

## GR-65J050JT: TO-247-3L Cascode GaN HEMT

### Description

GR-65J050JT is a normally-off GaN High electron mobility transistor (HEMT) device using the cascode configuration, which provides high breakdown voltage, high current and high operating speed which is suitable for high power applications.

### Key Specifications

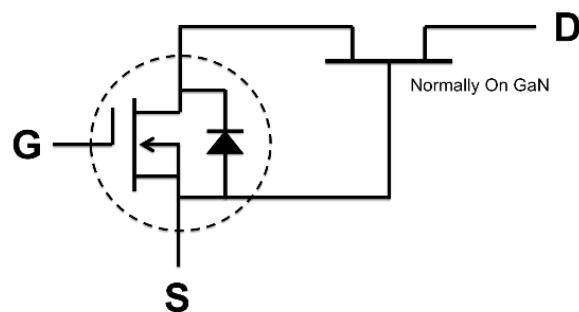
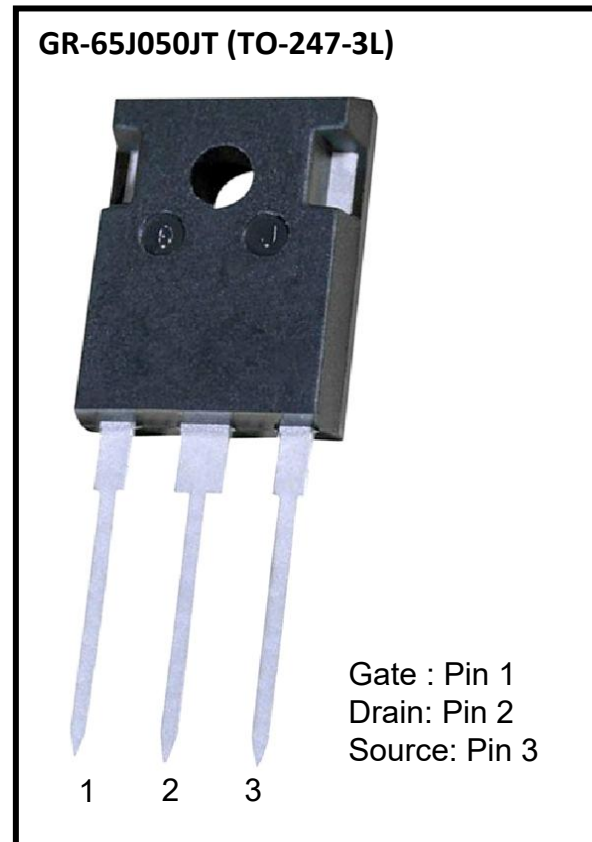
|                     |              |
|---------------------|--------------|
| Part Number         | GR-65J050JT  |
| $V_{DSS}$           | 650V         |
| $V_{(TR)DSS}$       | 800V         |
| $R_{DS(ON)}$ , typ. | 49m $\Omega$ |
| $Q_G$ , typ.        | 12.5nC       |
| Package             | TO-247-3L    |

### Features

- Gate drive voltage compatibility (-20V to +20V)
- High operating frequency
- Pin to Pin with CoolMOS/SJ and SiC MOSFET
- Low  $Q_{rr}$
- ESD-resistant
- Comply with JEDEC standards

