

International IOR Rectifier

Bulletin I27094 rev.B 03/01

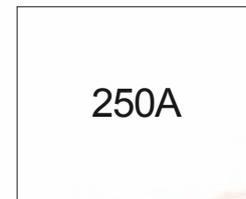
IRK.L240 SERIES

FAST RECOVERY DIODES

MAGN-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
- 3000 V_{RMS} isolating voltage
- UL E78996 approved 

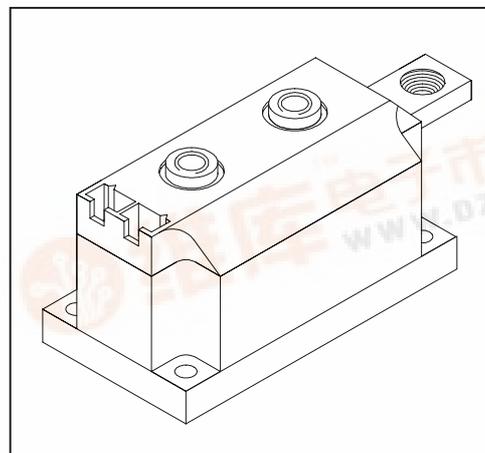


Description

The IRK.L240 Series of MAGN-A-paks 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

| Parameters | IRK.L240 | | Units | |
|----------------------|------------|------|--------------------|-------------------|
| | S10/S20 | S30 | | |
| I _{F(AV)} | 250 | 240 | A | |
| @ T _c | 100 | 100 | °C | |
| I _{F(RMS)} | 392 | 377 | A | |
| I _{FSM} | @ 50Hz | 8000 | 7500 | A |
| | @ 60Hz | 8400 | 7850 | A |
| I ² t | @ 50Hz | 322 | 280 | KA ² s |
| | @ 60Hz | 294 | 256 | KA ² s |
| I ² √t | 3220 | 2800 | KA ² √s | |
| V _{RRM} | up to 2500 | | V | |
| T _J range | -40 to 150 | | °C | |



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ELECTRICAL SPECIFICATIONS

Voltage Ratings

| Type number | Voltage Code | t_{tr} Code | V_{RRM} , maximum repetitive peak reverse voltage V | V_{RSM} , maximum non-repetitive peak reverse voltage V | I_{RRM} max. @ 150°C mA |
|-------------|--------------|---------------|--|--|---------------------------------|
| IRK.L240 | 06 | S10 | 600 | 700 | 50 |
| | 10 | S10 | 1000 | 1100 | |
| | 12 | S20 | 1200 | 1300 | |
| | 14 | S20 | 1400 | 1500 | |
| | 20 | S30 | 2000 | 2100 | |
| | 25 | S30 | 2500 | 2600 | |

Forward Conduction

| Parameter | IRK.L240 | | Units | Conditions | | | |
|--|----------|------|--------------------|--|---------------------------|--|--|
| | S10/S20 | S30 | | | | | |
| $I_{F(AV)}$ Max. average forward current @ Case temperature | 250 | 240 | A | 180° conduction, half sine wave | | | |
| $I_{F(RMS)}$ Max. RMS forward current | 100 | 100 | °C | | | | |
| $I_{F(RMS)}$ Max. RMS forward current | 392 | 377 | A | as AC switch | | | |
| I_{FSM} Max. peak, one-cycle forward, non-repetitive surge current | 8000 | 7500 | A | t = 10ms | No voltage reappplied | Sinusoidal half wave, Initial $T_J = T_{J \max}$ | |
| | 8400 | 7850 | | t = 8.3ms | 100% V_{RRM} reappplied | | |
| | 6750 | 6300 | | t = 10ms | 100% V_{RRM} reappplied | | |
| | 7100 | 6600 | | t = 8.3ms | 100% V_{RRM} reappplied | | |
| I^2t Maximum I^2t for fusing | 322 | 280 | KA ² s | t = 10ms | No voltage reappplied | | Sinusoidal half wave, Initial $T_J = T_{J \max}$ |
| | 294 | 256 | | t = 8.3ms | 100% V_{RRM} reappplied | | |
| | 228 | 198 | | t = 10ms | 100% V_{RRM} reappplied | | |
| | 208 | 181 | | t = 8.3ms | 100% V_{RRM} reappplied | | |
| I^2/t Maximum I^2/t for fusing | 3220 | 2800 | KA ² /s | t = 0.1 to 10ms, no voltage reappplied | | | |
| $V_{F(TO)1}$ Low level value of threshold voltage | 0.98 | 0.98 | V | $(16.7\% \times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)}) T_J = T_{J \max}$ | | | |
| $V_{F(TO)2}$ High level value of threshold voltage | 1.31 | 1.31 | V | $(I > \pi \times I_{F(AV)}) T_J = T_{J \max}$. | | | |
| r_{f1} Low level value of forward slope resistance | 0.75 | 0.97 | mΩ | $(16.7\% \times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)}) T_J = T_{J \max}$ | | | |
| r_{f2} High level value of forward slope resistance | 0.41 | 0.60 | mΩ | $(I > \pi \times I_{F(AV)}) T_J = T_{J \max}$. | | | |
| V_{FM} Max. forward voltage drop | 1.57 | 1.75 | V | $I_{FM} = 800, T_J = 150^\circ\text{C}$ tp = 10 ms Av. power = $V_{F(TO)} \times I_{F(AV)} + r_f \times (I_{F(RMS)})^2$ | | | |

