

## Features

- 1) Low on-resistance
- 2) Fast switching speed
- 3) Fast reverse recovery
- 4) Easy to parallel
- 5) Simple to drive
- 6) Pb-free lead plating ; RoHS compliant

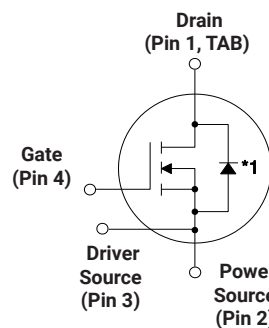
## Applications

- Solar inverters
- DC/DC converters
- Switch mode power supplies
- Induction heating

T0-247-4  
Package



Inner circuit



- (1) Drain  
(2) Power Source  
(3) Driver Source  
(4) Gate

\*1 Body Diode

| Part Number  | Marking     | Package | $V_{DS}$ | $I_D$ @ 25°C | $R_{DS(on)}$ |
|--------------|-------------|---------|----------|--------------|--------------|
| GC3M0120100K | GC3M0120100 | T0247-4 | 1000 V   | 22 A         | 120 mΩ       |

## Maximum Ratings ( $T_c = 25^\circ\text{C}$ unless otherwise specified)

| Symbol         | Parameter                                  | Value       | Unit | Test Conditions                                        | Note    |
|----------------|--------------------------------------------|-------------|------|--------------------------------------------------------|---------|
| $V_{DSmax}$    | Drain - Source Voltage                     | 1000        | V    | $V_{GS} = 0\text{ V}$ , $I_D = 100\text{ }\mu\text{A}$ |         |
| $V_{GSmax}$    | Gate - Source Voltage (dynamic)            | -8/+19      | V    | AC ( $f > 1\text{ Hz}$ )                               | Note: 1 |
| $V_{GSop}$     | Gate - Source Voltage (static)             | -4/+15      | V    | Static                                                 | Note: 2 |
| $I_D$          | Continuous Drain Current                   | 22          | A    | $V_{GS} = 15\text{ V}$ , $T_c = 25^\circ\text{C}$      | Fig. 19 |
|                |                                            | 14          |      | $V_{GS} = 15\text{ V}$ , $T_c = 100^\circ\text{C}$     |         |
| $I_{D(pulse)}$ | Pulsed Drain Current                       | 50          | A    | Pulse width $t_p$ limited by $T_{jmax}$                | Fig. 22 |
| $P_D$          | Power Dissipation                          | 83          | W    | $T_c = 25^\circ\text{C}$ , $T_j = 150^\circ\text{C}$   | Fig. 20 |
| $T_j, T_{stg}$ | Operating Junction and Storage Temperature | -55 to +150 | °C   |                                                        |         |
| $T_L$          | Solder Temperature                         | 260         | °C   | 1.6mm (0.063") from case for 10s                       |         |

