



# JL3T550V120RE3E7SN

LE3 Pack Module with NCE Gen.7 Trench/Fieldstop IGBT and Emitter Controlled diode and NTC

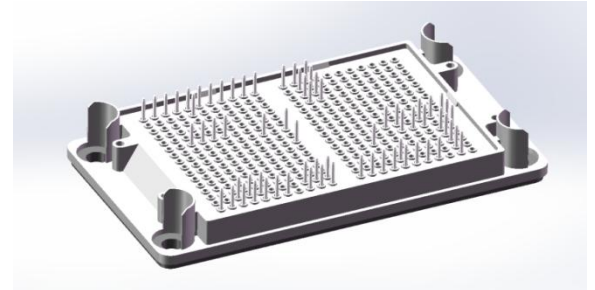


## Features

- Neutral Point Clamped Three-Level Inverter Module
- Low Inductive Layout
- Solderable Pins

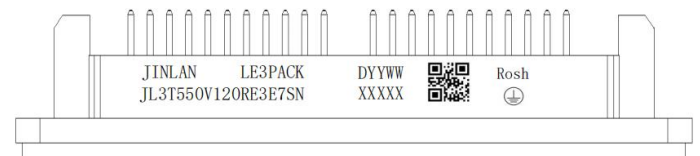
## Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Low Conduction Losses Over Temperature



LE3 Pack

## MARKING DIAGRAM



## Typical Applications

- Solar Inverters
- 3-level-applications Converters
- UPS Systems

JINLAN

JL3T550V120RE3E7SN

YYWW

XXXXX

QR code

= Company Name

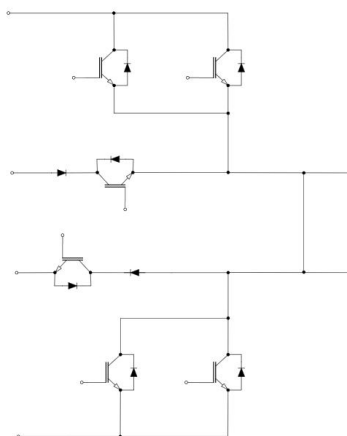
= Specific Device Code

= Year and Work Week Code

= Serial Number

= Custom Assembly Information

## Description





Package Insulation coordination

| Parameter                               | Symbol             | Note or test condition | Values | Unit |
|-----------------------------------------|--------------------|------------------------|--------|------|
| Isolation test voltage                  | V <sub>ISOL</sub>  | RMS,f=50Hz,t=60s       | 2.5    | kV   |
| Creepage distance                       | d <sub>creep</sub> | terminal to heatsink   | > 12   | mm   |
| Clearance                               | d <sub>clear</sub> | terminal to heatsink   | > 11   | mm   |
| Comparative tracking index (electrical) | CTI                |                        | ≥500   |      |

Package Characteristic values

| Parameter                           | Symbol           | Note or test condition                        |           | Values |      |      | Unit |
|-------------------------------------|------------------|-----------------------------------------------|-----------|--------|------|------|------|
|                                     |                  |                                               |           | Min.   | Typ. | Max. |      |
| Stray Inductance                    | L <sub>CE</sub>  |                                               |           | -      | 15   | -    | nH   |
| Mounting torque for module mounting | M                | -Mounting according to valid application note | M5, Screw | 3      |      | 5    | Nm   |
| Storage Temperature Range           | T <sub>STG</sub> |                                               |           | -40    |      | 125  | °C   |
| Flatness of base plate              |                  |                                               |           |        |      | 0.3  | mm   |



## IGBT(Q1,Q4)

### Absolute Maximum Ratings (T<sub>c</sub> = 25°C unless otherwise noted)

| Symbol           | Description                                           | Value | Unit |
|------------------|-------------------------------------------------------|-------|------|
| V <sub>CES</sub> | Collector-Emitter Voltage                             | 1200  | V    |
| V <sub>GES</sub> | Gate-Emitter Voltage                                  | ± 20  | V    |
| I <sub>C</sub>   | Continuous Collector Current @ T <sub>J</sub> = 150°C | 550   | A    |
| I <sub>CP</sub>  | Pulsed Collector Current @ T <sub>J</sub> = 150°C     | 1100  | A    |

