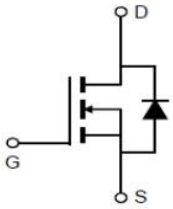
# LH20N50A

**N-Channel Power MOSFET**

## •General Description

The Power MOSFET LH20N50A has the low $R_{DS(on)}$,low gate charge,fast switching and excellent avalanche characteristics.This device offers extremely fast and robust body diode,and is suitable for telecom and power supplies.




VDS =500V

$R_{DS(ON)}$ =0.24Ω

ID =20A


TO-220F


TO-220

■ RoHS COMPLIANT

## •Features

■Low Thermal Resistance
■Fast Switching
■High Input Resistance

## •Application

■LED/LCD/PDP TV and monitor Lighting
■Power Supplies

## •Ordering Information:

| Part number | LH20N50A | LH20N50A |
|---|---|---|
| Package | TO-220F | TO-220 |
| Basic ordering unit (pcs) | 1000 | 1000 |
| Normal Package Material Ordering Code | LH20N50AF-T0220F-TU | LH20N50AT-T0220-TU |
| Halogen Free Ordering Code | LH20N50AF-T0220F-TU-HF | LH20N50AT-T0220-TU-HF |

## •Absolute Maximum Ratings（TC =25℃）

| PARAMETER | | SYMBOL | Value | | UNIT |
|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage[1] | | $BV_{DSS}$ | 500 | | V |
| Gate-Source Voltage | | $V_{GS}$ | ±30 | | V |
| Continuous Drain Current | TC = 25°C | $I_D$ | 20 | | A |
| | TC = 100°C | | Figure 3 | | |
| Pulsed drain current ($T_C$ = 25°C, tp limited by Tjmax)[2] | | $I_{DM}$ | Figure 6 | | A |
| Single Pulse Avalanche Energy | | $E_{AS}$ | 1500 | | mJ |
| Peak Diode Recovery dv/dt[3] | | dv/dt | 5.0 | | V/nS |
| Power Dissipation($T_C$=25℃) | | $P_D$ | TO-220F: 60 | TO-220: 175 | W |
| Maximum Temperature for Soldering Leads at 0.063 in (1.6mm) from Case for 10 seconds.Packing Body for 10 seconds | | $T_L$<br>$T_{PAK}$ | 300<br>260 | | ℃ |
| Junction Temperature | | $T_J$ | -55~+150 | | ℃ |
| Storage Temperature | | $T_{STG}$ | -55~+150 | | ℃ |

## ●Electronic Characteristics

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$ =0V, $I_D$=250uA | 500 | -- | -- | V |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{DS}$=VGS,$I_D$=250uA | 2.0 | -- | 4.0 | V |
| Drain-source On Resistance[3] | $R_{DS(ON)}$ | $V_{GS}$ =10V, $I_D$=10A | -- | 0.24 | 0.3 | Ω |
| Drain-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=500V,$V_{GS}$=0V,$T_J$=25℃ | -- | -- | 1 | uA |
| | | $V_{DS}$=400V,$V_{GS}$=0V,$T_J$=125℃ | -- | -- | 100 | |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±30 | -- | -- | ±100 | nA |
| Forward Transconductance[4] | gfs | $V_{DS}$=15V,$I_D$=10A | -- | 18 | -- | S |
| Input Capacitance | Ciss | $V_{GS}$=0V, $V_{DS}$=25V, f=1.0MHz | -- | 2670 | -- | pF |
| Output Capacitance | Coss | | -- | 35 | -- | |
| Reverse transfer Capacitance | Crss | | -- | 260 | -- | |
| Turn-On Delay Time | Td(on) | $V_{DD}$ =250V, $I_D$ =20A, $V_{GS}$=10V, $R_G$=25Ω | -- | 35 | -- | ns |
| Rise Time | Trise | | -- | 75 | -- | |
| Turn -Off Delay Time | Td(off) | | -- | 165 | -- | |
| Fall Time | Tfall | | -- | 85 | -- | |
| Total Gate Charge | Qg | $I_D$=20A, $V_{DS}$=250V $V_{GS}$=10V | -- | 65 | --- | nC |
| Gate-to-Source Charge | Qgs | | -- | 14 | -- | |
| Gate-to-Drain Charge | Qgd | | -- | 24 | --- | |
| Continuous Diode Forward Current | $I_S$ | | -- | -- | 20 | A |
| Pulsed Diode Forward Current | $I_{SM}$ | | -- | -- | 80 | A |
| Diode Forward Voltage | $V_{SD}$ | Tj=25°C, Is=20A $V_{GS}$ =0V | -- | -- | 1.5 | V |
| Reverse Recovery Time | trr | If=Is $di_F/dt$=100A/μs | -- | 320 | -- | ns |
| Reverse Recovery Charge | Qrr | | -- | 3.0 | -- | uC |

## ●Thermal Characteristics

| PARAMETER | SYMBOL | MAX | | UNIT |
|---|---|---|---|---|
| | | TO-220F | TO-220 | |
| Thermal Resistance Junction-case | $Rth_{JC}$ | 2.08 | 0.71 | ℃/W |
| Thermal Resistance Junction-ambient | $Rth_{JA}$ | 100 | 62 | ℃/W |

Notes:

1.$T_J$=25 to150℃

2.Repetitive Rating: Pulse width limited by maximum junction temperature.