Blocking

| | | | |
|---|------|----|--|
| I_{RRM} Max. peak reverse leakage current | 50 | mA | $T_J = 150^\circ\text{C}$, leakage current |
| V_{INS} RMS isolation voltage | 3000 | V | 50Hz, circuit to base, all terminals shorted, 25°C, t = 1s |

Thermal and Mechanical Specifications

| | | | | |
|-------------|---|------------|--------|---|
| T_J | Max. junction operating temperature | -40 to 150 | °C | |
| T_{stg} | Max. storage temperature range | -40 to 150 | °C | |
| R_{thJ-C} | Max. internal thermal resistance junction to case | 0.125 | K/W | Per junction, DC operation |
| R_{thC-S} | Thermal resistance, case to heatsink | 0.02 | K/W | Mounting surface flat, smooth and greased Per module |
| T | Mounting torque $\pm 10\%$ | | | 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 |
| | MAP to heatsink | 4 to 6 | Nm | |
| | Busbar to MAP | 8 to 10 | Nm | |
| wt | Approximate weight | 850 (30) | g (oz) | |
| | Case style | MAGN-A-pak | | |

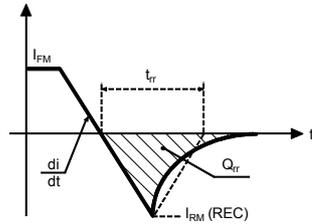
DR Conduction (per Junction)

(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° | 0.008 | 0.007 | K/W | $T_J = T_J \text{ max.}$ |
| 120° | 0.010 | 0.011 | K/W | |
| 90° | 0.013 | 0.015 | K/W | |
| 60° | 0.019 | 0.020 | K/W | |
| 30° | 0.032 | 0.033 | K/W | |

Recovery Characteristics

| Code | Test conditions | | | Typ. values @ $T_J = 150^\circ\text{C}$ | |
|------|-----------------|--------------------------------|--------------|---|-----------------|
| | I_{pk} (A) | di/dt (A/ μs) | V_r (V) | Q_{rr} (μC) | I_{rr} (A) |
| S10 | 500 | 100 | 50 | 135 | 100 |
| S20 | " | " | " | 250 | 145 |
| S30 | " | " | " | 360 | 200 |



Ordering Information Table

Device Code

IRK
D
L
240
-
25
S30

1
2
3
4
5
6

- 1** - Module type
- 2** - Circuit configuration (See Outline Table)
- 3** - L = Fast recovery diode
- 4** - Current rating
- 5** - Voltage code: Code x 100 = VRRM (See Voltage Ratings Table)
- 6** - trr code (See Recovery Characteristics Table)

