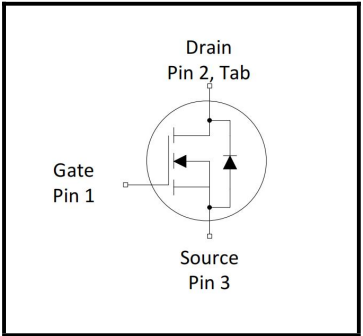
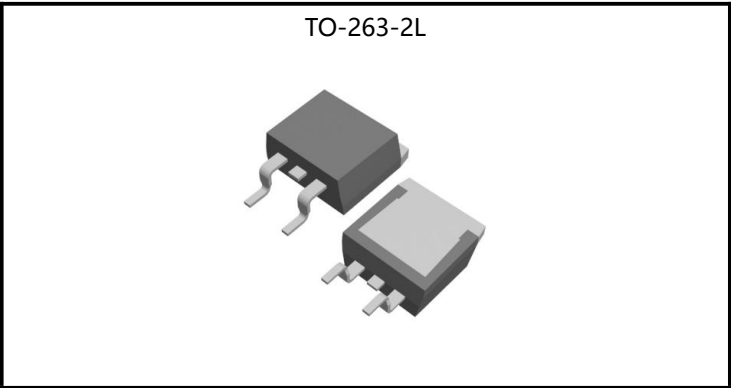


# MOSFET

10 Amps,500 Volts N-CHANNEL MOSFET

## FEATURE

- ◆ Low gate charge
- ◆ Low Ciss
- ◆ Fast switching
- ◆ 100% avalanche tested
- ◆ Improved dv/dt capability
- ◆ RoHS 2.0 Compliant



| Parameter  | Values | Unit     |
|------------|--------|----------|
| Bvdss      | 500    | V        |
| Id         | 10     | A        |
| Rdson(max) | 0.8    | $\Omega$ |

| Ordering Code | Marking | Package   | Packaging |
|---------------|---------|-----------|-----------|
| 10N50B        | 10N50B  | TO-263-3L | Tape&Reel |

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

| Parameter                                                                       | Symbol         | Values |     |     | Unit               | Note/Test Conditions                                    |
|---------------------------------------------------------------------------------|----------------|--------|-----|-----|--------------------|---------------------------------------------------------|
|                                                                                 |                | Min    | Typ | Max |                    |                                                         |
| Drain-Source Voltage                                                            | $V_{DSS}$      | -      | -   | 500 | V                  | -                                                       |
| Gate-Source Voltage                                                             | $V_{GS}$       | -30    | -   | 30  | V                  | -                                                       |
| Continuous Drain Current(Package Limited)                                       | $I_D$          | -      | -   | 10  | A                  | $T_C=25^{\circ}\text{C}$                                |
|                                                                                 |                | -      | -   | 6   | A                  | $T_C=100^{\circ}\text{C}$                               |
| Pulsed Drain Current(Note1)                                                     | $I_{DM}$       | -      | -   | 40  | A                  | -                                                       |
| Single Pulse Avalanche Energy                                                   | $E_{AS}$       | -      | -   | 507 | mJ                 | $L=10\text{mH}, V_D=50\text{V}, T_C=25^{\circ}\text{C}$ |
| Maximum Power Dissipation                                                       | $P_D$          | -      | -   | 130 | W                  | $T_C=25^{\circ}\text{C}$                                |
| Reverse Diode $dV/dt$ (Note2)                                                   | $dv/dt$        | -      | -   | 5   | V/ns               | -                                                       |
| Operating Junction and Storage Temperature Range                                | $T_J, T_{STG}$ | -55    | -   | 150 | $^{\circ}\text{C}$ | -                                                       |
| Maximum lead temperature for soldering purposes,<br>1/8"from case for 5 seconds | $T_L$          | -      | -   | 260 | $^{\circ}\text{C}$ | -                                                       |

## Thermal Characteristics

| Parameter                            | Symbol         | Values |      |     | Unit                        | Note/Test Conditions |
|--------------------------------------|----------------|--------|------|-----|-----------------------------|----------------------|
|                                      |                | Min    | Typ  | Max |                             |                      |
| Thermal resistance , Channel to Case | $R_{th(ch-c)}$ | -      | 0.96 | -   | $^{\circ}\text{C}/\text{W}$ | -                    |