### Characteristics (T<sub>c</sub> = 25°C unless otherwise noted)

| Symbol               | Parameter                              | Test Condition                                                                                                                                              | Min                    | Typ   | Max               | Unit |
|----------------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------|-------------------|------|
| V <sub>CE(sat)</sub> | Collector-Emitter Saturation Voltage   | V <sub>GE</sub> = 15 V, I <sub>C</sub> = 550 A                                                                                                              | T <sub>J</sub> = 25°C  | --    | 1.80              | V    |
|                      |                                        |                                                                                                                                                             | T <sub>J</sub> = 150°C | --    | 2.10              |      |
| V <sub>GE(TH)</sub>  | Gate-Emitter Threshold Voltage         | V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 9 mA                                                                                                   | --                     | 5.25  | --                | V    |
| I <sub>CES</sub>     | Collector-Emitter Cutoff Current       | V <sub>GE</sub> = 0 V, V <sub>CE</sub> = 1200 V                                                                                                             | --                     | --    | 150               | μA   |
| I <sub>GES</sub>     | Gate Leakage Current                   | V <sub>GE</sub> = 20 V, V <sub>CE</sub> = 0 V                                                                                                               | --                     | --    | 100               | nA   |
| Q <sub>g</sub>       | Total Gate Charge                      | V <sub>CE</sub> = 600 V, V <sub>GE</sub> = ± 15 V                                                                                                           | --                     | 2.21  | --                | μC   |
| C <sub>iss</sub>     | Input Capacitance                      | V <sub>CE</sub> = 30 V, V <sub>GE</sub> = 0 V, f = 100 kHz                                                                                                  | --                     | 64.2  | --                | nF   |
| C <sub>rss</sub>     | Reverse Transfer Capacitance           |                                                                                                                                                             | --                     | 0.32  | --                | nF   |
| t <sub>d(on)</sub>   | Turn-On Delay Time (inductive load)    | T <sub>J</sub> = 25°C<br>V <sub>CE</sub> = 600V, I <sub>C</sub> = 300A<br>V <sub>GE</sub> = -7 V to +15 V, R <sub>Gon</sub> = 2Ω,<br>R <sub>Goff</sub> = 2Ω | --                     | 97    | --                | ns   |
| t <sub>r</sub>       | Rise Time (inductive load)             |                                                                                                                                                             | --                     | 22    | --                |      |
| t <sub>d(off)</sub>  | Turn-off Delay Time (inductive load)   |                                                                                                                                                             | --                     | 135   | --                |      |
| t <sub>f</sub>       | Fall Time (inductive load)             |                                                                                                                                                             | --                     | 20    | --                |      |
| E <sub>on</sub>      | Turn-On Switching Loss per Pulse       |                                                                                                                                                             | --                     | 9.76  | --                | mJ   |
| E <sub>off</sub>     | Turn Off Switching Loss per Pulse      |                                                                                                                                                             | --                     | 13.17 | --                |      |
| t <sub>d(on)</sub>   | Turn-On Delay Time                     | T <sub>J</sub> = 25°C<br>V <sub>CE</sub> = 600V, I <sub>C</sub> = 300A<br>V <sub>GE</sub> = -7 V to +15 V, R <sub>Gon</sub> = 2Ω,<br>R <sub>Goff</sub> = 2Ω | --                     | 107   | --                | ns   |
| t <sub>r</sub>       | Rise Time                              |                                                                                                                                                             | --                     | 35    | --                |      |
| t <sub>d(off)</sub>  | Turn-off Delay Time                    |                                                                                                                                                             | --                     | 165   | --                |      |
| t <sub>f</sub>       | Fall Time                              |                                                                                                                                                             | --                     | 47    | --                |      |
| E <sub>on</sub>      | Turn-on Switching Loss per Pulse       |                                                                                                                                                             | --                     | 19.5  | --                | mJ   |
| E <sub>off</sub>     | Turn Off Switching Loss per Pulse      |                                                                                                                                                             | --                     | 21.3  | --                |      |
| C <sub>iss</sub>     | Input Capacitance                      | V <sub>CE</sub> = 30 V, V <sub>GE</sub> = 0 V, f = 100 kHz                                                                                                  | --                     | 64.2  | --                | nF   |
| C <sub>rss</sub>     | Reverse Transfer Capacitance           |                                                                                                                                                             | --                     | 0.32  | --                |      |
| R <sub>thJC</sub>    | Thermal Resistance – Chip-to-Case      | Junction-to-Case (per diode)                                                                                                                                | --                     | 0.053 | --                | °C/W |
| T <sub>vj op</sub>   | Temperature under switching conditions |                                                                                                                                                             | -40                    | --    | 175 <sup>1)</sup> | °C   |

