# GSX07N80E

## MOSFET

Metal Oxide Semiconductor Field Effect Transistor

Super Junction MOSFET

800V Super-Junction Power Transistor

GSX07N80E

Data Sheet

Ver 1.0

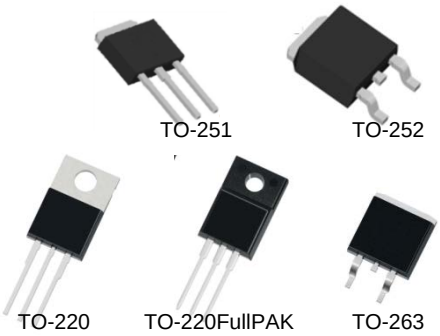
2019-3-20

# 800V 7A Power MOSFET

## ■Description

GroupSemiconductor(GS) has series Multi-EPI Super-Junction power MOSFET platforms for voltage up 500V to 1000V, both with design service and manufacturing capability, including cell, termination design and simulation.

The GS 800V 7A Power MOSFET is a Low voltage N channel Multi-EPI Super-Junction power MOSFET sample with advanced technology to have better characteristics, such as fast switching time, low Ciss and Crss, low on resistance and excellent avalanche characteristics, making it especially suitable for applications which require superior power density and outstanding efficiency.




## ■ Features

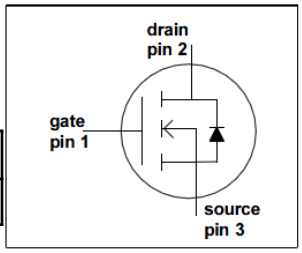
RDS(ON)=0.85Ω @VGS = 10V

VDS = 800V

ID (@ VGS=10V) = 7A

## ■ PKG

| GSA07N80E | GSP07N80E | GSB07N80E | GSD07N80E | GSS07N80E |
|---|---|---|---|---|
| TO-220Fullpak | TO-220 | TO-263 | TO-252 | TO-251 |




## ■Absolute Maximum Ratings (TC = 25° C, unless otherwise specified)

| Symbol | Parameter | GSP/T/S07N80E | GSA07N80E | Unit |
|---|---|---|---|---|
| $V_{DSS}$ | Drain-Source Voltage | 800 | | V |
| $I_D$ | Drain Current -Continuous (TC = 25°C)<br>-Continuous (TC = 100°C) | 7*<br>5.5* | | A |
| $I_{DM}$ | Drain Current - Pulsed (Note 1) | 15* | | A |
| $V_{GSS}$ | Gate-Source voltage | ±30 | | V |
| $E_{AS}$ | Single Pulsed Avalanche Energy (Note 2) | 60 | | mJ |
| $I_{AR}$ | Avalanche Current (Note 1) | 2 | | A |
| $E_{AR}$ | Repetitive Avalanche Energy (Note 1) | 0.3 | | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | 15 | | V/ns |
| dVds/dt | Drain Source voltage slope (Vds=720V) | 50 | | V/ns |
| $P_D$ | Power Dissipation (TC = 25°C) | 37 | 26 | W |
| $T_J$, $T_{STG}$ | Operating and Storage Temperature Range | -55 to +150 | | °C |
| $T_L$ | Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds | 300 | | °C |

# 800V 7A Power MOSFET

## Electrical Characteristics $T_C$ = 25℃ unless otherwise noted

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = 250μA, $T_J$ = 25℃ | 800 | -- | -- | V |
| | | $V_{GS}$ = 0V, $I_D$ = 250μA, $T_J$ = 150℃ | -- | 850 | -- | V |
| $\Delta BV_{DSS}$ / $\Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250μA, Referenced to 25℃ | -- | 0.6 | -- | V/℃ |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 800V, $V_{GS}$ = 0V | -- | -- | 1 | μA |
| | | -$T_J$ = 150℃ | | 10 | - | μA |
| $I_{GSSF}$ | Gate-Body Leakage Current, Forward | $V_{GS}$ = 30V, $V_{DS}$ = 0V | -- | -- | 100 | nA |
| $I_{GSSR}$ | Gate-Body Leakage Current, Reverse | $V_{GS}$ = -30V, $V_{DS}$ = 0V | -- | -- | -100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 2.5 | 3.5 | 4.5 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS}$ = 10V, $I_D$ = 3.5A | -- | 0.75 | 0.85 | Ω |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 40V, $I_D$ = 7A | -- | 6 | -- | S |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 25V, $V_{GS}$ = 0V, f = 1.0MHz | -- | 380 | - | pF |
| $C_{oss}$ | Output Capacitance | | -- | 110 | - | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | -- | 7 | -- | pF |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = 400V, $I_D$ = 3.5A, $R_G$ = 20Ω(Note 4) | -- | 13 | -- | ns |
| $t_r$ | Turn-On Rise Time | | -- | 10 | -- | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 85 | -- | ns |
| $t_f$ | Turn-Off Fall Time | | -- | 14 | -- | ns |
| $Q_g$ | Total Gate Charge | $V_{DS}$ = 480V, $I_D$ = 3.5A, $V_{GS}$ = 10V (Note 4) | -- | 25 | - | nC |
| $Q_{gs}$ | Gate-Source Charge | | -- | 2.0 | -- | nC |
| $Q_{gd}$ | Gate-Drain Charge | | -- | 2.7 | -- | nC |
| **Drain-Source Diode Characteristics and Maximum Ratings** | | | | | | |
| $I_S$ | Maximum Continuous Drain-Source Diode Forward Current | | -- | -- | 7 | A |
| $I_{SM}$ | Maximum Pulsed Drain-Source Diode Forward Current | | -- | -- | 20 | A |
| $V_{SD}$ | Drain-Source Diode Forward Voltage | $V_{GS}$ = 0V, $I_S$ = 3.5A | -- | 0.9 | 1.5 | V |
| $t_{rr}$ | Reverse Recovery Time | $V_{GS}$ = 0V, $I_S$ = 3.5A, $dI_F/dt$ =100A/μs | -- | 190 | -- | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | -- | 2.3 | -- | μC |

