

## STANDARD RECOVERY DIODES, 60A (ADD-A-PAK Power Modules)

### DESCRIPTION:



The ALPKD55XXA is Standard Recovery Diodes, 60A (ADD-A-PAK Power Modules) used for Excellent thermal performances obtained by the usage of exposed direct bonded copper substrate. Up to 1600V



### PRODUCT SUMMARY

|             |                             |
|-------------|-----------------------------|
| $I_{F(AV)}$ | 60A                         |
| Type        | Modules-Diode, High Voltage |

### FEATURES:

- High voltage
- High surge capability
- 3000 V<sub>RMS</sub> isolating voltage
- Industrial standard package
- Easy mounting on heatsinks
- UL approved file E320098
- Glass passivated chips
- Low thermal resistance
- Designed and qualified for industrial level
- Compliant to RoHs

### APPLICATIONS:

- These modules are intended for general purpose high voltage applications such as
- High voltage regulated power supplies
  - Lighting circuits
  - Temperature and motor speed control circuits
  - UPS and battery charger

### MECHANICAL CHARACTERISTICS

- The new generation of ADD-A-PAK module.
- Combines the excellent thermal performances obtained by the usage of exposed direct bonded copper substrate with advanced compact simple package solution and simplified internal structure with minimized number of interfaces.

### ORDERING PART NUMBER

| PART NUMBER | ORDERING PART NUMBER |
|-------------|----------------------|
| ALPKD55XXA  | ALPKD55XXA-N         |

**TYPICAL DEVICE CHARACTERISTICS**

| MAJOR RATINGS AND CHARACTERISTICS |                           |                  |                              |
|-----------------------------------|---------------------------|------------------|------------------------------|
| SYMBOL                            | CHARACTERISTICS           | VALUE            | UNITS                        |
| $I_{F(AV)}$                       | $T_C = 100^\circ\text{C}$ | 60               | A                            |
| $I_{F(RMS)}$                      |                           | 94               | A                            |
| $I_{FSM}$                         | 50 HZ                     | 1300             | A                            |
|                                   | 60 HZ                     | 1360             |                              |
| $I^2t$                            | 50 HZ                     | 8.45             | $\text{kA}^2\text{s}$        |
|                                   | 60 HZ                     | 7.68             |                              |
| $I^2\sqrt{t}$                     |                           | 84.5             | $\text{kA}^2\sqrt{\text{s}}$ |
| $V_{RRM}$                         | Range                     | 400 to 1600      | V                            |
| $T_J$                             |                           | -40 to $\pm 150$ | $^\circ\text{C}$             |
| $T_{STG}$                         |                           | -40 to $\pm 150$ | $^\circ\text{C}$             |

| VOLTAGE RATINGS |         |                                                             |                                                                 |                                                           |
|-----------------|---------|-------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------|
| PART NUMBER     | VOLTAGE | $V_{RRM}$ , MAXIMUM REPETITIVE<br>PEAK REVERSE VOLTAGE<br>V | $V_{RSM}$ , MAXIMUM NON-REPETITIVE<br>PEAK REVERSE VOLTAGE<br>V | $I_{RRM}$ , MAXIMUM<br>AT $T_J = 150^\circ\text{C}$<br>mA |
| ALPKD5504A      | 04      | 400                                                         | 500                                                             | 8                                                         |
| ALPKD5508A      | 08      | 800                                                         | 900                                                             |                                                           |
| ALPKD5512A      | 12      | 1200                                                        | 1300                                                            |                                                           |
| ALPKD5514A      | 14      | 1400                                                        | 1500                                                            |                                                           |
| ALPKD5516A      | 16      | 1600                                                        | 1700                                                            |                                                           |

