current

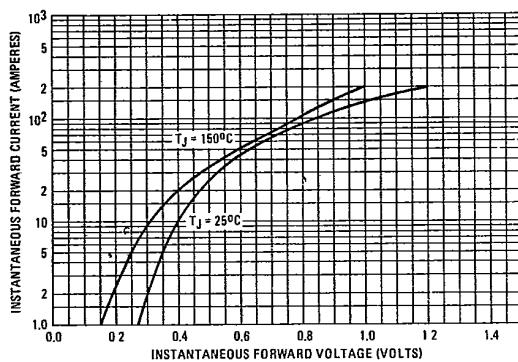


Fig. 3 - Maximum Forward Voltage Vs. Forward Current

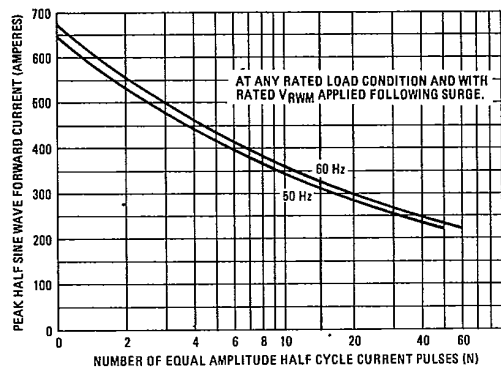


Fig. 4 - Maximum Non-Repetitive Surge Current Vs. Number of Cycles

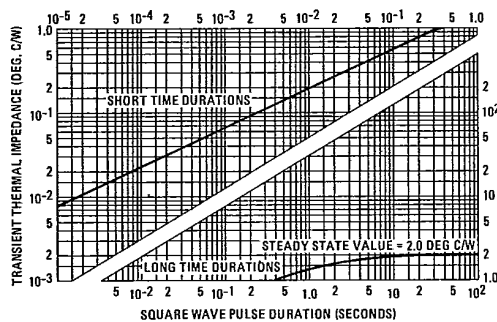


Fig. 5 - Maximum Transient Thermal Impedance, Junction-to-Case, Vs. Pulse Duration

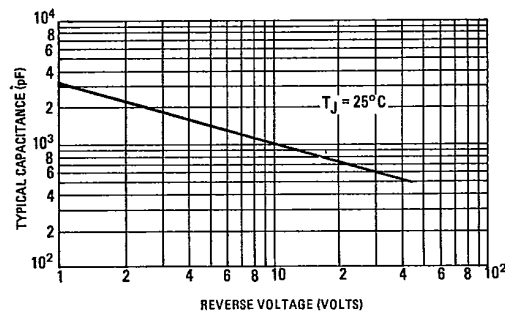


Fig. 6 - Typical Capacitance Vs. Reverse Voltage

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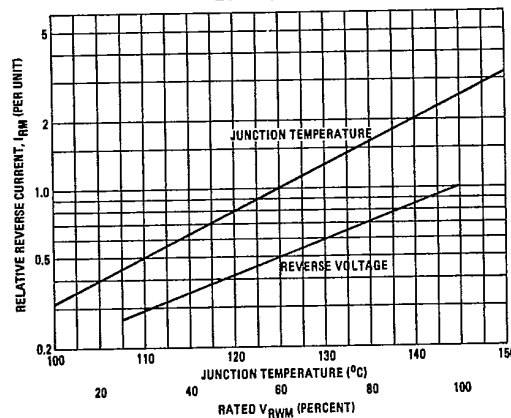


Fig. 7 - Typical Variation of Reverse Current Vs. Junction Temperature and Reverse Voltage

