International Rectifier

SERIES IRK.61, .81, .101

HIGH VOLTAGE DIODES

NEW ADD-A-pak™ Power Modules

60A
80A
100A

Features

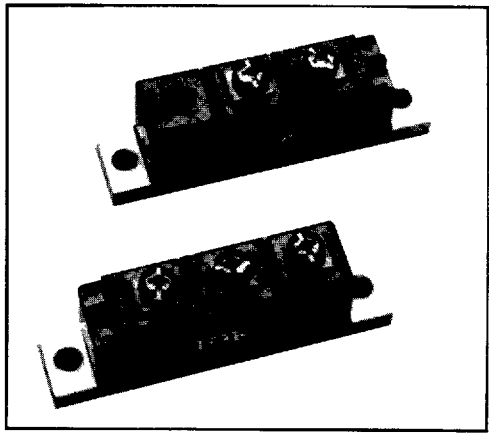
- High voltage
- Electrically isolated base plate
- 3500 V_{RMS} isolating voltage
- Standard JEDEC package
- Simplifies mechanical designs, rapid assembly
- High surge capability
- Large creepage distances
- Alumina substrate
- UL E 78996 approved

Description

This new IRK series of ADD-A-paks uses high voltage power diodes in four basic configurations. The semiconductors are electrically isolated from the metal base, allowing common heatsinks and compact assemblies to be built. They can be interconnected to form single phase or three phase bridges and the single diode module can be used in conjunction with the thyristor modules as a freewheel diode. These modules are intended for general purpose applications such as battery chargers, welders and plating equipment and everywhere high voltage and high current are required.

Major Ratings and Characteristics

Parameters		IRK.61	IRK.81	IRK.101	Units
$I_{F(AV)}$		60	80	100	A
$I_{F(RMS)}$		94	125	157	A
I_{FSM}	@ 50Hz	1450	1600	2020	A
	@ 60Hz	1520	1680	2110	A
I^2t	@ 50Hz	10520	12890	20430	A^2s
	@ 60Hz	9600	11760	18650	A^2s
$I^2\sqrt{t}$		105200	128900	204300	$A^2\sqrt{s}$
V_{RRM} range		1400 to 2000			V
T_J range		-40 to 150			°C



ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number	Voltage Code	V_{RRM}, maximum repetitive peak reverse voltage V	V_{RSM}, maximum non-repetitive peak reverse voltage V	I_{RRM} max. mA
	14	1400	1500	10
IRK.61-	16	1600	1700	10
IRK.81-	18	1800	1900	10
IRK.101-	20	2000	2100	10

Forward Conduction

	Parameters	IRK.61	IRK.81	IRK.101	Units	Conditions		
$I_{F(AV)}$	Max. average forward current	60	80	100	A	180° conduction, half sine wave		
	@ Case temperature	90	88	87	°C			
$I_{F(RMS)}$	Max. RMS forward current	94	125	157	A			
I_{FSM}	Max. peak, one-cycle forward, non-repetitive surge current	1450	1600	2020	A	t=10ms	No voltage reapplied	Sinusoidal half wave, Initial $T_J = T_J$ max
		1520	1680	2110	A	t=8.3ms		
		1220	1350	1700	A	t=10ms	100% V_{RRM} reapplied	
		1270	1410	1780	A	t=8.3ms		
I^2t	Maximum I^2t for fusing	10520	12890	20430	A^2s	t=10ms	No voltage reapplied	Sinusoidal half wave, Initial $T_J = T_J$ max
		9600	11760	18650	A^2s	t=8.3ms		
		7440	9110	14450	A^2s	t=10ms	100% V_{RRM} reapplied	
		6790	8320	13200	A^2s	t=8.3ms		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	105200	128900	204300	$A^2\sqrt{s}$	t=0.1 to 10ms, no voltage reapplied		
$V_{F(TO)1}$	Low level value of threshold voltage	0.73	0.75	0.71	V	$(16.7\% \times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)})$		
$V_{F(TO)2}$	High level value of threshold voltage	0.92	0.89	0.861	V	$(\pi \times I_{F(AV)} < I < 20 \times \pi \times I_{F(AV)})$		
r_{f1}	Low level value of forward slope resistance	3.70	2.73	1.84	mΩ	$(16.7\% \times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)})$		
r_{f2}	High level value of forward slope resistance	2.90	2.26	1.45	mΩ	$(\pi \times I_{F(AV)} < I < 20 \times \pi \times I_{F(AV)})$		
V_{FM}	Max. forward voltage drop	1.35	1.36	1.34	V	$I_{FM} = \pi \times I_{F(AV)}$, $T_J = 25°C$, tp = 400µs square wave Av. power $= V_{F(TO)} \times I_{F(AV)} + r_f \times (I_{F(RMS)})^2$		

Thermal and Mechanical Specifications

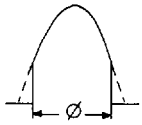
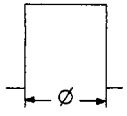
T_J	Junction operating temperature	-40 to 150			°C		
T_{stg}	Storage temperature range	-40 to 150			°C		
R_{thJC}	Max. internal thermal resistance junction to case	0.325	0.250	0.22	K/W	IRKD../IRKJ../IRKC..	Per module, DC operation
		0.65	0.50	0.44	K/W	IRKE..	Per junction, DC operation
R_{thC-S}	Thermal resistance, case to heatsink	0.1	0.1	0.1	K/W	Mounting surface flat, smooth and greased	
T	Mounting torque ±10% ADD-A-pak to heatsink	5			Nm	A mounting compound is recommended and the torque should be rechecked after a period of about 3 hours to allow for the spread of the compound	
	Busbar to ADD-A-pak	3			Nm		
wt	Approximate weight	170 (6)			g (oz)		
-	Case style	TO-240AA				JEDEC	

