

## 100V N-Channel Enhancement Mode MOSFET

### Description

The NP12N10G uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. It can be used in a wide variety of applications.

### General Features

- ◆  $V_{DS} = 100V$ ,  $I_D = 12A$   
 $R_{DS(ON)}(Typ.) = 105m\Omega$  @  $V_{GS} = 10V$   
 $R_{DS(ON)}(Typ.) = 122m\Omega$  @  $V_{GS} = 4.5V$
- ◆ High density cell design for ultra low  $R_{dson}$
- ◆ Fully characterized avalanche voltage and current
- ◆ Good stability and uniformity with high  $E_{AS}$
- ◆ Excellent package for good heat dissipation
- ◆ Special process technology for high ESD capability

### Application

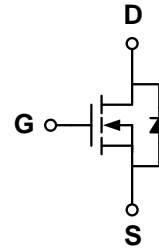
- ◆ Automotive applications
- ◆ Hard switched and high frequency circuits
- ◆ Uninterruptible power supply

### Package

- ◆ TO-252-2L



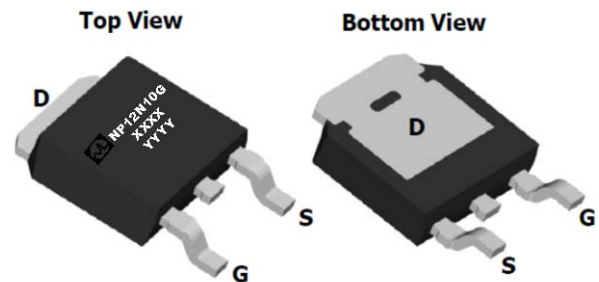
### Schematic diagram



### Marking and pin assignment

#### TO-252-2L

(Top View)



XXXX—Wafer Information

YYYY—Quality Code

### Ordering Information

| Part Number | Storage Temperature | Package   | Devices Per Reel |
|-------------|---------------------|-----------|------------------|
| NP12N10G-G  | -55°C to +150°C     | TO-252-2L | 2500             |

### Absolute Maximum Ratings (TA=25°C unless otherwise noted)

| parameter                                     | symbol   | limit    | unit |
|---|----------|----------|------|
| Drain-source voltage                          | $V_{DS}$ | 100      | V    |
| Gate-source voltage                           | $V_{GS}$ | ±20      | V    |
| Continuous Drain Current                      | $I_D$    | TC=25°C  | 12   |
|   |          | TC=100°C | 8    |
| Pulsed Drain Current                          | $I_{DP}$ | 48       | A    |
| Avalanche energy( L=0.5mH) <sup>(note1)</sup> | $E_{AS}$ | 25       | mJ   |
| Maximum power dissipation                     | $P_D$    | 50       | W    |
| Operating junction Temperature range          | $T_j$    | -55—150  | °C   |