S10 = 1000 ns
S20 = 2000 ns
S30 = 3000 ns

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Outline Table

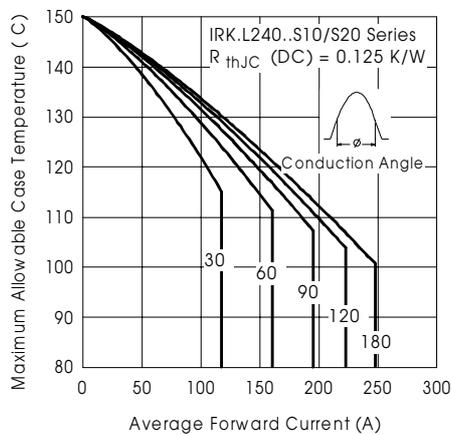
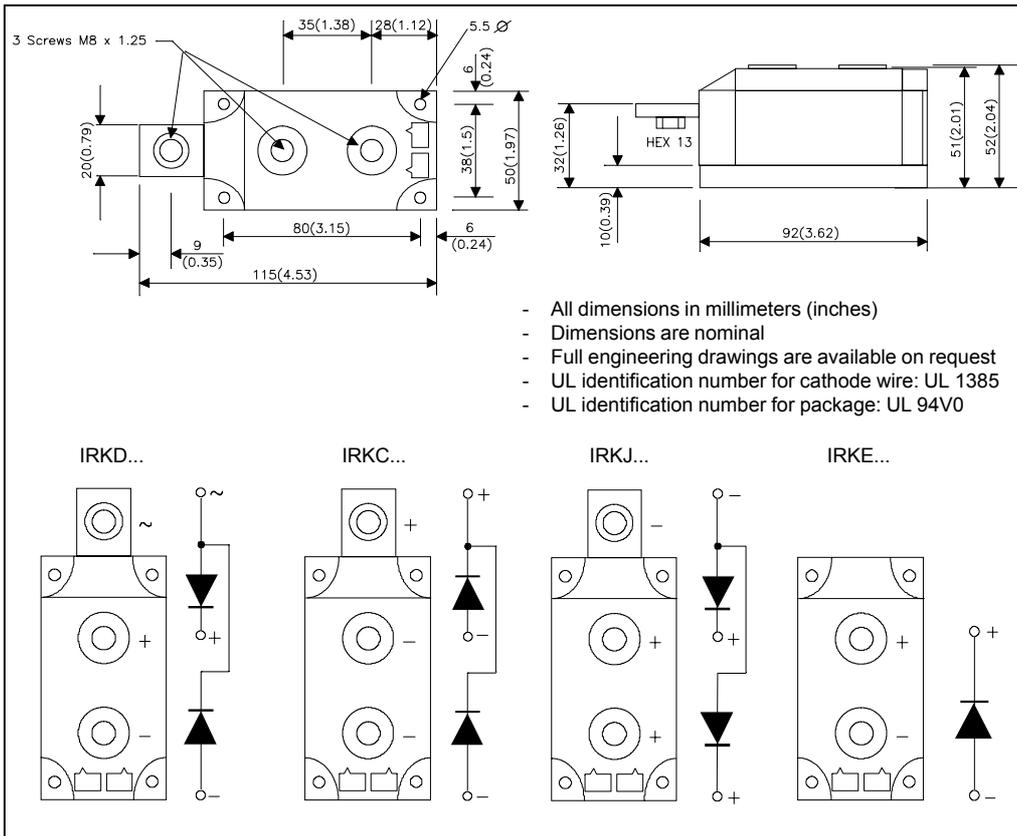