<sup>1)</sup>T<sub>vj op</sub> > 150°C is only allowed for operation at overload conditions. For detailed specifications please refer to AN 2018-14.



## Diode (D1, D4)

### Absolute Maximum Ratings (T<sub>c</sub> = 25°C unless otherwise noted)

| Symbol           | Description                                             | Value | Unit |
|------------------|---------------------------------------------------------|-------|------|
| V <sub>RRM</sub> | Peak Repetitive Reverse Voltage                         | 1200  | V    |
| I <sub>F</sub>   | Continuous Forward Current @T <sub>J</sub> = 150°C      | 400   | A    |
| I <sub>FRM</sub> | Repetitive Peak Forward Current @T <sub>J</sub> = 150°C | 800   | A    |

### Characteristics (T<sub>c</sub>=25°C unless otherwise noted)

| Symbol             | Parameter                              | Test Condition                                                                                                                                               | Min | Typ    | Max               | Unit |
|--------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|--------|-------------------|------|
| V <sub>F</sub>     | Diode Forward Voltage                  | I <sub>F</sub> = 400 A                                                                                                                                       |     |        |                   | V    |
|                    |                                        |                                                                                                                                                              |     |        |                   |      |
|                    |                                        | T <sub>J</sub> = 25°C                                                                                                                                        | --  | 1.50   | --                |      |
|                    |                                        | T <sub>J</sub> = 150°C                                                                                                                                       | --  | 1.40   | --                |      |
| Q <sub>rr</sub>    | Reverse Recovery Charge                | T <sub>J</sub> = 25°C<br>V <sub>CE</sub> = 600V, I <sub>C</sub> = 300A<br>V <sub>GE</sub> = -7 V to +15 V, R <sub>Gon</sub> = 2Ω,<br>R <sub>Goff</sub> = 2Ω  | --  | 1.9    | --                | μC   |
| I <sub>RRM</sub>   | Peak Reverse Recovery Current          |                                                                                                                                                              | --  | 24.775 | --                | A    |
| E <sub>REC</sub>   | Reverse Recovery Energy                |                                                                                                                                                              | --  | 1.755  | --                | mJ   |
| Q <sub>rr</sub>    | Reverse Recovery Charge                | T <sub>J</sub> = 150°C<br>V <sub>CE</sub> = 600V, I <sub>C</sub> = 300A<br>V <sub>GE</sub> = -7 V to +15 V, R <sub>Gon</sub> = 2Ω,<br>R <sub>Goff</sub> = 2Ω | --  | 5.91   | --                | μC   |
| I <sub>RRM</sub>   | Peak Reverse Recovery Current          |                                                                                                                                                              | --  | 35.45  | --                | A    |
| E <sub>REC</sub>   | Reverse Recovery Energy                |                                                                                                                                                              | --  | 4.345  | --                | mJ   |
| R <sub>thJC</sub>  | Thermal Resistance – Chip-to-Case      | Junction-to-Case (per diode)                                                                                                                                 | --  | 0.083  | --                | °C/W |
| T <sub>vj op</sub> | Temperature under switching conditions |                                                                                                                                                              | -40 | --     | 175 <sup>2)</sup> | °C   |

<sup>2)</sup>T<sub>vj op</sub> > 150°C is only allowed for operation at overload conditions. For detailed specifications please refer to AN 2018-14.



