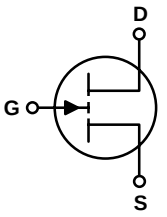
# INN100FQ016A

## 1. General description

**GaN-on-Silicon enhancement mode high-electron-mobility-transistor (HEMT) in FCQFN with 4.0 mm x 6.0 mm package size.**



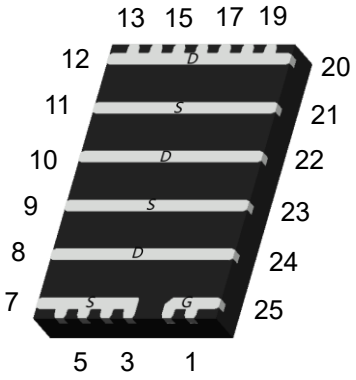

## 2. Features

- GaN-on-Silicon E-mode HEMT technology
- Very low gate charge
- Ultra-low on resistance
- Very small footprint

## 3. Applications

- High frequency DC-DC converter
- Point of Load
- RF envelope tracking
- PC charger
- Mobile power bank
- Motor driver


Top View




Bottom View

## 4. Key performance parameters

**Table 1 Key performance parameters at $T_J$ = 25 °C**

| Parameter | Value | Unit |
|---|---|---|
| $V_{DS,max}$ | 100 | V |
| $R_{DS(on),max}$ @ $V_{GS}$ = 5 V | 1.8 | mΩ |
| $Q_{G,typ}$ @ $V_{DS}$ = 50V | 22 | nC |
| $I_{DS,Pulse}$ | 320 | A |
| $Q_{OSS}$ @ $V_{DS}$ = 50V | 125 | nC |

## 5. Pin information

**Table 2 Pin information**

| Pin | Pin description | Pin function |
|---|---|---|
| 1,2,25 | Gate | Driver Gate |
| 3-7,9,11,21,23 | Source | Source |
| 8,10,12-20,22,24 | Drain | Power Drain |

**Table 3 Ordering information**

| Type/Ordering Code | Package | Product Code |
|---|---|---|
| INN100FQ016A | FCQFN 4X6 | J23 |

## Table of contents

## 6. Maximum ratings

at $T_J$ = 25 °C unless otherwise specified.

Continuous application of maximum ratings can deteriorate transistor lifetime. For further information, contact Innoscience sales office.

**Table 4 Maximum ratings**

| SYMBOL | PARAMETER | MAX | UNIT |
|---|---|---|---|
| $V_{DS}$ | Drain-to-Source Voltage (Continuous) | 100 | V |
| $V_{DS(tr)}$ | Drain-to-Source Voltage (up to 300,000 5ms pulse at 150 ˚C) | 120 | V |
| $I_D$ | Continuous current | 100 | A |
| | Pulsed (25˚C, $T_{Pulse}$ = 100 µs) | 320 | A |
| $V_{GS}$ | Gate-to-Source Voltage | 6 | V |
| | Gate-to-Source Voltage | -4 | V |
| $T_J$ | Operating Temperature | -40 to 150 | ˚C |
| $T_{STG}$ | Storage Temperature | -40 to 150 | ˚C |

## 7. Thermal characteristics

**Table 5 Thermal characteristics**

| SYMBOL | PARAMETER | TYP | UNIT | Note/Test Condition |
|---|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 13.96 | ˚C/W | |
| $R_{\theta JB}$ | Thermal Resistance, Junction to Board | 1.92 | ˚C/W | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient [1] | 57.56 | ˚C/W | |
| $T_{sold}$ | Maximum reflow soldering temperature | 260 | °C | MSL3 |

Note 1: $R_{\theta JA}$ is determined with the device mounted on one square inch of copper pad, single layer 2 oz copper on FR4 board.

## 8. Electric characteristics

at $T_J$ = 25 °C, unless specified otherwise

**Table 6 Static characteristics**

| SYMBOL | PARAMETER | MIN | TYP | MAX | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-to-Source Voltage | 100 | - | - | V | $V_{GS}$ = 0 V, $I_D$ = 900 μA |
| $I_{DSS}$ | Drain Source Leakage | - | 9.5 | 93 | μA | $V_{GS}$ = 0 V, $V_{DS}$ = 80 V |
| $I_{GSS}$ | Gate-to-Source Forward Leakage | - | 2.8 | 55 | μA | $V_{GS}$ = 5 V |
| | Gate-to-Source Reverse Leakage | - | 0.3 | 1.2 | μA | $V_{GS}$ = -4 V |
| $V_{GS(TH)}$ | Gate Threshold Voltage | 0.8 | 1.1 | 2.5 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 21 mA |
| $R_{DS(on)}$ | Drain-Source On-state Resistance | - | 1.4 | 1.8 | mΩ | $V_{GS}$ = 5 V, $I_D$ = 40 A |
| $V_{SD}$ | Source-Drain Forward Voltage | - | 1.5 | - | V | $I_S$ = 0.5 A, $V_{GS}$ = 0 V |

