



### Features

- Ultra-low  $R_{DS(ON)}$
- Low Gate Charge
- 100% UIS Tested, 100%  $R_g$  Tested
- Pb-free Lead Plating
- Halogen-free and RoHS-compliant

### Application

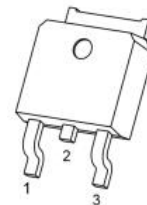
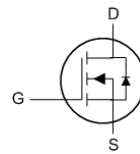
- Motor Driving in Power Tool, E-vehicle, Robotics
- Current Switching in DC/DC & AC/DC (SR) Sub-systems
- Power Management in Telecom., Industrial Automation, CE

$V_{DSS}$  100 V  
 $I_D$  120 A  
 $R_{DS(ON)}$  3.5m $\Omega$



LOGO GK XXX CODE

120 N 10



Schematic Diagram TO-263(G:1 D:2 S:3)

## MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$ unless otherwise noted)

| Parameter                               | Symbol         | Value                     | Unit             |
|---|----------------|---------------------------|------------------|
| Drain-to-Source Voltage                 | $V_{DS}$       | 100                       | V                |
| Gate-to-Source Voltage                  | $V_{GS}$       | $\pm 20$                  | V                |
| Continuous Drain Current <sup>(1)</sup> | $I_D$          | $T_C = 25^\circ\text{C}$  | 200              |
|   |                | $T_C = 100^\circ\text{C}$ | 120              |
| Pulsed Drain Current <sup>(2)</sup>     | $I_{DM}$       | 689                       | A                |
| Avalanche Energy <sup>(3)</sup>         | $E_{AS}$       | 726                       | mJ               |
| Power Dissipation <sup>(4)</sup>        | $P_D$          | $T_C = 25^\circ\text{C}$  | 312              |
|   |                | $T_C = 100^\circ\text{C}$ | 125              |
| Junction & Storage Temperature Range    | $T_J, T_{STG}$ | -55 to 150                | $^\circ\text{C}$ |

## Electrical Characteristics ( $T_J=25^\circ\text{C}$ unless otherwise noted)

| Parameter                                     | Symbol        | Conditions   | Min. | Typ. | Max.       | Unit          |
|---|---------------|--|------|------|------------|---------------|
| <b>STATIC PARAMETERS</b>                      |               |  |      |      |            |               |
| Drain-Source Breakdown Voltage                | $V_{(BR)DSS}$ | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$   | 100  |      |            | V             |
| Zero Gate Voltage Drain Current               | $I_{DSS}$     | $V_{DS} = 80\text{V}, V_{GS} = 0\text{V}$<br>$T_J = 55^\circ\text{C}$              |      |      | 1.0<br>5.0 | $\mu\text{A}$ |
| Gate-Body Leakage Current                     | $I_{GSS}$     | $V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$                                      |      |      | $\pm 100$  | nA            |
| Gate Threshold Voltage                        | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$  | 2.0  | 3.0  | 4.0        | V             |
| Static Drain-Source ON-Resistance             | $R_{DS(on)}$  | $V_{GS} = 10\text{V}, I_D = 20\text{A}$  |      | 3.5  | 4.5        | m $\Omega$    |
| Forward Transconductance                      | $g_{FS}$      | $V_{DS} = 5\text{V}, I_D = 20\text{A}$   |      | 50   |            | S             |
| Diode Forward Voltage                         | $V_{SD}$      | $I_S = 1\text{A}, V_{GS} = 0\text{V}$  |      | 0.66 | 1.0        | V             |
| Diode Continuous Current                      | $I_S$         | $T_C = 25^\circ\text{C}$   |      |      | 215        | A             |
| <b>DYNAMIC PARAMETERS <sup>(5)</sup></b>      |               |  |      |      |            |               |
| Input Capacitance                             | $C_{iss}$     | $V_{GS} = 0\text{V}, V_{DS} = 50\text{V}, f = 1\text{MHz}$                         |      | 4797 |            | pF            |
| Output Capacitance                            | $C_{oss}$     |  |      | 900  |            | pF            |
| Reverse Transfer Capacitance                  | $C_{rss}$     |  |      | 19.1 |            | pF            |
| Gate Resistance                               | $R_g$         | $V_{GS} = 0\text{V}, V_{DS} = 0\text{V}, f = 1\text{MHz}$                          |      | 1.9  |            | $\Omega$      |
| <b>SWITCHING PARAMETERS <sup>(5)</sup></b>    |               |  |      |      |            |               |
| Total Gate Charge (@ $V_{GS} = 10\text{V}$ )  | $Q_g$         | $V_{GS} = 0 \text{ to } 10\text{V}$<br>$V_{DS} = 50\text{V}, I_D = 20\text{A}$     |      | 84   |            | nC            |
| Total Gate Charge (@ $V_{GS} = 6.0\text{V}$ ) | $Q_g$         |  |      | 57   |            | nC            |
| Gate Source Charge                            | $Q_{gs}$      |  |      | 24   |            | nC            |
| Gate Drain Charge                             | $Q_{gd}$      |  |      | 27   |            | nC            |
| Turn-On DelayTime                             | $t_{D(on)}$   | $V_{GS} = 10\text{V}, V_{DS} = 50\text{V}$<br>$R_L = 2.5\Omega, R_{GEN} = 3\Omega$ |      | 21   |            | ns            |
| Turn-On Rise Time                             | $t_r$         |  |      | 35   |            | ns            |
| Turn-Off DelayTime                            | $t_{D(off)}$  |  |      | 49   |            | ns            |
| Turn-Off Fall Time                            | $t_f$         |  |      | 30   |            | ns            |
| Body Diode Reverse Recovery Time              | $t_{rr}$      | $I_F = 20\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$                              |      | 71   |            | ns            |
| Body Diode Reverse Recovery Charge            | $Q_{rr}$      | $I_F = 20\text{A}, dI_F/dt = 100\text{A}/\mu\text{s}$                              |      | 127  |            | nC            |