NOTES:
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $I_{AS}$=1.7A, VDD=50V, Starting TJ=25 ℃
3. $I_{SD}$≤ID, di/dt ≤ 200A/us, $V_{DD}$ ≤ $BV_{DSS}$, Starting TJ = 25 ℃
4. Essentially Independent of Operating Temperature Typical Characteristics

# 800V 7A Power MOSFET

## Typical Performance Characteristics

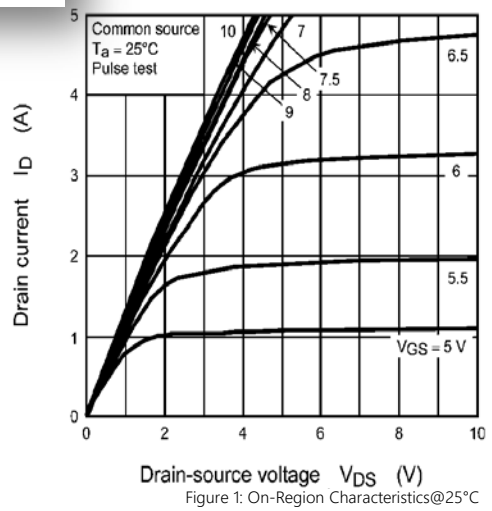



Figure 1: On-Region Characteristics@25°C

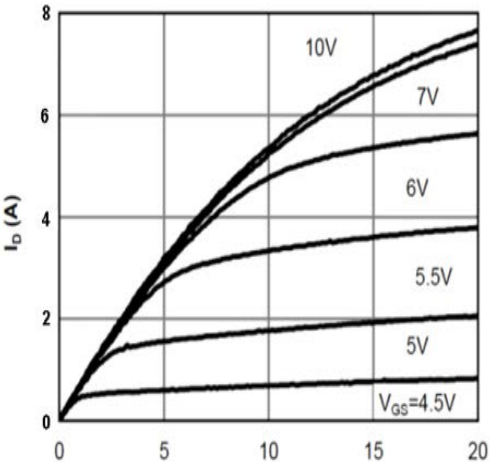



Figure 2: On-Region Characteristics@125°C

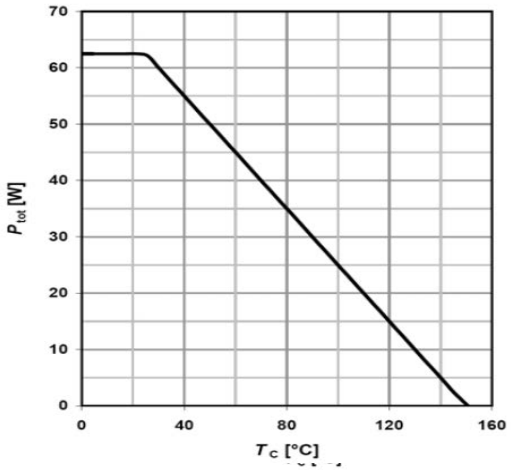



