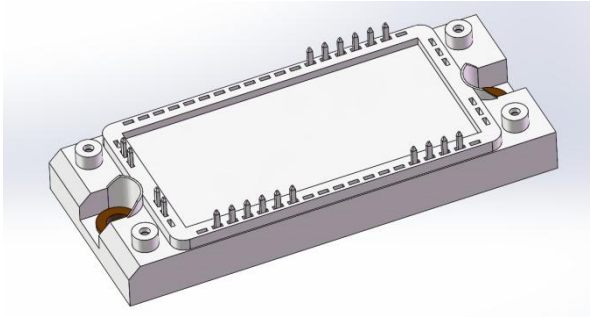
# JLFD400V120RN2E7SN

LN2 PACK module with Trench/Fieldstop IGBT and Emitter Controlled diode and NTC

RoHS

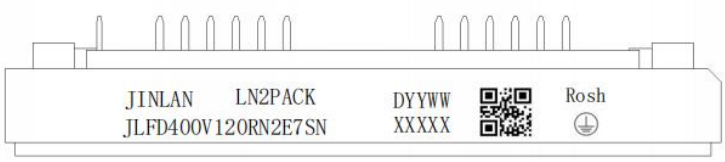
## Features

- Low VCE(sat) Trench IGBT technology
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- High power density
- Integrated temperature sensor available



**LN2 Pack**

## MARKING DIAGRAM

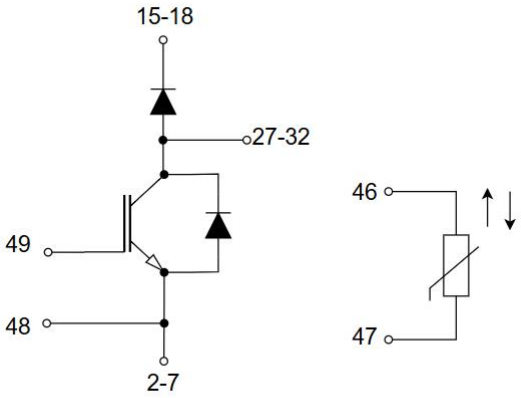



| | |
|---|---|
| JINLAN | = Company Name |
| JLFD400V120RN2E7SN | = Specific Device Code |
| YYWW | = Year and Work Week Code |
| XXXXX | = Serial Number |
| QR code | = Custom Assembly Information |

## Typical Applications

- AC motor drives
- Solar inverter
- Medical equipment
- Uninterruptible power supply
- Air-conditioning systems
- Welding equipment
- Switched-mode and resonant-mode power supplies
- Inductive heating, cookers
- Pumps, Fans

## Description



## Package Insulation coordination

| Parameter | Symbol | Note or test condition | Values | Unit |
|---|---|---|---|---|
| Isolation test voltage | $V_{ISOL}$ | RMS,f=50Hz,t=60s | 2.5 | kV |
| Internal isolation | | basic insulation(class 1,IEC 61140) | $Al_2O_3$ | |
| Creepage distance | $d_{creep}$ | terminal to backside | 12 | mm |
| Creepage distance | $d_{creep}$ | terminal to terminal | 6 | mm |
| Comparative tracking index (electrical) | CTI | | >200 | |
| RTI Elec. | RTI | housing | 140 | ℃ |

## Package Characteristic values

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Stray Inductance | $L_{CE}$ | | -- | 30 | -- | nH |
| Module Lead Resistance, Terminal to Chip | $R_{CC'+EE'}$ | | -- | 2.2 | -- | mΩ |
| Storage Temperature Range | $T_{STG}$ | | -40 | | 125 | ℃ |
| Mounting Torque, Screw M5 | M | | 3 | | 6 | N.m |
| Weight | G | | -- | 176 | -- | g |