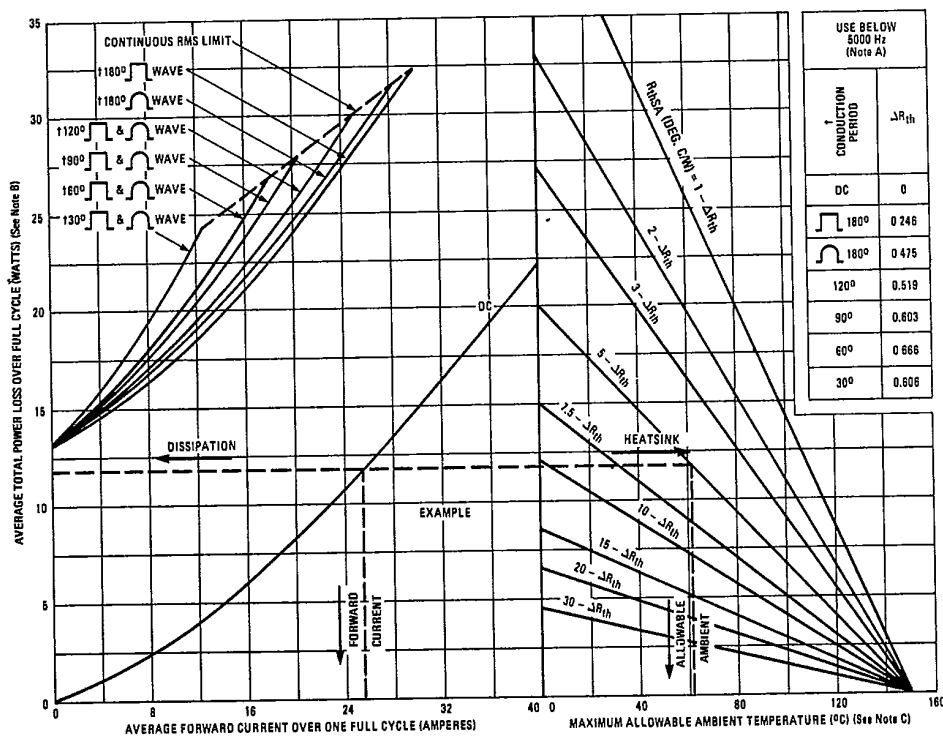


Fig. 8 - Thermal Nomogram

- NOTES: A. Maximum allowable heatsink thermal resistance, R_{thSA} , equals the graph value minus the ΔR_{th} factor which allows for instantaneous T_J excursion. At frequencies above 5000 Hz, ΔR_{th} becomes essentially zero and can be ignored.
- B. The total power dissipation curves assume the worst case reverse conditions of halfwave (180°) rectangular reverse voltage, full rated V_R , and $T_J = 160^\circ\text{C}$. Lower reverse power losses allow higher operating ambient, smaller heatsinks or larger operating safety margin.
- C. Caution: Data assumes that the rectifier is mounted with thermally conductive grease to achieve $R_{thCS} = 0.50^\circ\text{C/W}$.

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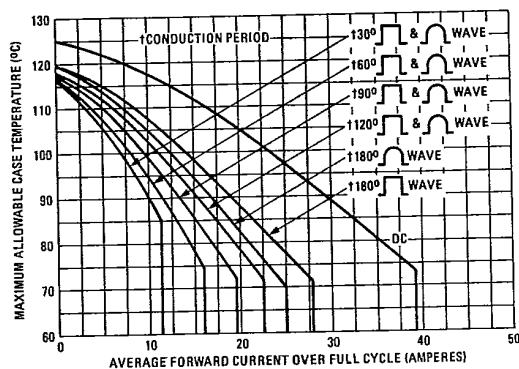