**Table 7 Dynamic characteristics**

| SYMBOL | PARAMETER | MIN | TYP | MAX | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| $C_{ISS}$ | Input Capacitance | - | 2500 | - | pF | $V_{GS}$ = 0 V, $V_{DS}$ = 50 V |
| $C_{OSS}$ | Output Capacitance | - | 1100 | - | | $V_{GS}$ = 0 V, $V_{DS}$ = 50 V |
| $C_{RSS}$ | Reverse Transfer Capacitance | - | 19 | - | | $V_{GS}$ = 0 V, $V_{DS}$ = 50 V |
| $C_{OSS(ER)}$ | Energy Related $C_{OSS}$ | - | 1700 | - | | $V_{GS}$ = 0 V, $V_{DS}$ = 0 V to 50 V |
| $C_{OSS(TR)}$ | Time Related $C_{OSS}$ | - | 2500 | - | | $V_{GS}$ = 0 V, $V_{DS}$ = 0 V to 50 V |
| $R_G$ | Gate resistance | - | 1.8 | - | Ω | f = 5 MHz, open drain |
| $Q_G$ | Total Gate Charge | - | 22 | - | nC | $V_{GS}$ = 5 V, $V_{DS}$ = 50 V, $I_D$=40 A |
| $Q_{GS}$ | Gate to Source Charge | - | 4.5 | - | | $V_{DS}$ = 50 V, $I_D$=40 A |
| $Q_{GD}$ | Gate to Drain Charge | - | 4.5 | - | | $V_{DS}$ = 50 V, $I_D$=40 A |
| $Q_{G(TH)}$ | Gate Charge at Threshold | - | 2.5 | - | | $V_{DS}$ = 50 V, $I_D$=40 A |
| $Q_{OSS}$ | Output Charge | - | 125 | - | | $V_{GS}$ = 0 V, $V_{DS}$ = 50 V |

## 9. Electric characteristics diagrams

at $T_J$ = 25 °C, unless specified otherwise

Fig. 1 Typical Output Characteristics ($T_J$=25°C)

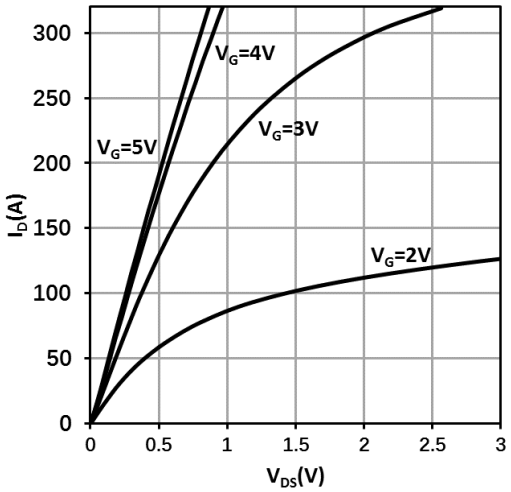



Fig. 2 Typical Output Characteristics ($T_J$=125°C)

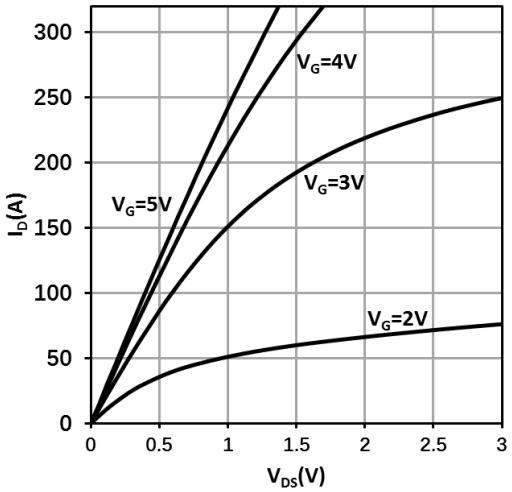



Fig.3 Typical Drain On-state Resistance ($T_J$=25°C)