### Applications

- Switch Mode Power Supplies (SMPS)
- AC-DC/ DC-DC Converters
- Motor Drives



Cascode Device Structure

## 1- Electrical Characteristics

➤ **Table 1 Absolute maximum ratings**

| Symbol        | Parameter                                                         |          | Value       | Unit             |
|---------------|-------------------------------------------------------------------|----------|-------------|------------------|
| $V_{DS}$      | Drain-source voltage                                              |          | 650         | V                |
| $V_{GS}$      | Gate- source voltage                                              |          | -20V ~ +20V | V                |
| $I_D$         | Drain current (continuous) at $T_C = 25^\circ\text{C}$ operation  |          | 32.3        | A                |
|               | Drain current (continuous) at $T_C = 100^\circ\text{C}$ operation |          | 20.5        | A                |
| $I_{D,Pulse}$ | Pulsed drain current (pulse width: 10 $\mu\text{s}$ )             |          | 121         | A                |
| $P_D$         | Maximum power dissipation $T_C=25^\circ\text{C}$                  |          | 139         | W                |
| $T_C$         | Operating temperature                                             | Case     | -55 to +150 | $^\circ\text{C}$ |
| $T_J$         |                                                                   | Junction | -55 to +150 | $^\circ\text{C}$ |
| $T_S$         | Storage temperature                                               |          | -55 to +150 | $^\circ\text{C}$ |
| $T_{SOLD}$    | Soldering peak temperature <sup>b</sup>                           |          | 260         | $^\circ\text{C}$ |
| MSL           | Moisture sensitivity level                                        |          | MSL3        |                  |

a. In off-state, spike duty cycle  $D < 0.01$ , spike duration  $< 1\mu\text{s}$

b. For 10 sec., 1.6mm from the case

➤ **Table 2 Thermal Characteristics**

| Symbol          | Parameter                           | Value | Unit                      |
|-----------------|-------------------------------------|-------|---------------------------|
| $R_{\theta JA}$ | Thermal resistance junction-ambient | 55    | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JC}$ | Thermal resistance junction-case    | 0.9   | $^\circ\text{C}/\text{W}$ |

➤ **Table 3 ESD Rating**

| Symbol          | Reference                   | Value | Unit |
|-----------------|-----------------------------|-------|------|
| HBM (G-S) (G-D) | ANSI/ESDA/JEDEC JS-001-2024 | 2000  | V    |
| HBM (D-S)       | ANSI/ESDA/JEDEC JS-001-2024 | 8000  | V    |

➤ **Table 4 Electrical Characteristics** ( $T_{CASE} = 25\text{ }^{\circ}\text{C}$  unless otherwise stated)

| Symbol        | Parameter                              | Conditions                                                         | Values |      |      | Unit |
|---------------|----------------------------------------|--------------------------------------------------------------------|--------|------|------|------|
|               |                                        |                                                                    | min.   | typ. | max. |      |
| $V_{(BL)DSS}$ | Drain-source voltage                   | $V_{GS}=0V$                                                        | 650    | -    | -    | V    |
| $V_{GS(th)}$  | Gate threshold voltage                 | $V_{GS}=V_{DS}$ , $I_D=1mA$                                        | 2.0    | 3.0  | 4.0  | V    |
| $R_{DS(on)}$  | Static drain-source on-resistance      | $V_{GS}=10V$ , $I_D=5A$ , $T_J=25\text{ }^{\circ}\text{C}$         | -      | 49   | 60   | mΩ   |
|               |                                        | $V_{GS}=10V$ , $I_D=5A$ , $T_J=150\text{ }^{\circ}\text{C}$        | -      | 91   | -    |      |
| $I_{DSS}$     | Drain-source leakage current           | $V_{GS}=0V$ , $V_{DS}=650V$ , $T_J=25^{\circ}\text{C}$             | -      | 3.5  | 70   | μA   |
|               |                                        | $V_{GS}=0V$ , $V_{DS}=650V$ , $T_J=150^{\circ}\text{C}$            | -      | 17.5 | -    |      |
| $I_{GSS}$     | Gate-to-source forward leakage current | $V_{GS}=20V$                                                       | -      | -    | 100  | nA   |
|               | Gate-to-source reverse leakage current | $V_{GS}=-20V$                                                      | -      | -    | -100 |      |
| $C_{ISS}$     | Input capacitance                      | $V_{GS}=0V$ , $V_{DS}=400V$ , $f=1MHz$                             | -      | 738  | -    | pF   |
| $C_{OSS}$     | Output capacitance                     |                                                                    | -      | 48.9 | -    |      |
| $C_{RSS}$     | Reverse transfer capacitance           |                                                                    | -      | 2.93 | -    |      |
| $Q_G$         | Gate charge                            | $V_{GS}=0\sim10V$ , $V_{DS}=400V$ , $I_{DS}=5A$                    | -      | 12.5 | -    | nC   |
| $Q_{GS}$      | Gate-source charge                     |                                                                    | -      | 2.45 | -    |      |
| $Q_{GD}$      | Gate-drain charge                      |                                                                    | -      | 4.12 | -    |      |
| $Q_{OSS}$     | Output charge                          | $V_{GS}=0V$ , $V_{DS}=0\sim400V$                                   | -      | 69.6 | -    |      |
| $t_{D(on)}$   | Turn-on delay time                     | $V_{DS}=400V$ , $V_{GS}=0$ to $10V$ , $I_{DS}=2A$ , $R_G=25\Omega$ | -      | 11.2 | -    | ns   |
| $t_{D(off)}$  | Turn-off delay time                    |                                                                    | -      | 26   | -    |      |
| $Q_{RR}$      | Reverse recovery charge                | $I_S=5A$ , $V_{DS}=400V$                                           | -      | 8.8  | -    | nC   |
| $V_{SD}$      | Diode forward voltage                  | $V_{GS}=0V$ , $I_{SD}=20A$ , $T_J=25^{\circ}\text{C}$              | -      | 2.05 | -    | V    |