**FORWARD CONDUCTION**

| PARAMETER                                                     | TEST CONDITIONS                                                                                         |                                  |                                                                       | SYMBOL              | VALUES | UNITS              |  |
|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------------------------------------------|---------------------|--------|--------------------|--|
| Maximum average forward current at case temperature           | 180° conduction, half sine wave                                                                         |                                  |                                                                       | I <sub>F(AV)</sub>  | 60     | A                  |  |
|                                                               |                                                                                                         |                                  |                                                                       |                     | 100    | °C                 |  |
| Maximum RMS forward current                                   | DC at 100°C case temperature                                                                            |                                  |                                                                       | I <sub>F(RMS)</sub> | 94     | A                  |  |
| Maximum peak, one-cycle forward, non-repetitive surge current | t = 10ms                                                                                                | No voltage reappplied            | Sinusoidal half wave, initial T <sub>J</sub> = T <sub>J</sub> maximum | I <sub>FSM</sub>    | 1300   | A                  |  |
|                                                               | t = 8.3ms                                                                                               |                                  |                                                                       |                     | 1360   |                    |  |
|                                                               | t = 10ms                                                                                                | 100% V <sub>RRM</sub> reappplied |                                                                       |                     | 1094   |                    |  |
|                                                               | t = 8.3ms                                                                                               |                                  |                                                                       |                     | 1146   |                    |  |
| Maximum I <sup>2</sup> t for fusing                           | t = 10ms                                                                                                | No voltage reappplied            |                                                                       | I <sup>2</sup> t    | 8.45   | kA <sup>2</sup> s  |  |
|                                                               | t = 8.3ms                                                                                               |                                  |                                                                       |                     | 7.68   |                    |  |
|                                                               | t = 10ms                                                                                                | 100% V <sub>RRM</sub> reappplied |                                                                       |                     | 5.98   |                    |  |
|                                                               | t = 8.3ms                                                                                               |                                  |                                                                       |                     | 5.45   |                    |  |
| Maximum I <sup>2</sup> √t for fusing                          | t = 0.1 to 10 ms, no voltage reappplied                                                                 |                                  |                                                                       | I2√t                | 84.5   | kA <sup>2</sup> √s |  |
| Low level value of threshold voltage                          | (16.7% x π x I <sub>F(AV)</sub> < I < π x I <sub>F(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum |                                  |                                                                       | V <sub>F(TO)1</sub> | 0.74   | V                  |  |
| High level value of threshold voltage                         | (I > π x I <sub>F(AV)</sub> ), T <sub>J</sub> =T <sub>J</sub> maximum                                   |                                  |                                                                       | V <sub>F(TO)2</sub> | 0.86   | V                  |  |
| Low level value of forward slope resistance                   | (16.7% x π x I <sub>F(AV)</sub> < I < π x I <sub>F(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> maximum |                                  |                                                                       | r <sub>f1</sub>     | 3.90   | mΩ                 |  |
| High level value of forward slope resistance                  | (I > π x I <sub>F(AV)</sub> ), T <sub>J</sub> =T <sub>J</sub> maximum                                   |                                  |                                                                       | r <sub>f2</sub>     | 3.40   | mΩ                 |  |
| Maximum forward voltage drop                                  | I <sub>FM</sub> = 165A, T <sub>J</sub> = 25°C, t <sub>p</sub> = 400 μs square wave                      |                                  |                                                                       | V <sub>FM</sub>     | 1.35   | V                  |  |

**BLOCKING**

| PARAMETER                            | TEST CONDITIONS     | SYMBOL    | VALUES                     | UNITS |
|--------------------------------------|---------------------|-----------|----------------------------|-------|
| Maximum peak reverse leakage current | $T_J = 150^\circ C$ | $I_{RRM}$ | 8                          | mA    |
| Maximum RMS insulation Voltage       | 50 Hz               | $V_{INS}$ | 3000 (1 min)<br>3600 (1 s) | V     |

**THERMAL AND MECHANICAL SPECIFICATIONS**

| PARAMETER                                                     |                 | TEST CONDITIONS                                                                                                                          | SYMBOL         | VALUES               | UNITS |
|---------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------|-------|
| Junction and storage temperature range                        |                 |                                                                                                                                          | $T_J, T_{stg}$ | -40 to 150           | °C    |
| Maximum internal thermal resistance, junction to case per leg |                 | DC operation                                                                                                                             | $R_{thJC}$     | 0.33                 | °C/W  |
| Typical thermal resistance, case to heatsink per module       |                 | Mounting surface flat, Smooth, and greased                                                                                               | $R_{thCS}$     | 0.1                  | °C/W  |
| Mounting force, $\pm 10\%$                                    | to heatsink, M6 | A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow for the spread of the compound. |                | 4                    | Nm    |
|                                                               | busbar, M5      |                                                                                                                                          |                | 3                    |       |
| Approximate weight                                            |                 |                                                                                                                                          |                | 115                  | g     |
|                                                               |                 |                                                                                                                                          |                | 4.06                 | oz.   |
| Case style                                                    |                 | JEDEC                                                                                                                                    |                | ADD-A-PAK (TO-240AA) |       |

