

## FAST RECOVERY DIODES

## NEW INT-A-pak™ Power Modules

### Features

- Fast recovery time characteristics
- Electrically isolated base plate
- Industrial standard package
- Simplified mechanical designs, rapid assembly
- High surge capability
- Large creepage distances
- UL recognised
- 3000 V<sub>RMS</sub> isolating voltage
- Beryllium oxide substrate
- Also available with aluminum nitride substrate

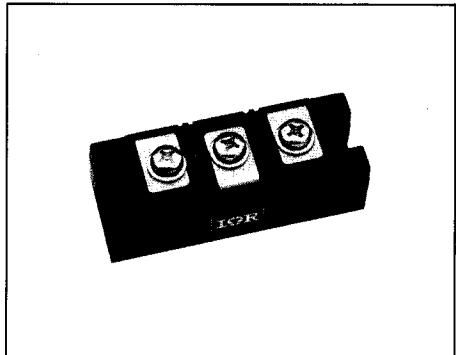
140A

### Description

The IRK.L132 Series of INT-A-pak uses fast recovery power diodes in four basic configurations. The semiconductors are electrically isolated from the metal base, allowing common heatsinks and compact assemblies to be built. Application includes power supplies, battery chargers, welders, motor controls and general industrial current rectification. These modules are intended for those applications where fast recovery characteristics are required.

### Major Ratings and Characteristics

Parameter	IRK.L131/132	Units
I <sub>F(AV)</sub>	140 (130)	A
	@ T <sub>C</sub>	100 (105) °C
I <sub>F(RMS)</sub>	220	A
I <sub>FSM</sub>	@ 50Hz	3000 A
	@ 60Hz	3100 A
t <sub>rr</sub>	@ 50Hz	44.2 kA <sup>2</sup> s
	@ 60Hz	40.3 kA <sup>2</sup> s
V <sub>RRM</sub> range	400 to 1400	V
T <sub>J</sub>	-40 to 150	°C



**ELECTRICAL SPECIFICATIONS**

**Voltage Ratings**

Type number	Voltage Code	$t_{rr}$ Code	$V_{RRM}$ , maximum repetitive peak reverse voltage V	$V_{RSM}$ , maximum non-repetitive peak reverse voltage V	$I_{RRM}$ max. mA
IRK.L131/132	04	S10/S20	400	500	40
	06	S10/S20	600	700	40
	08	S10/S20	800	900	40
	10	S10/S20	1000	1100	40
	12	S20	1200	1300	40
	14	S20	1400	1500	40

**Forward Conduction**

Parameter	IRK.L131/132	Units	Conditions
$I_{F(AV)}$ Max. average forward current @ Case temperature	140 (130) 100 (105)	A °C	180° conduction, half sine wave
$I_{F(RMS)}$ Max. RMS forward current	220	A	as AC switch
$I_{FSM}$ Max. peak, one-cycle forward, non-repetitive surge current	3000	A	$t = 10ms$ No voltage
	3100	A	$t = 8.3ms$ reapplied
	2500	A	$t = 10ms$ 100% $V_{RRM}$
	2600	A	$t = 8.3ms$ reapplied
$I^2t$ Maximum $I^2t$ for fusing	44.2	kA <sup>2</sup> s	$t = 10ms$ No voltage
	40.3	kA <sup>2</sup> s	$t = 8.3ms$ reapplied
	31.2	kA <sup>2</sup> s	$t = 10ms$ 100% $V_{RRM}$
	28.5	kA <sup>2</sup> s	$t = 8.3ms$ reapplied
$I^2/t$ Maximum $I^2/t$ for fusing	442	kA <sup>2</sup> /s	$t = 0.1$ to 10ms, no voltage reapplied
$V_{F(TO)1}$ Low level value of threshold voltage	1.12	V	$(16.7\% \times \pi \times I_{F(AV)} < 1 < \pi \times I_{F(AV)})$ $T_J = T_J$ max
$V_{F(TO)2}$ High level value of threshold voltage	1.51	V	$(\pi \times I_{F(AV)} < 1 < 20 \times \pi \times I_{F(AV)})$ $T_J = T_J$ max
$r_{\theta 1}$ Low level value of forward slope resistance	1.52	mΩ	$(16.7\% \times \pi \times I_{F(AV)} < 1 < \pi \times I_{F(AV)})$ $T_J = T_J$ max
$r_{\theta 2}$ High level value of forward slope resistance	0.71	mΩ	$(\pi \times I_{F(AV)} < 1 < 20 \times \pi \times I_{F(AV)})$ $T_J = T_J$ max
$V_{FM}$ Max. forward voltage drop	1.68	V	$I_{FM} = \pi \times I_{F(AV)}$ $T_J = 25^\circ C$ Av. power = $V_{F(TO)} \times I_{F(AV)} + r_f \times (I_{F(RMS)})^2$