### 2- Typical Characteristic Curves

Fig 1. On-Region Characteristics

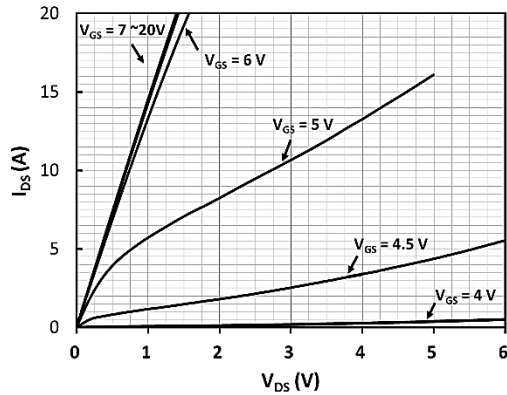


Fig 2. On-Resistance vs Drain Current and Temperature

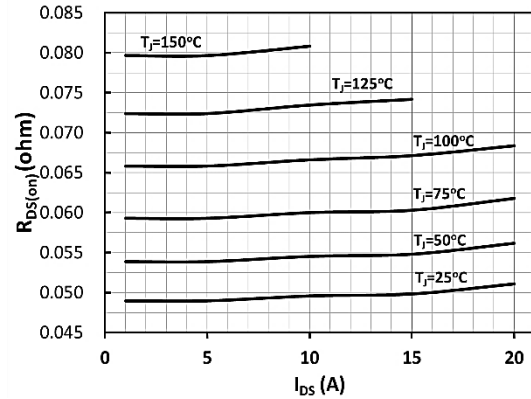


Fig 3. On-Resistance with Drain Current

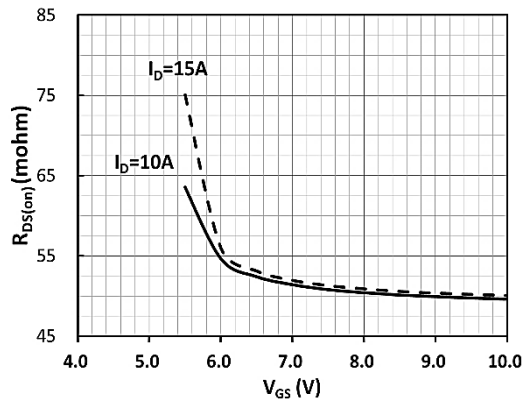


