## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)TYP}$ | $I_D$ |
|---|---|---|
| 650V | 40mΩ@10V | 50A |

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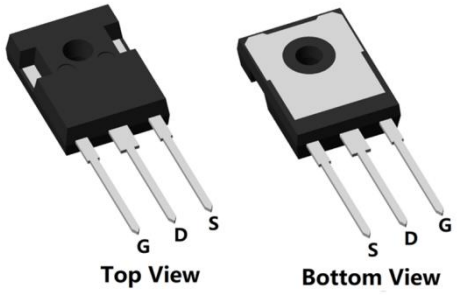
## Feature

- Fast Switching
- Low Gate Charge and Rdson
- 100% Single Pulse avalanche energy Test

## Applications

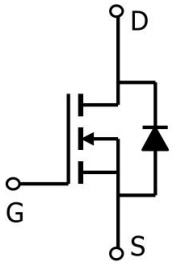
- PWM Application
- Hard switched and high frequency circuits
- Power Management

## Package

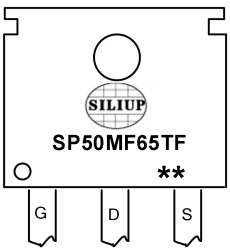



**TO-247(1:G 2:D 3:S)**

## Circuit diagram




## Marking




**SP50MF65TF** :Device Code
** :Week Code

## Order Information

| Device | Package | Unit/Tube |
|---|---|---|
| SP50MF65TF | TO-247 | 30 |

## Absolute maximum ratings (Ta=25℃,unless otherwise noted)

| Parameter | Symbol | Rating | Units |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 650 | V |
| Gate-Source Voltage | $V_{GS}$ | ±30 | V |
| Continuous Drain Current (Tc=25℃) | $I_D$ | 50 | A |
| Continuous Drain Current (Tc=100℃) | $I_D$ | 32A | A |
| Pulsed Drain Current | $I_{DM}$ | 200 | A |
| Single Pulse Avalanche Energy[1] | $E_{AS}$ | 172 | mJ |
| Power Dissipation (Tc=25℃) | $P_D$ | 198 | W |
| Thermal Resistance Junction-to-Case | $R_{\theta JC}$ | 0.63 | ℃/W |
| Storage Temperature Range | $T_{STG}$ | -55 to 150 | ℃ |
| Operating Junction Temperature Range | $T_J$ | -55 to 150 | ℃ |

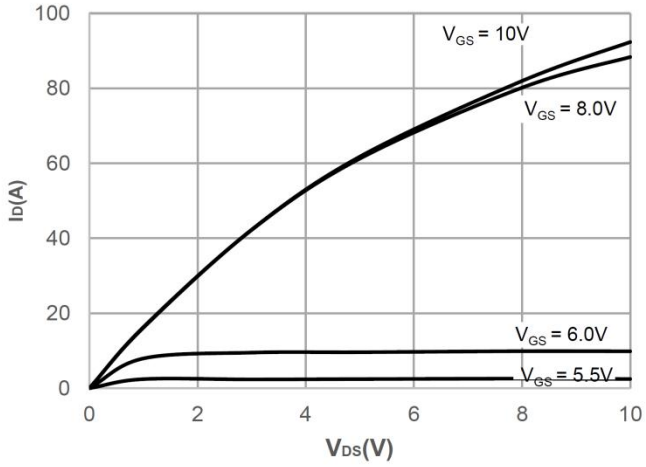
## Electrical characteristics (Ta=25℃, unless otherwise noted)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $I_D$ = 250μA, $V_{GS}$ = 0V | 650 | - | - | V |
| Drain-Source Leakage Current | $I_{DSS}$ | $V_{DS}$ = 520V, $V_{GS}$ = 0V | - | - | 1 | uA |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$ = ±30V, $V_{DS}$ = 0V | - | - | ±100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 3 | 4 | 5 | V |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$ = 10V, $I_D$ = 35A | - | 40 | 50 | mΩ |
| **Dynamic characteristics** | | | | | | |
| Input Capacitance | $C_{iss}$ | VDS=400V , VGS=0V , f=1MHz | - | 4240 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 64 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 45 | - | |
| Total Gate Charge | $Q_g$ | VDS=400V , VGS=10V , ID=20A | - | 81 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 26 | - | |
| Gate-Drain Charge | $Q_{gd}$ | | - | 24 | - | |
| **Switching Characteristics** | | | | | | |
| Turn-On Delay Time | $T_{d(on)}$ | VDD=400V, VGS=10V , RG=2Ω, ID=20A | - | 34 | - | nS |
| Rise Time | $T_r$ | | - | 11 | - | |
| Turn-Off Delay Time | $T_{d(off)}$ | | - | 124 | - | |
| Fall Time | $T_f$ | | - | 5 | - | |
| **Diode Characteristics** | | | | | | |
| Diode Forward Voltage | $V_{SD}$ | VGS=0V , IS=1A , TJ=25℃ | - | - | 1.2 | V |
| Maximum Body-Diode Continuous Current | $I_S$ | | - | - | 40 | A |
| Reverse recover time | $T_{rr}$ | $I_S$=20A, di/dt=100A/us, Tj=25℃ | - | 161 | - | nS |
| Reverse recovery charge | $Q_{rr}$ | | - | 1.1 | - | uC |