Blocking

I_{RRM}	Max. peak rev. leakage current	10	10	10	mA	$T_J = 150°C$
V_{INS}	RMS isolation voltage	3500	3500	3500	V	50Hz, circuit to base, all terminals shorted; t = 1s

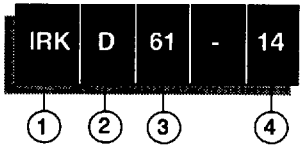
ΔR Conduction (per Junction)

(The following table shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC)

Conduction angle		IRK.61..	IRK.81..	IRK.101..	Units	Conditions
	180°	0.110	0.094	0.062	K/W	$T_J = T_J$ max.
	120°	0.131	0.112	0.087	K/W	
	90°	0.168	0.143	0.111	K/W	
	60°	0.247	0.210	0.164	K/W	
	30°	0.413	0.357	0.279	K/W	
	180°	0.080	0.067	0.052	K/W	$T_J = T_J$ max.
	120°	0.138	0.116	0.090	K/W	
	90°	0.184	0.155	0.121	K/W	
	60°	0.258	0.220	0.172	K/W	
	30°	0.417	0.361	0.283	K/W	

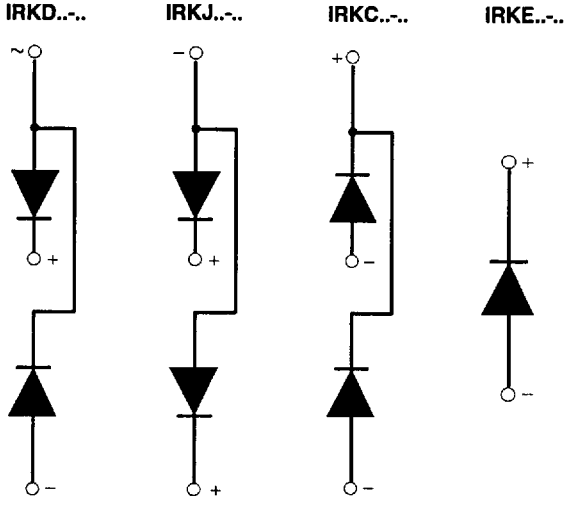
Ordering Information Table

Device Code



1 - Module type
2 - Circuit configuration (See Circuit Configuration Table)
3 - Current code
4 - Voltage code (See Voltage Ratings Table)

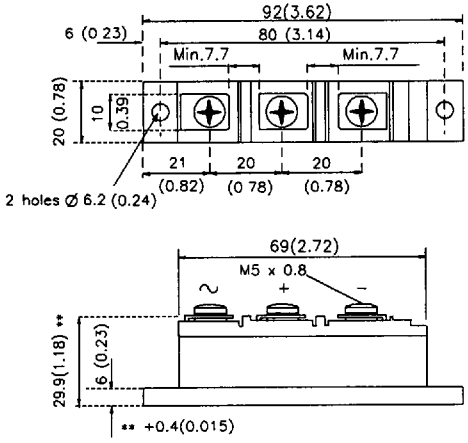
Circuit Configurations



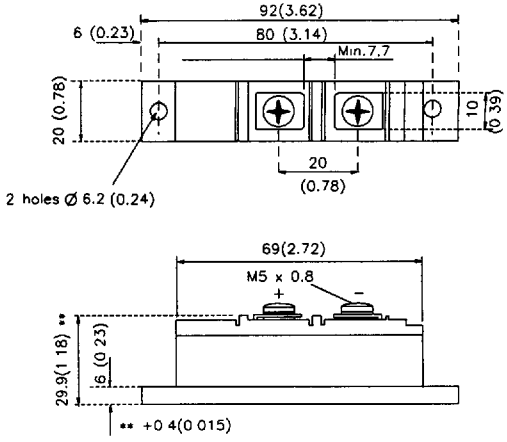
D	=	2 diodes in series
E	=	Single diode
J	=	2 diodes / Common anode
C	=	2 diodes / Common cathode

Outlines Table

IRKD..-..

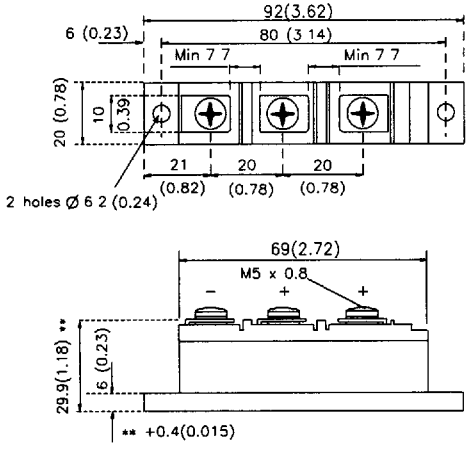


IRKE..-..