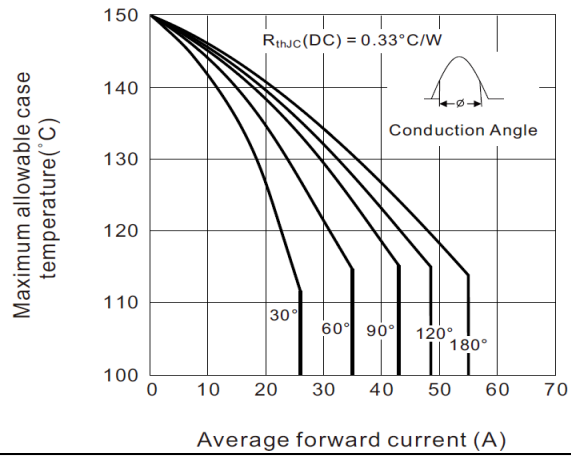
 **$\Delta R_{thJC}$  CONDUCTION**

| DEVICE     | SINE HALF WAVE CONDUCTION |       |       |       |       | RECTANGULAR WAVE CONDUCTION |       |       |       |       | UNITS |
|------------|---------------------------|-------|-------|-------|-------|-----------------------------|-------|-------|-------|-------|-------|
|            | 180°                      | 120°  | 90°   | 60°   | 30°   | 180°                        | 120°  | 90°   | 60°   | 30°   |       |
| ALPKD55XXA | 0.115                     | 0.136 | 0.173 | 0.236 | 0.346 | 0.09                        | 0.145 | 0.185 | 0.243 | 0.349 | °C/W  |

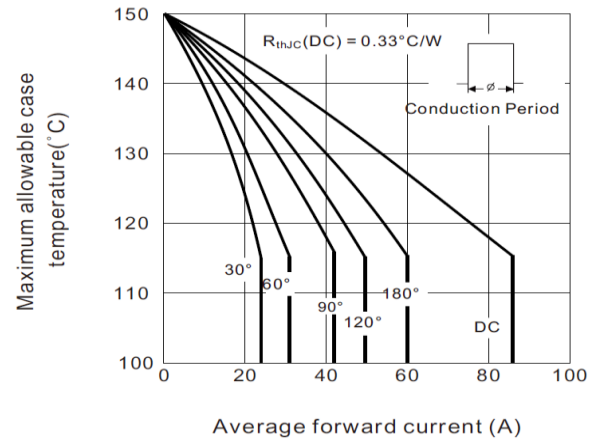
**Note:**

- Table shows the increment of thermal resistance  $R_{thJC}$  when devices operate at different conduction angles than DC

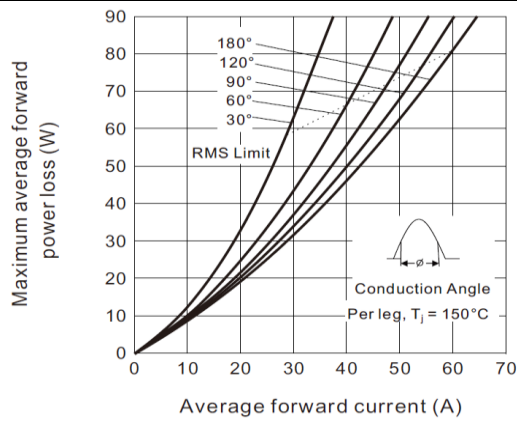
## TYPICAL DEVICE CHARACTERISTICS CURVES



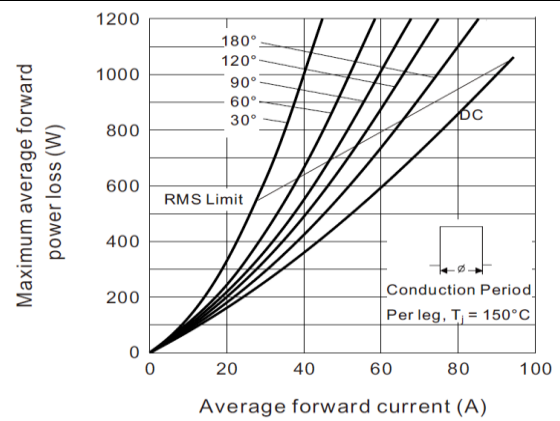
**Fig.1 Current ratings characteristics**



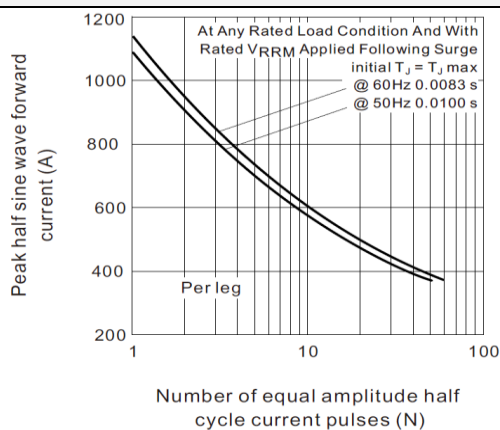
**Fig.2 Current ratings characteristics**