## IGBT(Q2,Q3)

### Absolute Maximum Ratings (T<sub>c</sub> = 25°C unless otherwise noted)

| Symbol           | Description                                           | Value | Unit |
|------------------|-------------------------------------------------------|-------|------|
| V <sub>CES</sub> | Collector-Emitter Voltage                             | 750   | V    |
| V <sub>GES</sub> | Gate-Emitter Voltage                                  | ±20   | V    |
| I <sub>C</sub>   | Continuous Collector Current @ T <sub>J</sub> = 150°C | 400   | A    |
| I <sub>CP</sub>  | Pulsed Collector Current @ T <sub>J</sub> = 150°C     | 800   | A    |

### Characteristics (T<sub>c</sub> = 25°C unless otherwise noted)

| Symbol               | Parameter                              | Test Condition                                                                                                                                            |                        | Min | Typ   | Max               | Unit |
|----------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----|-------|-------------------|------|
| V <sub>CE(sat)</sub> | Collector–Emitter Saturation Voltage   | V <sub>GE</sub> = 15 V, I <sub>C</sub> =400 A                                                                                                             | T <sub>J</sub> = 25°C  | --  | 1.55  | 2.00              | V    |
|                      |                                        |                                                                                                                                                           | T <sub>J</sub> = 150°C | --  | 1.85  | --                |      |
| V <sub>GE(TH)</sub>  | Gate–Emitter Threshold Voltage         | V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> =5 mA                                                                                                  |                        | --  | 5.25  | --                | V    |
| I <sub>CES</sub>     | Collector–Emitter Cutoff Current       | V <sub>GE</sub> = 0 V, V <sub>CE</sub> = 750 V                                                                                                            |                        | --  | --    | 100               | μA   |
| I <sub>GES</sub>     | Gate Leakage Current                   | V <sub>GE</sub> = 20 V, V <sub>CE</sub> = 0 V                                                                                                             |                        | --  | --    | 100               | nA   |
| Q <sub>g</sub>       | Total Gate Charge                      | V <sub>CE</sub> = 600 V, V <sub>GE</sub> = ± 15 V                                                                                                         |                        | --  | 0.775 | --                | μC   |
| C <sub>iss</sub>     | Input Capacitance                      | V <sub>CE</sub> = 30 V, V <sub>GE</sub> = 0 V, f = 100 kHz                                                                                                |                        | --  | 23.65 | --                | nF   |
| C <sub>oss</sub>     | Output Capacitance                     |                                                                                                                                                           |                        | --  | 0.785 | --                |      |
| C <sub>rss</sub>     | Reverse Transfer Capacitance           |                                                                                                                                                           |                        | --  | 0.145 | --                |      |
| t <sub>d(on)</sub>   | Turn–On Delay Time                     | V <sub>CE</sub> =400V, I <sub>C</sub> =300A<br>V <sub>GE</sub> = -7 V to +15 V, R <sub>Gon</sub> = 2Ω,<br>R <sub>Goff</sub> =2Ω<br>T <sub>J</sub> = 25°C  |                        | --  | 62    | --                | ns   |
| t <sub>r</sub>       | Rise Time                              |                                                                                                                                                           |                        | --  | 25    | --                |      |
| t <sub>d(off)</sub>  | Turn–off Delay Time                    |                                                                                                                                                           |                        | --  | 250   | --                |      |
| t <sub>f</sub>       | Fall Time                              |                                                                                                                                                           |                        | --  | 38    | --                |      |
| E <sub>on</sub>      | Turn–On Switching Loss per Pulse       |                                                                                                                                                           |                        | --  | 2.50  | --                | mJ   |
| E <sub>off</sub>     | Turn Off Switching Loss per Pulse      |                                                                                                                                                           |                        | --  | 1.12  | --                |      |
| t <sub>d(on)</sub>   | Turn–On Delay Time                     | V <sub>CE</sub> =400V, I <sub>C</sub> =300A<br>V <sub>GE</sub> = -7 V to +15 V, R <sub>Gon</sub> = 2Ω,<br>R <sub>Goff</sub> =2Ω<br>T <sub>J</sub> = 150°C |                        | --  | TBD   | --                | ns   |
| t <sub>r</sub>       | Rise Time                              |                                                                                                                                                           |                        | --  | TBD   | --                |      |
| t <sub>d(off)</sub>  | Turn–off Delay Time                    |                                                                                                                                                           |                        | --  | TBD   | --                |      |
| t <sub>f</sub>       | Fall Time                              |                                                                                                                                                           |                        | --  | TBD   | --                |      |
| E <sub>on</sub>      | Turn–on Switching Loss per Pulse       |                                                                                                                                                           |                        |     |       | --                | 3.37 |
| E <sub>off</sub>     | Turn Off Switching Loss per Pulse      |                                                                                                                                                           |                        | --  | 1.75  | --                |      |
| R <sub>thJC</sub>    | Thermal Resistance – Chip–to–Case      | Junction-to-Case (per diode)                                                                                                                              |                        | --  | 0.099 | --                | °C/W |
| T <sub>vj op</sub>   | Temperature under switching conditions |                                                                                                                                                           |                        | -40 | --    | 175 <sup>3)</sup> | °C   |