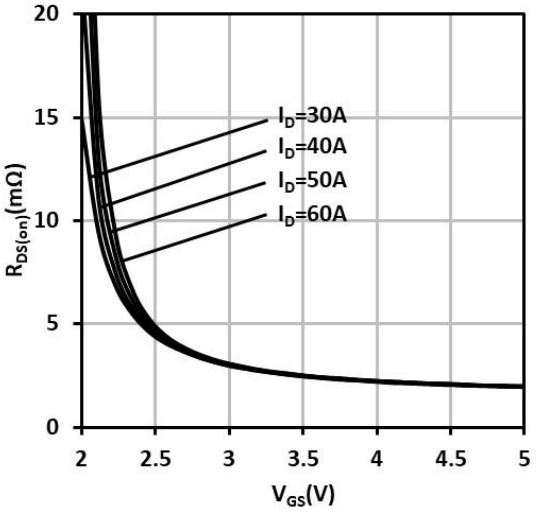



Fig. 4 Typical Drain On-state Resistance ($T_J$=125°C)

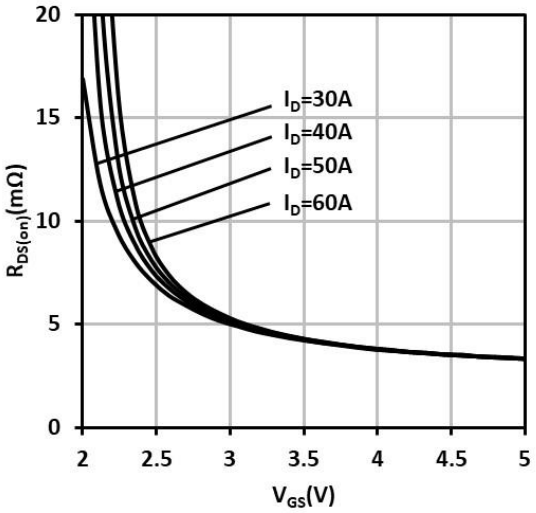


Fig. 5 Normalized On-State Resistance vs. Temp.

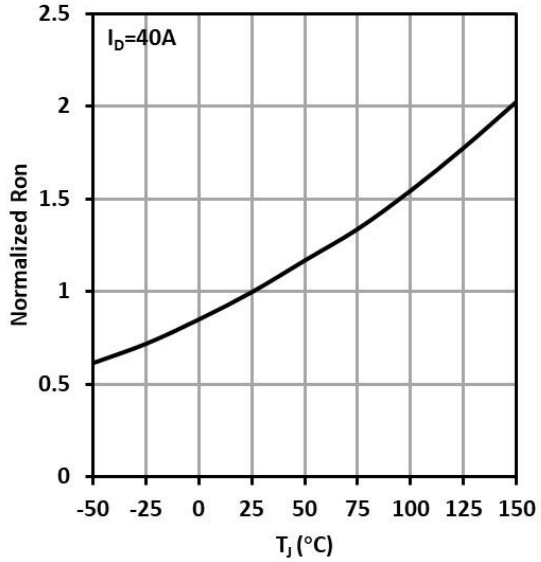



Fig. 6 Typical Transfer Characteristics

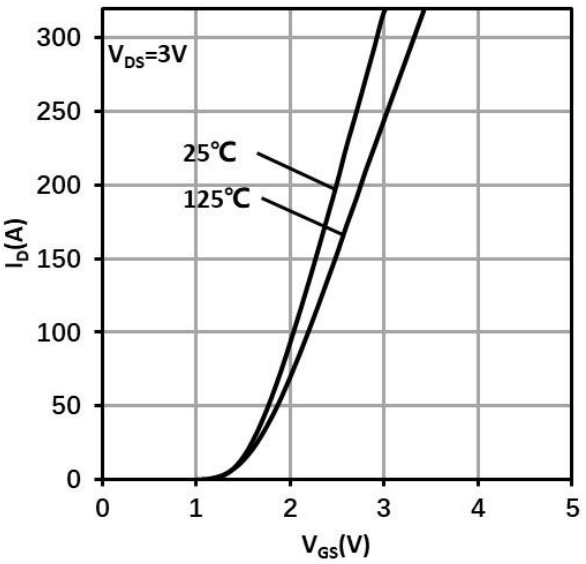



Fig. 7 Typ. Reverse Drain-Source Characteristics ($V_{GS}$≤0,$T_J$ =25°C)