2. $I_{SD}$ = 20A,di/dt<100A/us, $T_J$ = 150°C

3. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2

## ●Typical Characteristics

Figure 1. Maximum Effective Thermal Impedance, Junction-to-Case

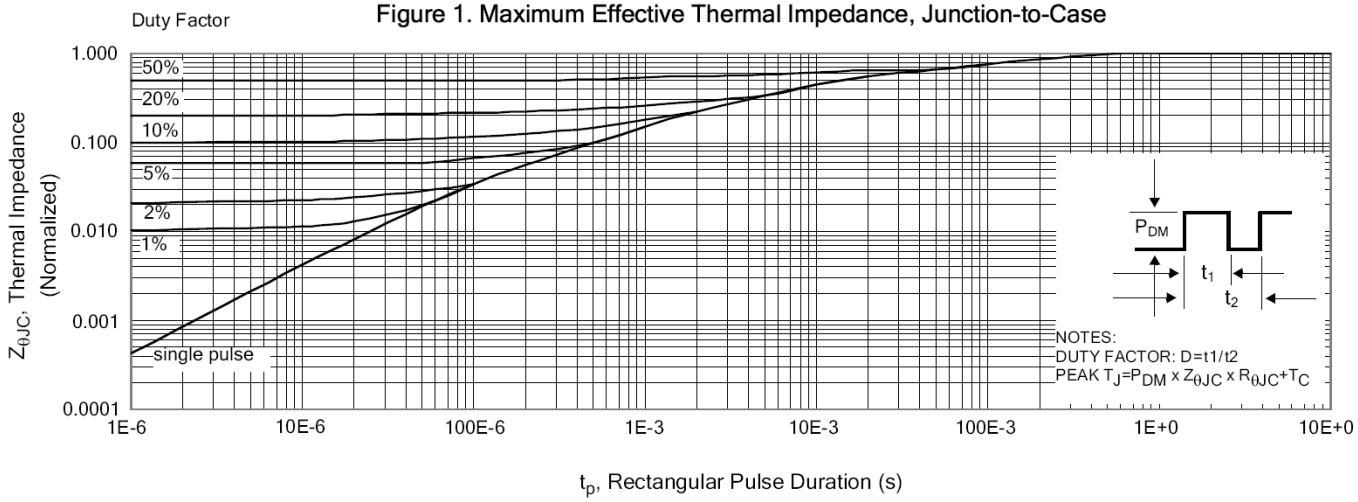



Figure 2. Maximum Power Dissipation vs Case Temperature

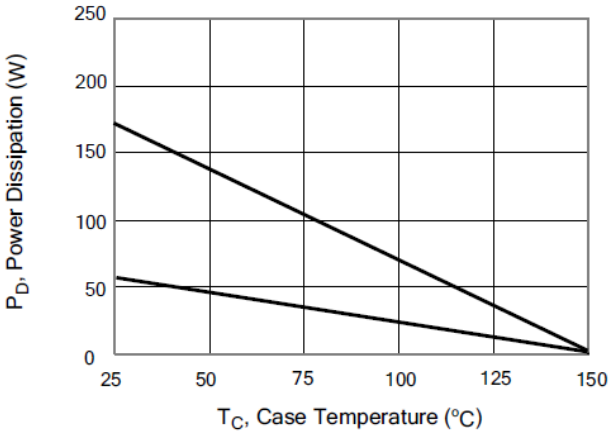



Figure 3. Maximum Continuous Drain Current vs Case Temperature

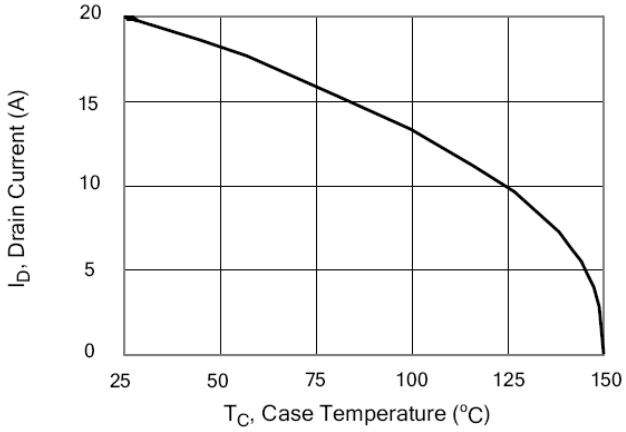



Figure 4. Typical Output Characteristics

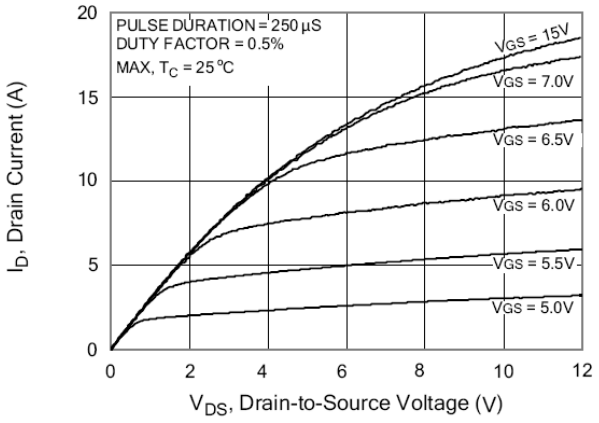
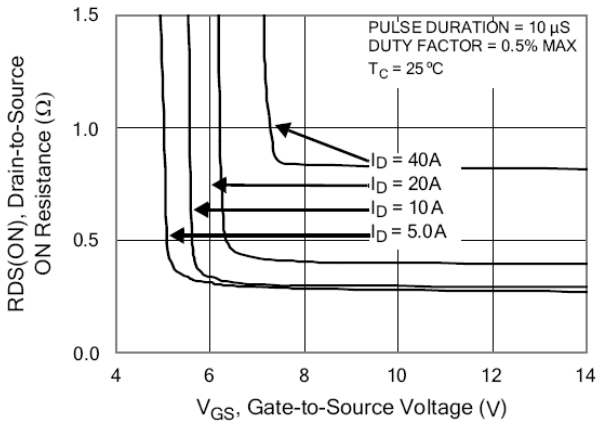