Figure 3:Power Dissipation
TO-252 , TO-251

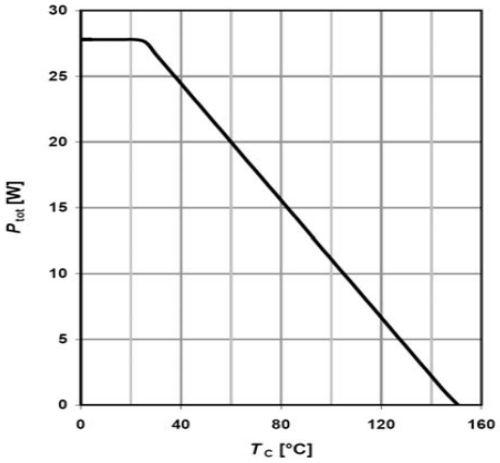



Figure 4 : Power dissipation
TO-220FullPAK

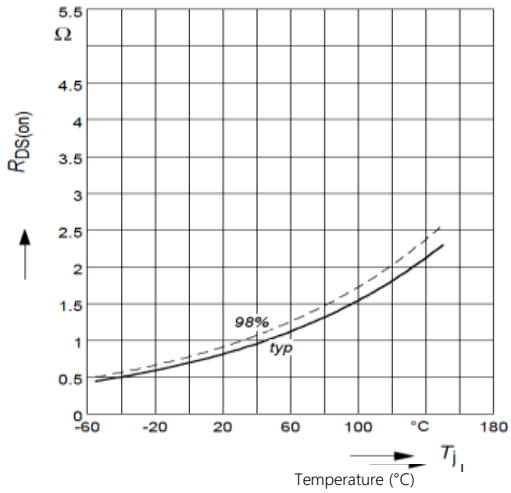



Figure 5: On-Resistance vs. Junction Temperature

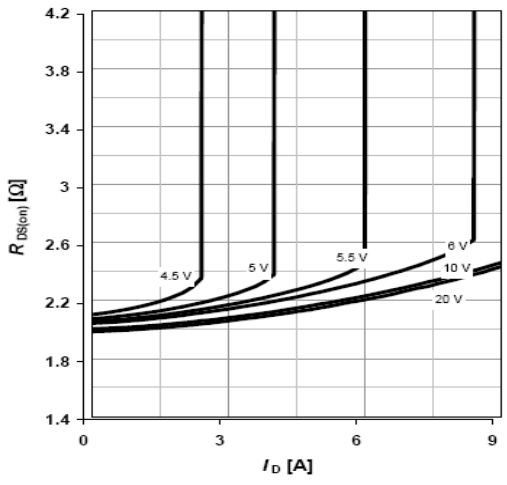



Figure 6: On-Resistance vs. Drain Current, Tj=150°C

# 800V 7A Power MOSFET

## Typical Performance Characteristics

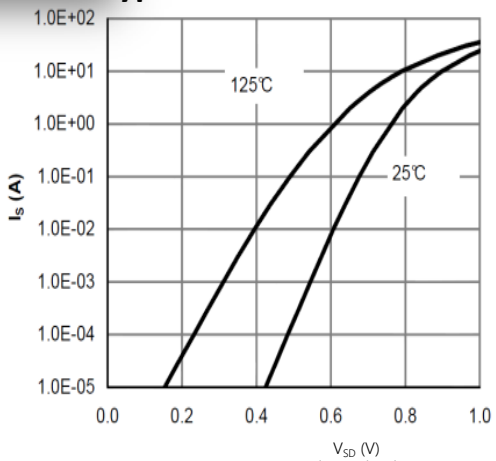



Figure 7: Body-Diode Characteristics

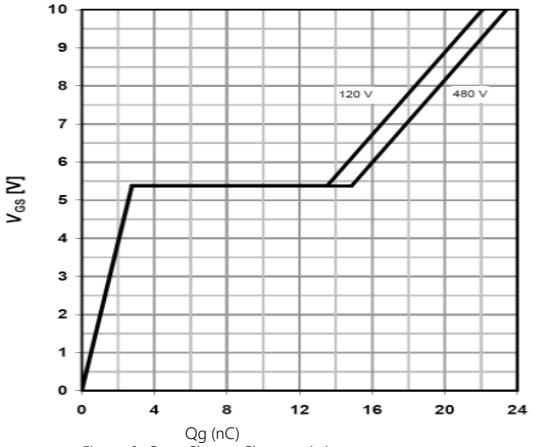



Figure 8: Gate-Charge Characteristics