**Electrical Characteristics** (TA=25°C unless otherwise noted)

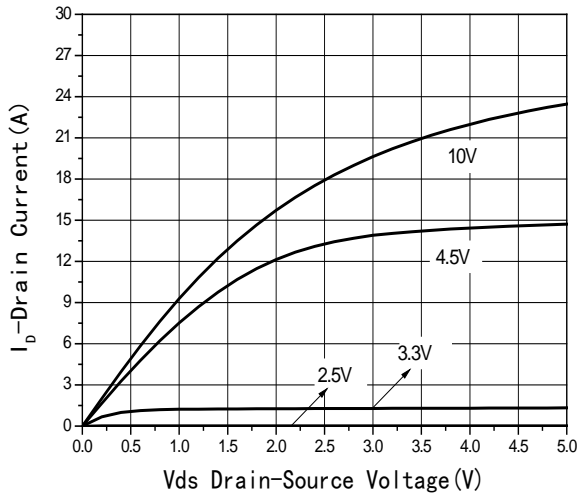
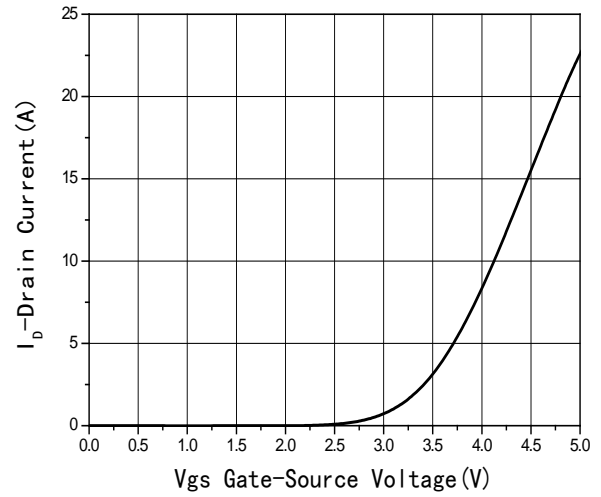
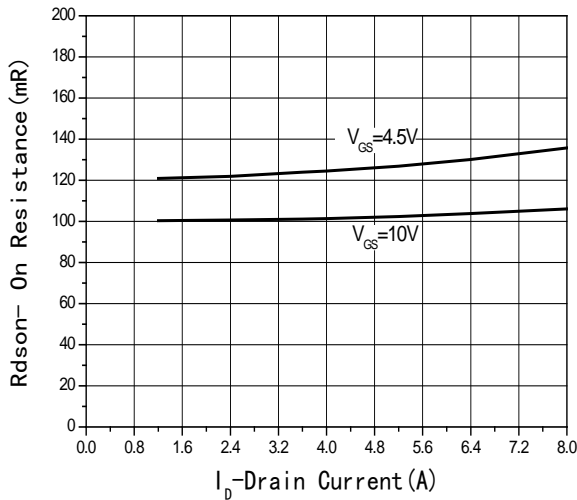
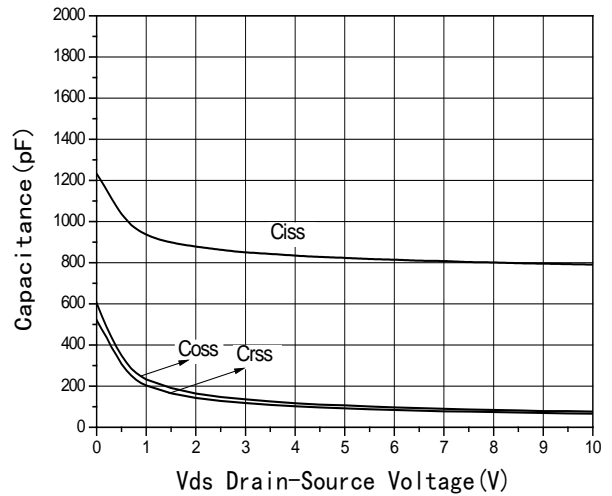
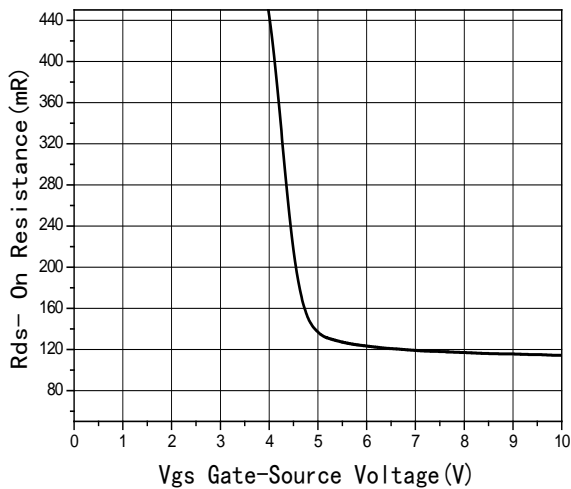
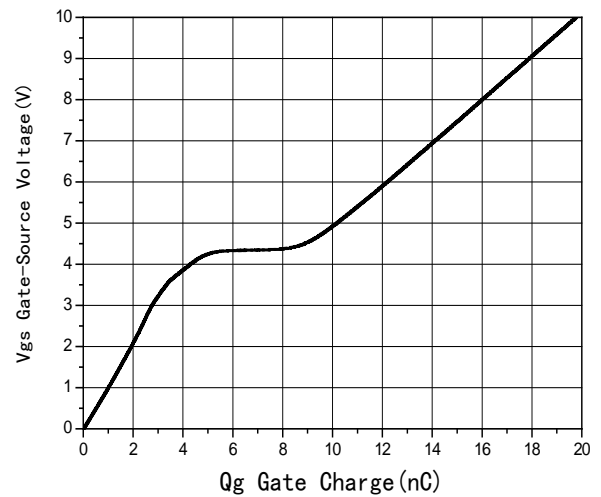
| Parameter                                     | Symbol       | Condition                             | Min              | Typ | Max       | Unit       |         |
|---|--------------|---------------------------------------|------------------|-----|-----------|------------|---------|
| <b>Static Characteristics</b>                 |              |                                       |                  |     |           |            |         |
| Drain-source breakdown voltage                | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$             | 100              | -   | -         | V          |         |
| Zero gate voltage drain current               | $I_{DSS}$    | $V_{DS}=100V, V_{GS}=0V$              | $T_J=25^\circ C$ | -   | -         | 1          | $\mu A$ |
|   |              |                                       | $T_J=85^\circ C$ | -   | -         | 30         |         |
| Gate Leakage Current                          | $I_{GSS}$    | $V_{DS}=0V, V_{GS}=\pm 20V$           | -                | -   | $\pm 100$ | nA         |         |
| Gate threshold voltage                        | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$         | 1                | 1.6 | 2.5       | V          |         |
| Drain-source on-state resistance <sup>1</sup> | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=12A$                 | -                | 105 | 130       | m $\Omega$ |         |
|   |              | $V_{GS}=4.5V, I_D=10A$                | -                | 122 | 150       |            |         |
| On Status Drain Current                       | $I_{D(ON)}$  | $V_{DS}=100V, V_{GS}=10V$             | 12               | -   | -         | A          |         |
| <b>Diode Characteristics</b>                  |              |                                       |                  |     |           |            |         |
| Diode Continuous Forward Current              | $I_S$        |                                       | -                | -   | 12        | A          |         |
| Reverse Recovery Time                         | $t_{rr}$     | $I_F=12A,$                            | -                | 22  | -         | ns         |         |
| Reverse Recovery Charge                       | $Q_{rr}$     | $di/dt=100A/us$                       | -                | 90  | -         | nC         |         |
| <b>Dynamic Characteristics<sup>2</sup></b>    |              |                                       |                  |     |           |            |         |
| Input capacitance                             | $C_{ISS}$    | $V_{GS}=0V, V_{DS}=50V$<br>$f=1.0MHz$ | -                | 730 | -         | pF         |         |
| Output capacitance                            | $C_{OSS}$    |                                       | -                | 36  | -         |            |         |
| Reverse transfer capacitance                  | $C_{RSS}$    |                                       | -                | 31  | -         |            |         |
| Turn-on delay time                            | $t_{D(ON)}$  | $V_{GS}=10V, V_{DS}=50V, I_D=12A$     | -                | 15  | -         | ns         |         |
| Turn-on Rise time                             | $t_r$        |                                       | -                | 5   | -         |            |         |
| Turn-off delay time                           | $t_{D(OFF)}$ |                                       | -                | 25  | -         |            |         |
| Turn-off Fall time                            | $t_f$        |                                       | -                | 7   | -         |            |         |
| Total gate charge                             | $Q_g$        | $V_{GS}=10V, I_D=12A$<br>$V_{DS}=50V$ | -                | 19  | -         | nC         |         |
| Gate-source charge                            | $Q_{gs}$     |                                       | -                | 4.6 | -         |            |         |
| Gate-drain charge                             | $Q_{gd}$     |                                       | -                | 4.1 | -         |            |         |
| <b>Drain-Source Diode Characteristics</b>     |              |                                       |                  |     |           |            |         |
| Diode forward voltage                         | $V_{SD}$     | $I_{SD}=12A, V_{GS}=0V$               | -                | 0.8 | 1.1       | V          |         |