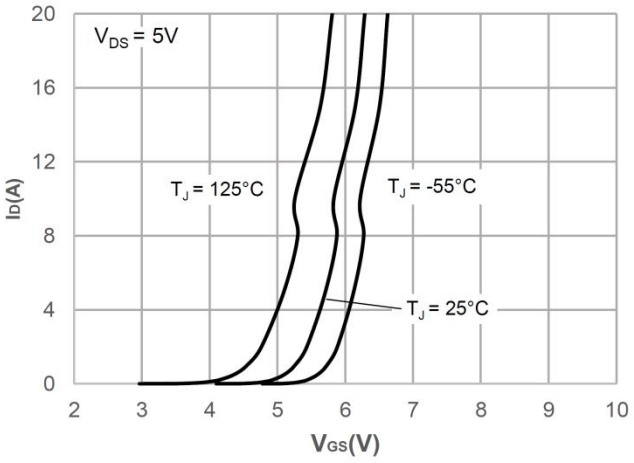
**Note :**

**1.** The test condition is VDD=100V,VGS=10V,L=60mH,RG=25Ω

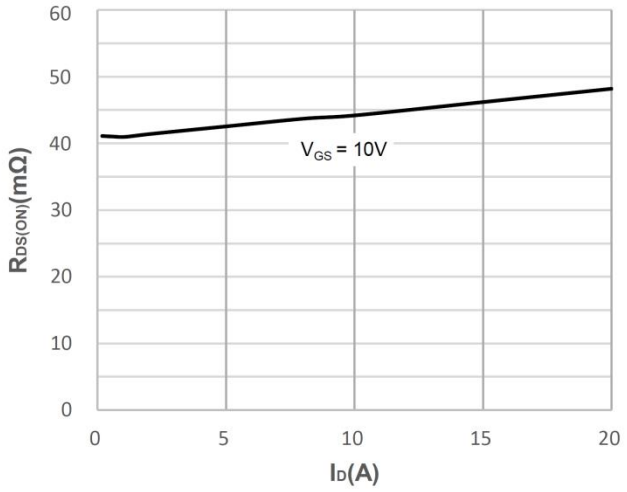
## Typical Characteristics



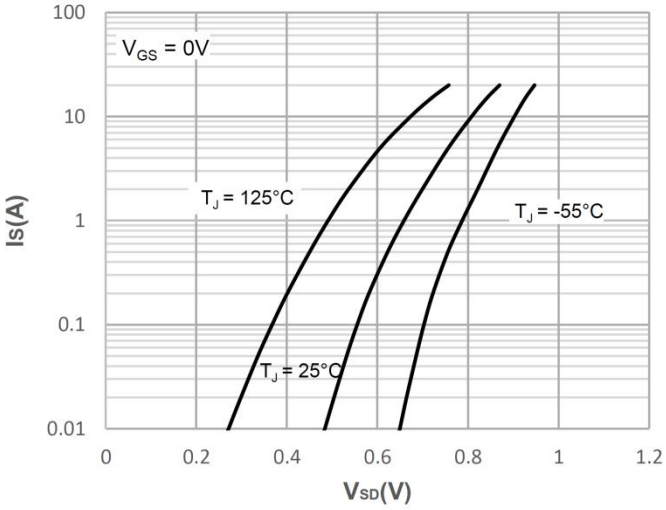

Output Characteristics



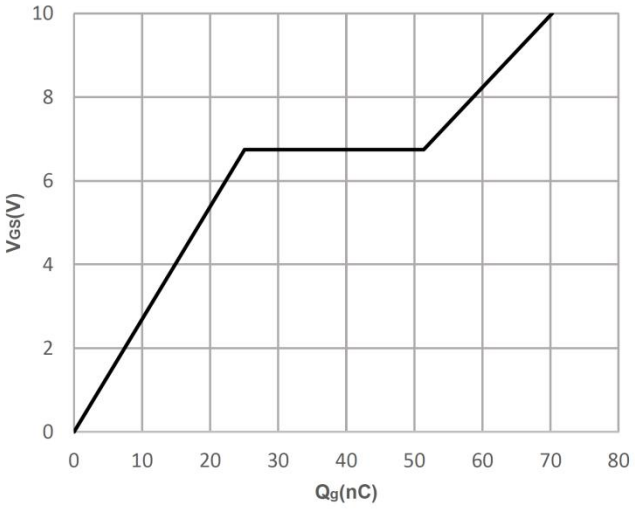

Typical Transfer Characteristics



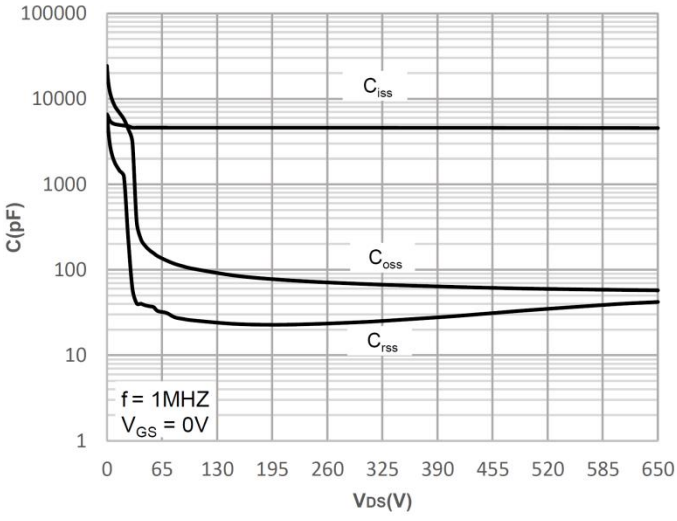

