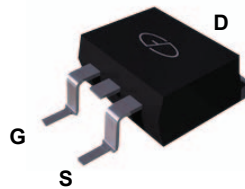
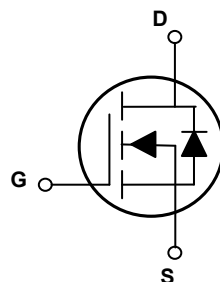


### Main Product Characteristics

|               |              |
|---------------|--------------|
| $V_{(BR)DSS}$ | 600V         |
| $R_{DS(ON)}$  | 0.19Ω (max.) |
| $I_D$         | 20A          |



TO-263 (D²PAK)



Schematic Diagram

### Features and Benefits

- Advanced MOSFET process technology
- Ideal for high efficiency switched mode power supplies
- Low on-resistance with low gate charge
- Fast switching and reverse body recovery



### Description

The GSFT60R190 utilizes the latest techniques to achieve high cell density and low on-resistance. These features make this device extremely efficient and reliable for use in high efficiency switch mode power supplies and a wide variety of other applications.

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

| Parameter                                                                | Symbol          | Max.        | Unit |
|--------------------------------------------------------------------------|-----------------|-------------|------|
| Drain-Source Voltage                                                     | $V_{DS}$        | 600         | V    |
| Gate-Source Voltage                                                      | $V_{GS}$        | ±30         | V    |
| Drain Current-Continuous, at Steady-State, ( $T_C=25^{\circ}\text{C}$ )  | $I_D$           | 20          | A    |
| Drain Current-Continuous, at Steady-State, ( $T_C=100^{\circ}\text{C}$ ) |                 | 12          |      |
| Drain Current-Pulsed                                                     | $I_{DM}$        | 80          | A    |
| Single Pulse Avalanche Energy <sup>1</sup>                               | $E_{AS}$        | 967         | mJ   |
| Power Dissipation ( $T_C=25^{\circ}\text{C}$ )                           | $P_D$           | 66          | W    |
|                                                                          |                 | 0.52        | W/°C |
| Body Diode Reverse Voltage Slope <sup>2</sup>                            | $dv/dt$         | 15          | V/ns |
| MOS $dv/dt$ Reggedness <sup>3</sup>                                      | $dv/dt$         | 50          | V/ns |
| Junction-to-Ambient (PCB Mounted, Steady-State)                          | $R_{\theta JA}$ | 62.5        | °C/W |
| Thermal Resistance, Junction-to-Case                                     | $R_{\theta JC}$ | 1.9         | °C/W |
| Operating Junction Temperature Range                                     | $T_J$           | -55 To +150 | °C   |
| Storage Temperature Range                                                | $T_{STG}$       | -55 To +150 | °C   |