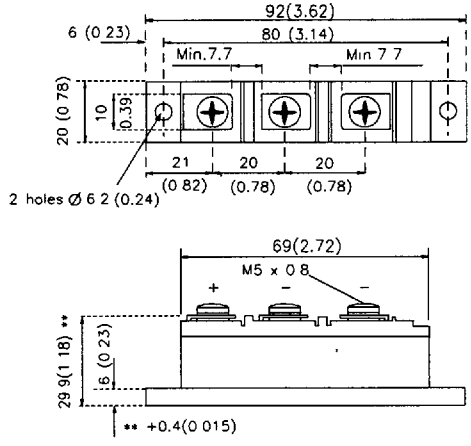


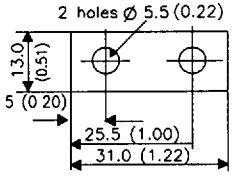
All dimensions in millimeters (inches)

IRKJ..-..

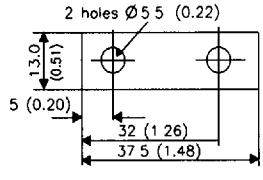


IRKC..-..





51-1383



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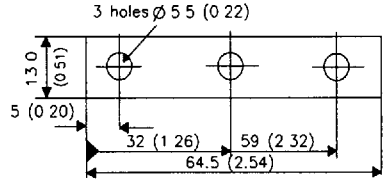
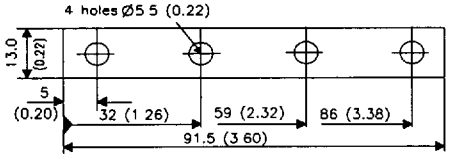
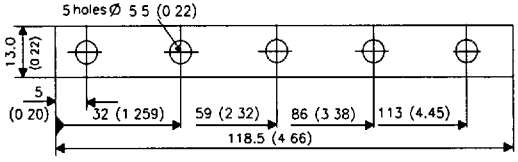


51-1359



51-1360

All busbars 3 to 3.5mm thick



All dimensions in millimeters (inches)