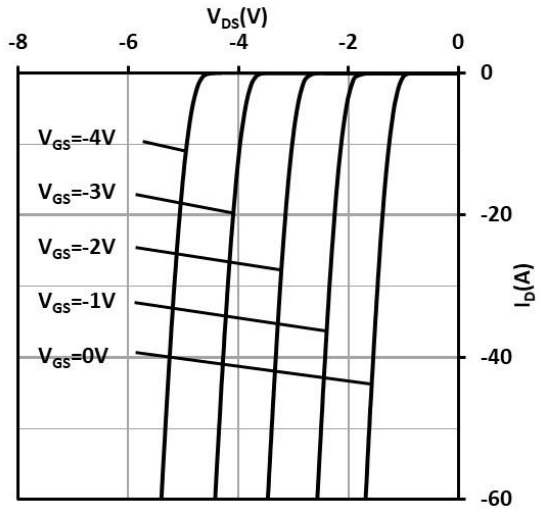



Fig. 8 Typ. Reverse Drain-Source Characteristics ($V_{GS}$≥0,$T_J$ =25°C)

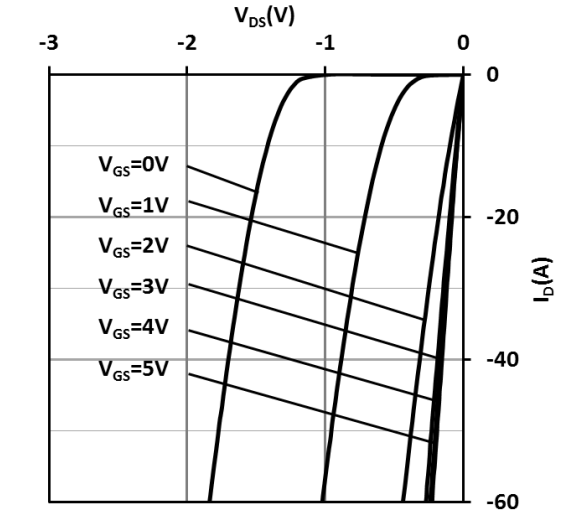


Fig. 9 Typ. Reverse Drain-Source Characteristics ($V_{GS}$≤0, $T_J$ = 125°C)

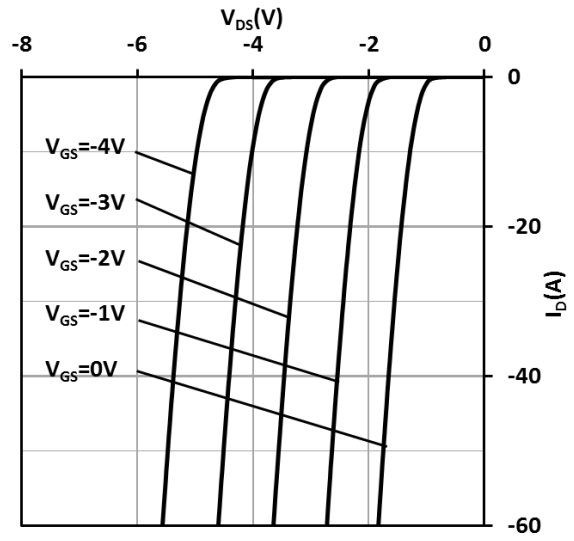



Fig. 10 Typ. Reverse Drain-Source Characteristics ($V_{GS}$≥0,$T_J$ = 125°C)