<sup>3)</sup>T<sub>vj op</sub> > 150°C is only allowed for operation at overload conditions. For detailed specifications please refer to AN 2018-14.



## Diode (D2, D3)

### Absolute Maximum Ratings (T<sub>c</sub> = 25°C unless otherwise noted)

| Symbol           | Description                                             | Value | Unit |
|------------------|---------------------------------------------------------|-------|------|
| V <sub>RRM</sub> | Peak Repetitive Reverse Voltage                         | 750   | V    |
| I <sub>F</sub>   | Continuous Forward Current @T <sub>J</sub> = 150°C      | 100   | A    |
| I <sub>FRM</sub> | Repetitive Peak Forward Current @T <sub>J</sub> = 150°C | 200   | A    |

### Characteristics (T<sub>c</sub>=25°C unless otherwise noted)

| Symbol             | Parameter                              | Test Condition               |                        | Min | Typ   | Max               | Unit |
|--------------------|----------------------------------------|------------------------------|------------------------|-----|-------|-------------------|------|
| V <sub>F</sub>     | Diode Forward Voltage                  | I <sub>F</sub> = 100 A       | T <sub>J</sub> = 25°C  | --  | 1.45  | --                | V    |
|                    |                                        |                              | T <sub>J</sub> = 150°C | --  | 1.35  | --                |      |
| R <sub>thJC</sub>  | Thermal Resistance – Chip-to-Case      | Junction-to-Case (per diode) |                        | --  | 0.357 | --                | °C/W |
| T <sub>vj op</sub> | Temperature under switching conditions |                              |                        | -40 | --    | 175 <sup>4)</sup> | °C   |

<sup>4)</sup>T<sub>vj op</sub> > 150°C is only allowed for operation at overload conditions. For detailed specifications please refer to AN 2018-14



## Diode (D5, D6)

### Absolute Maximum Ratings (T<sub>c</sub> = 25°C unless otherwise noted)

| Symbol           | Description                                                                 | Value | Unit |
|------------------|-----------------------------------------------------------------------------|-------|------|
| V <sub>RRM</sub> | Peak Repetitive Reverse Voltage                                             | 750   | V    |
| I <sub>F</sub>   | Continuous Forward Current @ T <sub>c</sub> = 75°C (T <sub>J</sub> = 150°C) | 500   | A    |
| I <sub>FRM</sub> | Repetitive Peak Forward Current@ T <sub>J</sub> = 150°C                     | 1000  | A    |