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

### Static characteristics

| Parameter                          | Symbol       | Values |      |      | Unit          | Note/Test Conditions                             |
|------------------------------------|--------------|--------|------|------|---------------|--------------------------------------------------|
|                                    |              | Min    | Typ  | Max  |               |                                                  |
| Drain-Source Breakdown Voltage     | $BV_{DSS}$   | 500    | -    | -    | V             | $V_{GS}=0\text{V}, I_D=250\mu\text{A}$           |
| Zero Gate Voltage Drain Current    | $I_{DSS}$    | -      | -    | 1    | $\mu\text{A}$ | $V_{DS}=500\text{V}, V_{GS}=0\text{V}$           |
| Gate-Body Leakage Current, Forward | $I_{GSSF}$   | -      | -    | 100  | nA            | $V_{GS}=30\text{V}, V_{DS}=0\text{V}$            |
| Gate-Body Leakage Current, Reverse | $I_{GSSR}$   | -      | -    | -100 | nA            | $V_{GS}=-30\text{V}, V_{DS}=0\text{V}$           |
| Gate-Source Threshold Voltage      | $V_{GS(th)}$ | 2.0    | -    | 4.0  | V             | $V_{DS}=V_{GS}, I_D=250\mu\text{A}$              |
| Drain-Source On-State Resistance   | $R_{DS(on)}$ | -      | 0.55 | 0.80 | $\Omega$      | $V_{GS}=10\text{V}, I_D=4\text{A}$               |
| Gate Resistance                    | $R_g$        | -      | 1.7  | -    | $\Omega$      | $V_{GS}=0\text{V}, V_{DS}$ Open, $f=1\text{MHz}$ |
| Forward Transconductance           | $g_{fs}$     | -      | 3.4  | -    | S             | $V_{DS}=5\text{V}, I_D=4\text{A}$                |

## Dynamic characteristics

| Parameter                    | Symbol       | Values |       |     | Unit | Note/Test Conditions                                  |
|------------------------------|--------------|--------|-------|-----|------|-------------------------------------------------------|
|                              |              | Min    | Typ   | Max |      |                                                       |
| Input Capacitance            | $C_{iss}$    | -      | 1565  | -   | pF   | $V_{DS}=25V, V_{GS}=0V, f=1.0MHz$                     |
| Output Capacitance           | $C_{oss}$    | -      | 118   | -   | pF   | $V_{DS}=25V, V_{GS}=0V, f=1.0MHz$                     |
| Reverse Transfer Capacitance | $C_{rss}$    | -      | 39    | -   | pF   | $V_{DS}=25V, V_{GS}=0V, f=1.0MHz$                     |
| Turn-On Delay Time           | $t_{d(on)}$  | -      | 16.8  | -   | ns   | $V_{DD}=250V, R_G=10\Omega, V_{GS}=10V, R_L=66\Omega$ |
| Turn-On Rise Time            | $t_r$        | -      | 1.6   | -   | ns   | $V_{DD}=250V, R_G=10\Omega, V_{GS}=10V, R_L=66\Omega$ |
| Turn-Off Delay Time          | $t_{d(off)}$ | -      | 164.4 | -   | ns   | $V_{DD}=250V, R_G=10\Omega, V_{GS}=10V, R_L=66\Omega$ |
| Turn-Off Fall Time           | $t_f$        | -      | 998.2 | -   | ns   | $V_{DD}=250V, R_G=10\Omega, V_{GS}=10V, R_L=66\Omega$ |

## Gate charge characteristics

| Parameter          | Symbol   | Values |      |     | Unit | Note/Test Conditions              |
|--------------------|----------|--------|------|-----|------|-----------------------------------|
|                    |          | Min    | Typ  | Max |      |                                   |
| Total Gate Charge  | $Q_g$    | -      | 28.5 | -   | nC   | $V_{DS}=400V, I_D=8A, V_{GS}=10V$ |
| Gate-Source Charge | $Q_{gs}$ | -      | 8.5  | -   | nC   | $V_{DS}=400V, I_D=8A, V_{GS}=10V$ |
| Gate-Drain Charge  | $Q_{gd}$ | -      | 6.7  | -   | nC   | $V_{DS}=400V, I_D=8A, V_{GS}=10V$ |