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

| Parameter                                                     | Symbol        | Conditions                                                                              | Min. | Typ. | Max. | Unit     |
|---------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------|------|------|------|----------|
| <b>On / Off Characteristics</b>                               |               |                                                                                         |      |      |      |          |
| Drain-Source Breakdown Voltage                                | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=250\mu A$                                                               | 600  | -    | -    | V        |
| Drain-Source Leakage Current                                  | $I_{DSS}$     | $V_{DS}=600V, V_{GS}=0V$                                                                | -    | -    | 200  | nA       |
| Gate-Source Leakage Current                                   | $I_{GSS}$     | $V_{DS}=0V, V_{GS}=30V$                                                                 | -    | -    | 100  | nA       |
|                                                               |               | $V_{DS}=0V, V_{GS}=-30V$                                                                | -    | -    | -100 |          |
| Static Drain-Source On-Resistance                             | $R_{DS(ON)}$  | $V_{GS}=10V, I_D=10A$<br>$T_J=25^\circ\text{C}$                                         | -    | 0.16 | 0.19 | $\Omega$ |
|                                                               |               | $V_{GS}=10V, I_D=10A$<br>$T_J=125^\circ\text{C}$                                        | -    | 0.3  | -    |          |
| Gate Threshold Voltage                                        | $V_{GS(th)}$  | $V_{GS}=V_{DS}, I_D=250\mu A$                                                           | 2    | -    | 4    | V        |
| <b>Dynamic and Switching Characteristics</b>                  |               |                                                                                         |      |      |      |          |
| Total Gate Charge <sup>4,5</sup>                              | $Q_g$         | $V_{DD}=480V, I_D=20A,$<br>$V_{GS}=10V$                                                 | -    | 39   | -    | nC       |
| Gate-Source Charge <sup>4,5</sup>                             | $Q_{gs}$      |                                                                                         | -    | 9.6  | -    |          |
| Gate-Drain ("Miller") Charge <sup>4,5</sup>                   | $Q_{gd}$      |                                                                                         | -    | 20   | -    |          |
| Turn-On Delay Time <sup>4,5</sup>                             | $t_{d(on)}$   | $V_{DD}=300V, R_G=25\Omega,$<br>$V_{GS}=10V, I_D=20A$                                   | -    | 20   | -    | nS       |
| Rise Time <sup>4,5</sup>                                      | $t_r$         |                                                                                         | -    | 60   | -    |          |
| Turn-Off Delay Time <sup>4,5</sup>                            | $t_{d(off)}$  |                                                                                         | -    | 105  | -    |          |
| Fall Time <sup>4,5</sup>                                      | $t_f$         |                                                                                         | -    | 42   | -    |          |
| Input Capacitance                                             | $C_{iss}$     | $V_{DS}=100V, V_{GS}=0V,$<br>$F=1\text{MHz}$                                            | -    | 1174 | -    | pF       |
| Output Capacitance                                            | $C_{oss}$     |                                                                                         | -    | 67   | -    |          |
| Reverse Transfer Capacitance                                  | $C_{rss}$     |                                                                                         | -    | 4    | -    |          |
| Gate Resistance                                               | $R_g$         | $F=1\text{MHz}$                                                                         | -    | 2.6  | -    | $\Omega$ |
| <b>Drain-Source Diode Characteristics and Maximum Ratings</b> |               |                                                                                         |      |      |      |          |
| Continuous Source Current (Body Diode)                        | $I_S$         | $T_C=25^\circ\text{C}$ , MOSFET symbol showing the integral reverse p-n junction diode. | -    | -    | 20   | A        |
| Pulsed Source Current                                         | $I_{SM}$      |                                                                                         | -    | -    | 80   | A        |
| Diode Forward Voltage                                         | $V_{SD}$      | $V_{GS}=0V, I_S=20A$                                                                    | -    | -    | 1.2  | V        |
| Reverse Recovery Time <sup>3</sup>                            | $t_{rr}$      | $V_{DD}=50V, I_F=20A,$<br>$dI_F/dt=100A/\mu s$                                          | -    | 426  | -    | nS       |
| Reverse Recovery Charge <sup>3</sup>                          | $Q_{rr}$      |                                                                                         | -    | 6.2  | -    | $\mu C$  |

Note:

1.  $L=79\text{mH}$ ,  $I_{AS}=4.6A$ ,  $V_{DD}=100V$ , starting temperature  $T_J=25^\circ\text{C}$ .
2.  $V_{DS}=0-400V$ ,  $I_{SD}\leq 20A$ ,  $T_J=25^\circ\text{C}$ .
3.  $V_{DS}=0-480V$ .
4. Pulse Test: Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
5. Essentially independent of operating temperature.