### Characteristics (T<sub>c</sub>=25°C unless otherwise noted)

| Symbol             | Parameter                              | Test Condition                                                                                                                                                | Min                    | Typ   | Max               | Unit |
|--------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------|-------------------|------|
| V <sub>F</sub>     | Diode Forward Voltage                  | I <sub>F</sub> = 500 A, V <sub>GE</sub> = 0 V                                                                                                                 | T <sub>J</sub> = 25°C  | --    | 1.50              | V    |
|                    |                                        |                                                                                                                                                               | T <sub>J</sub> = 150°C | --    | 1.40              |      |
| Q <sub>rr</sub>    | Reverse Recovery Charge                | V <sub>CE</sub> = 400 V, I <sub>C</sub> = 300A<br>V <sub>GE</sub> = -7 V to +15 V, R <sub>Gon</sub> = 2Ω,<br>R <sub>Goff</sub> = 0.5Ω, T <sub>J</sub> = 25°C  | --                     | 6.07  | --                | μC   |
| I <sub>RRM</sub>   | Peak Reverse Recovery Current          |                                                                                                                                                               | --                     | 130   | --                | A    |
| E <sub>REC</sub>   | Reverse Recovery Energy                |                                                                                                                                                               | --                     | 1.62  | --                | mJ   |
| Q <sub>rr</sub>    | Reverse Recovery Charge                | V <sub>CE</sub> = 400 V, I <sub>C</sub> = 300A<br>V <sub>GE</sub> = -7 V to +15 V, R <sub>Gon</sub> = 2Ω,<br>R <sub>Goff</sub> = 0.5Ω, T <sub>J</sub> = 175°C | --                     | 13.87 | --                | μC   |
| I <sub>RRM</sub>   | Peak Reverse Recovery Current          |                                                                                                                                                               | --                     | 169   | --                | A    |
| E <sub>REC</sub>   | Reverse Recovery Energy                |                                                                                                                                                               | --                     | 4.42  | --                | mJ   |
| R <sub>thJC</sub>  | Thermal Resistance – Chip-to-Case      | Junction-to-Case (per diode)                                                                                                                                  | --                     | 0.1   | --                | °C/W |
| T <sub>vj op</sub> | Temperature under switching conditions |                                                                                                                                                               | -40                    | --    | 175 <sup>4)</sup> | °C   |