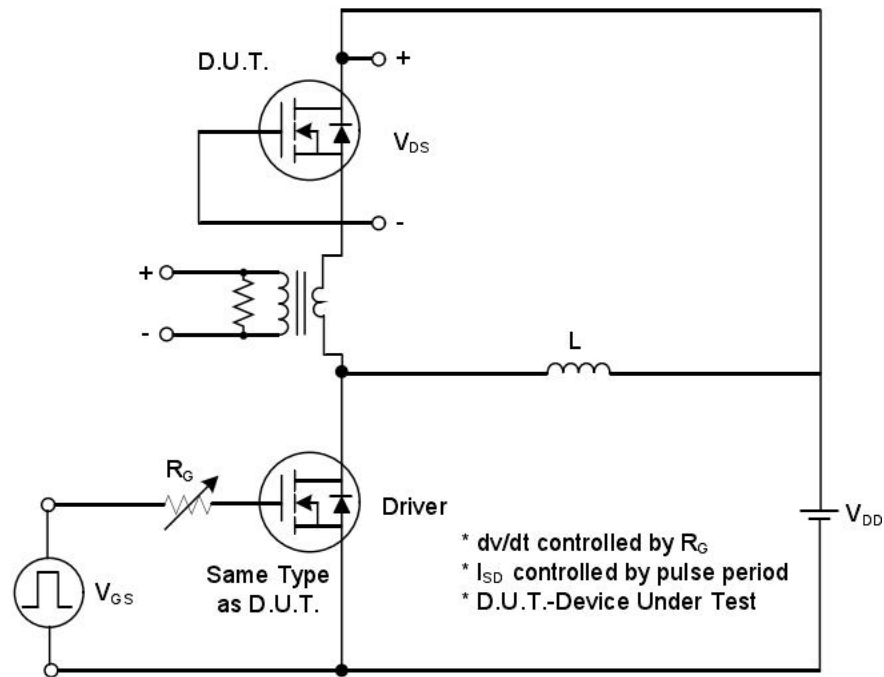
## Reverse diode

| Parameter                        | Symbol   | Values |       |     | Unit | Note/Test Conditions        |
|----------------------------------|----------|--------|-------|-----|------|-----------------------------|
|                                  |          | Min    | Typ   | Max |      |                             |
| Continuous Diode Forward Current | $I_S$    | -      | -     | 10  | A    | -                           |
| Pulsed Diode Forward Current     | $I_{SM}$ | -      | -     | 40  | A    | -                           |
| Diode Forward Voltage            | $V_{SD}$ | -      | -     | 1.5 | V    | $I_S=4A, V_{GS}=0V$         |
| Reverse Recovery Time            | $t_{rr}$ | -      | 172   | -   | ns   | $V_D=20V, I_F=1A$           |
| Reverse Recovery Charge          | $Q_{rr}$ | -      | 483.7 | -   | nC   | $di/dt=100A/\mu s, (Note2)$ |

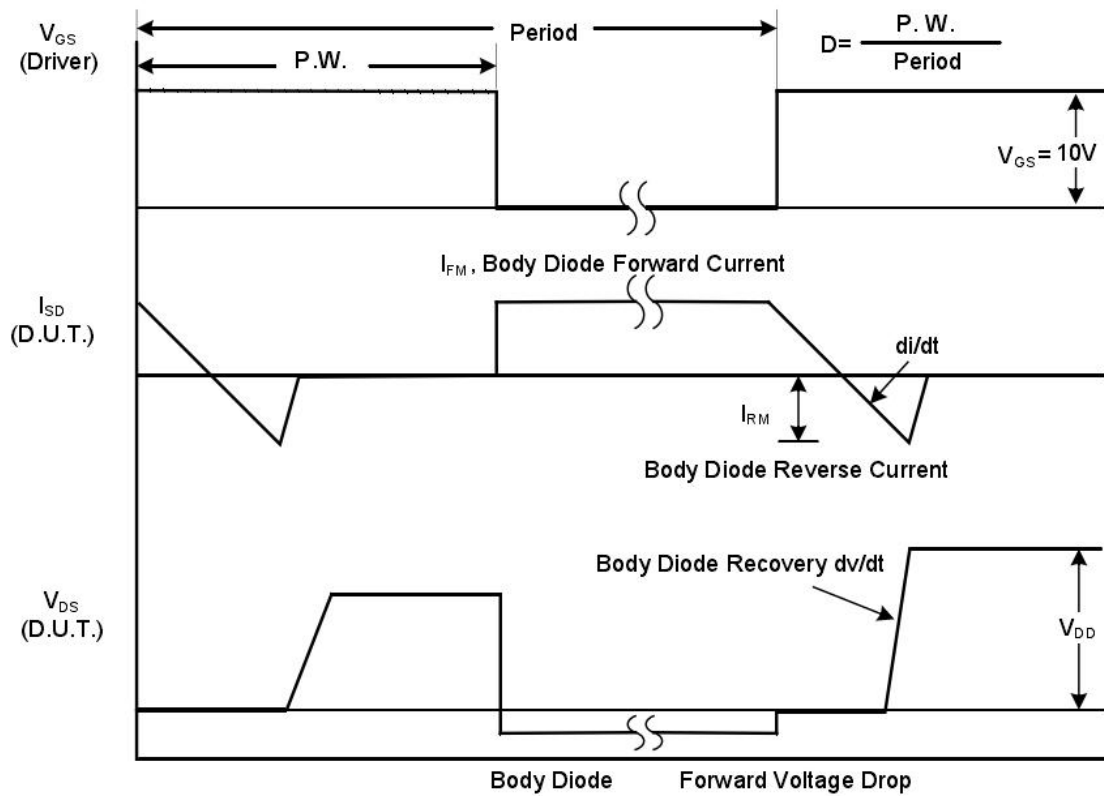
## Notes

1. Repetitive Rating:pulse width limited by maximum junction temperature.
2. Pulse width $\leq 300\mu s$ , duty cycle $\leq 2\%$ .