Fig. 1 - Current Ratings Characteristics

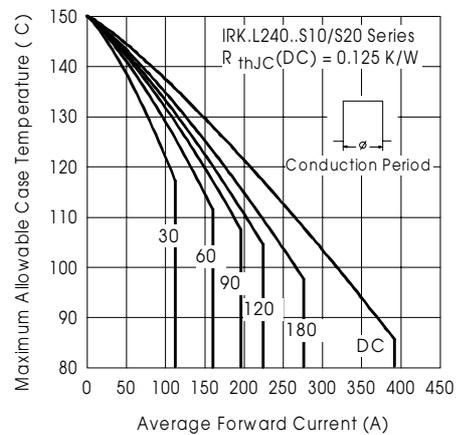


Fig. 2 - Current Ratings Characteristics

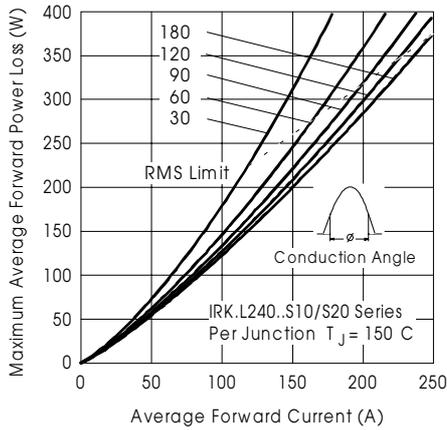


Fig. 3-Forward Power Loss Characteristics

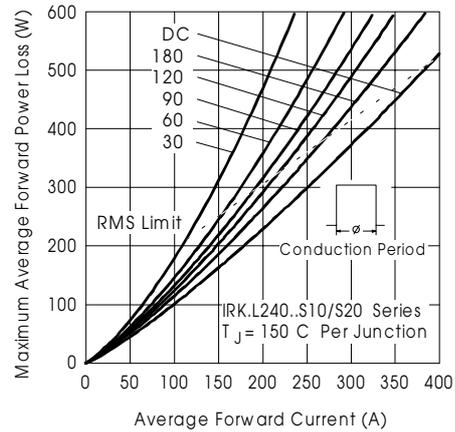


Fig. 4-Forward Power Loss Characteristics

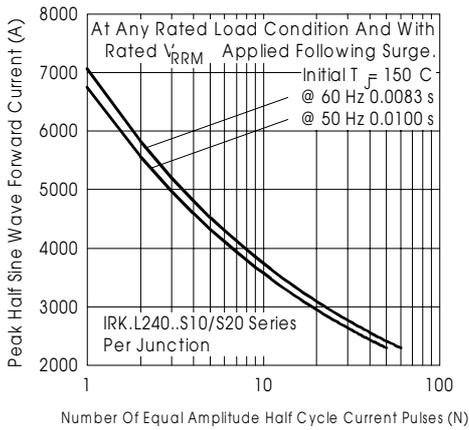


Fig. 5-Maximum Non-Repetitive Surge Current

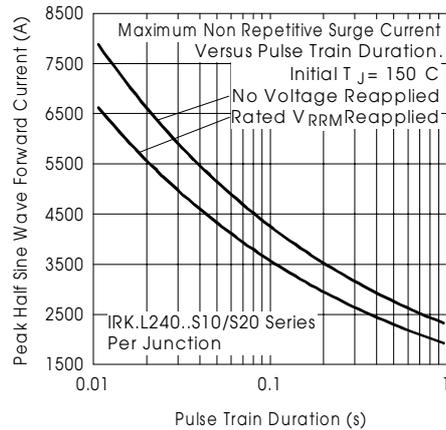


Fig. 6-Maximum Non-Repetitive Surge Current

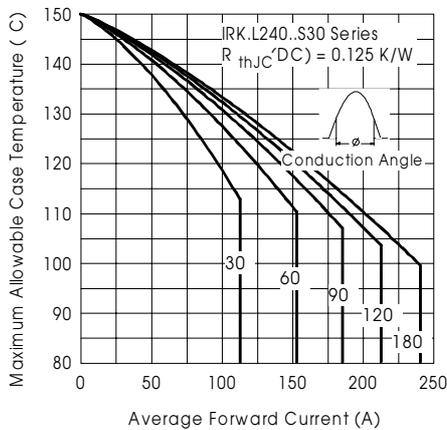


Fig. 7-Current Ratings Characteristics

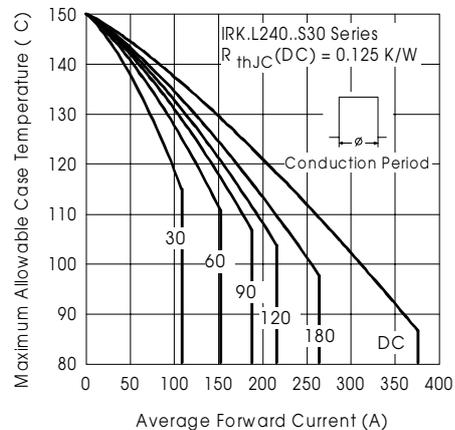


Fig. 8-Current Ratings Characteristics

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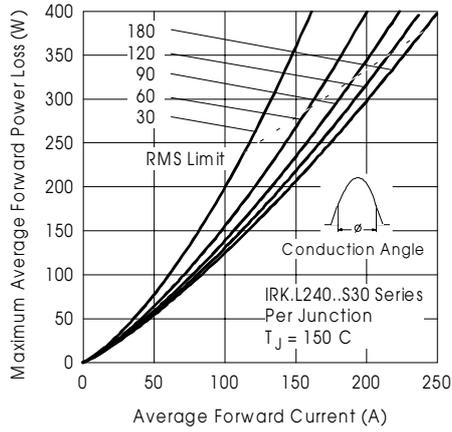