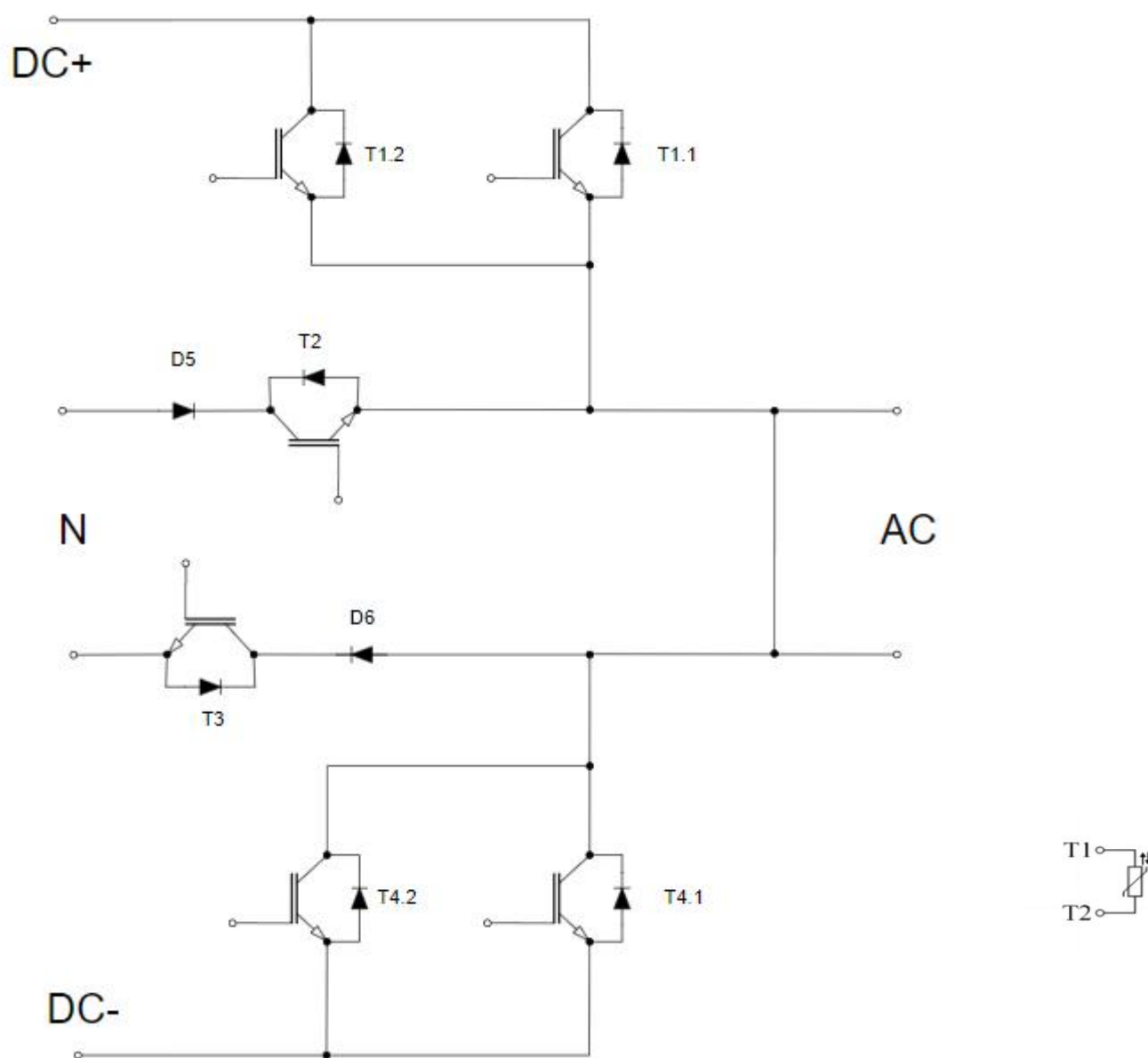
<sup>5)</sup>T<sub>vj op</sub> > 150°C is only allowed for operation at overload conditions. For detailed specifications please refer to AN 2018-14

### NTC Characteristics (T<sub>c</sub> = 25°C unless otherwise noted)

| Symbol              | Parameter         | Test Condition                                                                             | Min | Typ  | Max | Unit |
|---------------------|-------------------|--------------------------------------------------------------------------------------------|-----|------|-----|------|
| R <sub>25</sub>     | Rated Resistance  | T <sub>c</sub> = 25°C                                                                      | --  | 5    | --  | kΩ   |
| ΔR/R                | Deviation of R100 | T <sub>c</sub> = 100 °C, R <sub>100</sub> = 493Ω                                           | -5  | --   | 5   | %    |
| B <sub>25/50</sub>  | B-value           | R <sub>2</sub> = R <sub>25</sub> exp[B <sub>25/50</sub> (1/T <sub>2</sub> - 1/(298.15K))]  | --  | 3375 | --  | K    |
| B <sub>25/100</sub> | B-value           | R <sub>2</sub> = R <sub>25</sub> exp[B <sub>25/100</sub> (1/T <sub>2</sub> - 1/(298.15K))] | --  | 3433 | --  | K    |