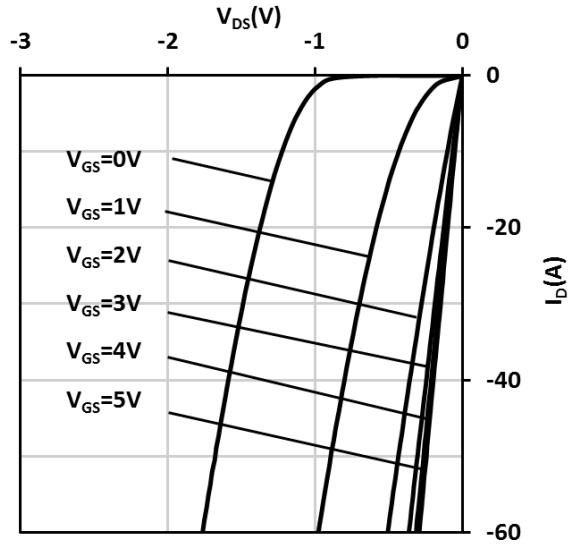



Fig. 11 Typ. Capacitances Characteristics

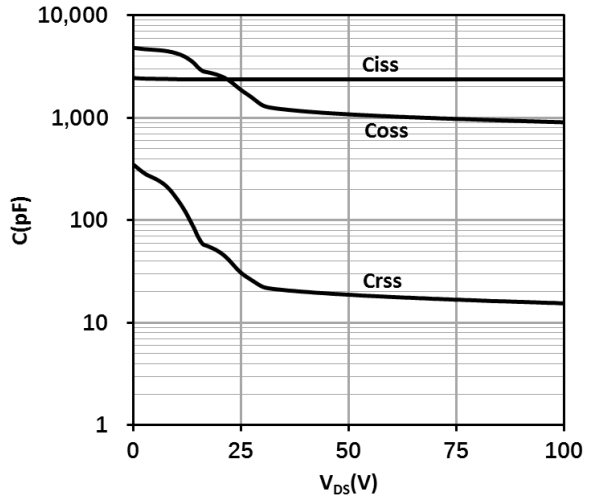



Fig. 12 Typ. Gate Charge

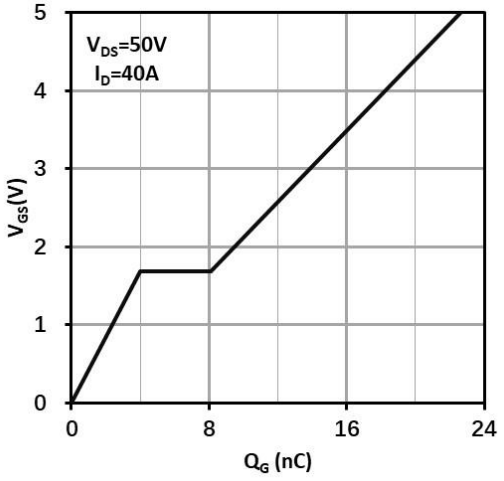


Fig. 13 Normalized Threshold Voltage vs. Temp.