## Typical Electrical and Thermal Characteristic Curves

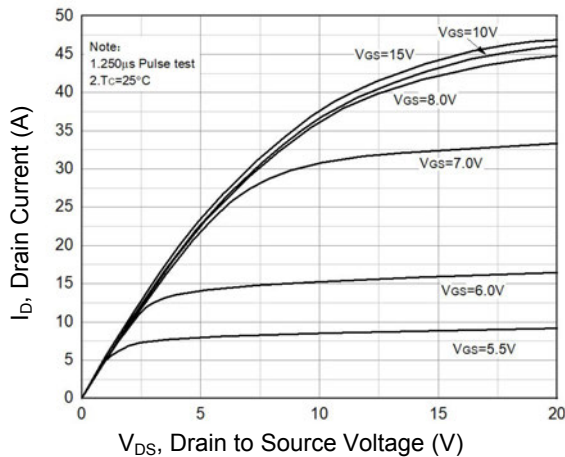


Figure 1. Typical Output Characteristics

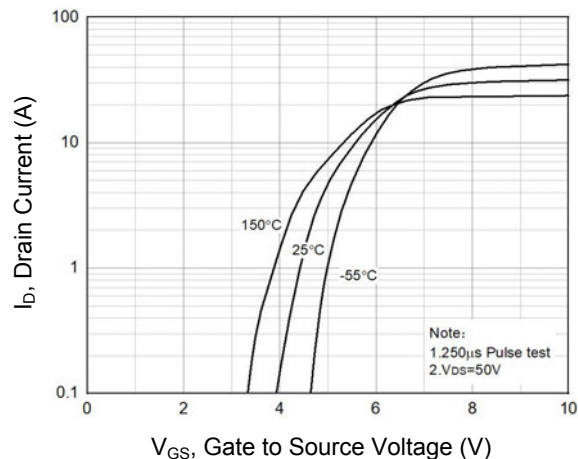


Figure 2. Typical Transfer Characteristics

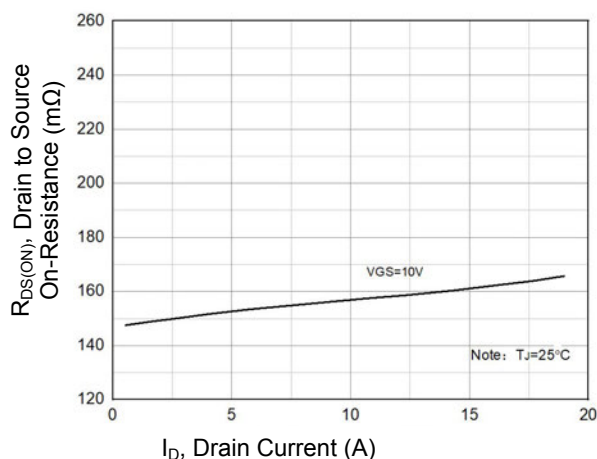


Figure 3. On Resistance vs. Drain Current

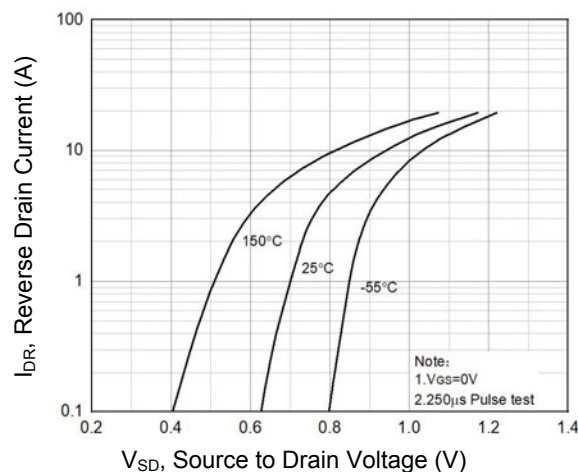


Figure 4. Body Diode Characteristics

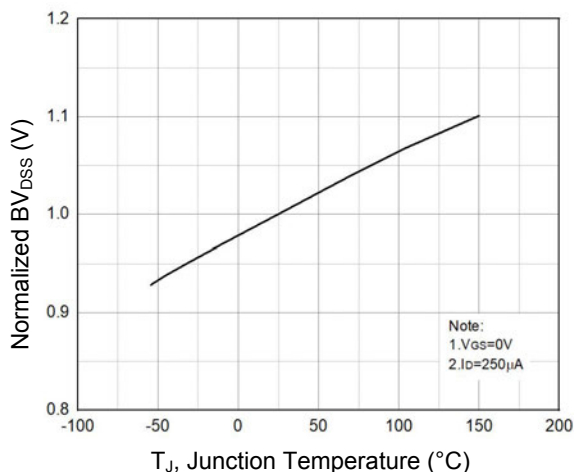


Figure 5. Normalized  $BV_{DSS}$  vs. Junction Temperature

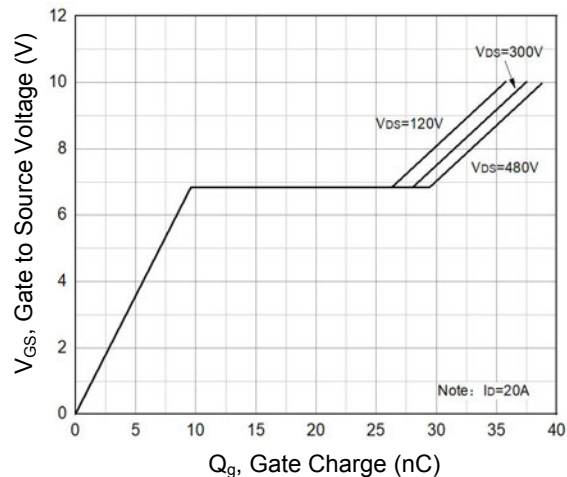


Figure 6. Gate Charge Characteristics

## Typical Electrical and Thermal Characteristic Curves

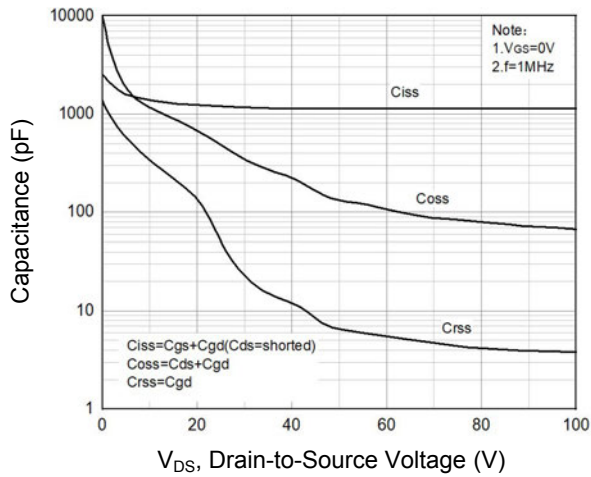


Figure 7. Capacitance Characteristics