**Thermal and Mechanical Specifications**

$T_J$ Max. junction operating temp.	-40 to 150	°C	
$T_{stg}$ Max. storage temperature range	-40 to 150	°C	
$R_{\theta JC}$ Max. internal thermal resistance junction to case	0.20	K/W	IRKDL/CL/JL
	0.20	K/W	IRKEL
$R_{\theta C-S}$ Thermal resistance, case to heatsink	0.035	K/W	Mounting surface flat, smooth and greased Per module
T Mounting torque ±10%	INT-A-pak to heatsink	4 to 6	Nm
	Busbar to INT-A-pak	4 to 6	Nm
wt Approximate weight	500 (17.8)	g (oz)	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
Case style	INT-A-pak		

Blocking

$I_{RRM}$ Max. peak reverse leakage current	40	mA	$T_J = 150^\circ\text{C}$
$V_{INS}$ RMS isolation voltage	3000	V	50Hz, circuit to base, all terminals shorted, $t = 1\text{s}$

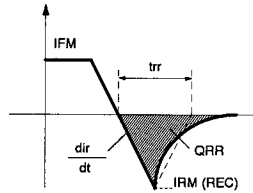
$\Delta R$  Conduction (per Junction)

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

Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.015	0.011	K/W	$T_J = T_J \text{ max.}$ Per junction
120°	0.018	0.019	K/W	
90°	0.024	0.026	K/W	
60°	0.035	0.037	K/W	
30°	0.059	0.060	K/W	

Recovery Characteristics

Code	Test conditions			Typ. values @ $T_J = 150^\circ\text{C}$	
	$I_{pk}$ (A)	$di/dt$ (A/ $\mu\text{s}$ )	$V_r$ (V)	$Q_{rr}$ ( $\mu\text{C}$ )	$I_{rr}$ (A)
S10	500	100	50	38	70
S20	"	"	"	68	95



Ordering Information Table

**Device Code**

IRK	D	L	13	2	-	14	S20	N
①	②	③	④	⑤		⑥	⑦	⑧

- ① Module type
- ② Circuit configuration (See Outline Table)
- ③ L = Fast recovery diode
- ④ Current rating
  - 1 = option with spacers and longer terminal screws
  - 2 = option with standard terminal screws
- ⑥ Voltage code: Code x 100 = VRRM (See Voltage Ratings Table)
- ⑦ trr code (See Recovery Characteristics Table)
- ⑧ None = Standard devices (beryllium oxide)  
N = Aluminum Nitride substrate (contact factory)

Recovery Characteristics Table  
S10= 1000 n s  
S20= 2000 n s

- All dimensions in millimeters (inches)
- Dimensions are nominal
- Full engineering drawings are available on request
- UL identification number for cathode wire: UL 1385
- UL identification number for package: UL 94V0

CONTAINS BERYLLIUM OXIDE CERAMIC

- May contain Beryllium Oxide Ceramic, and under normal circumstances is non hazardous.
- Do not open, cut or grind.
- Unserviceable parts must be disposed of as harmful waste.

HARMFUL

For all types	A	B	C	D	E
IRK...5	25(0.98)	---	---	41(1.61)	47(1.85)
IRK...6	23(0.91)	30(1.18)	36(1.42)	---	---

IRKDL...

IRKEL...

IRKCL...

IRKJL...