Fig. 9-Forward Power Loss Characteristics

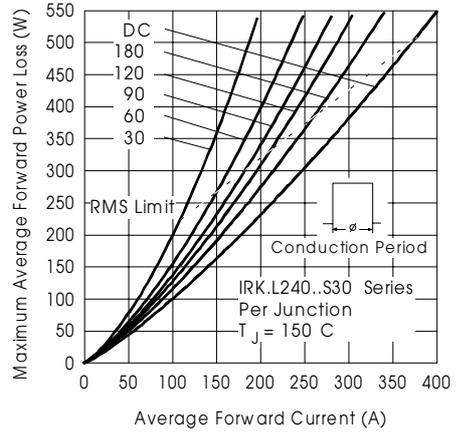


Fig. 10-Forward Power Loss Characteristics

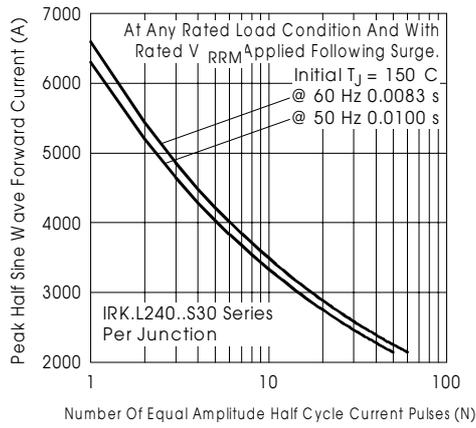


Fig. 11-Maximum Non-Repetitive Surge Current

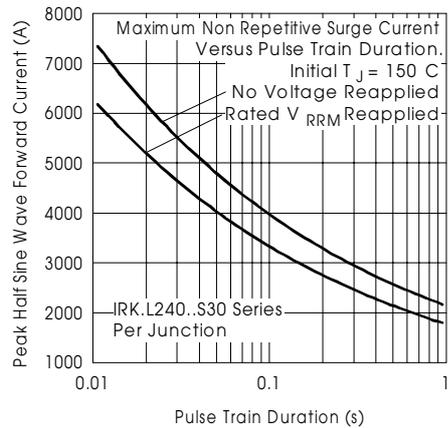


Fig. 12-Maximum Non-Repetitive Surge Current

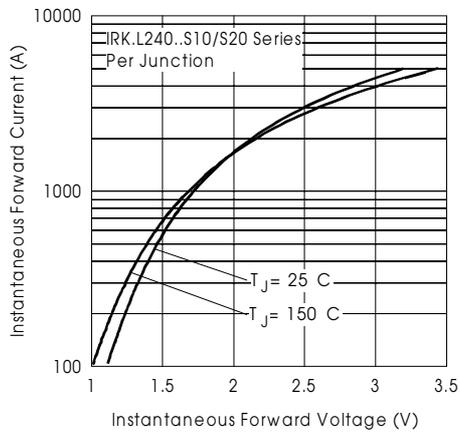


Fig. 13-Forward Voltage Drop Characteristics

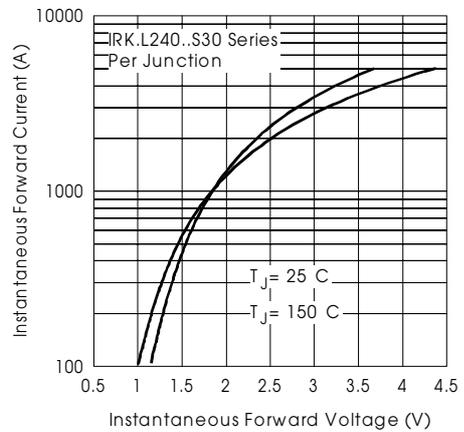


Fig. 14-Forward Voltage Drop Characteristics

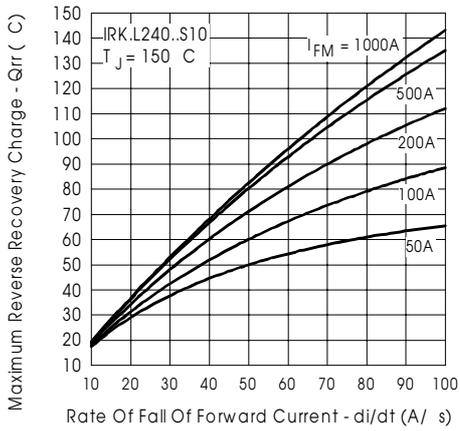


Fig.15-ReverseRecoveryChargeCharacteristics