# Boost IGBT

## Absolute Maximum Ratings (Tc = 25°C unless otherwise noted)

| Symbol | Description | Value | Unit |
|---|---|---|---|
| $V_{CES}$ | Collector-Emitter Voltage | 1200V | V |
| $V_{GES}$ | Gate-Emitter Voltage | ±30 | V |
| $I_{CDC}$ | Continuous Collector Current @ $T_C$ = 80°C ($T_{JMAX}$ = 175°C) | 400 | A |
| $I_{CM}$ | Pulsed Collector Current，$t_p$ limited by $T_{vj\,max}$ | 800 | A |
| $T_{jmax}$ | Maximum Junction Temperature | 175 | ℃ |

## Characteristics (Tc = 25°C unless otherwise noted)

| Symbol | Parameter | Test Condition | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{CE(sat)}$ | Collector−Emitter Saturation Voltage | $I_C$ =400A, $V_{GE}$ = 15 V | $T_{vj}$ = 25 °C | -- | 1.45 | 1.95 | V |
| | | | $T_{vj}$ = 150 °C | -- | 1.70 | -- | |
| | | | $T_{vj}$ = 175 °C | -- | 1.75 | -- | |
| $V_{GE(TH)}$ | Gate−Emitter Threshold Voltage | $V_{GE}$ = $V_{CE}$, $I_C$ = 5 mA, $T_{vj}$ = 25°C | | 5.0 | 5.8 | 6.5 | V |
| $I_{CES}$ | Collector−Emitter Cutoff Current | $V_{GE}$ = 0 V, $V_{CE}$ =1200V, $T_{vj}$= 25°C | | -- | -- | 100 | uA |
| $I_{GES}$ | Gate-Emitter Leakage Current | $V_{GE}$ = ±30 V, $V_{CE}$ = 0 V, $T_{vj}$ = 25°C | | -- | -- | ±100 | nA |
| $R_{Gint}$ | Internal Gate Resistance | $T_{vj}$ = 25 °C | | -- | 0.67 | -- | Ω |
| $C_{ies}$ | Input Capacitance | f = 100 kHz, $T_{vj}$ = 25 °C, $V_{CE}$ = 25 V, $V_{GE}$ = 0 V | | -- | 68 | -- | nF |
| $C_{oes}$ | Out Capacitance | | | -- | 1.6 | -- | nF |
| $C_{res}$ | Reverse Transfer | | | -- | 0.24 | -- | nF |
| $Q_G$ | Gate Charge | $V_{GE}$ = ±15 V, $V_{CC}$ = 960 V | | -- | 2.2 | -- | μC |
| $t_{d(on)}$ | Turn−On Delay Time | $I_C$ = 400A, $V_{CC}$ = 600 V, $V_{GE}$ = 15 /-5V, $R_G$ = 1.0 Ω | $T_{vj}$ = 25 °C | -- | 0.264 | -- | μS |
| | | | $T_{vj}$ = 150 °C | -- | 0.299 | -- | |
| | | | $T_{vj}$ = 175 °C | -- | 0.303 | -- | |
| $t_r$ | Rise Time | $I_C$ =400A, $V_{CC}$ = 600 V, $V_{GE}$ = 15 /-5V, $R_G$ = 1.0 Ω | $T_{vj}$ = 25 °C | -- | 0.048 | -- | μS |
| | | | $T_{vj}$ = 150 °C | -- | 0.057 | -- | |
| | | | $T_{vj}$ = 175 °C | -- | 0.059 | -- | |
| $t_{d(off)}$ | Turn−off Delay Time | $I_C$ = 400A, $V_{CC}$ = 600 V, $V_{GE}$ = 15 /-5V, $R_{Goff}$ = 1.0 Ω | $T_{vj}$ = 25 °C | -- | 0.536 | -- | μS |
| | | | $T_{vj}$ = 150 °C | -- | 0.611 | -- | |
| | | | $T_{vj}$ = 175 °C | -- | 0.624 | -- | |
| $t_f$ | Fall Time | $I_C$ = 400A, $V_{CC}$ = 600 V, $V_{GE}$ = 15 /-5V, $R_G$ = 1.0 Ω | $T_{vj}$ = 25 °C | -- | 0.065 | -- | μS |
| | | | $T_{vj}$ = 150 °C | -- | 0.146 | -- | |
| | | | $T_{vj}$ = 175 °C | -- | 0.148 | -- | |
| $E_{on}$ | Turn−On Switching Loss per Pulse | $I_C$ =400A, $V_{CC}$ = 600 V, $V_{GE}$ = 15 /-5V, $R_G$ = 1.0 Ω ($T_{vj\,max}$= 175 °C) | $T_{vj}$ = 25 °C | -- | 12.440 | -- | mJ |
| | | | $T_{vj}$ = 150 °C | -- | 24.800 | -- | |
| | | | $T_{vj}$ = 175 °C | -- | 27.600 | -- | |
| $E_{off}$ | Turn Off Switching Loss per Pulse | $I_C$ = 400A, $V_{CC}$ = 600 V, $V_{GE}$ = 15 /-5V, $R_G$ = 1.0 Ω ($T_{vj\,max}$= 175 °C) | $T_{vj}$ = 25 °C | -- | 54.060 | -- | mJ |
| | | | $T_{vj}$ = 150 °C | -- | 72.000 | -- | |
| | | | $T_{vj}$ = 175 °C | -- | 48.36 | -- | |
| $I_{SC}$ | SC Data | $V_{GE}$ ≤ 15 V, $V_{CC}$ = 800 V, $V_{CEmax}$=$V_{CES}$-$L_{sCE}$.di/dt | $t_P$ ≤ 10 μs, $T_{vj}$=150 °C | -- | 2000 | -- | A |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | $t_P \le 10$ μs, $T_{vj}$=175 °C | -- | 1880 | -- | |
| $R_{thJC}$ | Thermal resistance | Junction-to-Case (per IGBT) | | -- | 0.077 | | K/W |
| $T_{vj\ op}$ | | Temperature under switching conditions | | -40 | | 150[1)] | ℃ |