51-1361

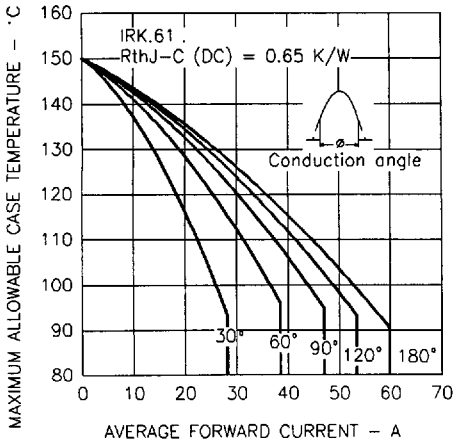


Fig. 1 - Current Ratings Characteristics

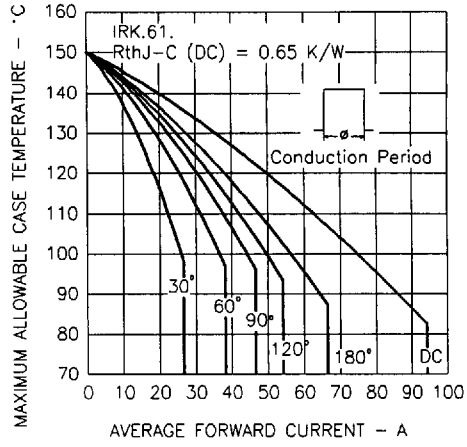


Fig. 2 - Current Ratings Characteristics

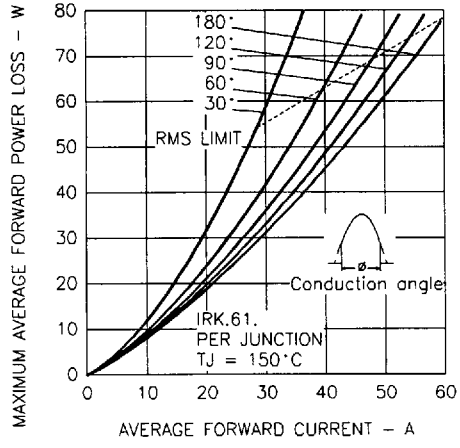


Fig. 3 - Forward Power Loss Characteristics

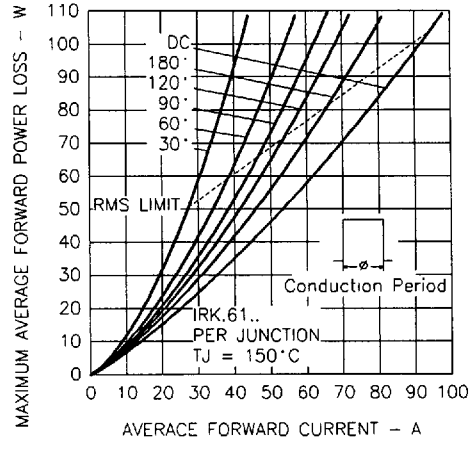


Fig. 4 - Forward Power Loss Characteristics

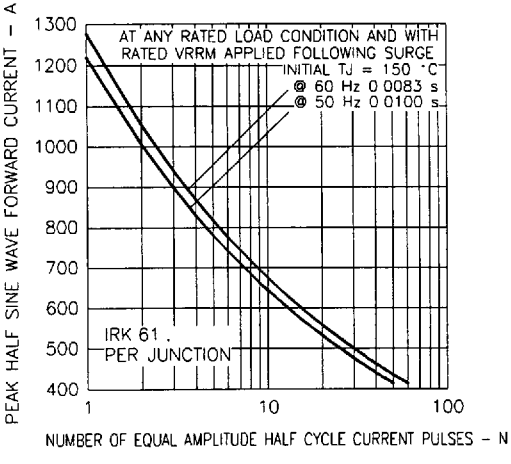


Fig. 5 - Maximum Non-Repetitive Surge Current

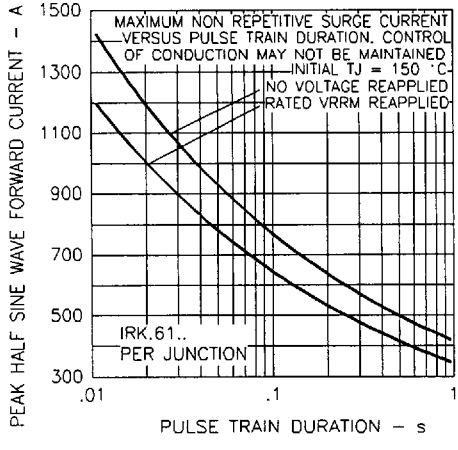


Fig. 6 - Maximum Non-Repetitive Surge Current