Fig 4. On-Resistance Variation with Temperature

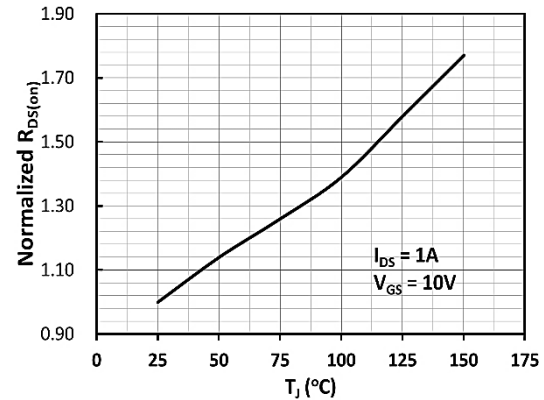


Fig 5. Threshold Voltage with Temperature

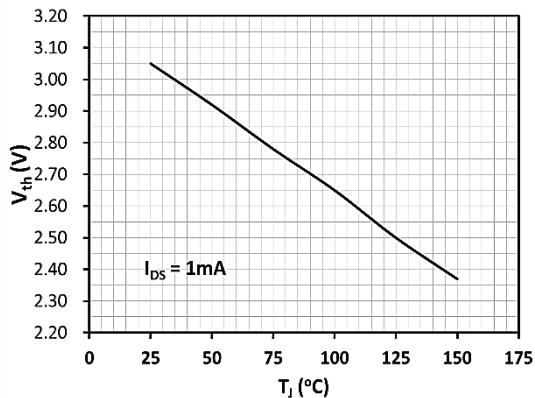


Fig 6. Capacitance Characteristics

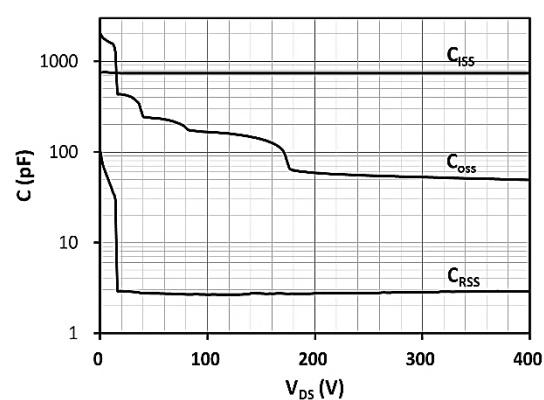


Fig 7. Gate Charge Characteristics, Qg