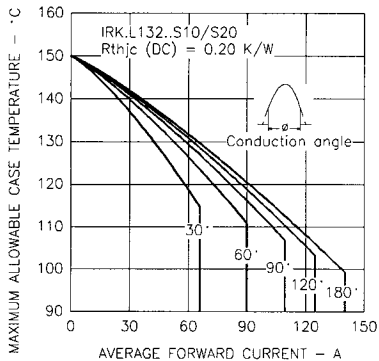


Fig. 1- Current Ratings Characteristics

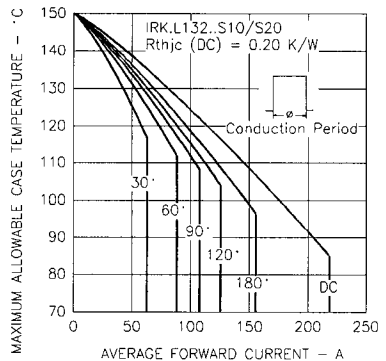


Fig. 2- Current Ratings Characteristics

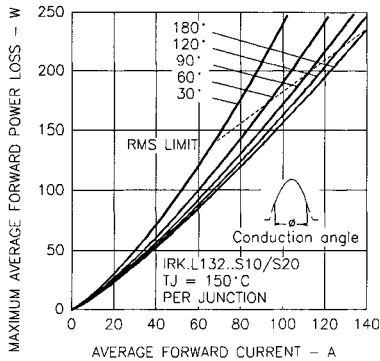


Fig. 3 - Forward Power Loss Characteristics

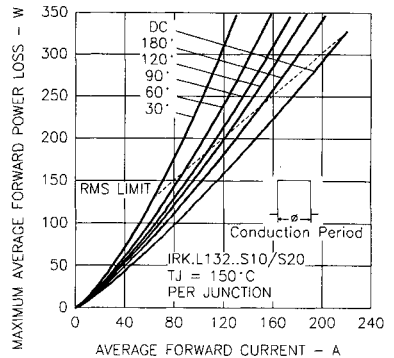


Fig. 4 - Forward Power Loss Characteristics

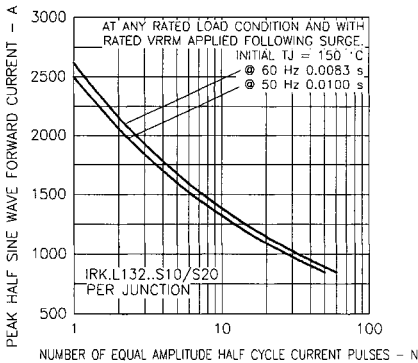


Fig. 5 - Maximum Non-Repetitive Surge Current

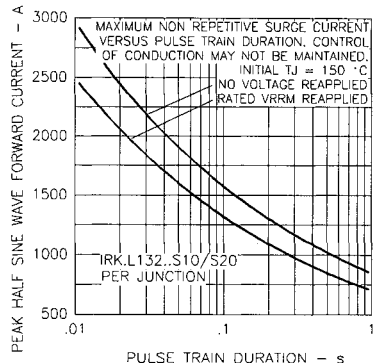


Fig. 6 - Maximum Non-Repetitive Surge Current

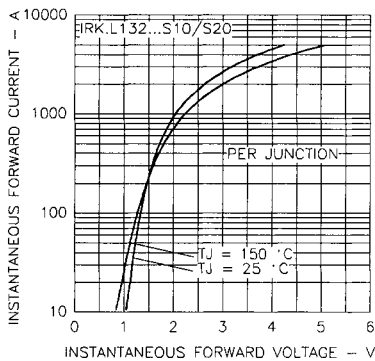


Fig. 7 - Forward Voltage/Drop Characteristics

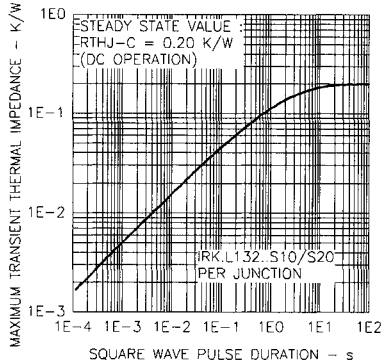


Fig. 8 - Thermal Impedance ZthJC Characteristics