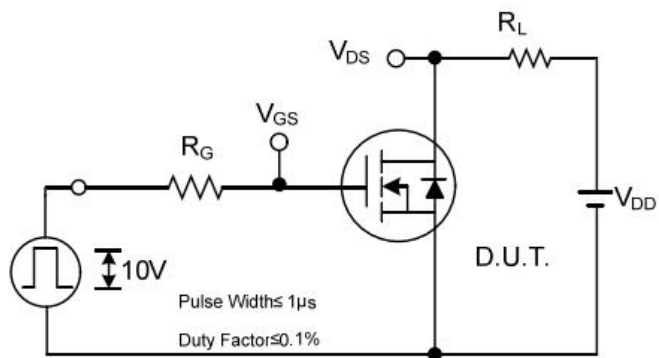
## RATING AND CHARACTERISTIC CURVES



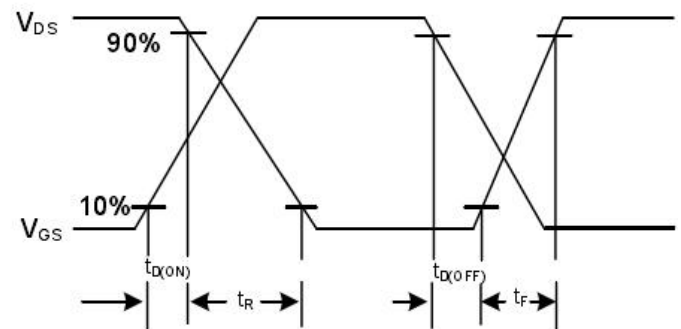
Peak Diode Recovery  $dv/dt$  Test Circuit