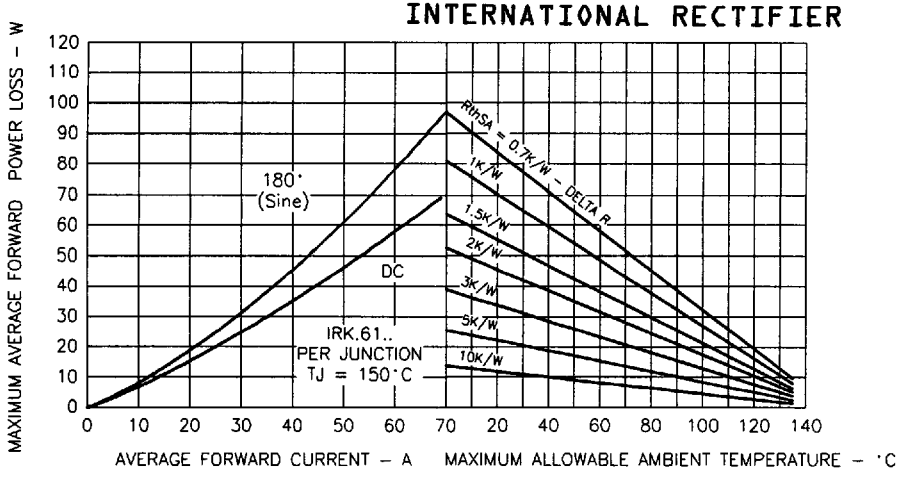


Fig. 7 - Forward Power Loss Characteristics

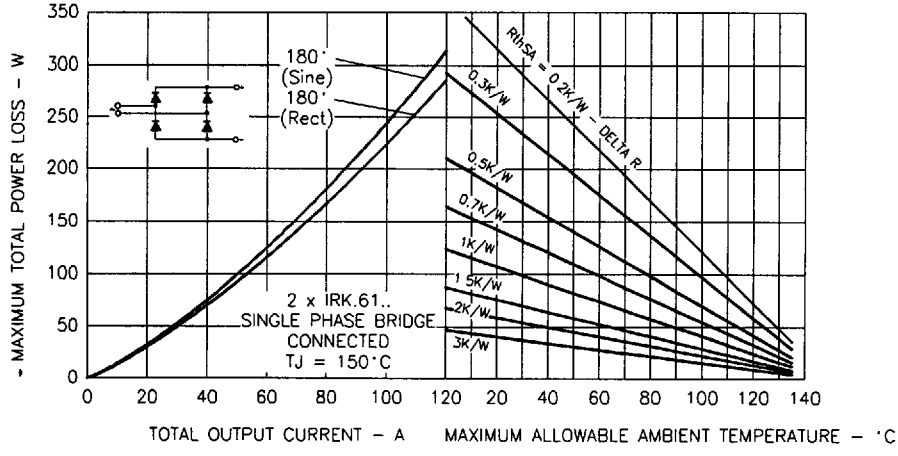


Fig. 8 - Forward Power Loss Characteristics

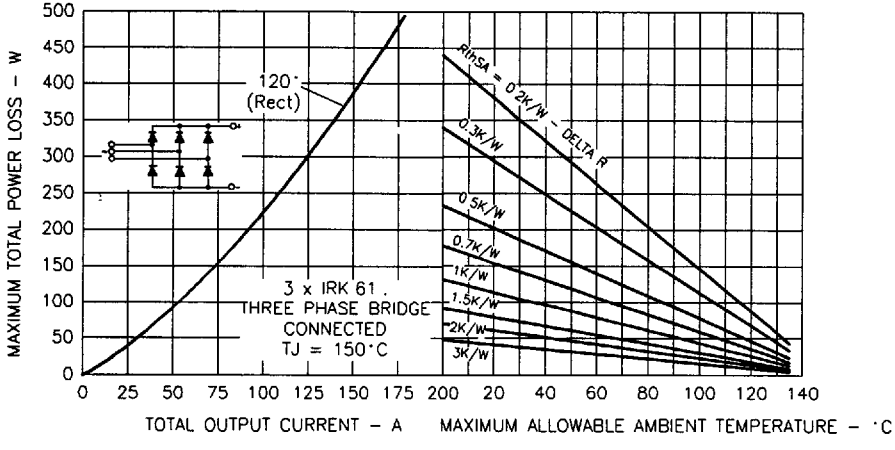


Fig. 9 - Forward Power Loss Characteristics

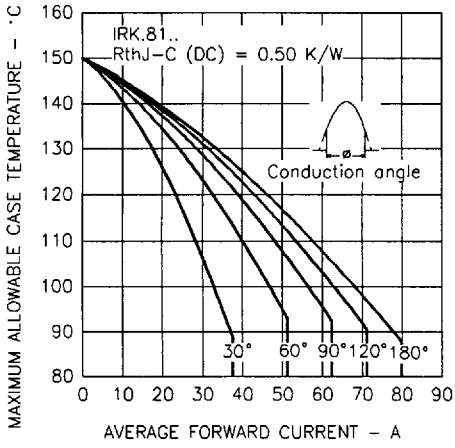


Fig. 10 - Current Ratings Characteristics

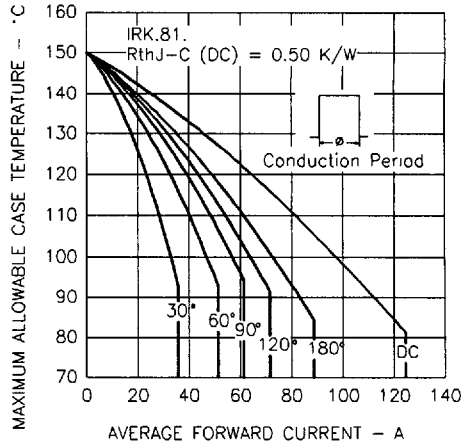


Fig. 11 - Current Ratings Characteristics

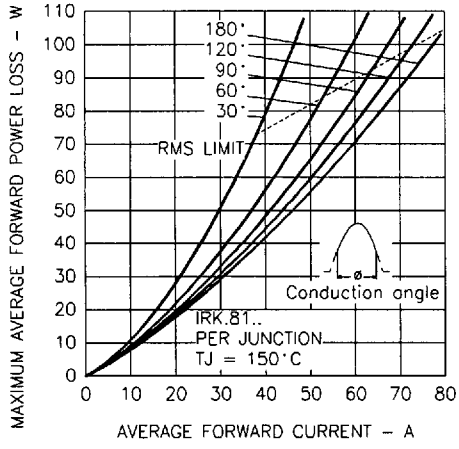


Fig. 12 - Forward Power Loss Characteristics

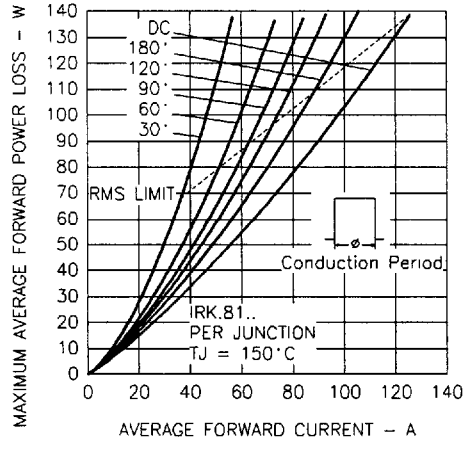