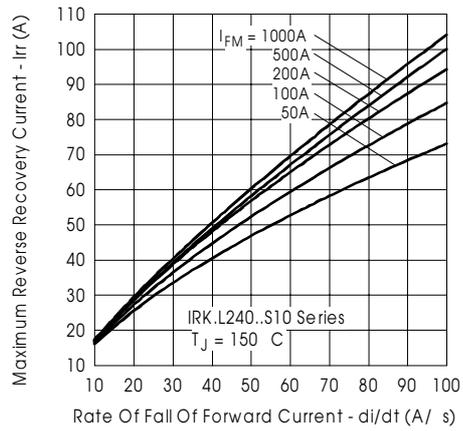


Fig.16-ReverseRecoveryCurrentCharacteristics

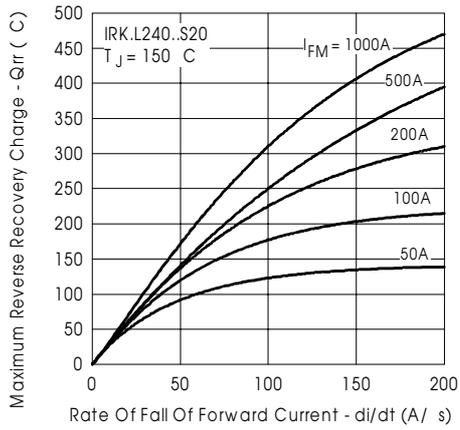


Fig.17-ReverseRecoveryChargeCharacteristics

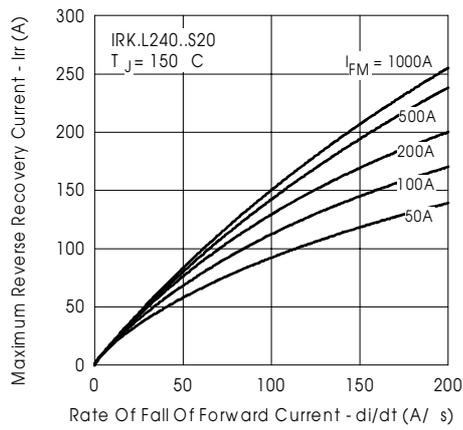


Fig.18-ReverseRecoveryCurrentCharacteristics

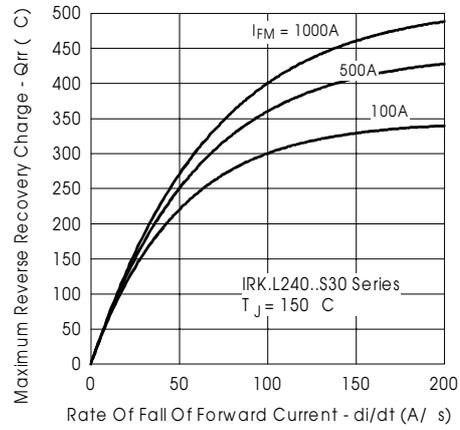


Fig.19-ReverseRecoveryChargeCharacteristics

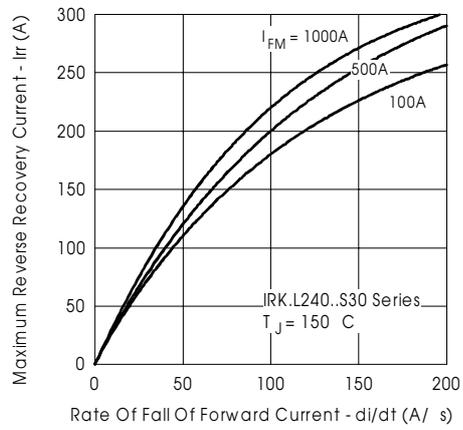


Fig.20-ReverseRecoveryCurrentCharacteristics

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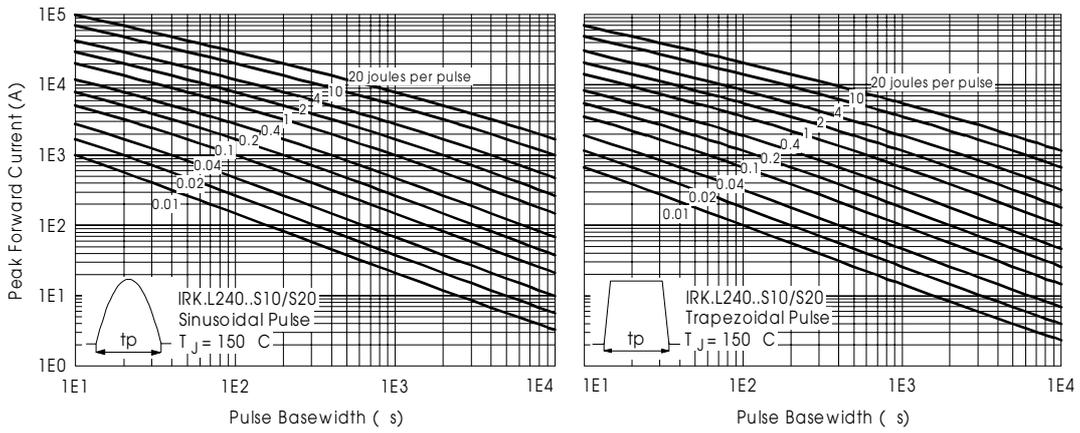