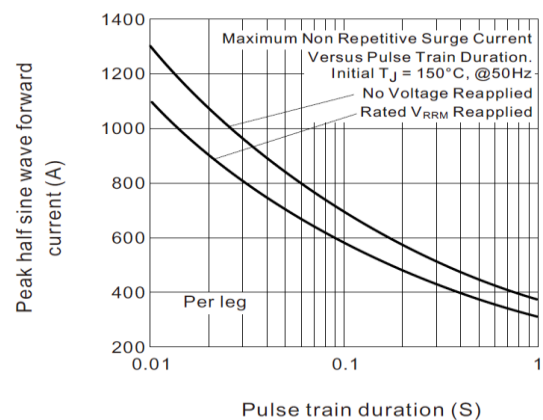
**Fig.3 Forward power loss characteristics**



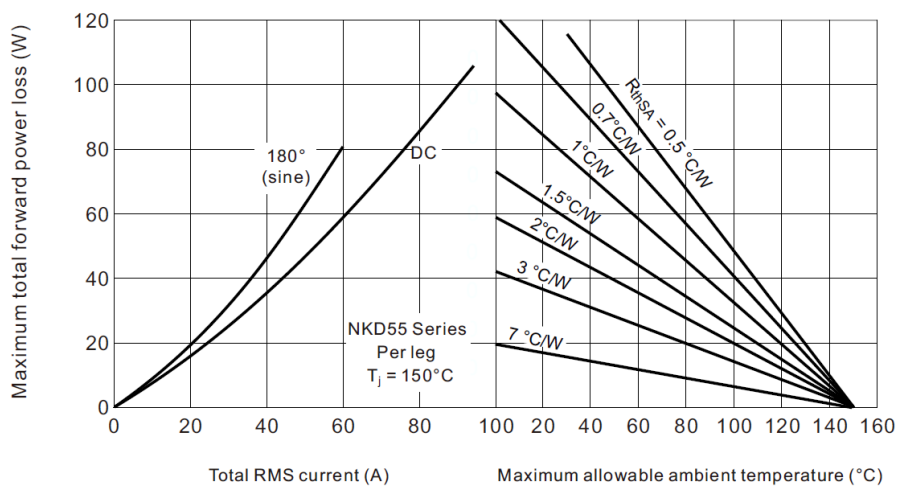
**Fig.4 Forward power loss characteristics**



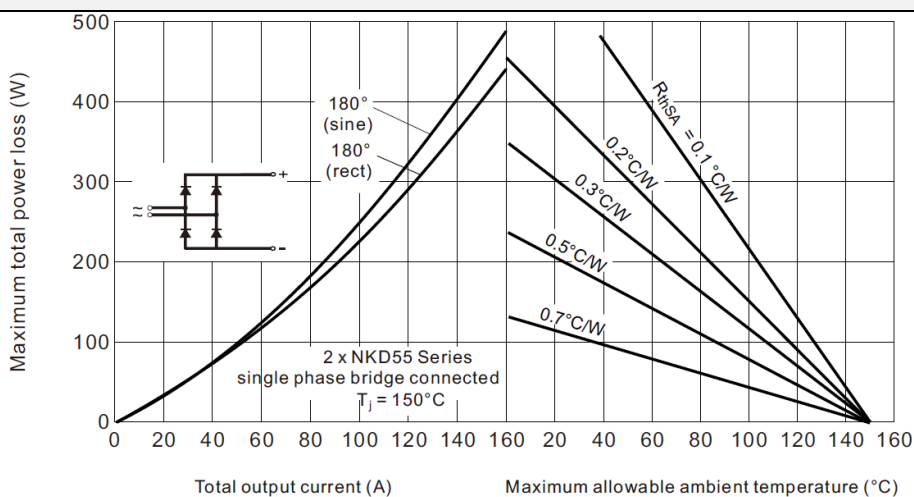
**Fig.5 Maximum non-repetitive surge current**