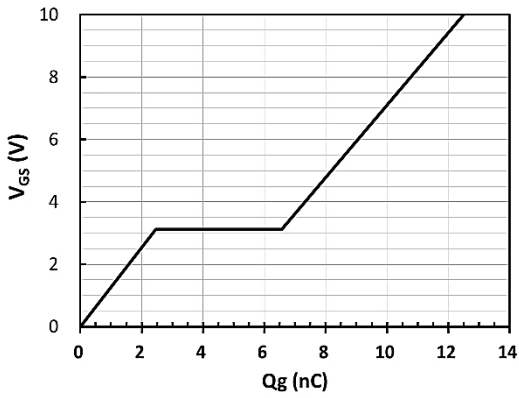


Fig 8. Capacitance Characteristics, Qoss

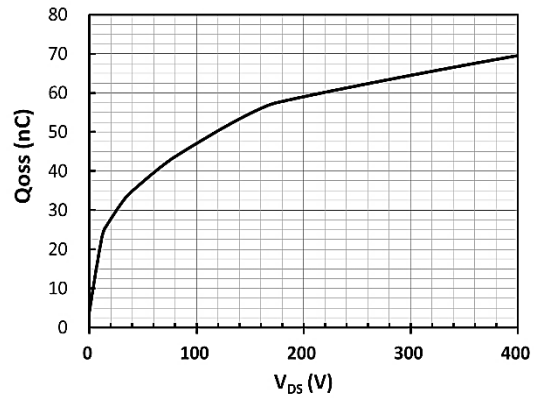


Fig 9. Power Dissipation Derating, Ptot

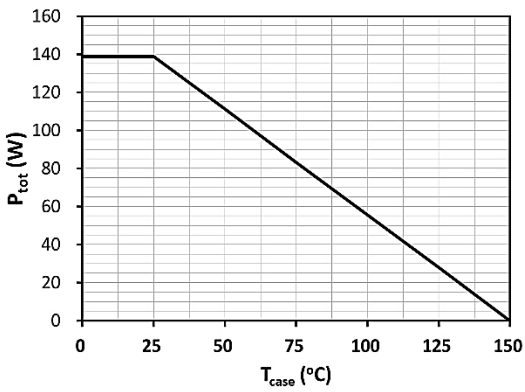
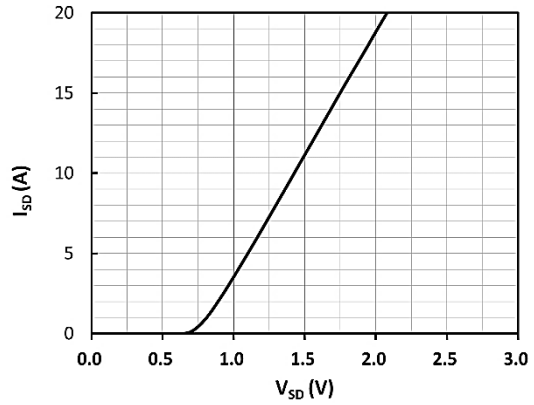
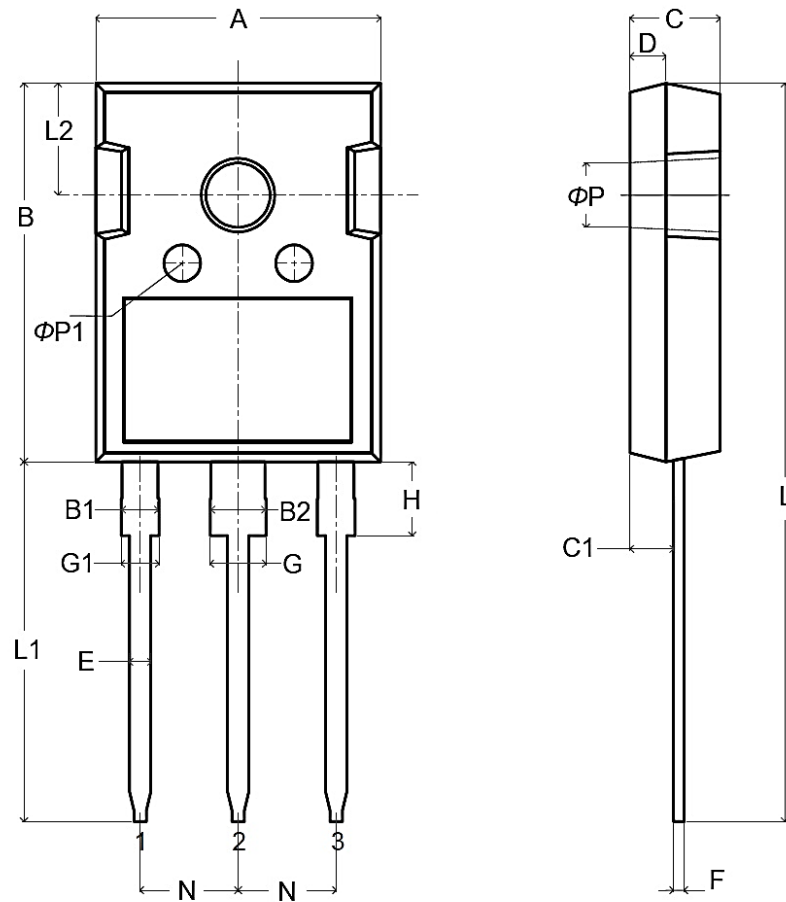