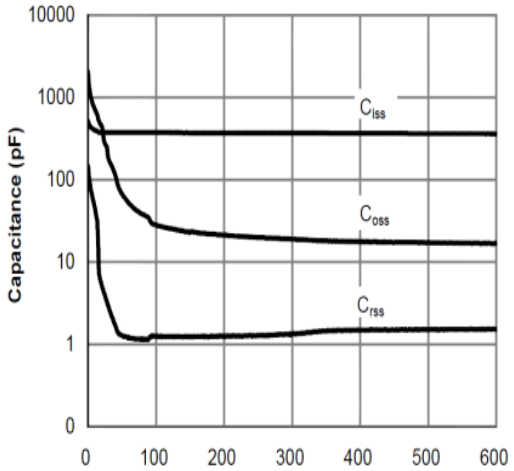



Figure 9: Capacitance Characteristics

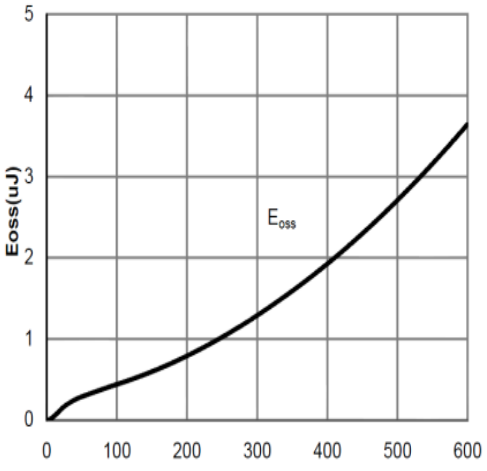



Figure 10: $C_{oss}$ stored Energy

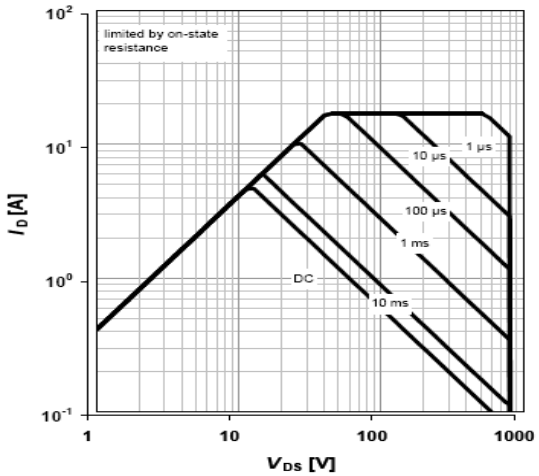



Figure 11: Maximum Forward Biased Safe Operating Area
Tc=25°C (TO-252 ， TO-251)

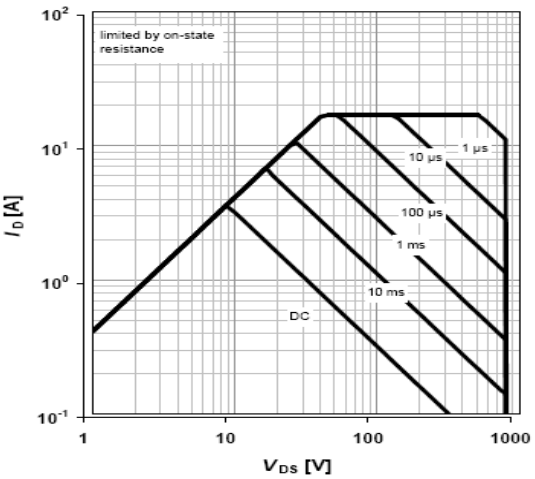
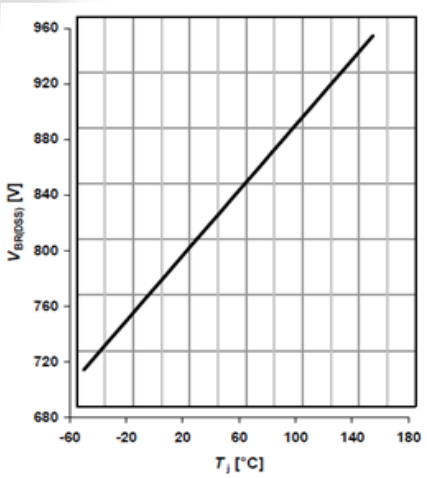
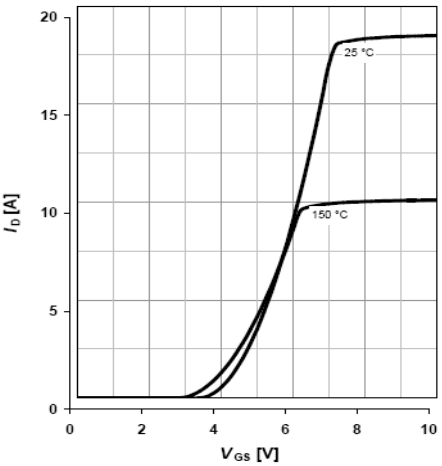


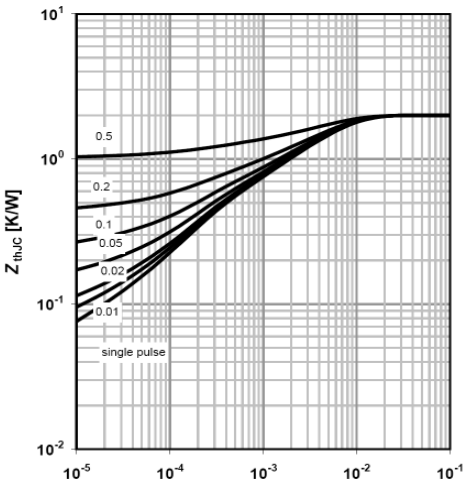

Figure 12: Maximum Forward Biased Safe Operating Area
Tc=25°C (TO-220 FullPAK )