### Thermal Performance

| Parameter                               | Symbol          | Typ. | Max. | Unit                      |
|---|-----------------|------|------|---------------------------|
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 45   | 55   | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ | 0.40 | 0.60 | $^\circ\text{C}/\text{W}$ |

#### Notes:

1. Computed continuous current assumes the condition of  $T_{J\_Max}$  while the actual continuous current depends on the thermal & electro-mechanical application board design.
2. This single-pulse measurement was taken under  $T_{J\_Max} = 150^\circ\text{C}$ .
3.  $E_{AS}$  of 726 mJ is based on starting  $T_J = 25^\circ\text{C}$ ,  $L = 3\text{mH}$ ,  $I_{AS} = 22\text{A}$ ,  $V_{GS} = 10\text{V}$ ,  $V_{DD} = 50\text{V}$ ; 100% test at  $L = 0.3\text{mH}$ ,  $I_{AS} = 45\text{A}$ ,  $T_{J\_Max} = 150^\circ\text{C}$ .
4. The power dissipation  $P_D$  is based on  $T_{J\_Max} = 150^\circ\text{C}$ .
5. This value is guaranteed by design hence it is not included in the production test.

RATING AND CHARACTERISTIC CURVES

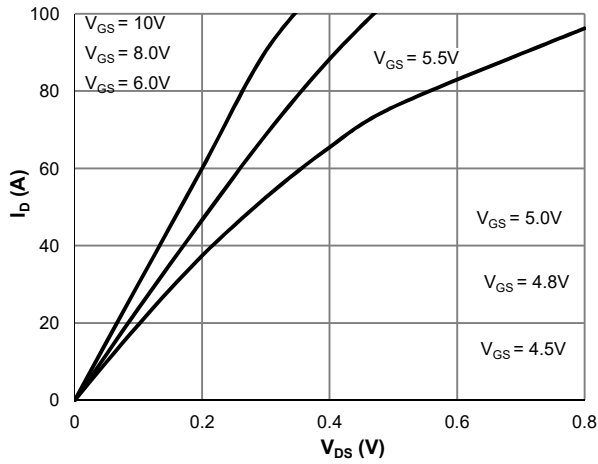


Figure 1: Saturation Characteristics

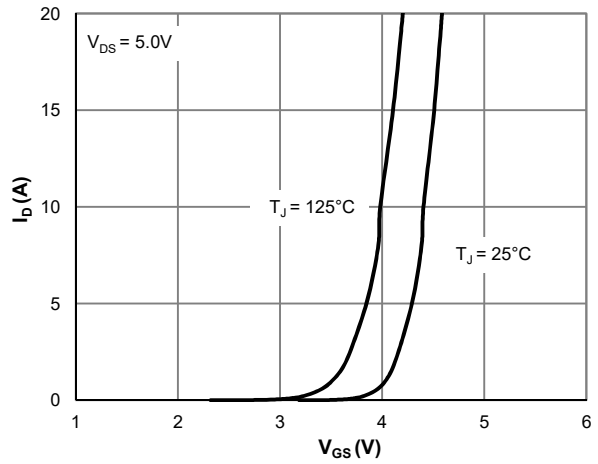


Figure 2: Transfer Characteristics

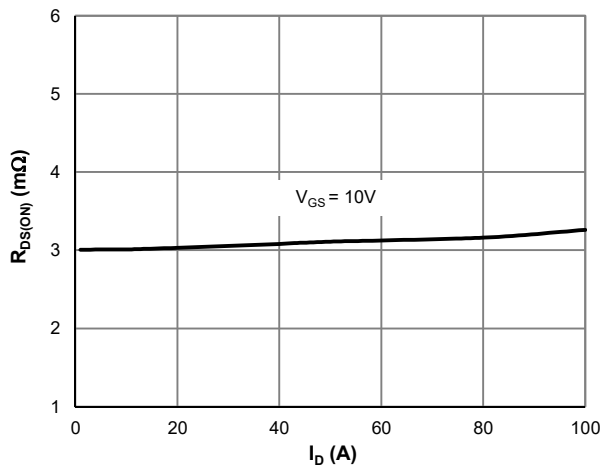