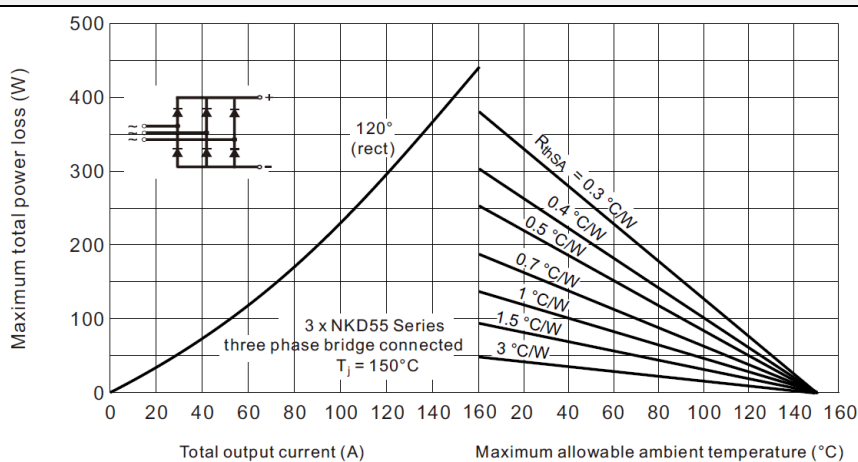
**Fig.6 Maximum non-repetitive surge current**



**Fig.7 Forward power loss characteristics**



**Fig.8 Forward power loss characteristics**



**Fig.9 Forward power loss characteristics**

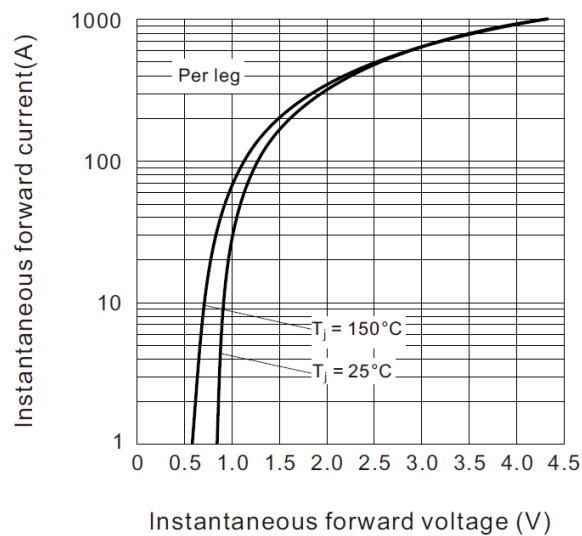


Fig.10 Forward voltage characteristics

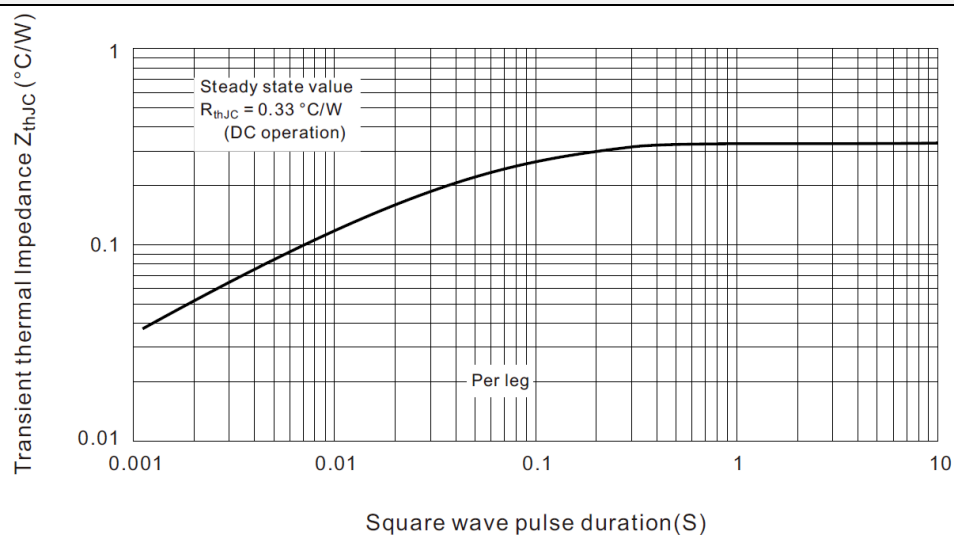


Fig.11 Thermal impedance  $Z_{thJC}$  characteristics

## PINNING INFORMATION

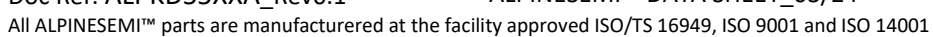
### SIMPLIFIED OUTLINE

### SYMBOL

#### ADD-A-PAK



All dimensions in millimeters





*beyond boundaries...*

**ALPKD55XXA**

**ADD-A-PAK**

## CUSTOMER NOTE:

### DISCLAIMER

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2. In Europe, please dispose as per EU Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE).



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