Note (1): When using MOSFET Body Diode  $V_{GSmax} = -4\text{V}/+19\text{V}$

Note (2): MOSFET can also safely operate at 0/+15 V

**Electrical Characteristics** ( $T_C = 25^\circ\text{C}$  unless otherwise specified)

| Symbol        | Parameter                                  | Min. | Typ. | Max. | Unit          | Test Conditions                                                                                                                                            |
|---------------|--------------------------------------------|------|------|------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage             | 1000 |      |      | V             | $V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$                                                                                                        |
| $V_{GS(th)}$  | Gate Threshold Voltage                     | 1.8  | 2.1  | 3.5  | V             | $V_{DS} = V_{GS}, I_D = 3\text{ mA}$                                                                                                                       |
|               |                                            |      | 1.6  |      | V             | $V_{DS} = V_{GS}, I_D = 3\text{ mA}, T_J = 150^\circ\text{C}$                                                                                              |
| $I_{DSS}$     | Zero Gate Voltage Drain Current            |      | 1    | 100  | $\mu\text{A}$ | $V_{DS} = 1000\text{ V}, V_{GS} = 0\text{ V}$                                                                                                              |
| $I_{GSS}$     | Gate-Source Leakage Current                |      | 10   | 250  | nA            | $V_{GS} = 15\text{ V}, V_{DS} = 0\text{ V}$                                                                                                                |
| $R_{DS(on)}$  | Drain-Source On-State Resistance           |      | 120  | 155  | m $\Omega$    | $V_{GS} = 15\text{ V}, I_D = 15\text{ A}$                                                                                                                  |
|               |                                            |      | 170  |      |               | $V_{GS} = 15\text{ V}, I_D = 15\text{ A}, T_J = 150^\circ\text{C}$                                                                                         |
| $g_{fs}$      | Transconductance                           |      | 8.9  |      | S             | $V_{DS} = 20\text{ V}, I_{DS} = 15\text{ A}$                                                                                                               |
|               |                                            |      | 7.1  |      |               | $V_{DS} = 20\text{ V}, I_{DS} = 15\text{ A}, T_J = 150^\circ\text{C}$                                                                                      |
| $C_{iss}$     | Input Capacitance                          |      | 414  |      | pF            | $V_{GS} = 0\text{ V}, V_{DS} = 600\text{ V}$<br>$f = 1\text{ MHz}$<br>$V_{AC} = 25\text{ mV}$                                                              |
| $C_{oss}$     | Output Capacitance                         |      | 48   |      |               |                                                                                                                                                            |
| $C_{rss}$     | Reverse Transfer Capacitance               |      | 3    |      |               |                                                                                                                                                            |
| $E_{oss}$     | $C_{oss}$ Stored Energy                    |      | 10.6 |      | $\mu\text{J}$ |                                                                                                                                                            |
| $E_{ON}$      | Turn-On Switching Energy (Body Diode FWD)  |      | 120  |      | $\mu\text{J}$ | $V_{DS} = 700\text{ V}, V_{GS} = -4\text{ V}/15\text{ V}, I_D = 15\text{ A},$<br>$R_{G(ext)} = 2.5\Omega, L = 158\mu\text{H}, T_J = 150^\circ\text{C}$     |
| $E_{OFF}$     | Turn Off Switching Energy (Body Diode FWD) |      | 22   |      |               |                                                                                                                                                            |
| $t_{d(on)}$   | Turn-On Delay Time                         |      | 5    |      | ns            | $V_{DD} = 700\text{ V}, V_{GS} = -4\text{ V}/15\text{ V}$<br>$I_D = 15\text{ A}, R_{G(ext)} = 2.5\Omega,$<br>Timing relative to $V_{DS}$<br>Inductive load |
| $t_r$         | Rise Time                                  |      | 9    |      |               |                                                                                                                                                            |
| $t_{d(off)}$  | Turn-Off Delay Time                        |      | 13   |      |               |                                                                                                                                                            |
| $t_f$         | Fall Time                                  |      | 7    |      |               |                                                                                                                                                            |
| $R_{G(int)}$  | Internal Gate Resistance                   |      | 13   |      | $\Omega$      | $f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$                                                                                                                  |
| $Q_{gs}$      | Gate to Source Charge                      |      | 5    |      | nC            | $V_{DS} = 700\text{ V}, V_{GS} = -4\text{ V}/15\text{ V}$<br>$I_D = 15\text{ A}$<br>Per IEC60747-8-4 pg 21                                                 |
| $Q_{gd}$      | Gate to Drain Charge                       |      | 9    |      |               |                                                                                                                                                            |
| $Q_g$         | Total Gate Charge                          |      | 22   |      |               |                                                                                                                                                            |

**Reverse Diode Characteristics** ( $T_C = 25^\circ\text{C}$  unless otherwise specified)

| Symbol         | Parameter                        | Typ. | Max. | Unit | Test Conditions                                                                                                                   |
|----------------|----------------------------------|------|------|------|-----------------------------------------------------------------------------------------------------------------------------------|
| $V_{SD}$       | Diode Forward Voltage            | 4.8  |      | V    | $V_{GS} = -4\text{ V}, I_{SD} = 7.5\text{ A}$                                                                                     |
|                |                                  | 4.4  |      | V    | $V_{GS} = -4\text{ V}, I_{SD} = 7.5\text{ A}, T_J = 150^\circ\text{C}$                                                            |
| $I_S$          | Continuous Diode Forward Current |      | 15   | A    | $V_{GS} = -4\text{ V}$                                                                                                            |
| $I_{S, pulse}$ | Diode pulse Current              |      | 50   | A    | $V_{GS} = -4\text{ V},$ pulse width $t_p$ limited by $T_{Jmax}$                                                                   |
| $t_{rr}$       | Reverse Recover time             | 17   |      | ns   | $V_{GS} = -4\text{ V}, I_{SD} = 15\text{ A}, V_R = 700\text{ V}$<br>$dif/dt = 2400\text{ A}/\mu\text{s}, T_J = 150^\circ\text{C}$ |
| $Q_{rr}$       | Reverse Recovery Charge          | 191  |      | nC   |                                                                                                                                   |
| $I_{rrm}$      | Peak Reverse Recovery Current    | 18   |      | A    |                                                                                                                                   |

**Thermal Characteristics**

| Symbol          | Parameter                                   | Max. | Unit                      | Test Conditions |
|-----------------|---------------------------------------------|------|---------------------------|-----------------|
| $R_{\theta JC}$ | Thermal Resistance from Junction to Case    | 1.5  | $^\circ\text{C}/\text{W}$ |                 |
| $R_{\theta JA}$ | Thermal Resistance From Junction to Ambient | 40   |                           |                 |

## Package Dimensions

## Package T0-247-4L

Unit: mm