Fig. 13 - Forward Power Loss Characteristics

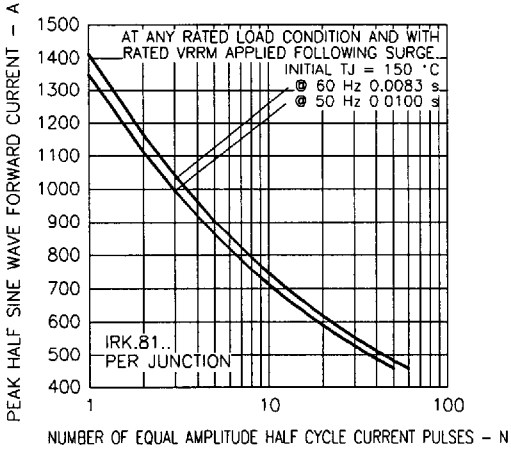


Fig. 14 - Maximum Non-Repetitive Surge Current

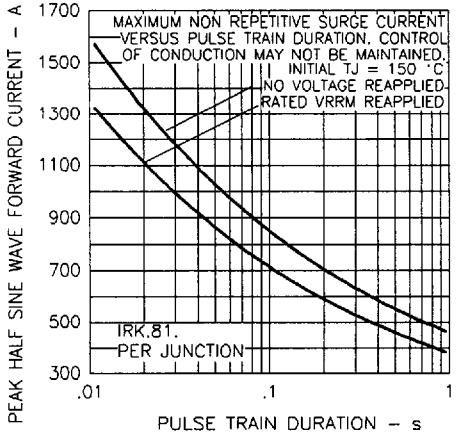


Fig. 15 - Maximum Non-Repetitive Surge Current

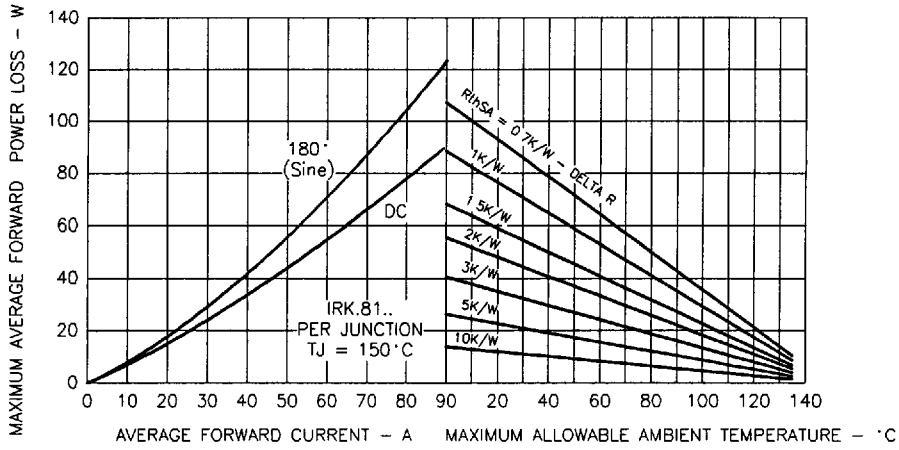


Fig. 16 - Forward Power Loss Characteristics

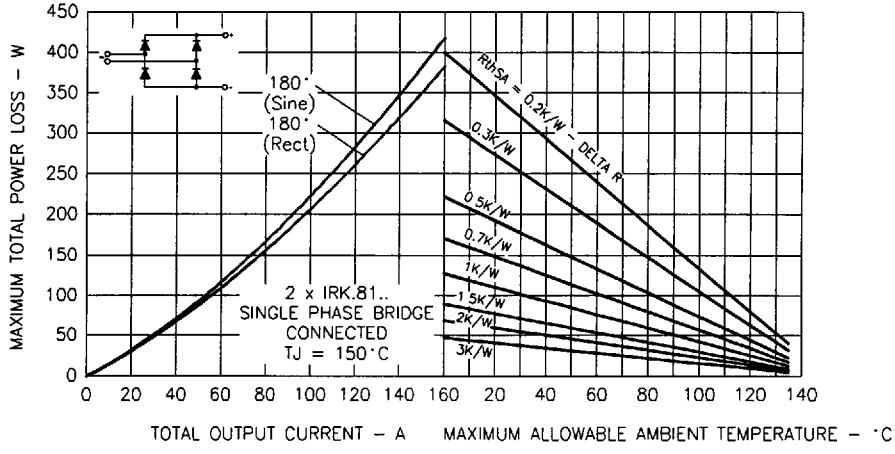


Fig. 17 - Forward Power Loss Characteristics

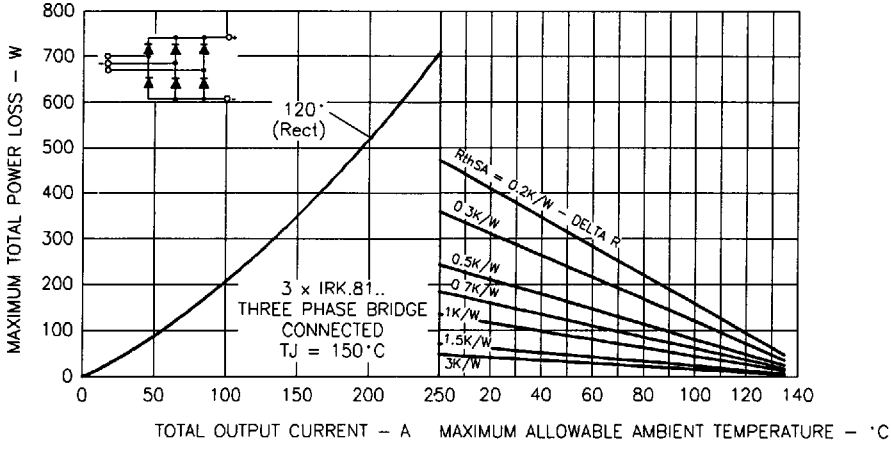


Fig. 18 - Forward Power Loss Characteristics

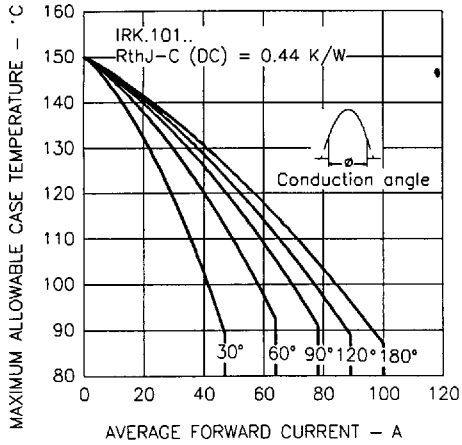