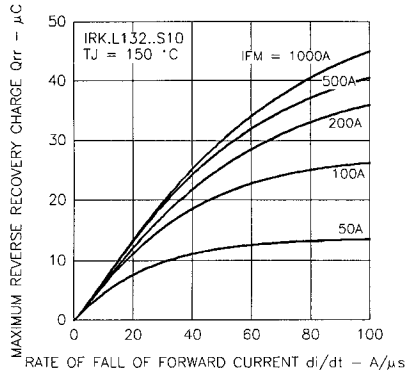


Fig. 9 - Reverse Recovery Charge Characteristics

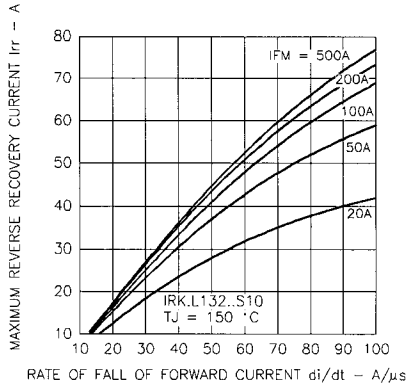


Fig. 10 - Reverse Recovery Current Characteristics

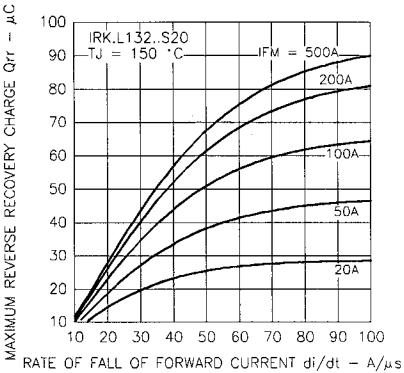


Fig. 11 - Reverse Recovery Charge Characteristics

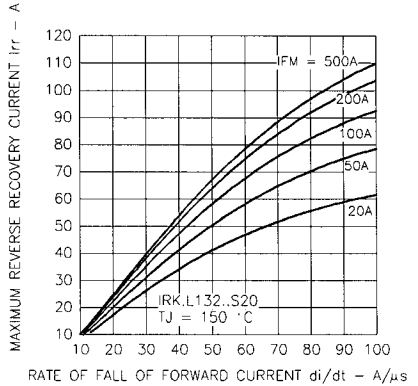


Fig. 12 - Reverse Recovery Current Characteristics

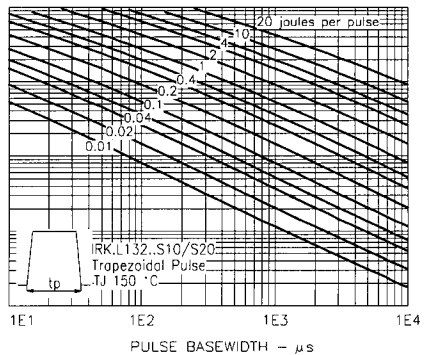
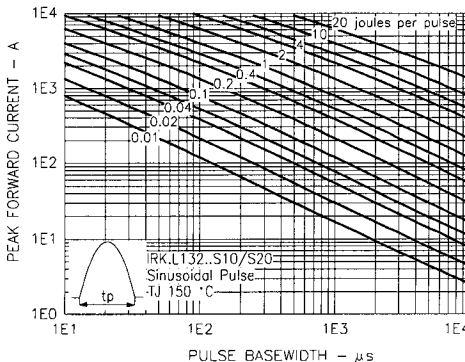


Fig. 13 - Maximum Forward Energy Power Loss Characteristics

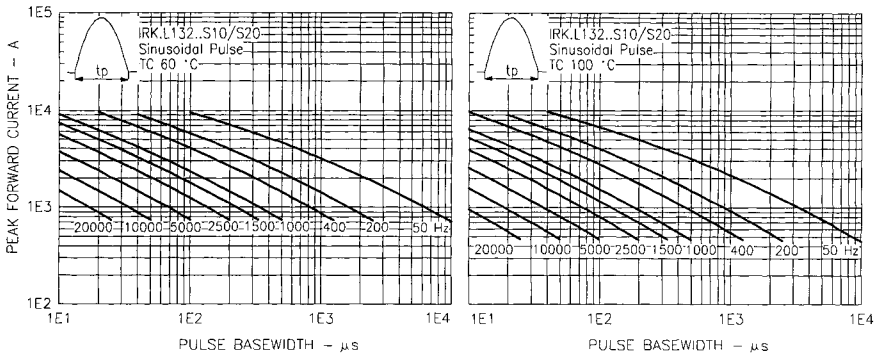


Fig. 14 - Frequency Characteristics

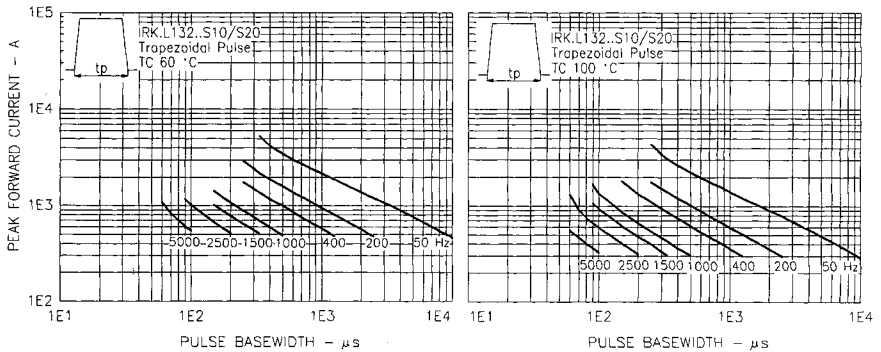


Fig. 15 - Frequency Characteristics