[1)] $T_{vj\ op}$ > 150℃ is only allowed for operation at overload conditions. For detailed specifications please refer to AN 2018-14.

# Boost Diodes

## Absolute Maximum Ratings (Tc = 25°C unless otherwise noted)

| Symbol | Description | Value | Unit |
|---|---|---|---|
| $V_{RRM}$ | Repetitive Peak Reverse Voltage | 1200 | V |
| $I_F$ | Diode Continuous Forward Current @ $T_C$=80℃ | 400 | A |
| $I_{FRM}$ | Diode Maximum Forward Current $t_p$=1ms | 800 | A |

## Characteristics （Tc=25℃ unless otherwise noted）

| Symbol | Parameter | Note or Test Condition | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_F$ | Diode Forward Voltage | $I_F$ = 400 A, $V_{GE}$ = 0 V | $T_{vj}$ = 25 °C | -- | 2.45 | 3.20 | V |
| | | | $T_{vj}$ = 125 °C | -- | 2.30 | -- | |
| | | | $T_{vj}$ = 150 °C | -- | 2.25 | -- | |
| $Q_r$ | Recovered Charge | $V_{cc}$ = 600 V, $I_F$ = 400 A, $V_{GE}$ = 15 /-5V $R_G$ = 1.0 Ω $-di_F/dt$ = 3100 A/μs | $T_{vj}$ = 25 °C | -- | 9.27 | -- | μC |
| | | | $T_{vj}$ = 125 °C | -- | 19.41 | -- | |
| | | | $T_{vj}$ = 150 °C | -- | 28.84 | -- | |
| $I_{RM}$ | Peak Reverse Recovery Current | $V_{cc}$ = 600 V, $I_F$ = 400 A, $V_{GE}$ = 15 /-5V $R_G$ = 1.0 Ω $-di_F/dt$ = 3100 A/μs | $T_{vj}$ = 25 °C | -- | 120.9 | -- | A |
| | | | $T_{vj}$ = 125 °C | -- | 166.1 | -- | |
| | | | $T_{vj}$ = 150 °C | -- | 173.1 | -- | |
| $E_{rec}$ | Reverse recovery energy | $V_{cc}$ = 600 V, $I_F$ = 400 A, $V_{GE}$ = 15 /-5V $R_G$ = 1.0 Ω $-di_F/dt$ = 3100 A/μs ($T_{vj\ max}$ = 175 °C) | $T_{vj}$ = 25 °C | -- | 8.57 | -- | mJ |
| | | | $T_{vj}$ = 125 °C | -- | 17.60 | -- | |
| | | | $T_{vj}$ = 150 °C | -- | 21.21 | -- | |
| $R_{thJC}$ | Thermal resistance, junction to case | per diode | | -- | 0.11 | -- | K/W |
| $T_{vj\ op}$ | | Temperature under switching conditions | | -40 | | 150[2)] | ℃ |