Fig 10. Source-drain diode forward characteristics



## 3- Package Outline Dimensions, GR-TO-247-3L

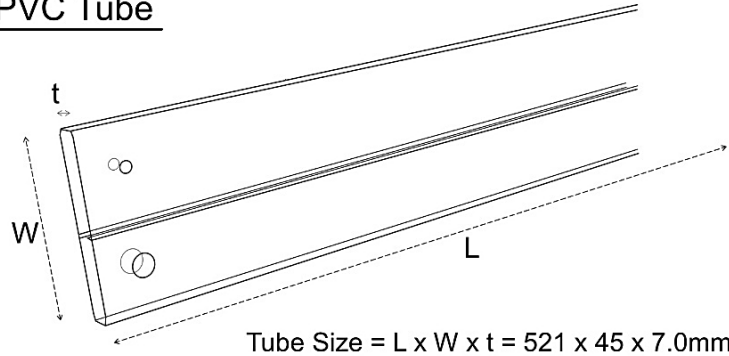


➤ Table 5 Dimension of GR-TO-247-3L

| SYMBOL | DIMENSION (IN MM) |      |      | SYMBOL    | DIMENSION (IN MM) |       |      |
|--------|-------------------|------|------|-----------|-------------------|-------|------|
|        | MIN.              | NOM. | MAX. |           | MIN.              | NOM.  | MAX. |
| A      | 15.6              | 15.8 | 16.0 | G         | 2.90              | 3.10  | 3.30 |
| B      | 19.9              | 21.0 | 21.2 | G1        | 1.90              | 2.10  | 2.30 |
| B1     | 1.80              | 2.00 | 2.20 | H         | 3.90              | 4.10  | 4.30 |
| B2     | 2.80              | 3.00 | 3.20 | L         | 40.5              | 40.95 | 41.4 |
| C      | 4.80              | 5.00 | 5.20 | L1        | 19.7              | 19.95 | 20.2 |
| C1     | 2.20              | 2.40 | 2.60 | L2        | 6.04              | 6.20  | 6.30 |
| D      | 1.90              | 2.00 | 2.10 | N         | 5.30              | 5.44  | 5.68 |
| E      | 1.00              | 1.20 | 1.40 | $\phi P1$ | 3.40              | 3.60  | 3.80 |
| F      | 0.50              | 0.60 | 0.70 | $\phi P2$ | 2.20              | 2.35  | 2.50 |

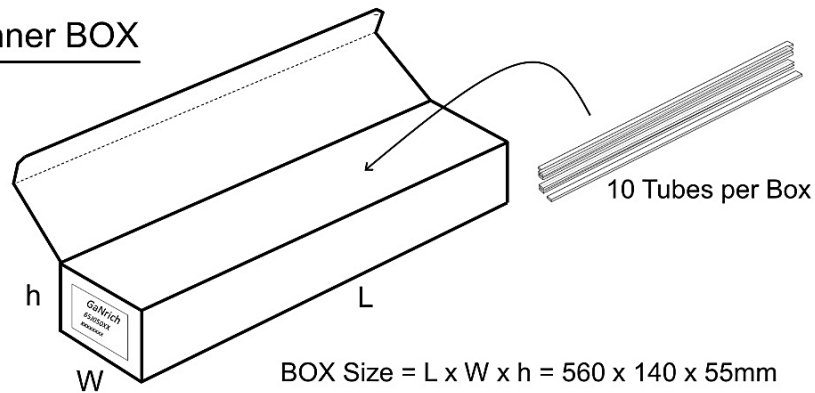
#### 4- Tube Package Information

TO-247-3L, TO-247-4L  
PVC Tube



Tube Size = L x W x t = 521 x 45 x 7.0mm

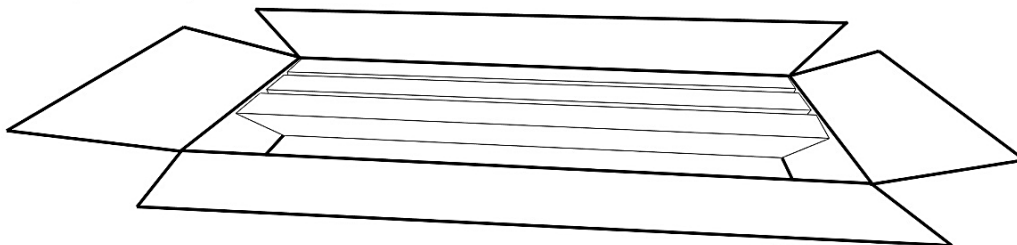
##### Inner BOX



10 Tubes per Box

BOX Size = L x W x h = 560 x 140 x 55mm

##### Carton



Carton Size = 575 x 160 x 295mm

| Package Type           | Tube  | Inner Box | Carton  |
|------------------------|-------|-----------|---------|
| TO-247-3L<br>TO-247-4L | 30 EA | 300 EA    | 1500 EA |
| -                      | -     | X10 Tube  | X5 Box  |

## 5- Change Log

| Version | Date           | Description                                                        |
|---------|----------------|--------------------------------------------------------------------|
| 01      | Nov 28, 2023   | Initial version                                                    |
| 02      | March 27, 2025 | Electrical characteristics, Curve and Package information revised. |
| 03      | April 16, 2026 | Electrical characteristics revised                                 |

- **Note:** GaNrich semiconductor reserves the right to revise products and/or specifications without notice.