Figure 5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current



## ●Typical Characteristics(cont.)

Figure 6. Maximum Peak Current Capability

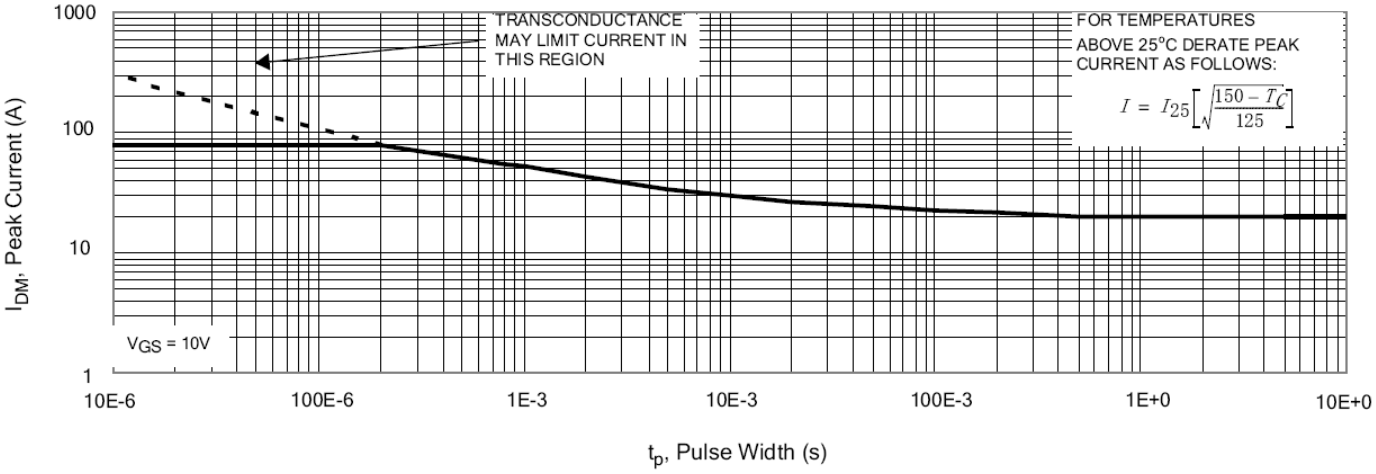



Figure 7. Typical Transfer Characteristics

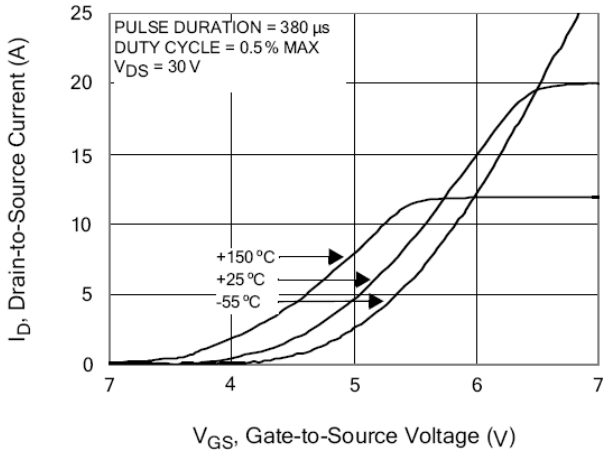