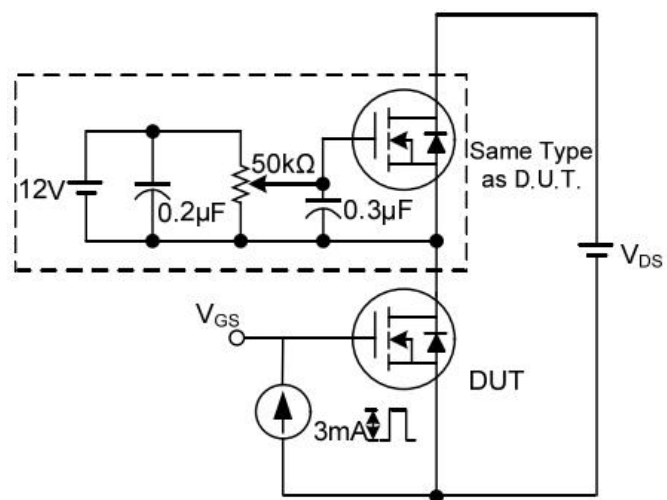
Peak Diode Recovery  $dv/dt$  Waveforms



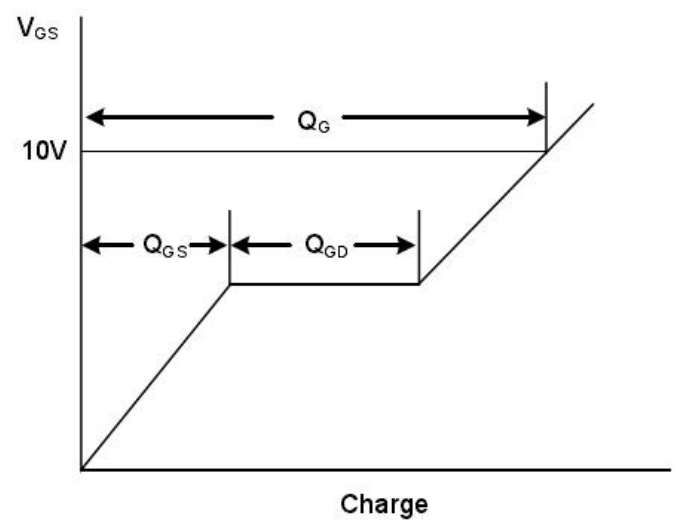
**Switching Test Circuit**



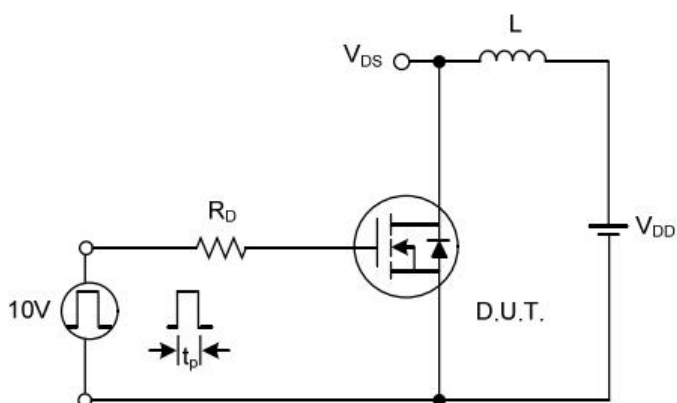
**Switching Waveforms**



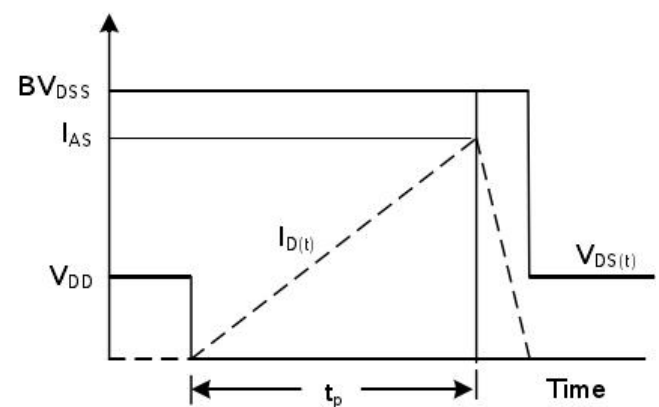
**Gate Charge Test Circuit**



**Gate Charge Waveform**



**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**

## RATING AND CHARACTERISTIC CURVES

Figure.1 Typical Output Characteristics

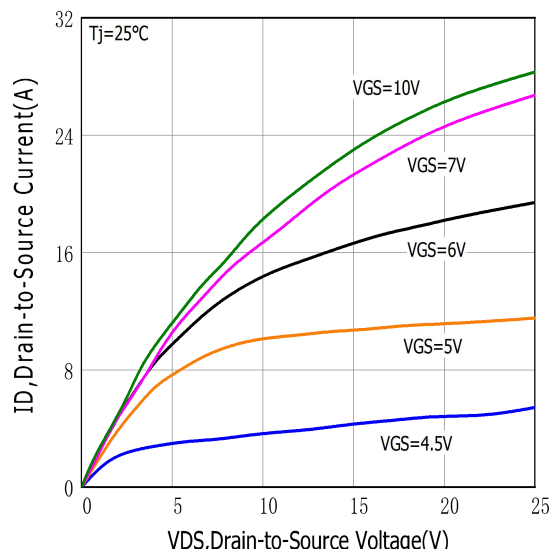


Figure.2 Typical Gate Charge vs Gate to Source Voltage

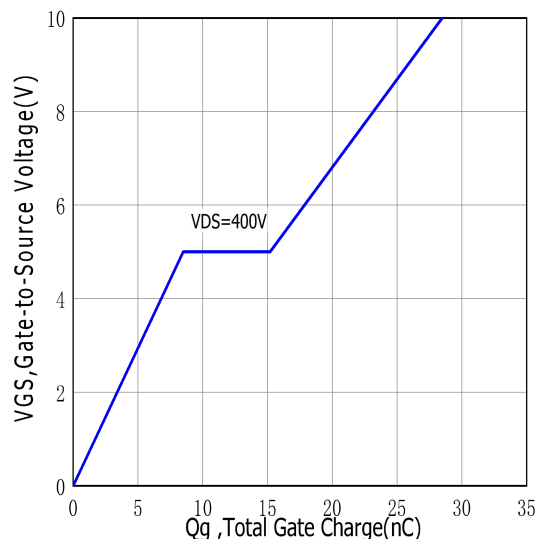


Figure.3 Typical Body Diode Transfer Characteristics