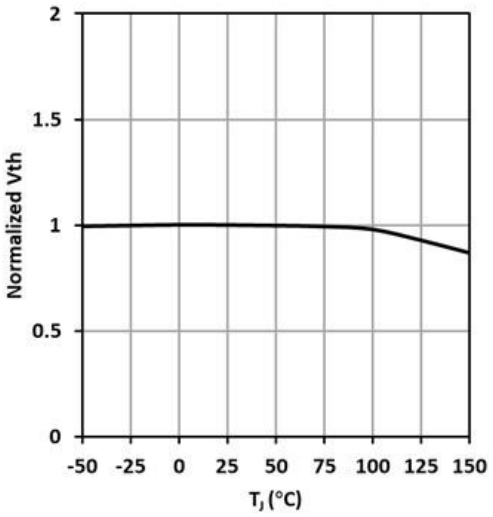



Fig. 14 Output Charge

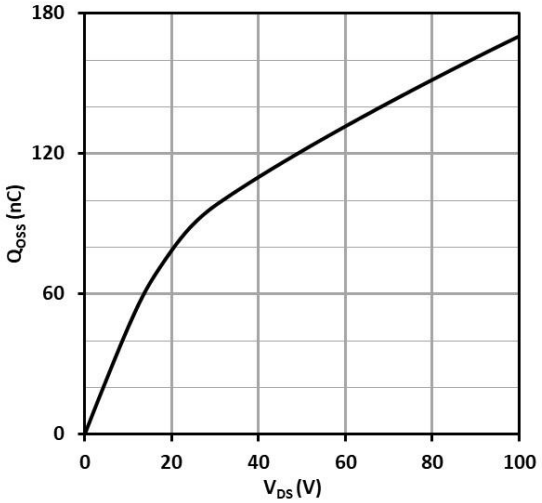



Fig. 15 Output Capacitance Stored Energy

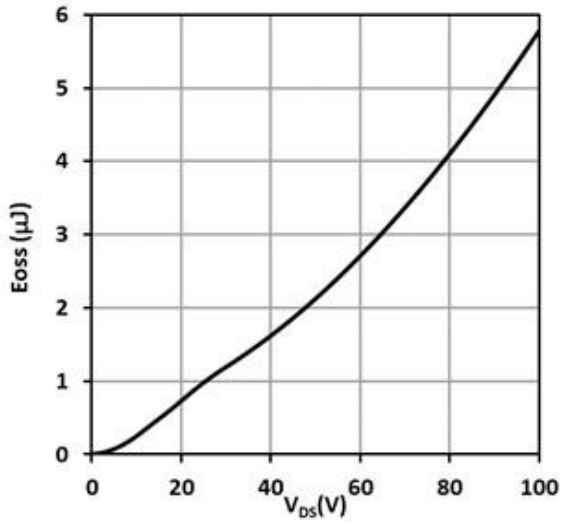



Fig. 16 Power Dissipation

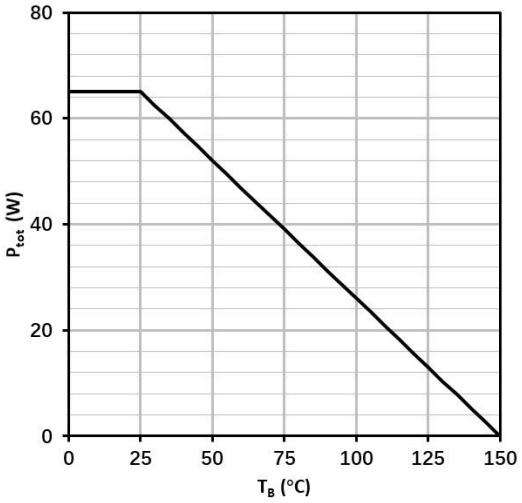


Fig. 17 Safe Operating Area

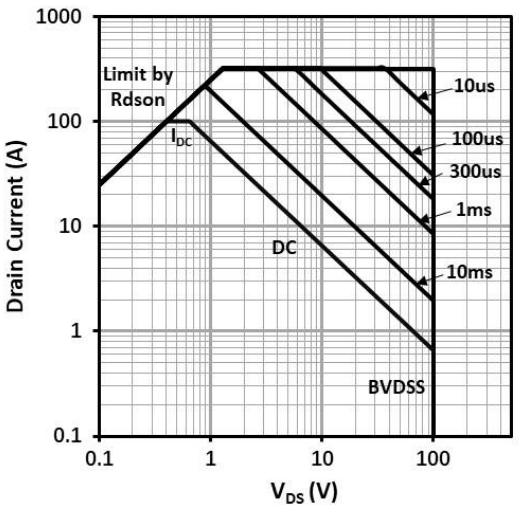
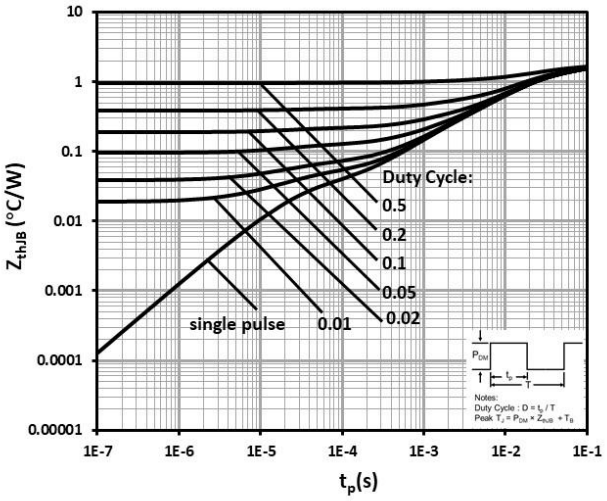
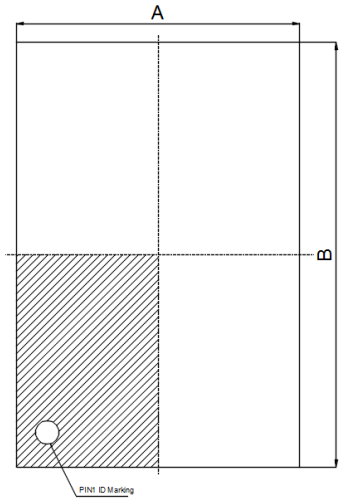