Figure 3:  $R_{DS(ON)}$  vs. Drain Current

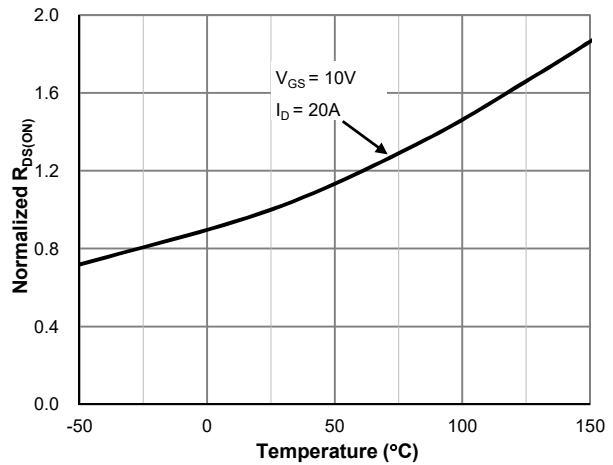


Figure 4:  $R_{DS(ON)}$  vs. Junction Temperature

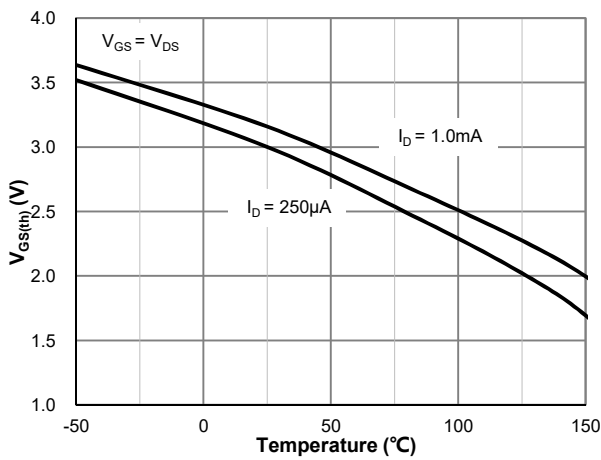


Figure 5:  $V_{GS(th)}$  vs. Junction Temperature

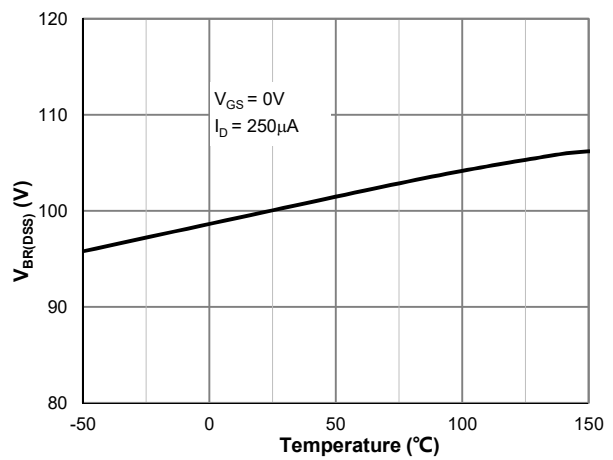


Figure 6:  $V_{BR(DSS)}$  vs. Junction Temperature

RATING AND CHARACTERISTIC CURVES

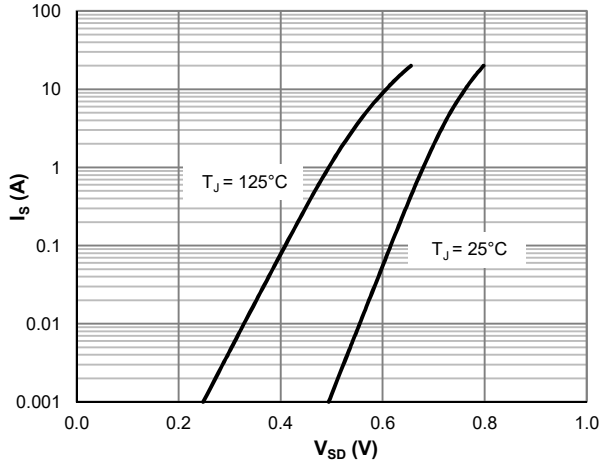


Figure 7: Body-Diode Characteristics

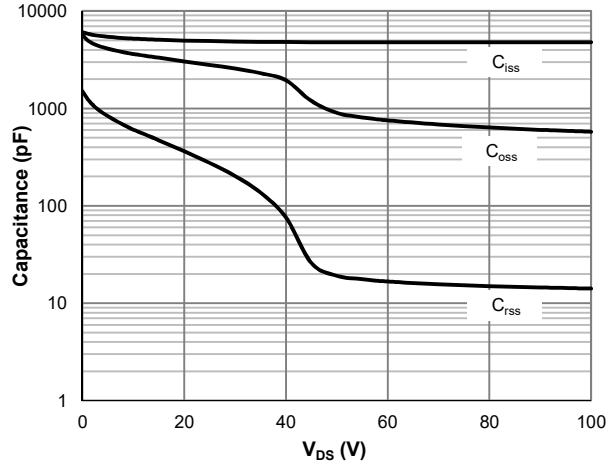


Figure 8: Capacitance Characteristics

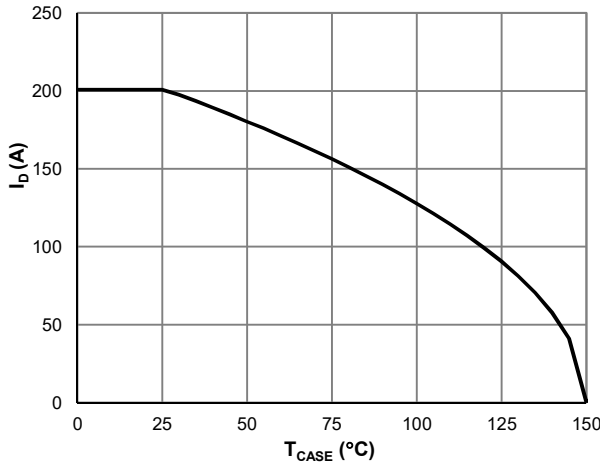


Figure 9: Current De-rating

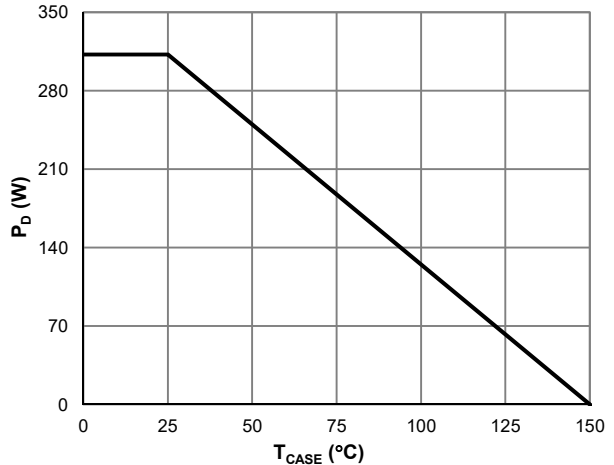


Figure 10: Power De-rating

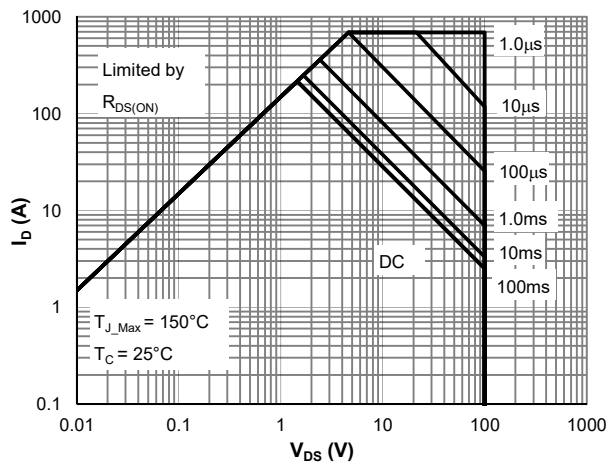


Figure 11: Maximum Safe Operating Area

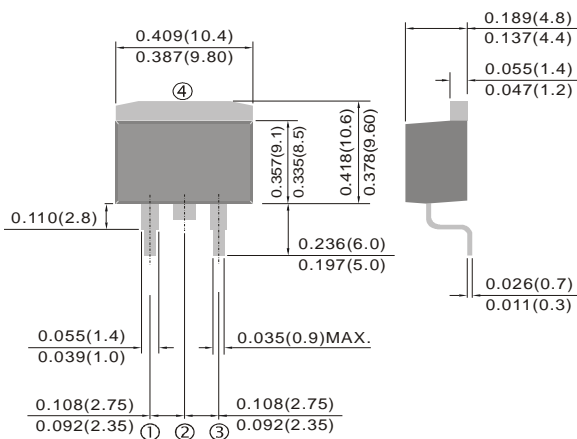
Soldering parameters

| Reflow Condition  |                                   | Pb-Free assembly<br>(see as below) |
|---|-----------------------------------|------------------------------------|
| Pre Heat  | -Temperature Min ( $T_{s(min)}$ ) | +150°C                             |
|   | -Temperature Max( $T_{s(max)}$ )  | +200°C                             |
|   | -Time (Min to Max) (ts)           | 60-180 secs.                       |