Fig. 9 - Average Forward Current Vs. Case Temperature

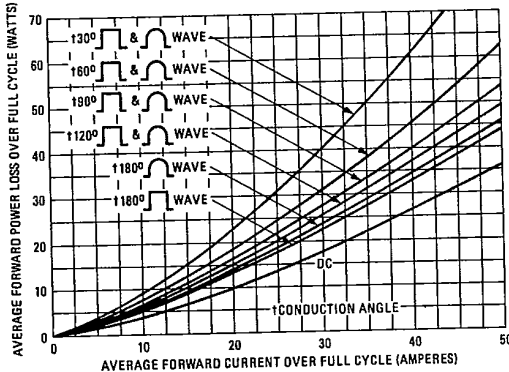


Fig. 10 - Maximum Average Forward Power Loss Vs. Average Forward Current

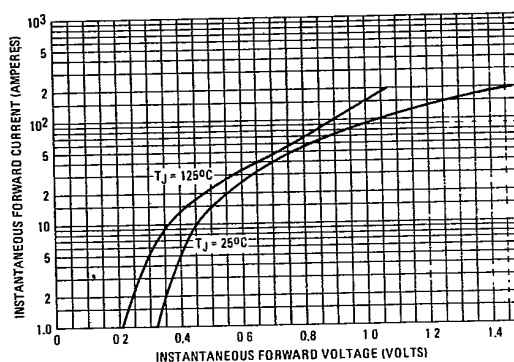


Fig. 11 - Maximum Forward Voltage Vs. Forward Current

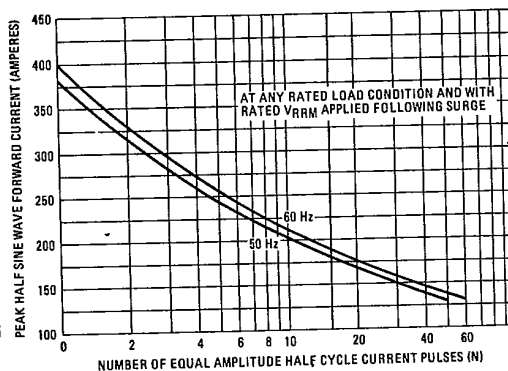


Fig. 12 - Maximum Non-Repetitive Surge Current Vs. Number of Cycles

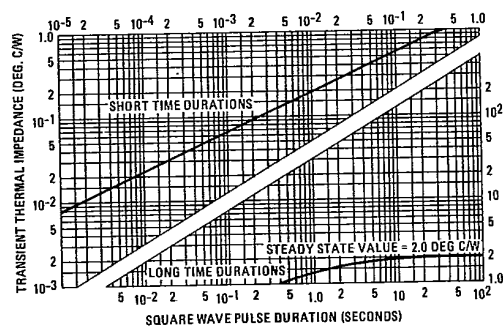


Fig. 13 - Maximum Transient Thermal Impedance, Junction-to-Case, Vs. Pulse Duration