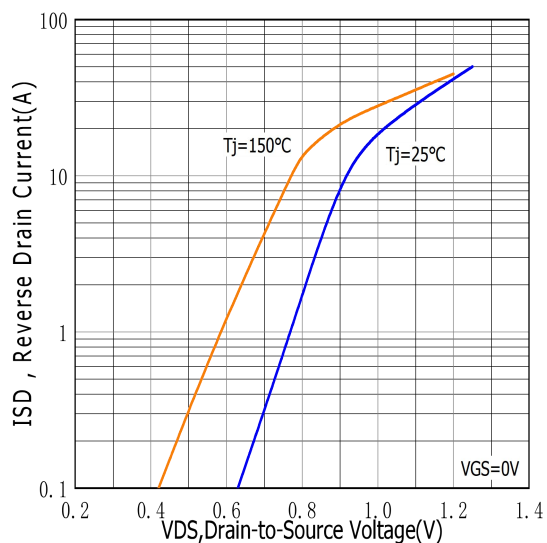


Figure.4 Typical Capacitance vs Drain to Source Voltage

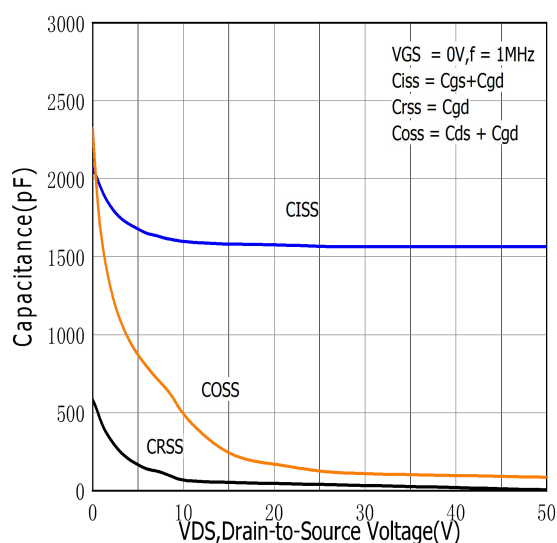


Figure.5 Typical Breakdown Voltage vs Junction Temperature

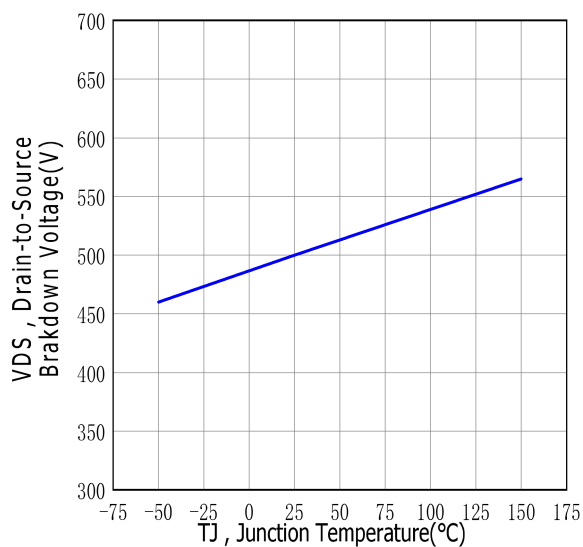


Figure.6 Typical Drain to Source on Resistance vs Junction Temperature

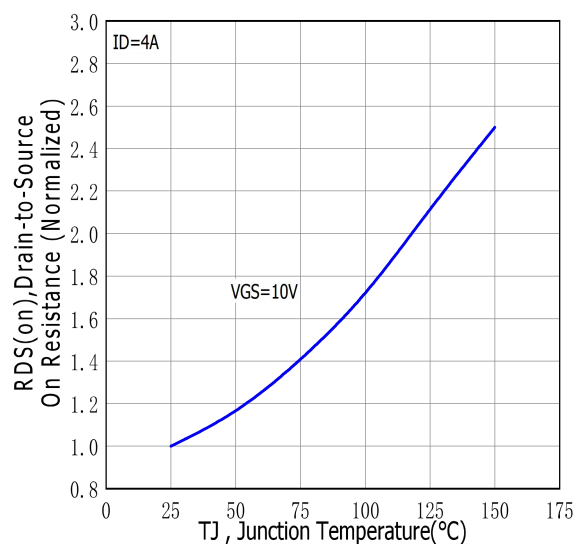


Figure.7 Maximum Forward Bias Safe Operating Area

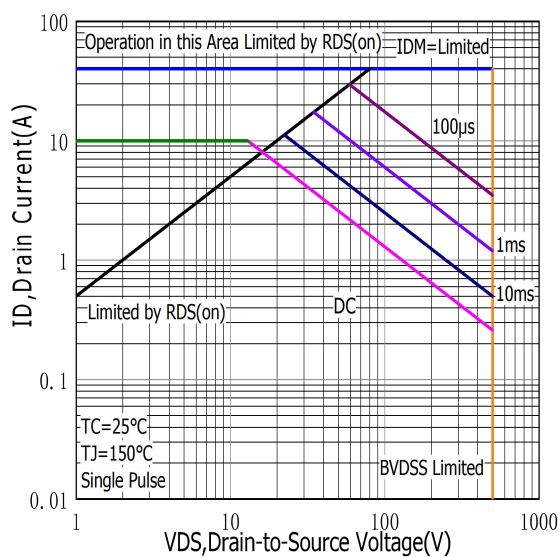


Figure.8 Typical Drain to Source ON Resistance vs Drain Current

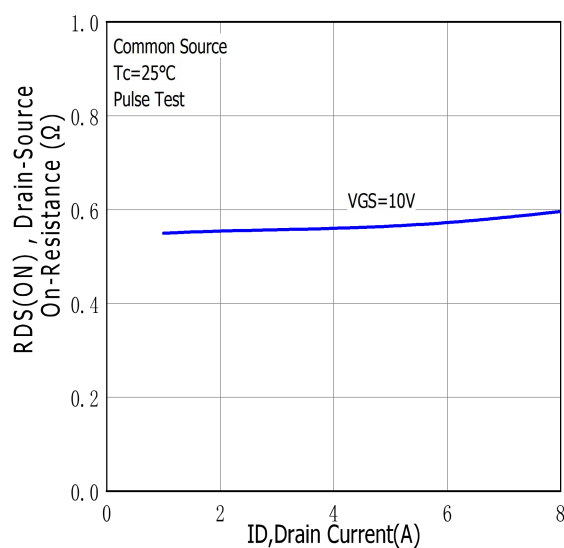


Figure.9 Maximum EAS vs Channel Temperature

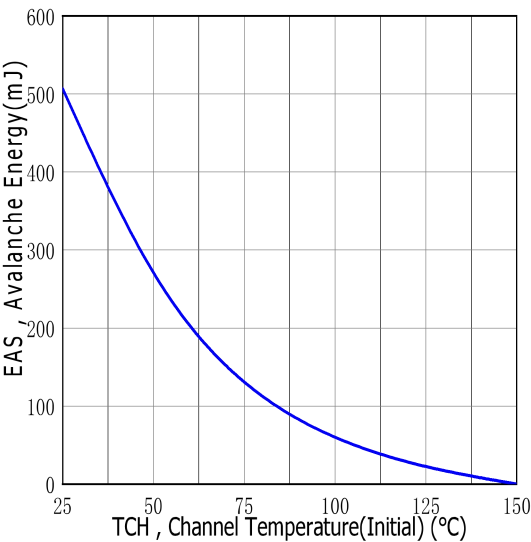


Figure.10 Typical Threshold Voltage vs Case Temperature