Fig.21-MaximumForwardEnergyPowerLossCharacteristics

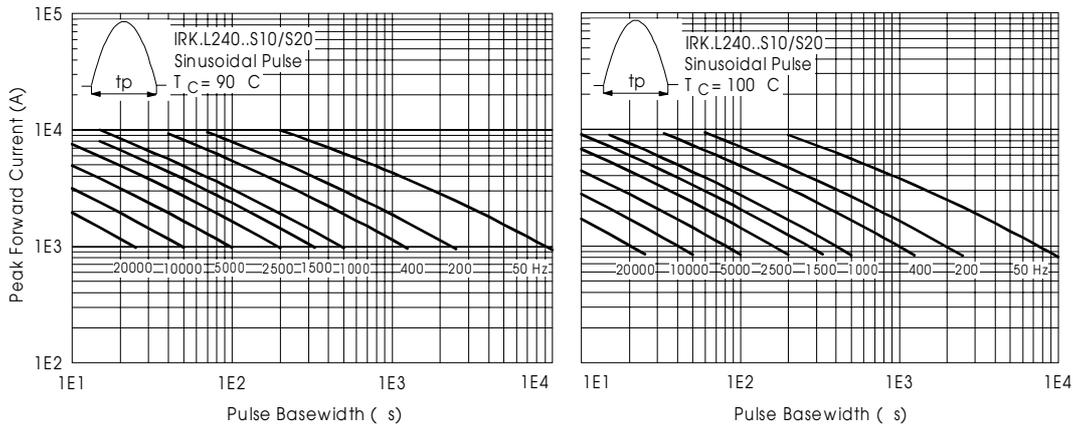


Fig. 22 - Frequency Characteristics

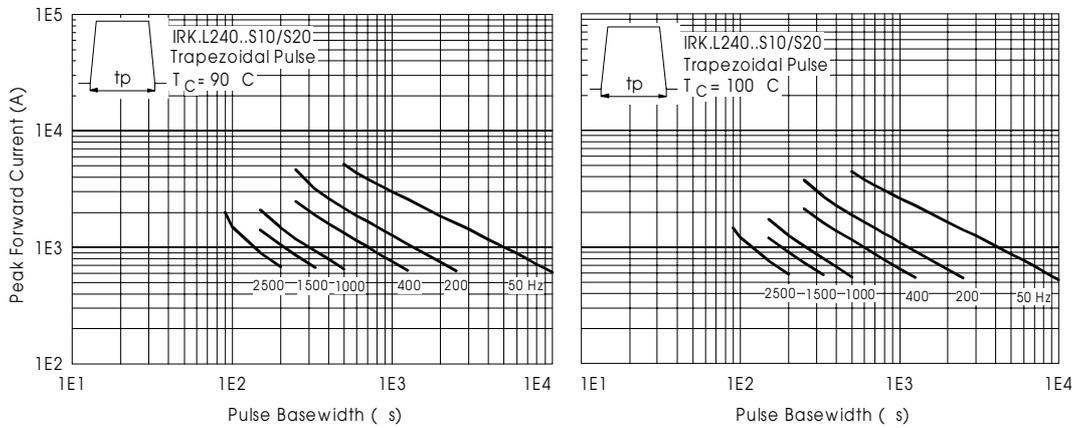


Fig. 23 - Frequency Characteristics

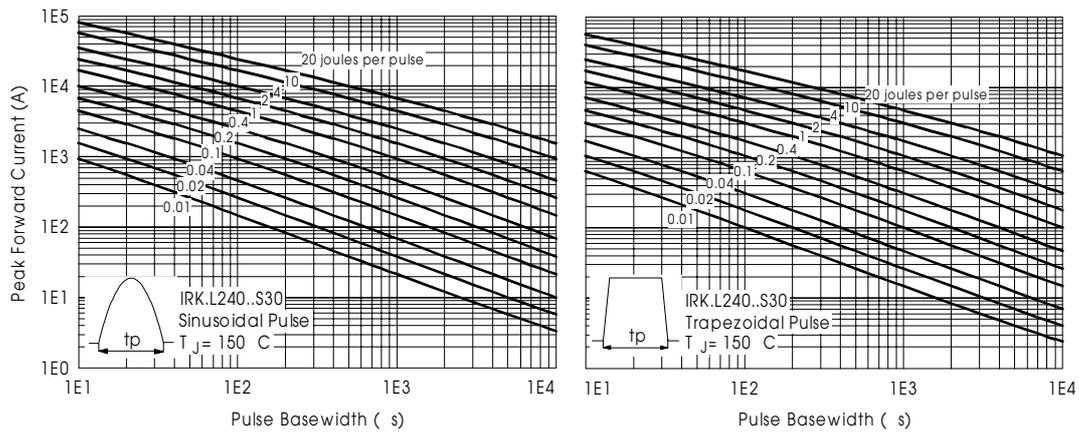


Fig. 24 - Maximum Forward Energy Power Loss Characteristics