Figure 8. Unclamped Inductive Switching Capability

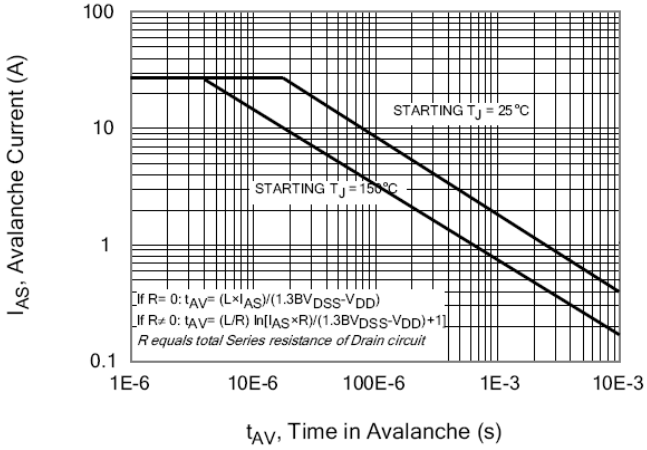



Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current

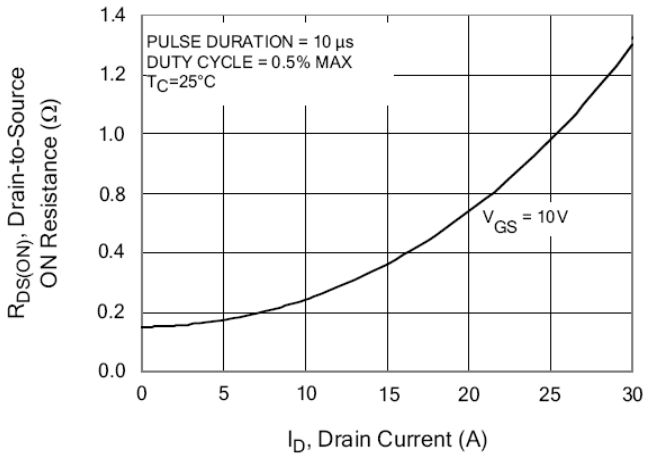
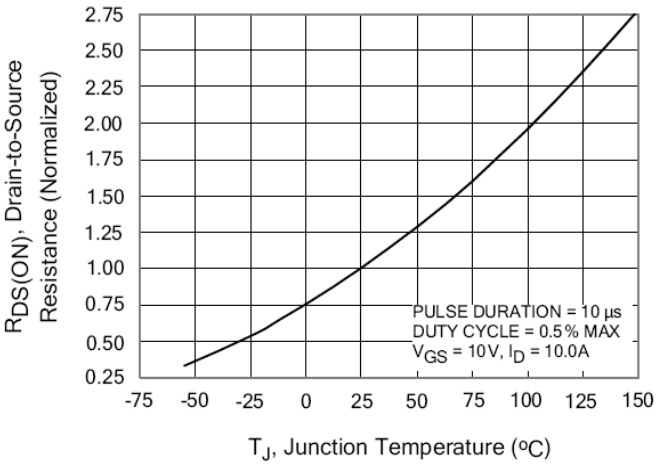



Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature



## ●Typical Characteristics(cont.)

Figure 11. Typical Breakdown Voltage vs Junction Temperature

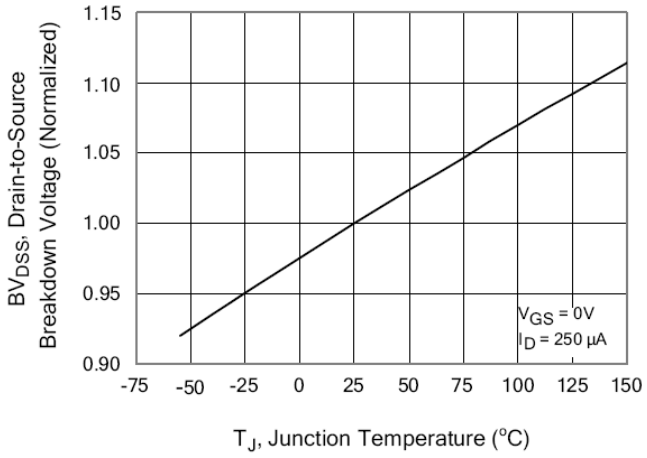



Figure 12. Typical Threshold Voltage vs Junction Temperature

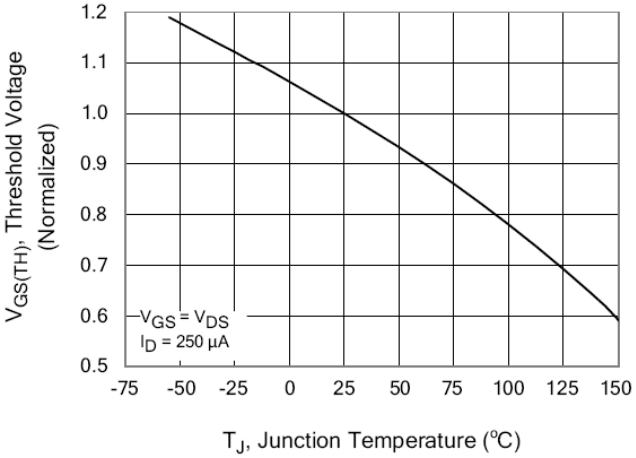



Figure 13. Maximum Forward Bias Safe Operating Area

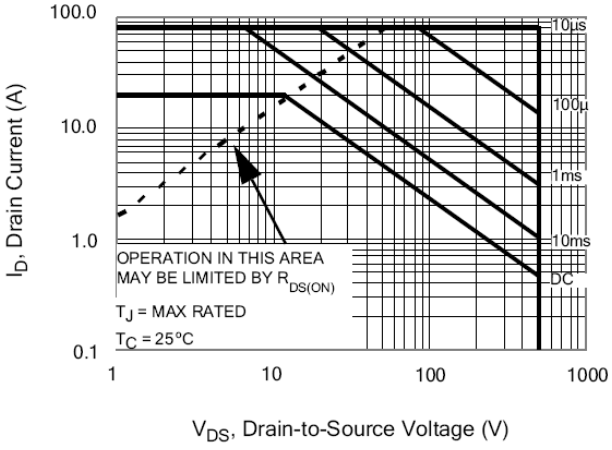



Figure 14. Typical Capacitance vs Drain-to-Source Voltage

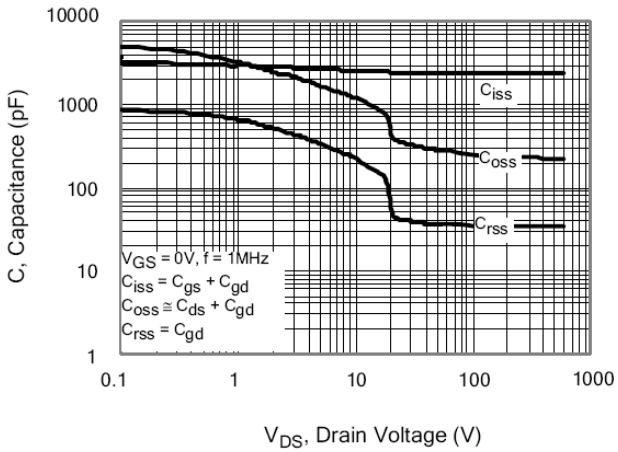



Figure 15. Typical Gate Charge vs Gate-to-Source Voltage

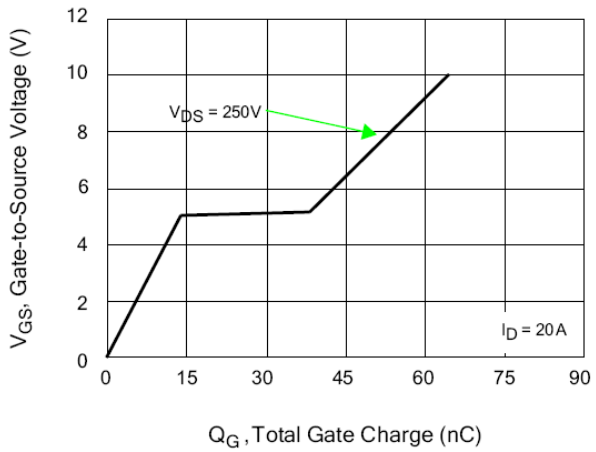
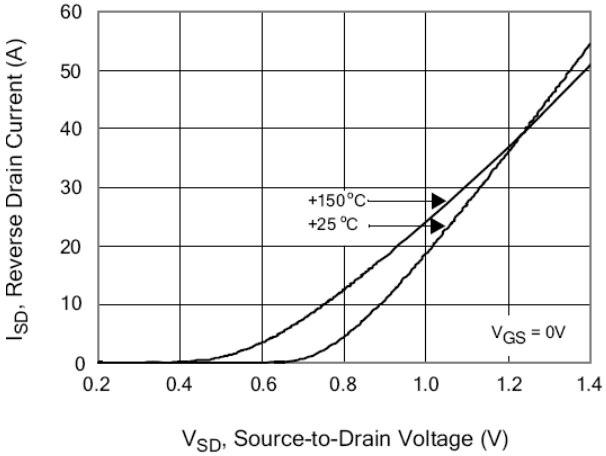