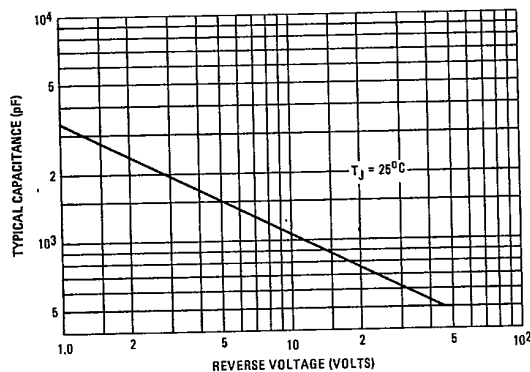


Fig. 14 - Typical Capacitance Vs. Reverse Voltage

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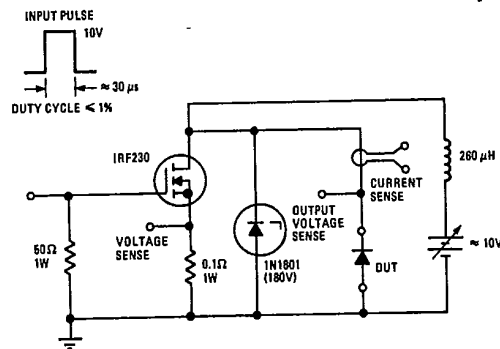
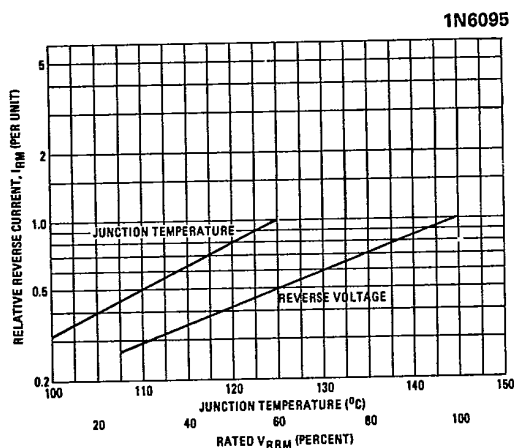
Fig. 16 - I_{RRM} Test Circuit

Fig. 15 - Typical Variation of Reverse Current Vs. Junction Temperature and Reverse Voltage

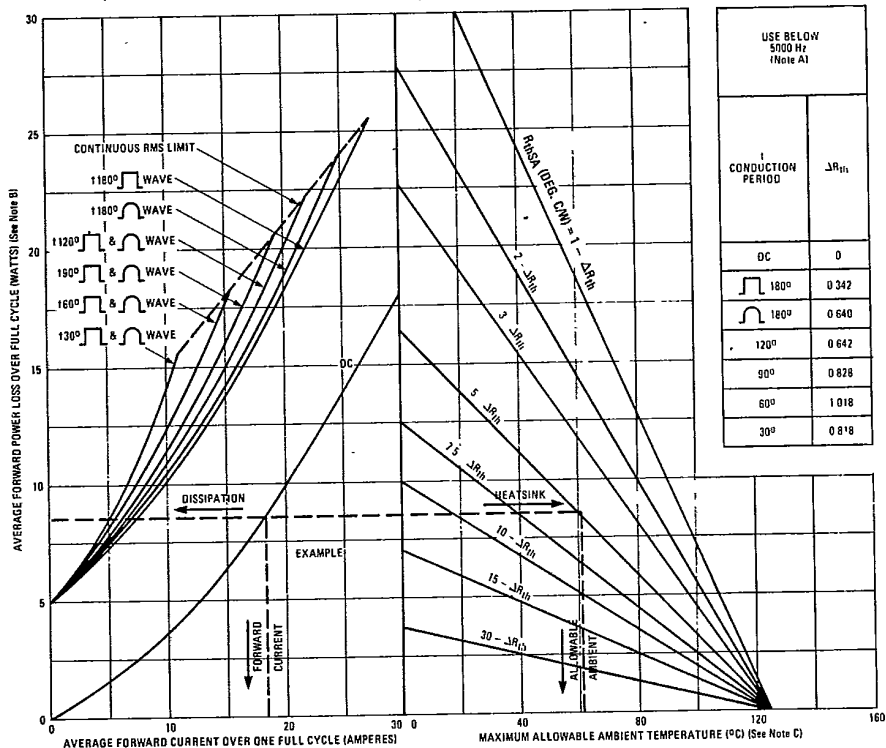


Fig. 17 - Thermal Nomogram

Notes: A. Maximum allowable heatsink thermal resistance, $R_{\theta SA}$, equals the graph value minus the $\Delta R_{\theta JA}$ factor which allows for instantaneous T_J excursion. At frequencies above 5000 Hz, $\Delta R_{\theta JA}$ becomes essentially zero and can be ignored.

B. The total power dissipation curves assume the worst case reverse conditions of halfwave (180°) rectangular reverse voltage, full rated V_R , and $T_J = 125^\circ\text{C}$. Lower reverse power losses allow higher operating ambient, smaller heatsinks or larger operating safety margin.

C. Caution: Data assumes that the rectifier is mounted with thermally conductive grease to achieve $R_{\theta JC} = 0.50^\circ\text{C/W}$.