Fig. 19 - Current Ratings Characteristics

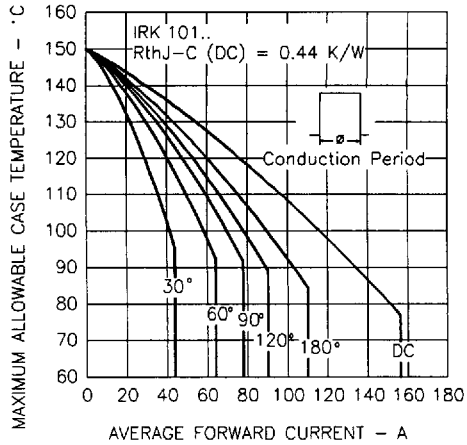


Fig. 20 - Current Ratings Characteristics

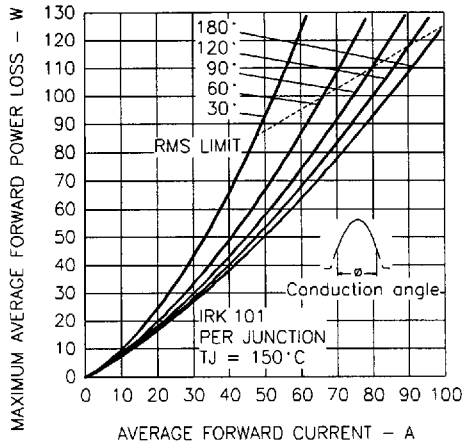


Fig. 21 - Forward Power Loss Characteristics

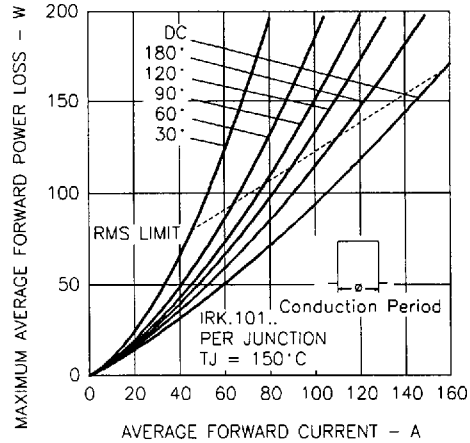


Fig. 22 - Forward Power Loss Characteristics

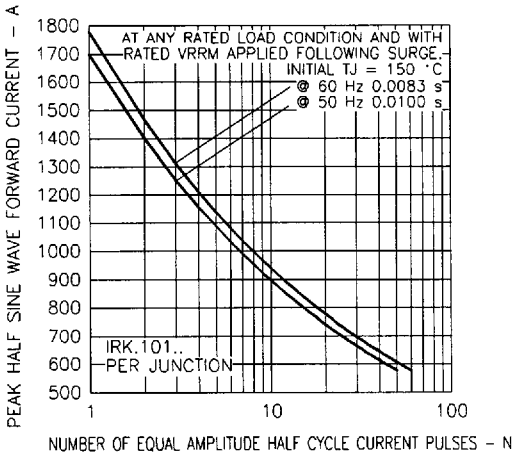


Fig. 23 - Maximum Non-Repetitive Surge Current

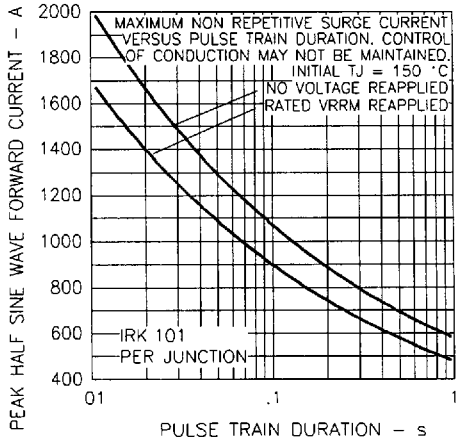


Fig. 24 - Maximum Non-Repetitive Surge Current

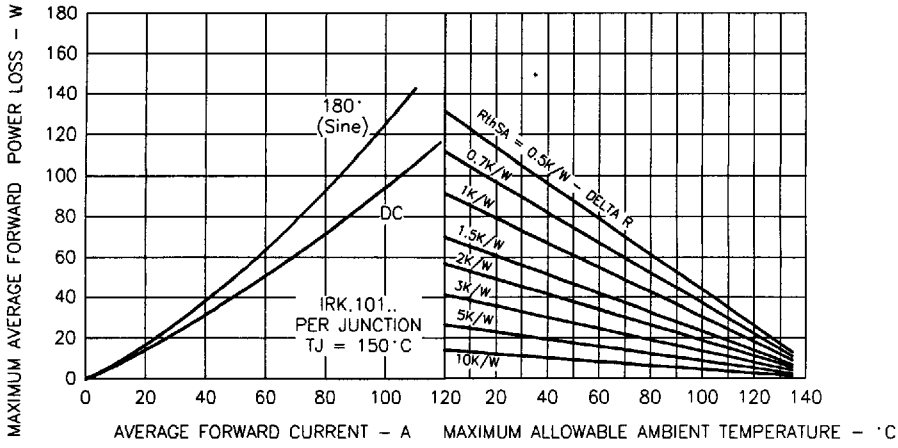


Fig. 25 - Forward Power Loss Characteristics