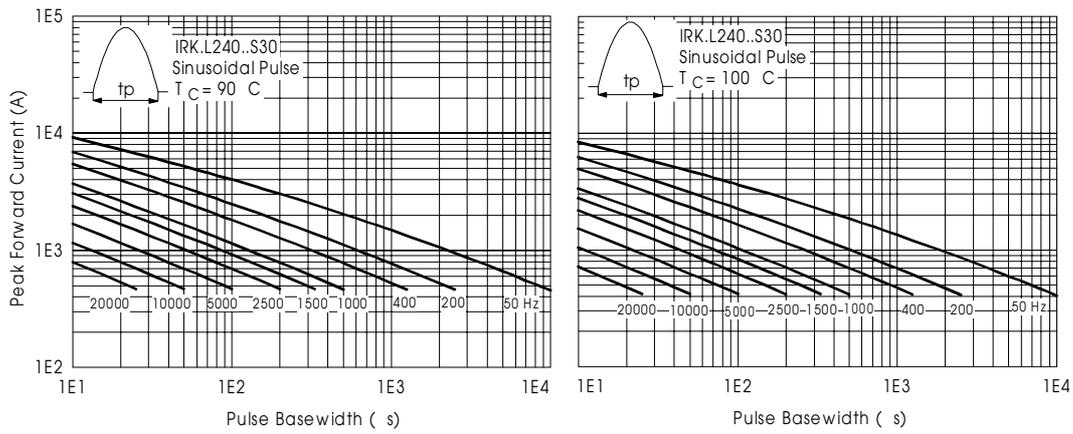


Fig.25-FrequencyCharacteristics

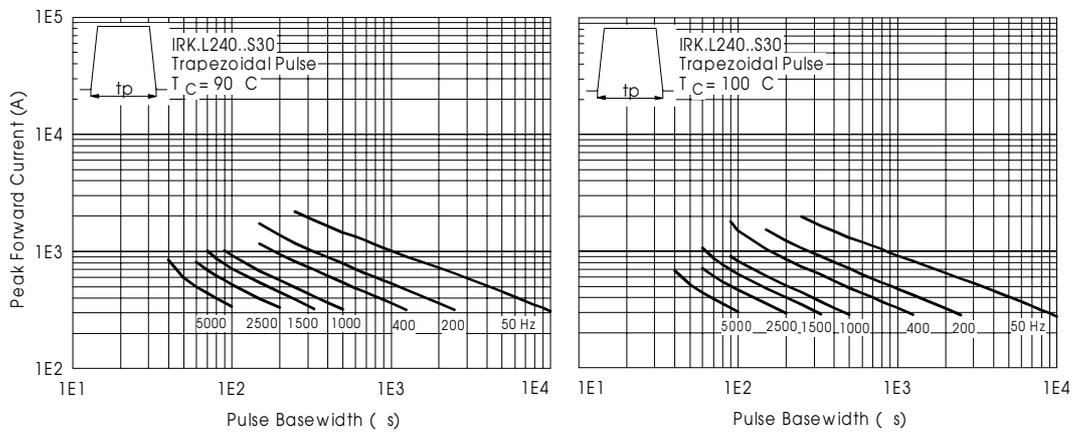


Fig.26-FrequencyCharacteristics

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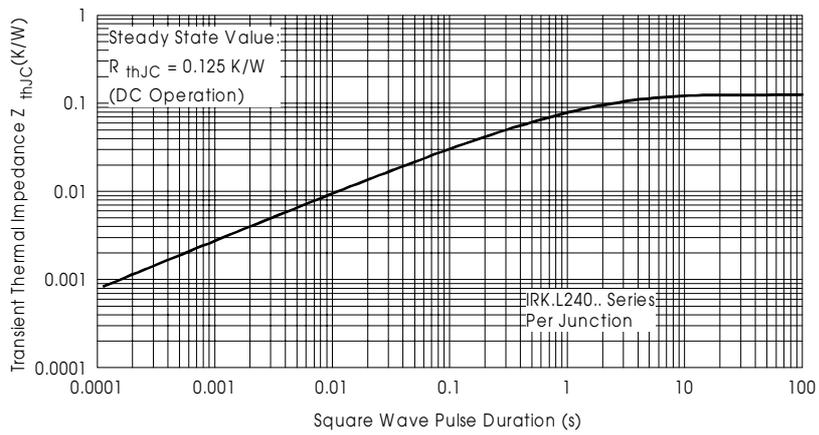


Fig. 27 - Thermal Impedance Z_{thJC} Characteristics