[2)] $T_{vj\ op}$ > 150℃ is only allowed for operation at overload conditions. For detailed specifications please refer to AN 2018-14.

# Free Wheeling Diodes

## Absolute Maximum Ratings (Tc = 25°C unless otherwise noted)

| Symbol | Description | Value | Unit |
|---|---|---|---|
| $V_{RRM}$ | Repetitive Peak Reverse Voltage | 1200V | V |
| $I_F$ | Diode Continuous Forward Current @ $T_C$=65℃ | 30 | A |
| $I_{FRM}$ | Diode Maximum Forward Current $t_p$=1ms | 60 | A |

## Characteristics （Tc=25℃ unless otherwise noted）

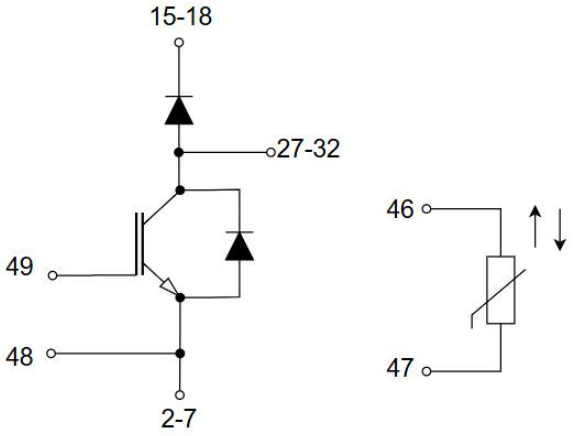
| Symbol | Parameter | Test Condition | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_F$ | Diode Forward Voltage | $I_F$=20A | $T_{VJ}$=25℃ | -- | 1.9 | 2.5 | V |
| | | $I_F$=40A | | -- | 2.4 | 3.2 | |
| | | $I_F$=20A | $T_{VJ}$=150℃ | -- | 1.8 | -- | |
| | | $I_F$=40A | | -- | 2.2 | -- | |
| $P_{tot}$ | total power dissipation | $T_C$=25℃ | | -- | -- | 125 | W |
| $R_{thJC}$ | Thermal resistance | Junction-to-Case (per diode) | | -- | 0.89 | -- | K/W |
| $T_{vj\ op}$ | | Temperature under switching conditions | | -40 | | 150[3)] | ℃ |

[3)] $T_{vj\ op}$ > 150℃ is only allowed for operation at overload conditions. For detailed specifications please refer to AN 2018-14.