Fig. 18 Max. Transient Thermal Impedance

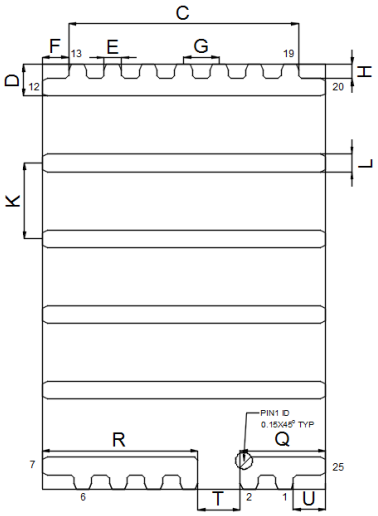


## 10. Package outlines

### Package Reference

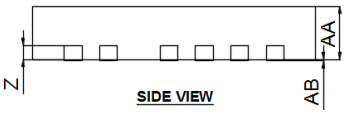



TOP VIEW




BOTTOM VIEW

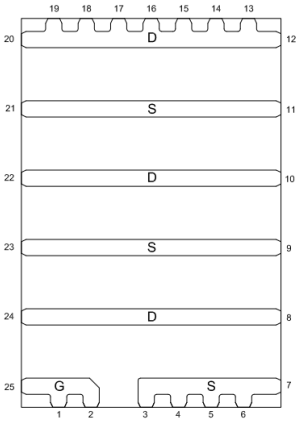
| SYMBOL | MILLIMETER | | | NOTE |
|---|---|---|---|---|
| | MIN | NOM | MAX | |
| A | 3.9 | 4.0 | 4.1 | |
| B | 5.9 | 6.0 | 6.1 | |
| C | 3.15 | 3.25 | 3.35 | |
| D | 0.35 | 0.45 | 0.55 | 3X |
| E | 0.20 | 0.25 | 0.30 | 13X |
| F | 0.375 REF | | | 2X |
| G | 0.5 BASIC | | | 10X |
| H | 0.2 REF | | | 3X |
| K | 1.07 BASIC | | | 6X |
| L | 0.20 | 0.25 | 0.30 | 4X |
| Q | 1.1 | 1.2 | 1.3 | |
| R | 2.1 | 2.2 | 2.3 | |
| T | 0.55 | 0.60 | 0.65 | |
| U | 0.45 REF | | | 2X |
| Z | 0.203 REF | | | 7X |
| AA | 0.75 | 0.85 | 0.95 | |
| AB | 0.00 | 0.02 | 0.05 | |




SIDE VIEW

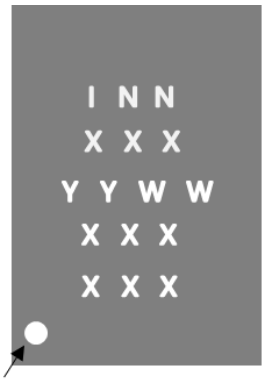
NOTE:
1)ALL DIMENSION ARE IN MILLIMETERS.
2)BOTTOM VIEW IS FT TESTER SIDE VIEW.
3)LEAD COPLANARITY SHALL BE 0.08 MILLIMETERS MAX.
4)COMPLIES WITH JEDEC MO-220.
5)DRAWING IS NOT TO SCALE.

### Pin information:




TOP VIEW

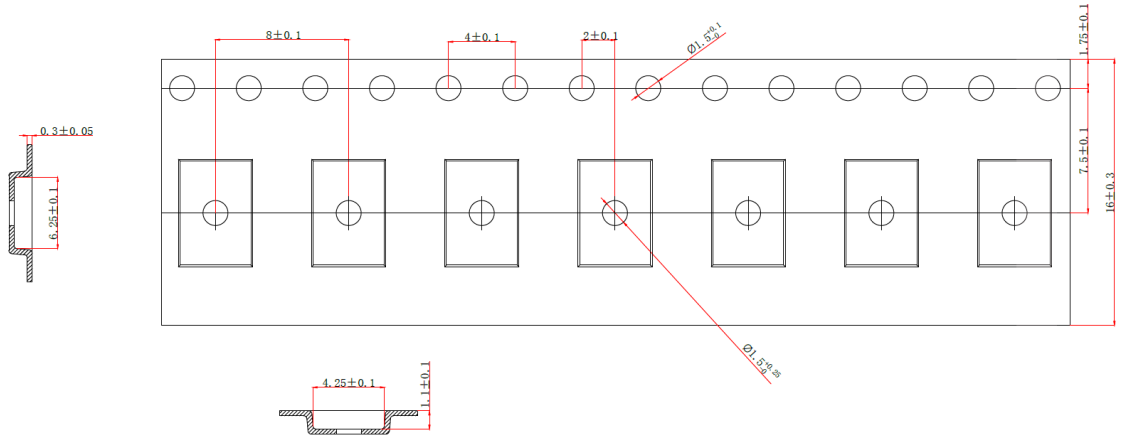
### Marking Reference:




Die Orientation Dot
&Gate Position

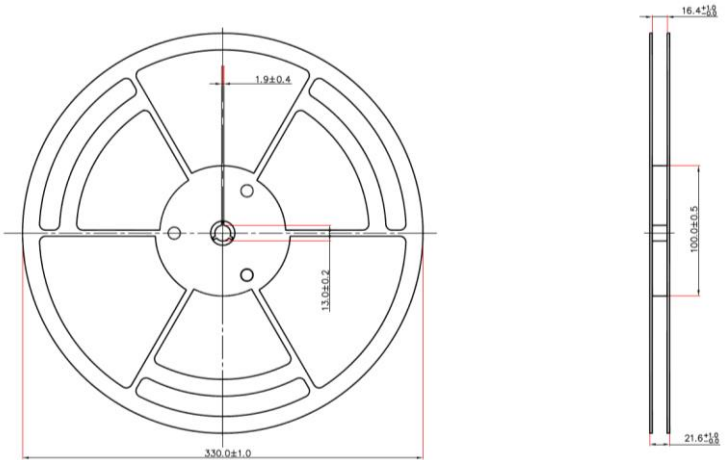
| Row | Description | Example |
|---|---|---|
| Row 1 | Company name | INN |
| Row 2 | Product code | XXX |
| Row 3 | Date code | YYWW |
| Row 4 | Lot No | XXX |
| Row 5 | Lot No | XXX |

## 11. Reel information




NOTES:

1. CARRIER TAPE COLOR: BLACK.
2. COVER TAPE WIDTH: 13.3±0.10.
3. COVER TAPE COLOR: TRANSPARENT.
4. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ±0.20 MAX.
5. CAMBER NOT TO EXCEED 1MM IN 100MM.
6. MOLD# QFN/DFN/MIS6X4X0.75/0.85.
7. ALL DIMS IN MM.
8. BAN TO USE THE ENVIRONMENT-RELATED SUBSANCES OF JCET PRESCRIBING.

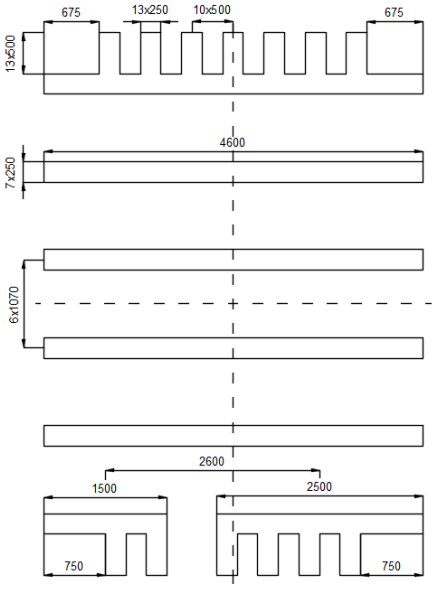



NOTES:

1. 2500 UNITS PER TRAY.
2. COLOR: WHITE.
3. ALL DIM IN mm.
4. GENERAL TOLERANCE±0.25.
5. BAN TO USE THE ENVIRONMENT-RELATED SUBSANCES OF JCET PRESCRIBING.
6. THE DERECTION OF VIEW:

## 12. Land pattern

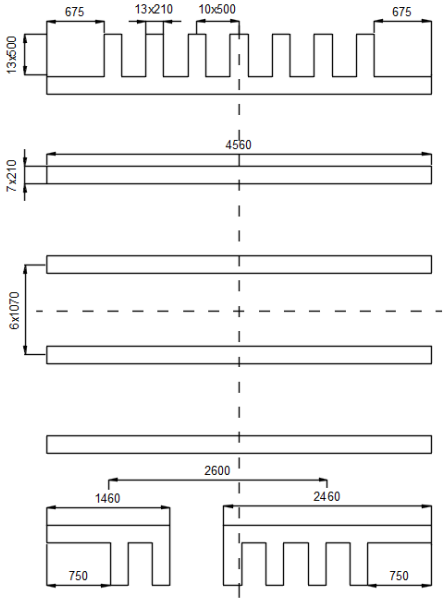
### Recommended land pattern




TOP VIEW

Unit: μm

### Recommended Stencil drawing




TOP VIEW

Unit: μm

## 13. Revision history

**Major changes since the last revision**

| Revision | Date | Description of changes |
|---|---|---|
| 1.0 | 2023-07-19 | Version 1.0 release |
| 1.1 | 2023-12-19 | Update thermal resistance & SOA |
| 1.2 | 2024-03-04 | Add $V_{DS(tr)}$ in table 4 |

## Important Notice

The information provided in this document is intended as a guide only and shall not in any event be regarded as a guarantee of conditions, characteristics or performance. Innoscience does not assume any liability arising out of the application or use of any product described herein, including but not limited to any personal injury, death, or property or environmental damage. No licenses, patent rights, or any other intellectual property rights is granted or conveyed. Innoscience reserves the right to modify without notice. 