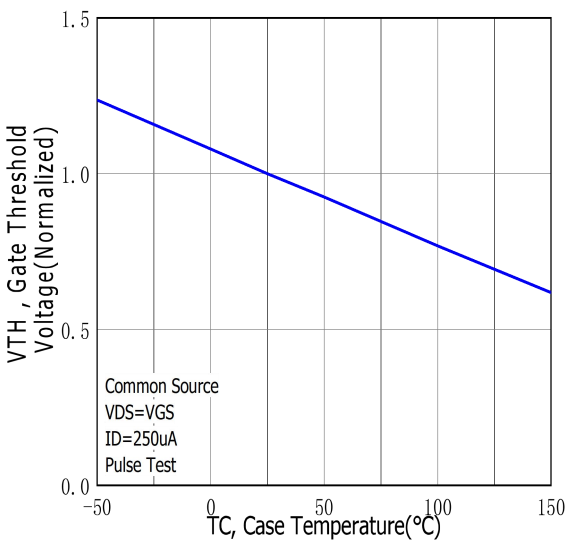


Figure.11 Typical Transfer Characteristics

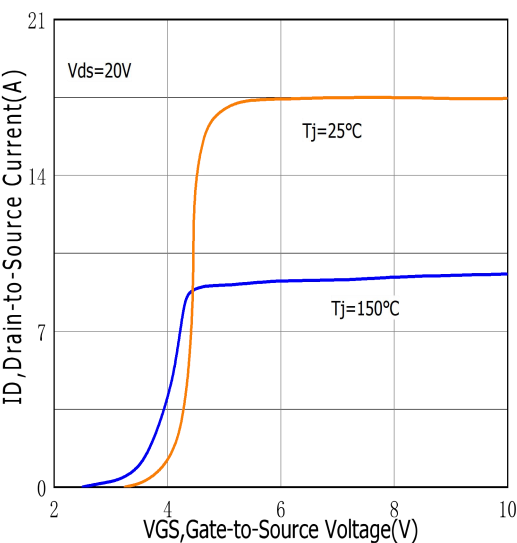


Figure.12 Maximum Power Dissipation vs Case Temperature

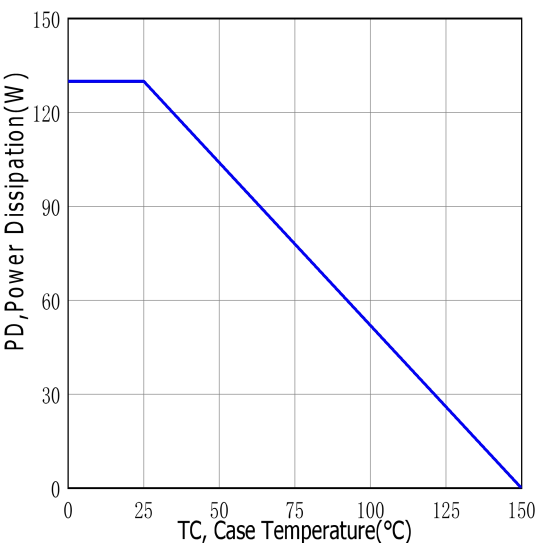
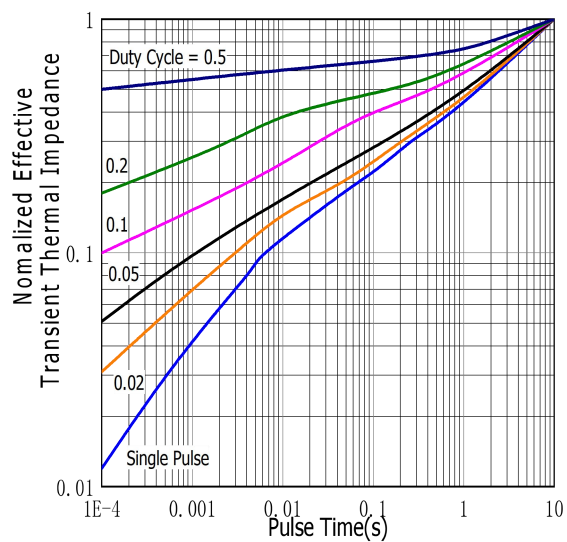
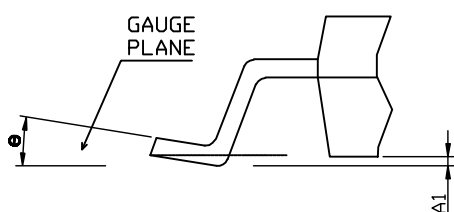
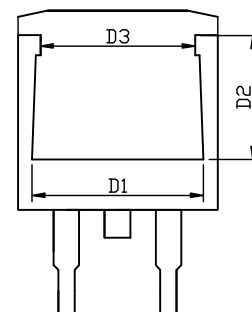
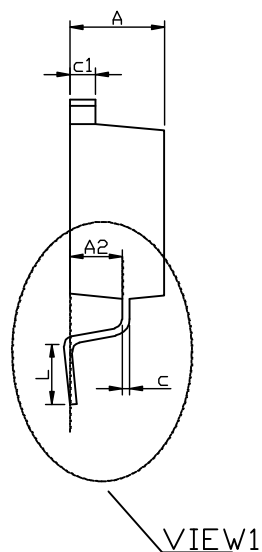
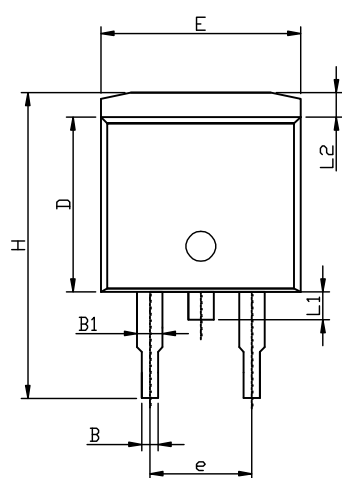


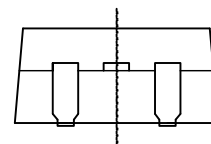
Figure.13 Maximum Effective Thermal Impedance , Junction to Case



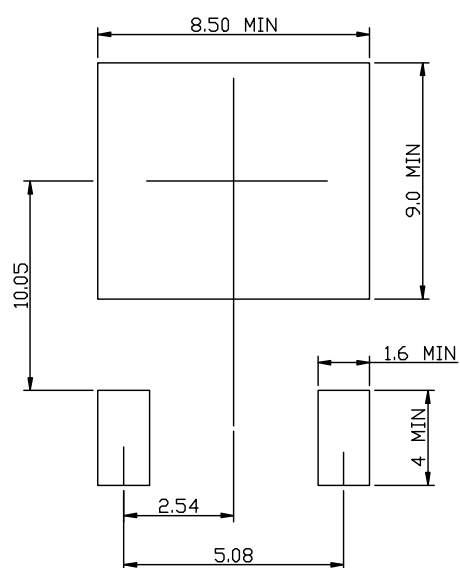
## TO-263-2L PACKAGE OUTLINE



VIEW1



### RECOMMENDED LAND PATTERN



|    | MIN   | NOM     | MAX   |
|----|-------|---------|-------|
| A  | 4.50  | 4.70    | 4.90  |
| A1 | 0.05  | 0.15    | 0.30  |
| A2 | 2.45  | 2.60    | 2.70  |
| B  | 0.72  | 0.82    | 0.92  |
| B1 | 1.12  | 1.27    | 1.42  |
| c  | 0.28  | 0.38    | 0.48  |
| c1 | 1.17  | 1.27    | 1.37  |
| D  | 8.46  | 8.66    | 8.86  |
| D1 | 7.90  | 8.10    | 8.40  |
| D2 | 5.50  | 5.70    | 5.90  |
| D3 | 7.10  | 7.30    | 7.50  |
| E  | 9.85  | 10.15   | 10.45 |
| e  |       | 5.08BCS |       |
| H  | 14.75 | 15.15   | 15.55 |
| L  | 2.30  | 2.55    | 2.80  |
| L1 | 1.20  | 1.40    | 1.60  |
| L2 | 1.01  | 1.23    | 1.50  |
| θ  | 0°    | 7°      | 8°    |

UNIT: mm