Figure 16. Typical Body Diode Transfer Characteristics



## ●Test Circuits & Wafeforms

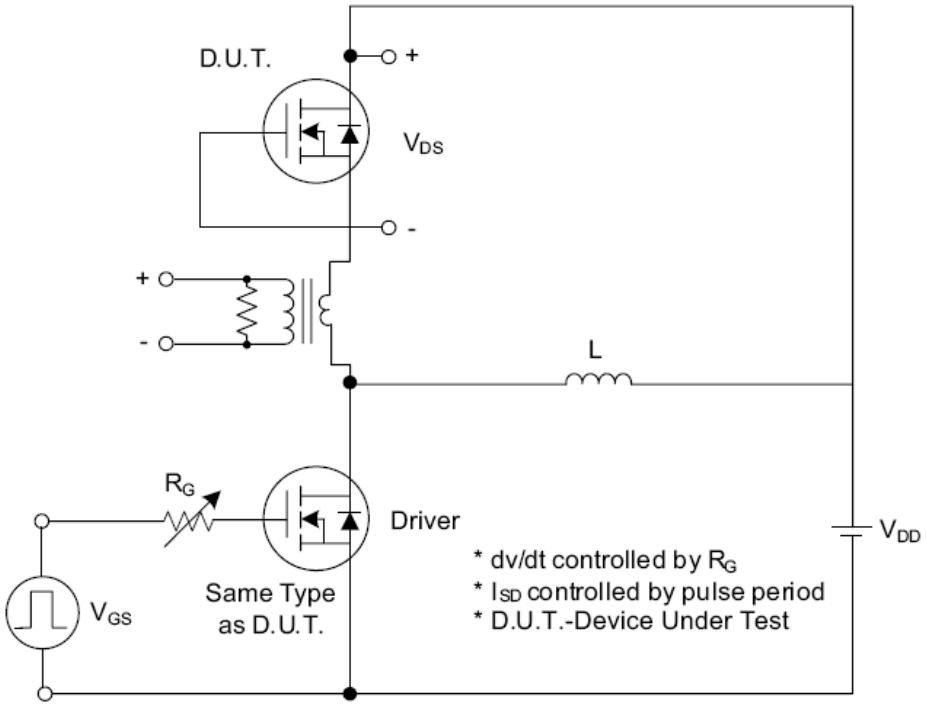



Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

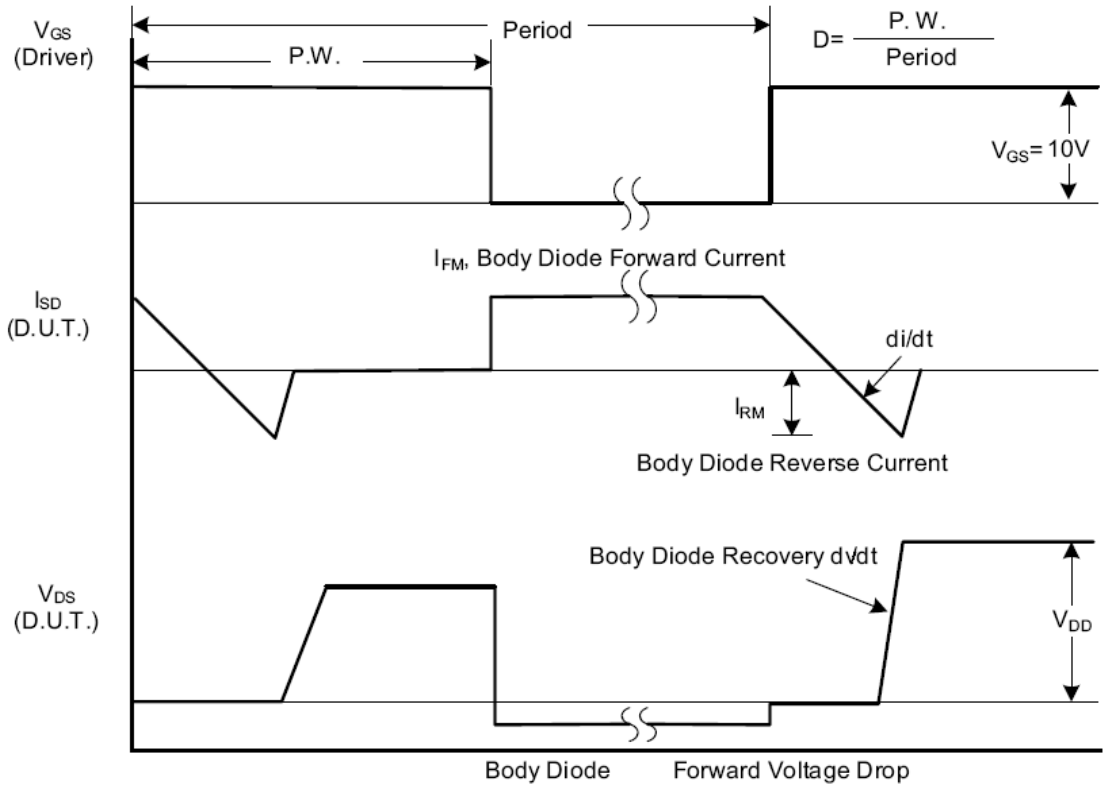



Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

## ●Test Circuits & Wafeforms(cont.)

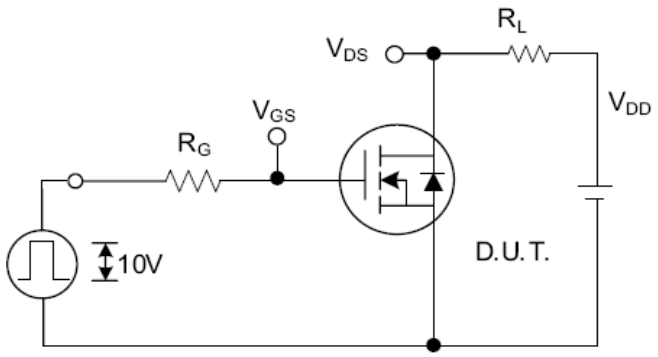



Fig. 2.1 Switching Test Circuit

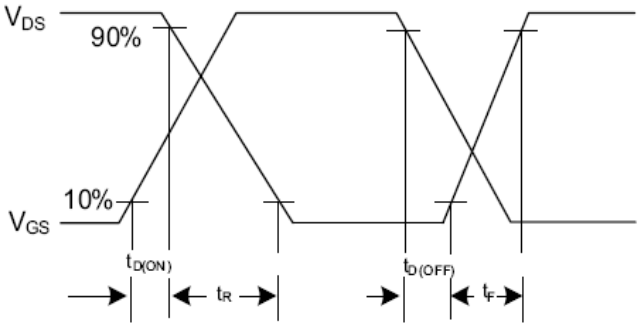



Fig. 2.2 Switching Waveforms

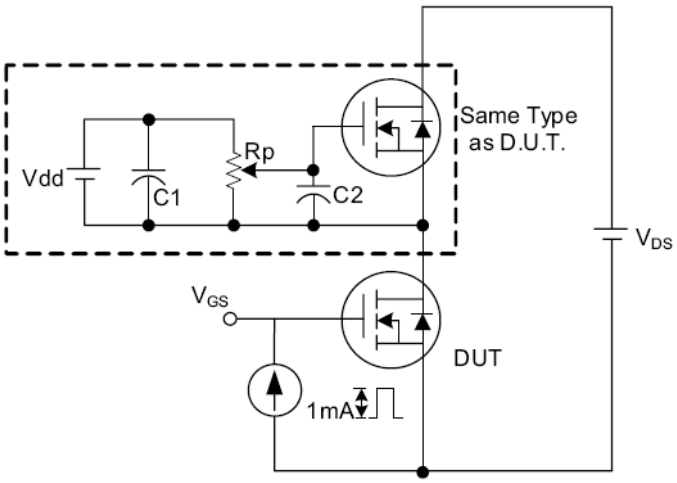



Fig. 3 . 1 Gate Charge Test Circuit