On-resistance vs. Drain Current



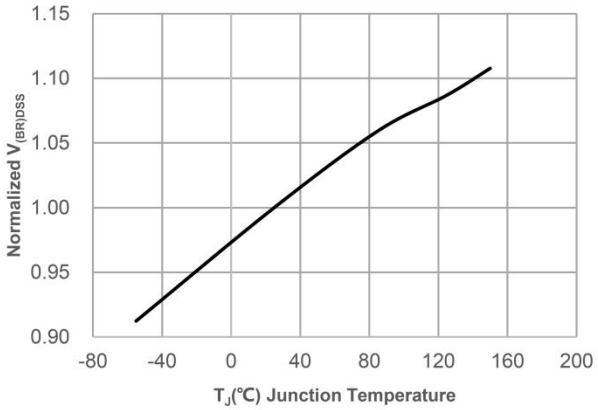

Body Diode Characteristics



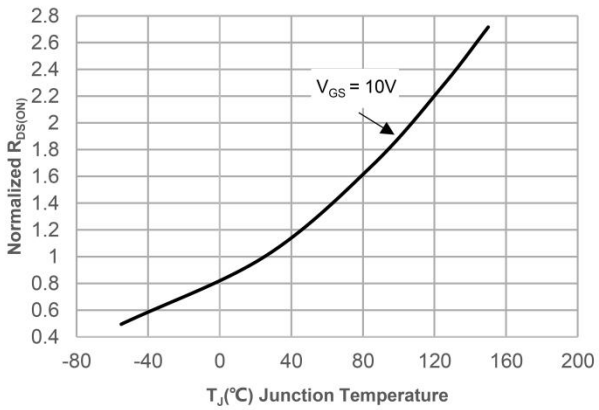

Gate Charge Characteristics



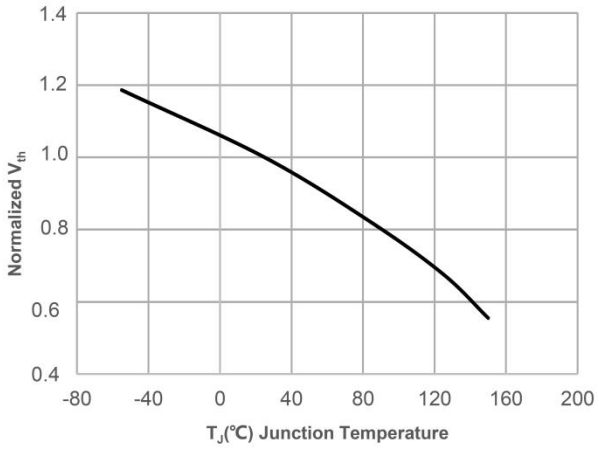

Capacitance Characteristics



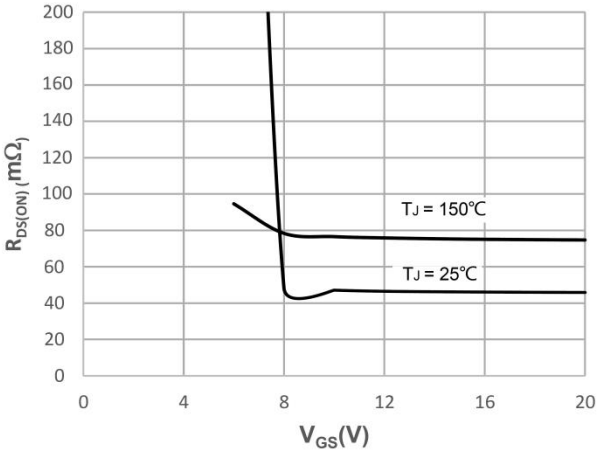

Normalized Breakdown voltage vs. Junction Temperature



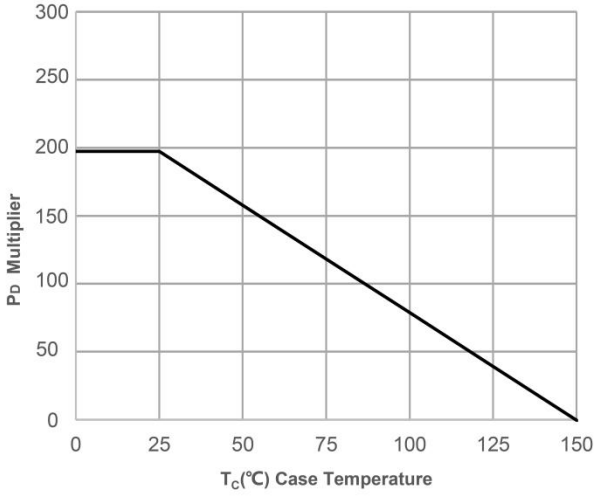