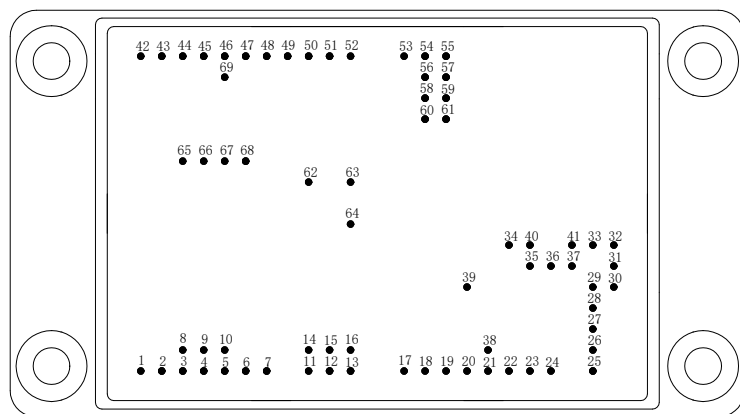
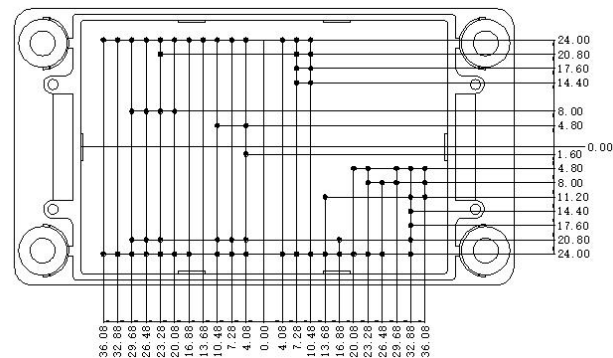
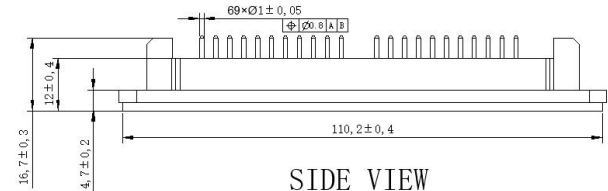
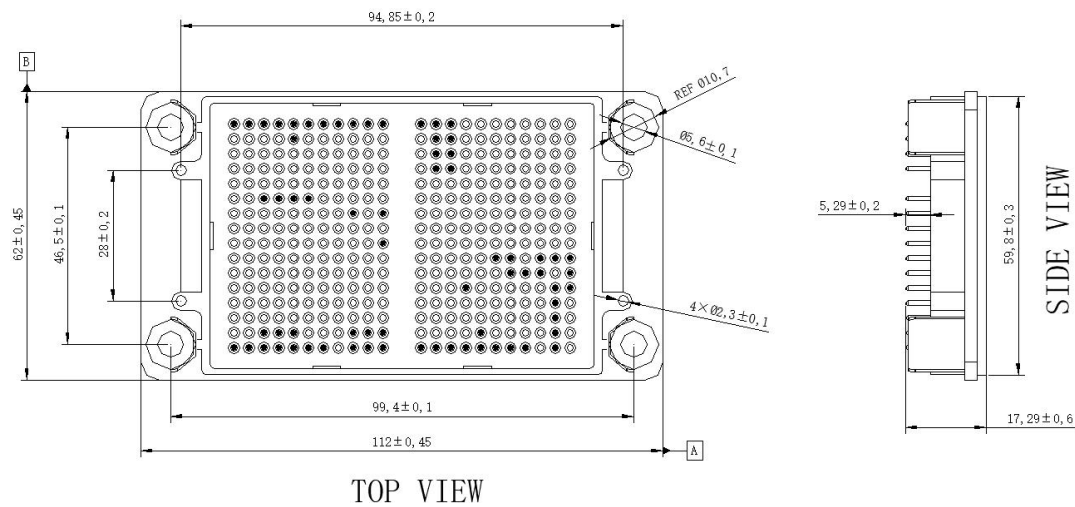


## CIRCUIT DIAGRAM





PACKAGE DIMENSIONS



| PIN   | PIN Definition |
|-------|----------------|
| 1~10  | DC+            |
| 11~24 | N              |
| 25~37 | DC-            |
| 38    | G3             |
| 39    | C3             |
| 40    | G4.2           |
| 41    | G4.1           |
| 42~61 | AC             |
| 62    | C2             |
| 63    | T1             |
| 64    | T2             |
| 65    | E1.2           |
| 66    | G1.2           |
| 67    | G1.1           |
| 68    | E1.1           |
| 69    | G2             |



REVISION HISTORY

| Document version | Date of release | Description of changes |
|------------------|-----------------|------------------------|
| Rev.00           | 2024-9-03       | Preview                |



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