# 800V 7A Power MOSFET

## Typical Performance Characteristics



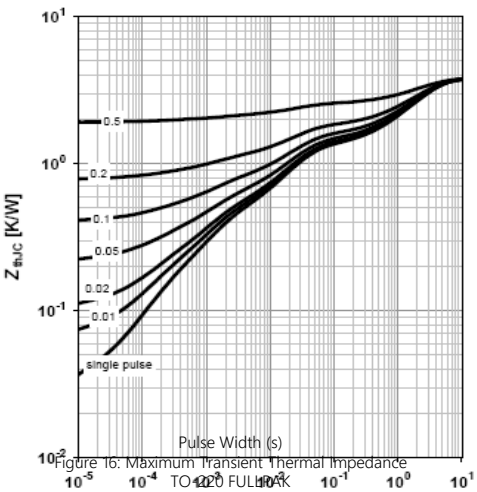
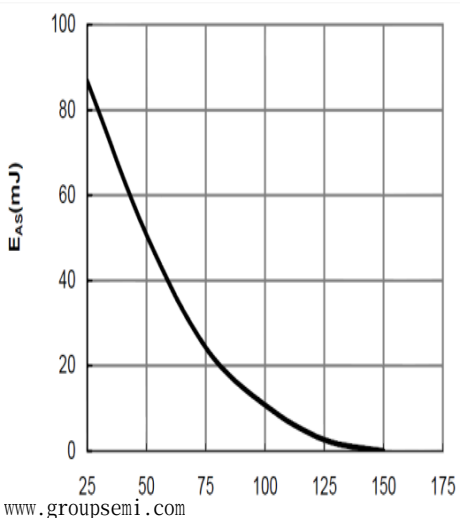