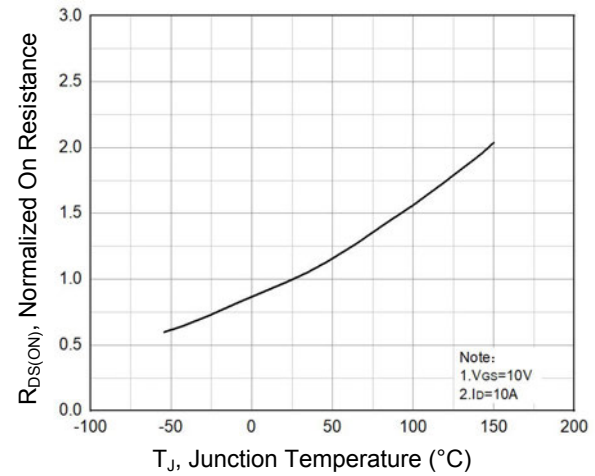


Figure 8. Normalized  $R_{DS(ON)}$  vs. Junction Temperature

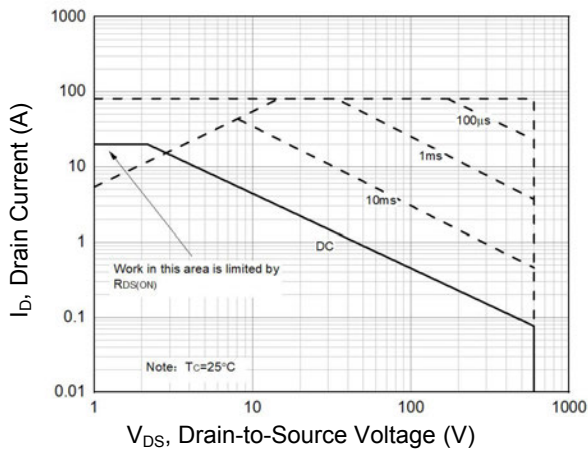
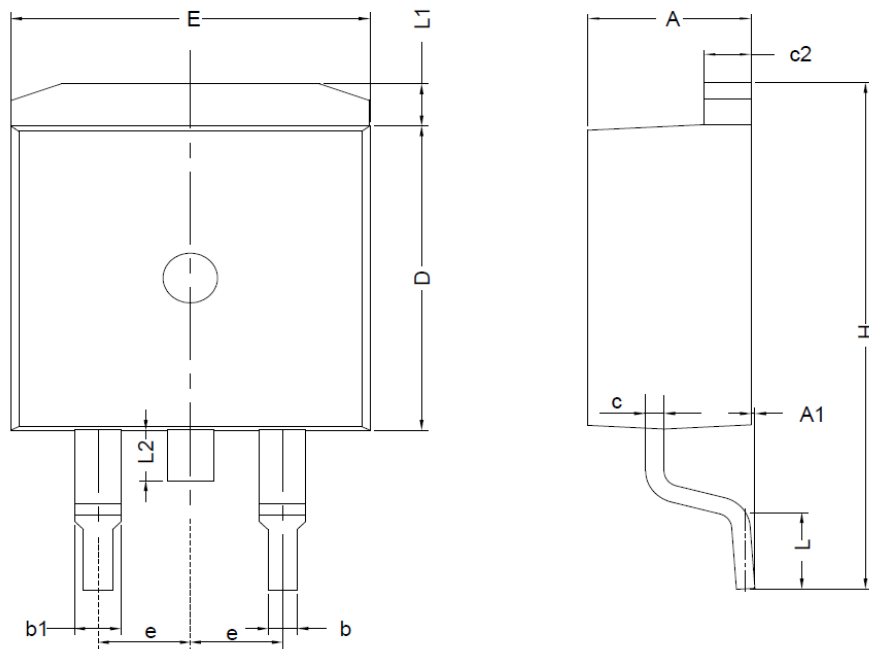


Figure 9. Safe Operation Area

## Package Outline Dimensions TO-263 (D<sup>2</sup>PAK)



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min                       | Max    | Min                  | Max   |
| A      | 4.300                     | 4.720  | 0.169                | 0.186 |
| A1     | 0.000                     | 0.250  | 0.000                | 0.010 |
| b      | 0.710                     | 0.910  | 0.028                | 0.036 |
| b1     | 1.170                     | 1.500  | 0.046                | 0.059 |
| c      | 0.300                     | 0.600  | 0.012                | 0.024 |
| c2     | 1.170                     | 1.370  | 0.046                | 0.054 |
| D      | 8.500                     | 9.350  | 0.335                | 0.368 |
| E      | 9.800                     | 10.450 | 0.386                | 0.411 |
| e      | 2.540 BSC                 |        | 0.100 BSC            |       |
| H      | 14.700                    | 15.750 | 0.579                | 0.620 |
| L      | 2.000                     | 2.740  | 0.079                | 0.108 |
| L1     | 1.120                     | 1.420  | 0.044                | 0.056 |
| L2     | -                         | 1.750  | -                    | 0.069 |