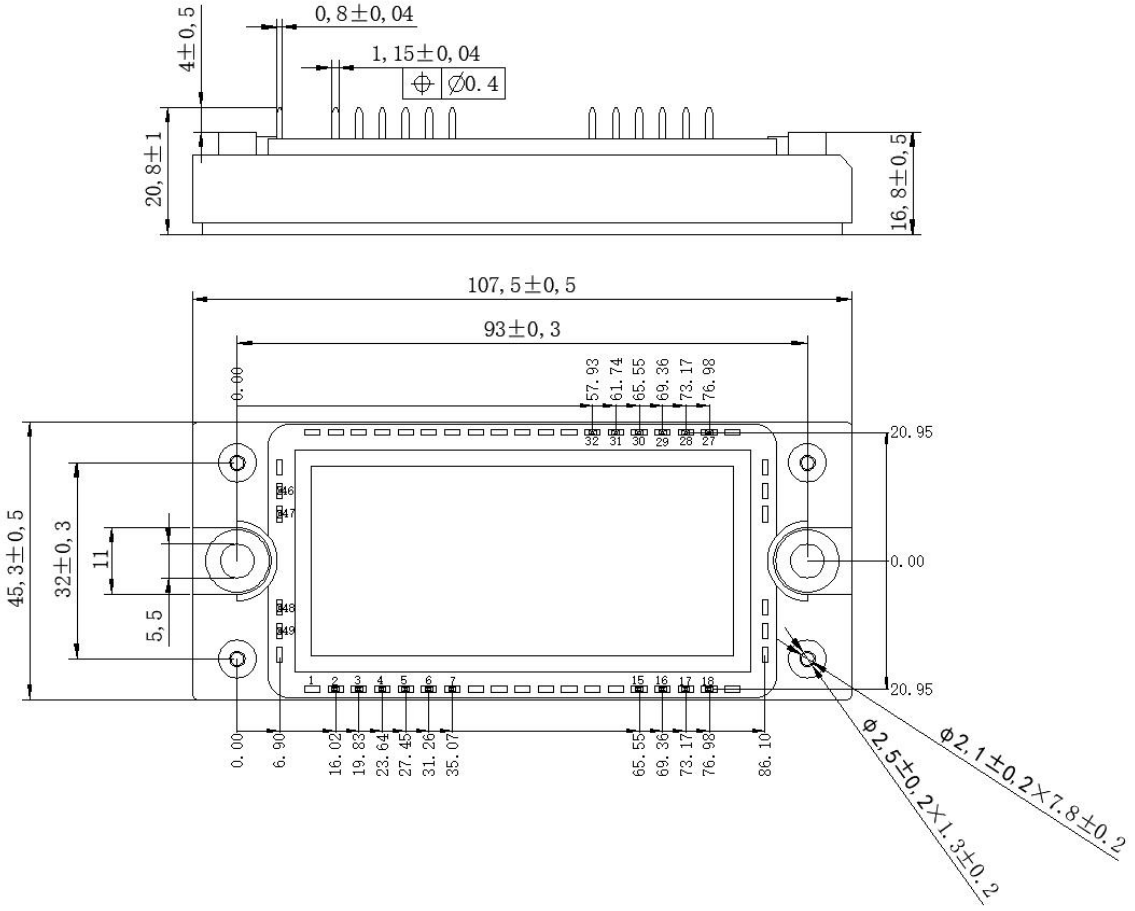
## NTC Characteristics (Tc = 25°C unless otherwise noted)

| Symbol | Parameter | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $R_{25}$ | Rated Resistance | | -- | 5.0 | -- | kΩ |
| ΔR/R | Deviation of R100 | $T_C$=100 ℃,$R_{100}$=493.3Ω | -5 | -- | 5 | % |
| $P_{25}$ | Power Dissipation | | -- | -- | 20.0 | mW |
| $B_{25/50}$ | B-value | $R_2=R_{25}\exp[B_{25/50}(1/T_2- 1/(298.15K))]$ | -- | 3375 | -- | K |
| $B_{25/80}$ | B-value | $R_2=R_{25}\exp[B_{25/80}(1/T_2- 1/(298.15K))]$ | -- | 3411 | -- | K |
| $B_{25/100}$ | B-value | $R_2=R_{25}\exp[B_{25/100}(1/T_2- 1/(298.15K))]$ | -- | 3433 | -- | K |

## CIRCUIT DIAGRAM




## PACKAGE DIMENSION



## REVISION HISTORY

| Document version | Date of release | Description of changes |
|---|---|---|
| Rev.00 | 2024-06-25 | Preview |
| | | |
| | | |

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