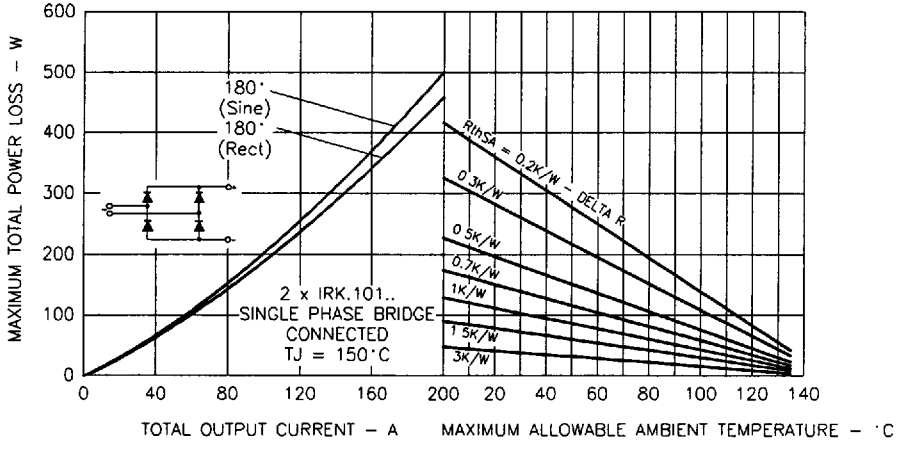


Fig. 26 - Forward Power Loss Characteristics

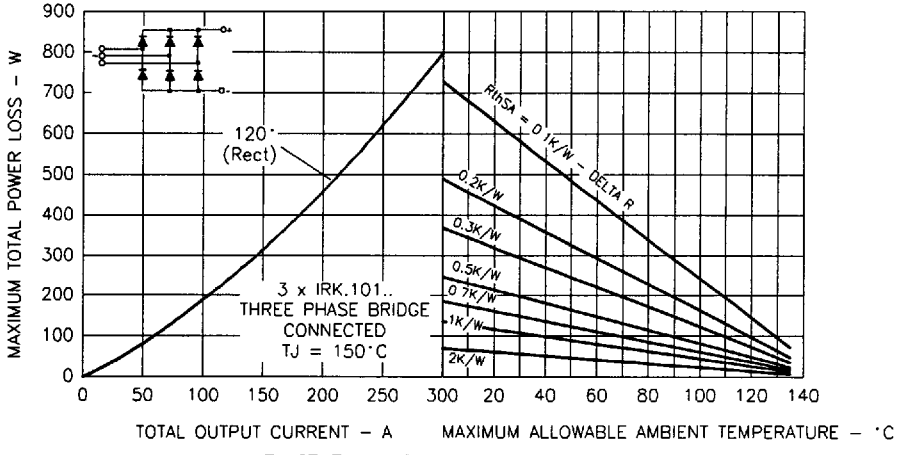


Fig. 27 - Forward Power Loss Characteristics

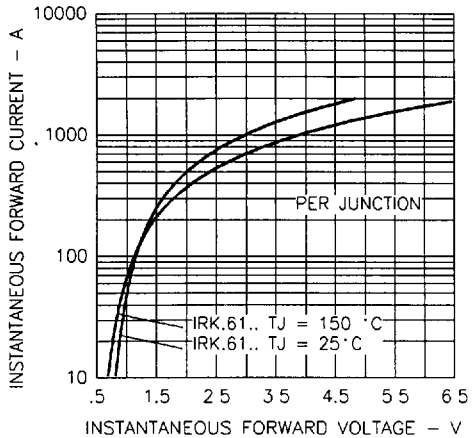


Fig. 28 - Forward Voltage Drop Characteristics

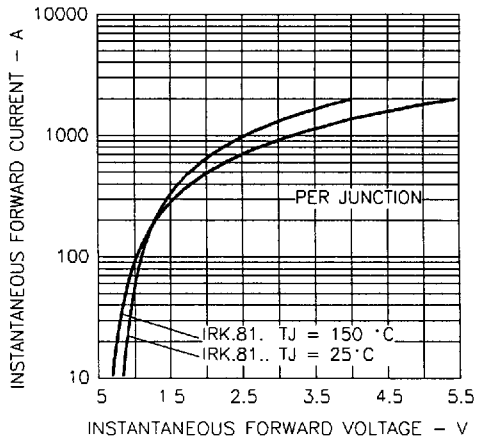


Fig. 29 - Forward Voltage Drop Characteristics

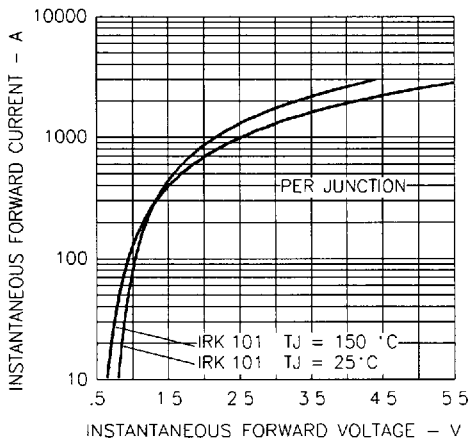


Fig. 30 - Forward Voltage Drop Characteristics

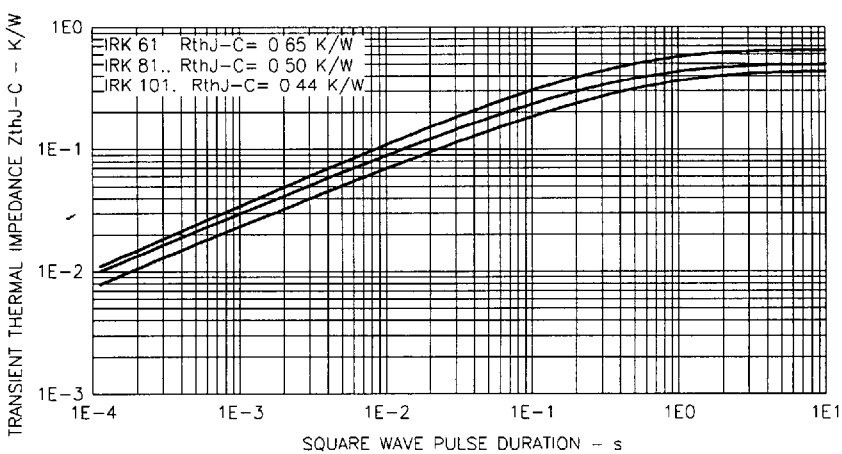


Fig. 31 - Thermal Impedance ZthJC Characteristics