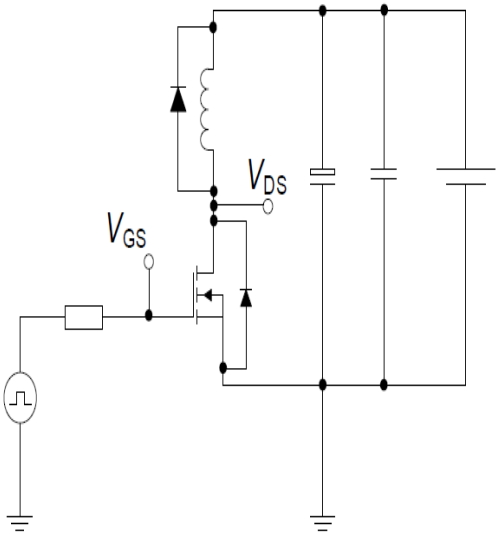

Figure 16: Maximum Transient Thermal Impedance
TO-220 FULLPAK



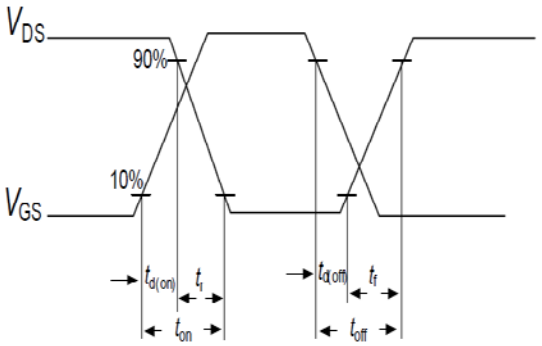
## Test circuits

Switching times test circuit and waveform for inductive load

Switching times test circuit for inductive load

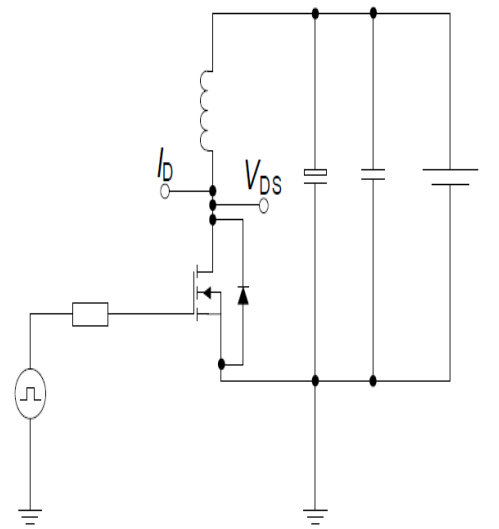



Switching time waveform

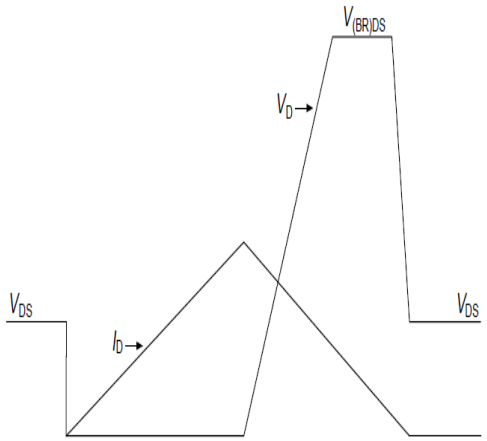



Unclamped inductive load test circuit and waveform

Unclamped inductive load test circuit



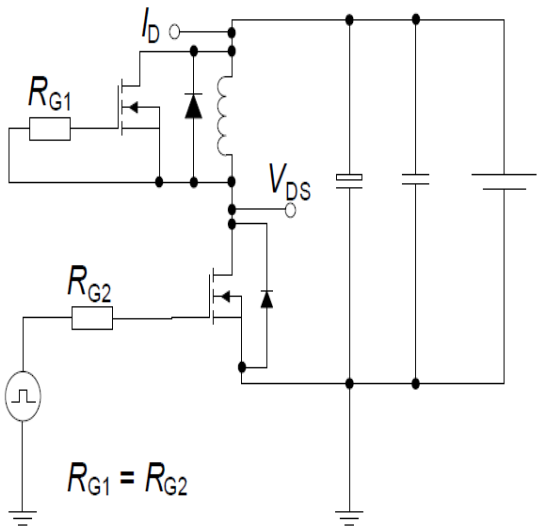

Unclamped inductive waveform



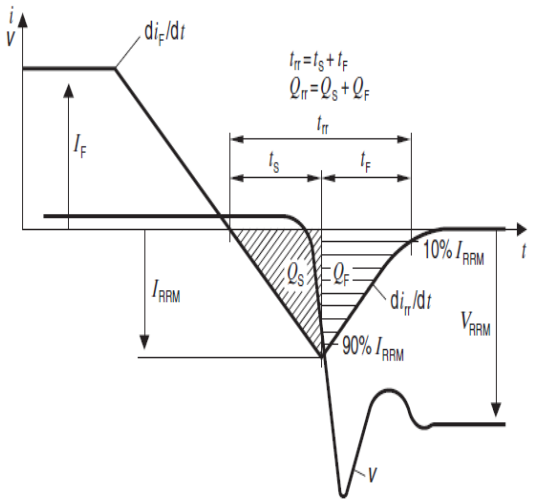
# 800V 7A Power MOSFET

## Test circuit and waveform for diode characteristics

### Test circuit for diode characteristics




### Diode recovery waveform

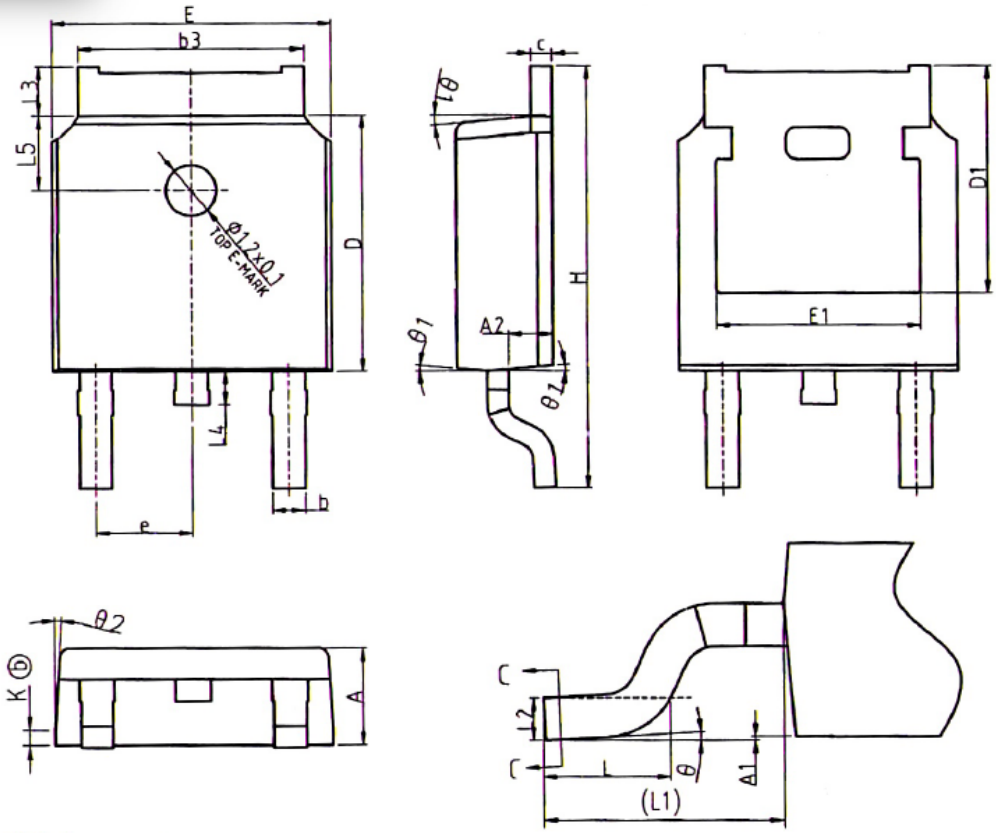


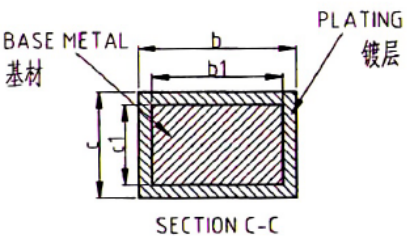