Normalized on Resistance vs. Junction Temperature



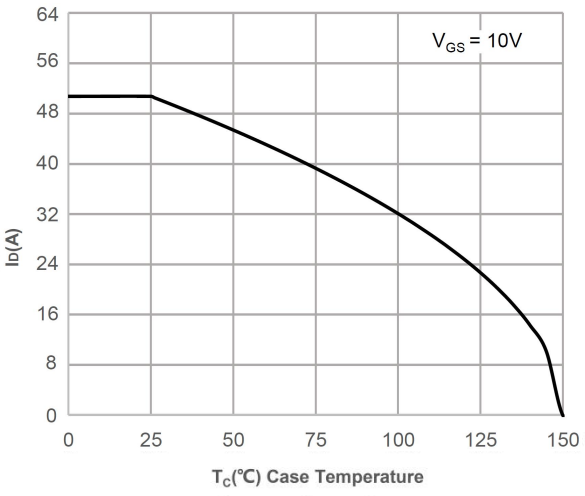

Normalized Threshold Voltage vs. Junction Temperature



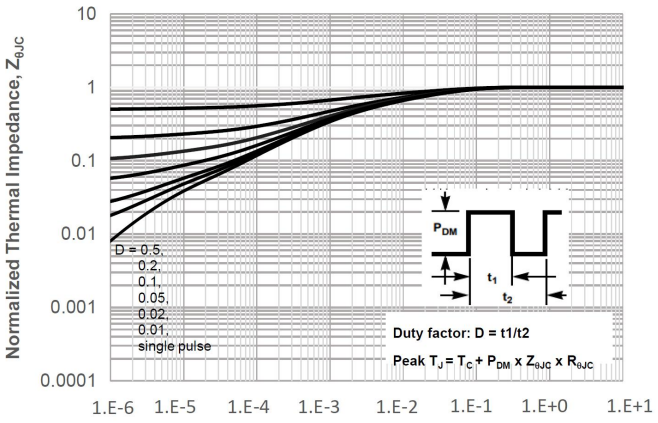

$R_{DS(ON)}$ vs. $V_{GS}$



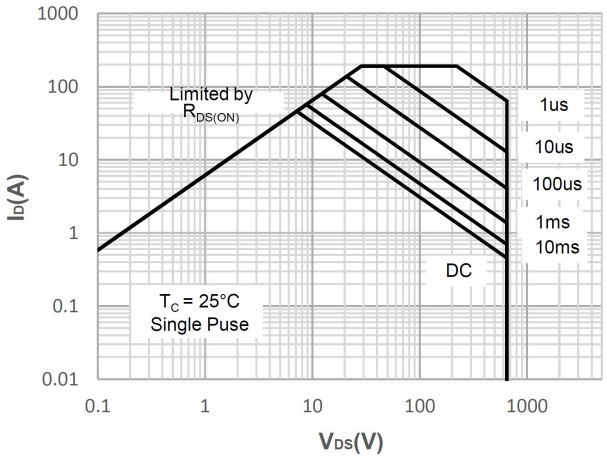

Power De-rating




Current De-rating

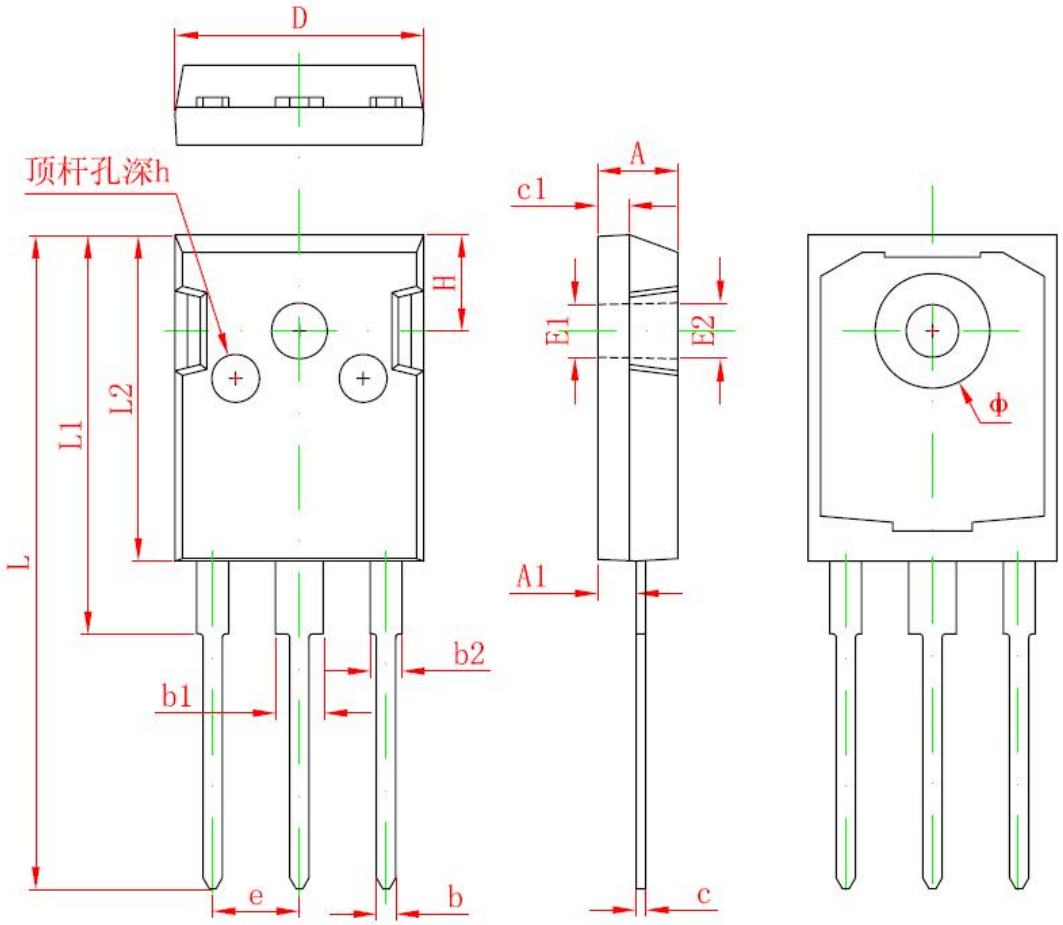



Normalized Maximum Transient Thermal Impedance




Maximum Safe Operating Area

## TO-247 Package Information




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 4.850 | 5.150 | 0.191 | 0.200 |
| A1 | 2.200 | 2.600 | 0.087 | 0.102 |
| b2 | 1.800 | 2.200 | 0.071 | 0.087 |
| b | 1.000 | 1.400 | 0.039 | 0.055 |
| b1 | 2.800 | 3.200 | 0.110 | 0.126 |
| c | 0.500 | 0.700 | 0.020 | 0.028 |
| c1 | 1.900 | 2.100 | 0.075 | 0.083 |
| D | 15.450 | 15.750 | 0.608 | 0.620 |
| E1 | 3.500 REF. | | 0.138 REF. | |
| E2 | 3.600 REF. | | 0.142 REF. | |
| L | 40.900 | 41.300 | 1.610 | 1.626 |
| L1 | 24.800 | 25.100 | 0.976 | 0.988 |
| L2 | 20.300 | 20.600 | 0.799 | 0.811 |
| Φ | 7.100 | 7.300 | 0.280 | 0.287 |
| e | 5.450 TYP. | | 0.215 TYP. | |
| H1 | 5.980 REF. | | 0.235 REF. | |
| h | 0.000 | 0.300 | 0.000 | 0.012 |