| Average ramp up rate (Liquid us Temp ( $T_L$ ) to peak) |                                   | 3°C/sec. Max                       |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                    |                                   | 3°C/sec. Max                       |
| Reflow  | -Temperature( $T_L$ )(Liquid us)  | +217°C                             |
|   | -Temperature( $t_L$ )             | 60-150 secs.                       |
| Peak Temp ( $T_P$ )                                     |                                   | +260(+0/-5)°C                      |
| Time within 5°C of actual Peak Temp ( $t_p$ )           |                                   | 30 secs. Max                       |
| Ramp-down Rate  |                                   | 6°C/sec. Max                       |
| Time 25°C to Peak Temp ( $T_P$ )                        |                                   | 8 min. Max                         |
| Do not exceed   |                                   | +260°C                             |

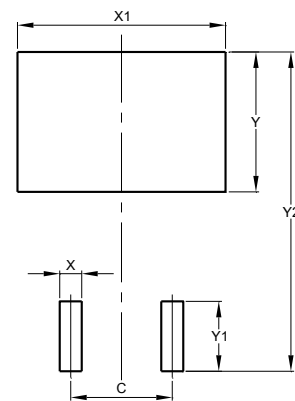


Package Dimensions & Suggested Pad Layout

TO-263 / D<sup>2</sup>PAK



Dimensions in inches and (millimeters)



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 5.05          |
| X          | 1.40          |
| X1         | 11.00         |
| Y          | 9.20          |
| Y1         | 4.00          |
| Y2         | 16.60         |

Tape & reel specification

| Tape                                      |           | Symbol   | Dimension (mm) |    |           |
|---|-----------|----------|----------------|----|-----------|
| <p>SECTION : A-A</p> <p>SECTION : B-B</p> |           | P0       | 4.00±0.20      |    |           |
|   |           | P1       | 16.00±0.20     |    |           |
|   |           | P2       | 2.00±0.20      |    |           |
|   |           | D0       | 1.50±0.20      |    |           |
|   |           | D1       | 1.50±0.20      |    |           |
|   |           | E        | 1.75±0.15      |    |           |
|   |           | F        | 11.50±0.20     |    |           |
|   |           | W        | 24.00±0.40     |    |           |
|   |           | A0       | 10.50±0.20     |    |           |
|   |           | B0       | 16.00±0.25     |    |           |
|   |           | K0       | 5.20±0.25      |    |           |
|   |           | T        | 0.35±0.10      |    |           |
|   |           | 13" Reel |                | D2 | 330.0±5.0 |
|   |           |          |                | D3 | 73Min.    |
| D4  | 14.0±2.5  |          |                |    |           |
| W1  | 28.00±2.0 |          |                |    |           |
| Quantity: 800PCS                          |           |          |                |    |           |