GROUP SEMICONDUCTOR

**Package Outline**

TO-252

# 800V 7A Power MOSFET




COMMON DIMENSIONS

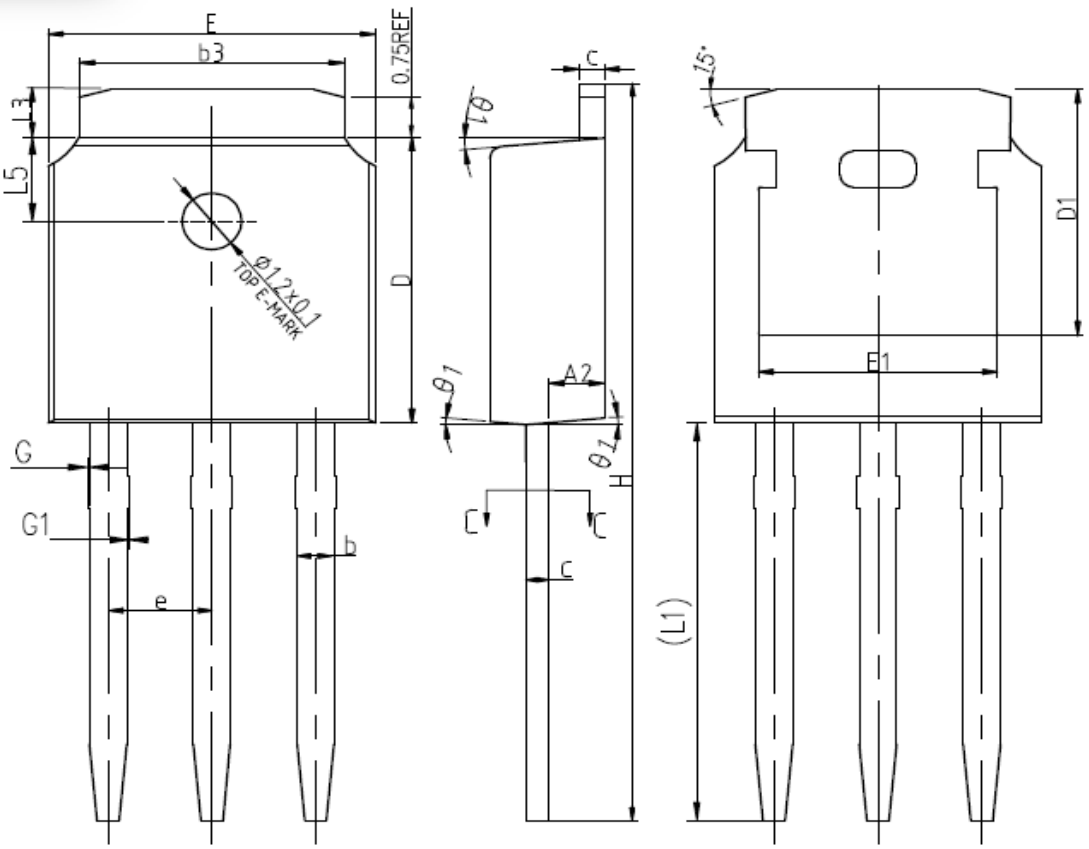
| SYMBOL | MM | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 2.20 | 2.30 | 2.38 |
| A1 | 0.00 | - | 0.10 |
| A2 | 0.97 | 1.07 | 1.17 |
| b | 0.72 | 0.78 | 0.85 |
| b1 | 0.71 | 0.76 | 0.81 |
| b3 | 5.23 | 5.33 | 5.46 |
| c | 0.47 | 0.53 | 0.58 |
| c1 | 0.46 | 0.51 | 0.56 |
| D | 6.00 | 6.10 | 6.20 |
| D1 | | 5.30REF | |
| E | 6.50 | 6.60 | 6.70 |
| E1 | 4.70 | 4.83 | 4.92 |
| e | | 2.286BSC | |
| H | 9.90 | 10.10 | 10.30 |
| L | 1.40 | 1.50 | 1.70 |
| L1 | | 2.90REF | |
| L2 | | 0.51BSC | |
| L3 | 0.90 | - | 1.25 |
| L4 | 0.60 | 0.80 | 1.00 |
| L5 | 1.70 | 1.80 | 1.90 |
| θ | 0° | - | 8° |
| θ1 | 5° | 7° | 9° |
| θ2 | 5° | 7° | 9° |
| K | | 0.40REF | |