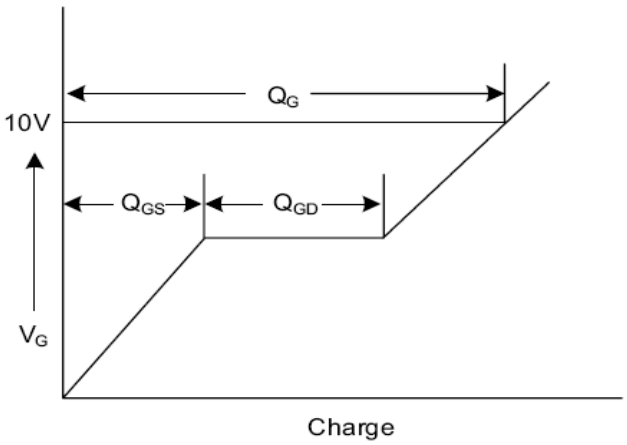



Fig. 3 . 2 Gate Charge Waveform

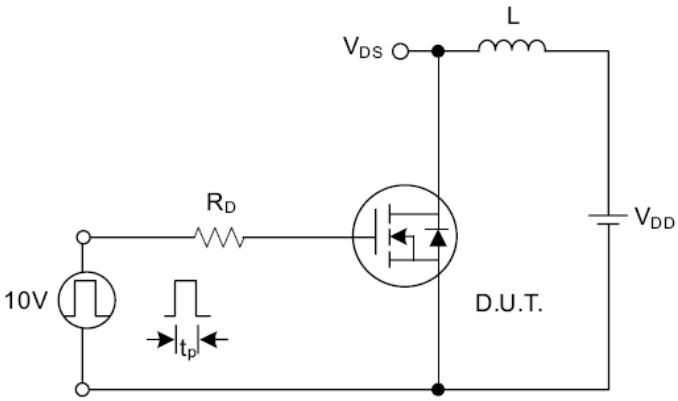



Fig. 4.1 Unclamped Inductive Switching Test Circuit

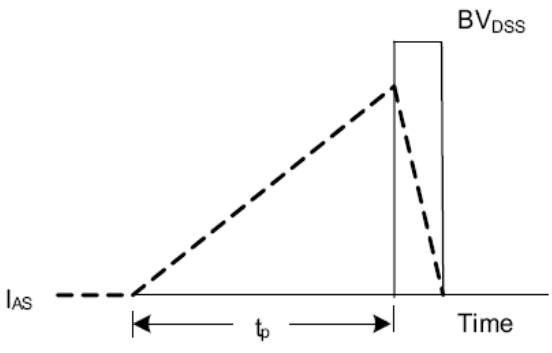
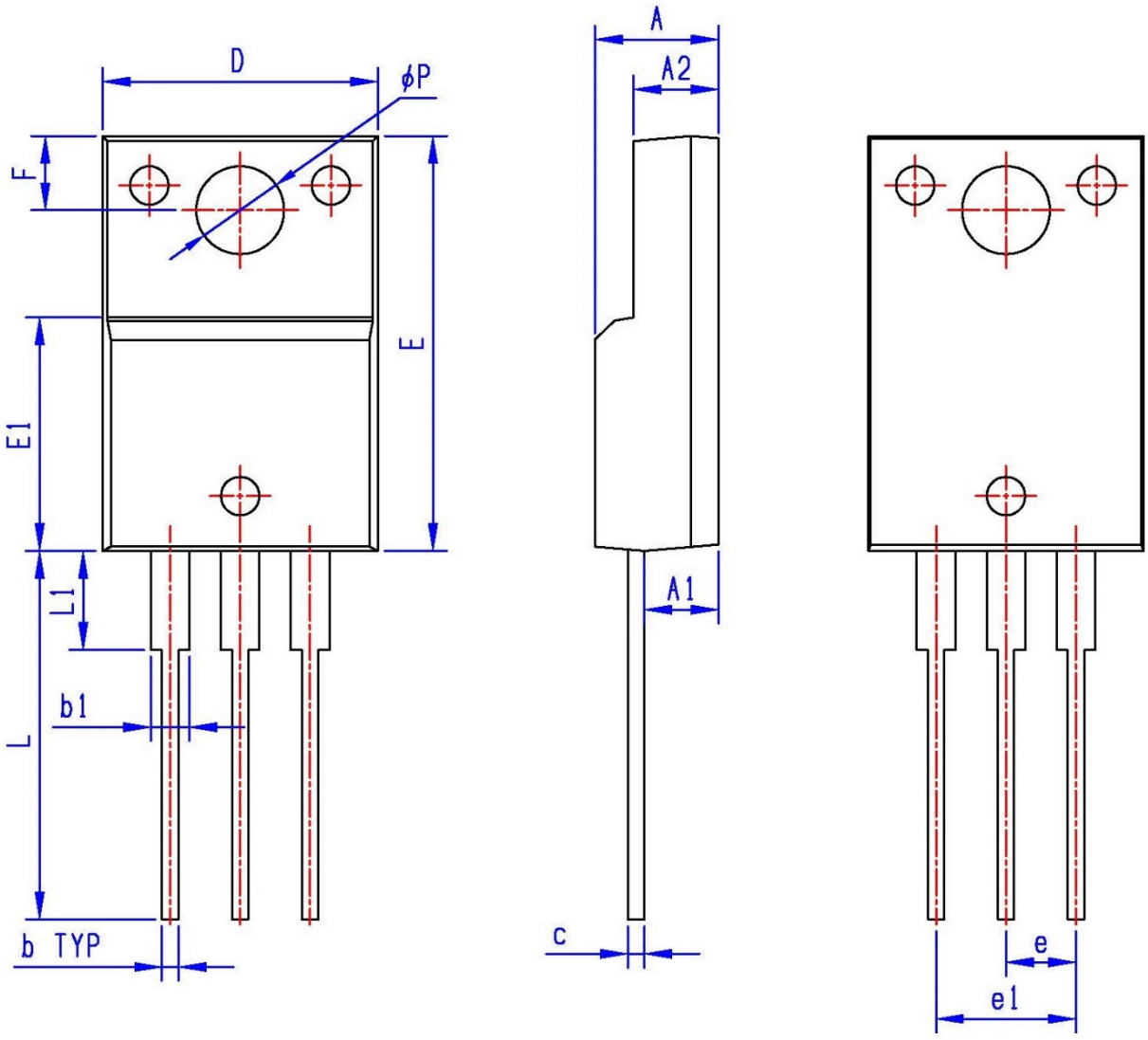



Fig. 4.2 Unclamped Inductive Switching Waveforms

## ●Dimensions（TO-220F)

UNIT:mm

| SYMBOL | min | max | SYMBOL | min | max |
|---|---|---|---|---|---|
| A | 4.20 | 4.80 | E1 | 8.30 | 8.70 |
| A1 | 2.50 | 2.90 | e | 2.40 | 2.70 |
| A2 | 2.90 | 3.30 | e1 | 4.95 | 5.25 |
| b | 0.40 | 0.80 | F | 2.50 | 2.90 |
| b1 | 1.10 | 1.50 | L | 13.00 | 14.00 |
| c | 0.50 | 0.70 | L1 | 3.00 | 4.00 |
| D | 9.80 | 10.60 | ⌀P | 2.90 | 3.50 |
| E | 14.60 | 15.60 | | | |



## ●Dimensions（TO-220)

UNIT:mm

| SYMBOL | min | max | SYMBOL | min | max |
|---|---|---|---|---|---|
| A | 4.25 | 4.85 | B1 | 2.60 | 3.00 |
| A1 | 2.30 | 3.00 | e | 2.40 | 2.70 |
| A2 | 1.20 | 1.40 | e1 | 4.95 | 5.25 |
| b | 0.60 | 0.90 | L | 12.60 | 14.40 |
| b1 | 1.10 | 1.70 | L1 | 2.40 | 4.00 |
| c | 0.40 | 0.70 | ⌀P | 3.50 | 3.90 |
| D | 9.80 | 10.60 | | | |
| B | 15.20 | 16.20 | | | |