GROUP SEMICONDUCTOR

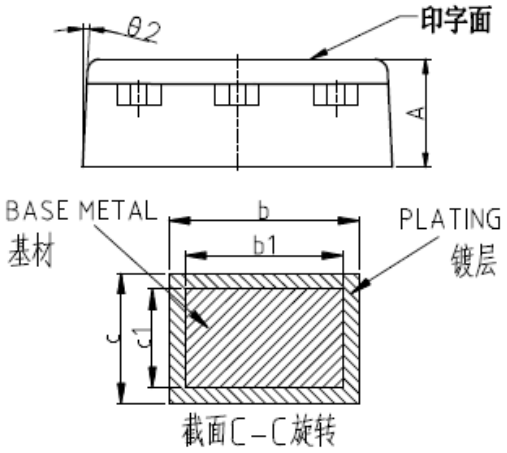
**Package Outline**

TO-251

# 800V 7A Power MOSFET




COMMON DIMENSIONS

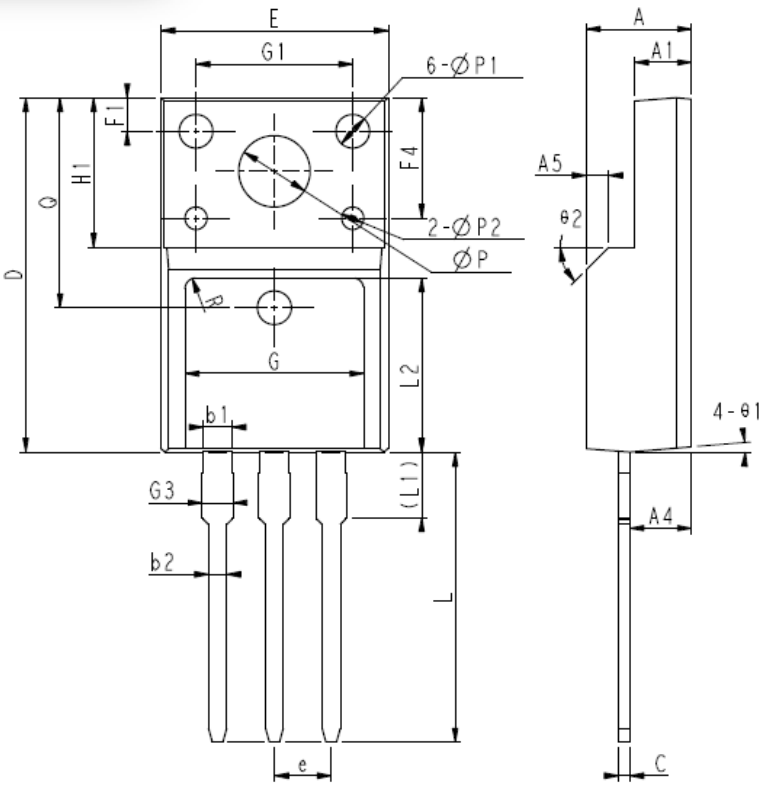


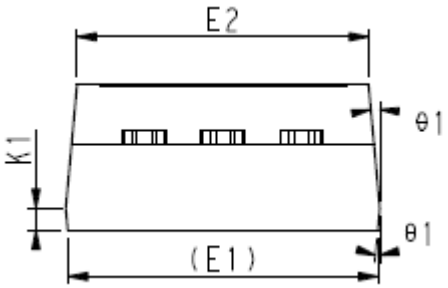

| SYMBOL | MM | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 2.20 | 2.30 | 2.38 |
| A2 | 0.97 | 1.07 | 1.17 |
| b | 0.72 | 0.78 | 0.85 |
| b1 | 0.71 | 0.76 | 0.81 |
| b3 | 5.23 | 5.33 | 5.46 |
| c | 0.47 | 0.53 | 0.58 |
| c1 | 0.46 | 0.51 | 0.56 |
| D | 6.00 | 6.10 | 6.20 |
| D1 | | 5.30REF | |
| E | 6.50 | 6.60 | 6.70 |
| E1 | 4.70 | 4.83 | 4.92 |
| e | | 2.286BSC | |
| H | 16.10 | 16.40 | 16.60 |
| L1 | 9.20 | 9.40 | 9.60 |
| L3 | 0.90 | 1.02 | 1.25 |
| L5 | 1.70 | 1.80 | 1.90 |
| θ1 | 5° | 7° | 9° |
| θ2 | 5° | 7° | 9° |

# 800V 7A Power MOSFET

## Package Outline

TO-220 Full PAK




COMMON DIMENSIONS

| SYMBOL | MM | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| E | 10.00 | 10.16 | 10.32 |
| E1 | 9.94 | 10.04 | 10.14 |
| E2 | 9.36 | 9.46 | 9.56 |
| A | 4.50 | 4.70 | 4.90 |
| A1 | 2.34 | 2.54 | 2.74 |
| A4 | 2.66 | 2.76 | 2.86 |
| A5 | | 1.00REF | |
| c | 0.45 | 0.50 | 0.60 |
| D | 15.67 | 15.87 | 16.07 |
| Q | | 9.40REF | |
| H1 | | 6.70REF | |
| e | | 2.54BSC | |
| ΦP | | 3.18REF | |
| L | 12.78 | 12.98 | 13.18 |
| L1 | 2.83 | 2.93 | 3.03 |
| L2 | 7.70 | 7.80 | 7.90 |
| ΦP1 | 1.40 | 1.50 | 1.60 |
| ΦP2 | 0.95 | 1.00 | 1.05 |
| ΦP3 | | 3.45REF | |
| θ1 | 3° | 5° | 7° |
| θ2 | - | 45° | - |
| F1 | 1.00 | 1.50 | 2.00 |
| F2 | 13.80 | 13.90 | 14.00 |
| F3 | 3.20 | 3.30 | 3.40 |
| F4 | 5.30 | 5.40 | 5.50 |
| G | 7.80 | 8.00 | 8.20 |
| G1 | 6.90 | 7.00 | 7.10 |
| G3 | 1.25 | 1.35 | 1.45 |
| b1 | 1.23 | 1.28 | 1.38 |
| b2 | 0.75 | 0.80 | 0.90 |
| K1 | 0.65 | 0.70 | 0.75 |
| R | | 0.50REF | |