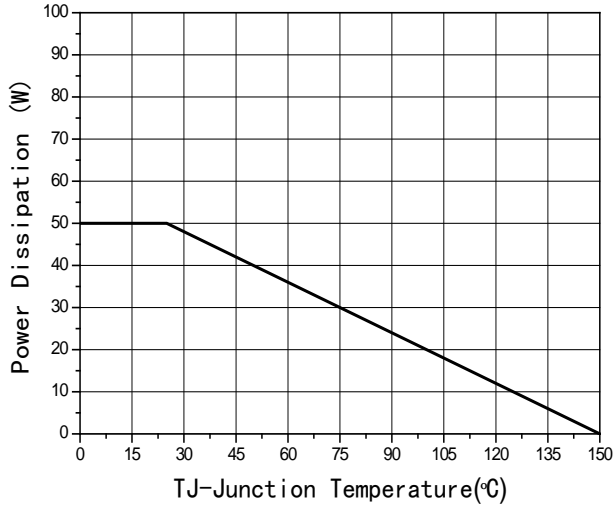
Note: 1: Eas test: VDD=50V, RG=50ohm, L=500uH

2: Pulse test; pulse width  $\leq 300ns$ , duty cycle  $\leq 2\%$ .

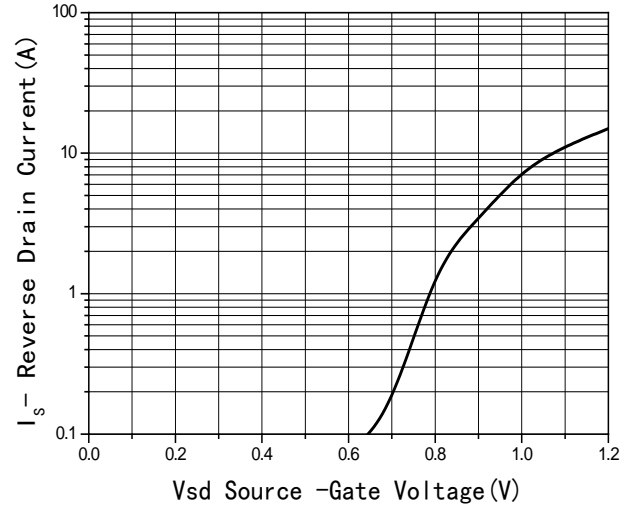
3: Guaranteed by design, not subject to production testing.

## Typical Performance Characteristics


**Fig1 Output Characteristics**

**Fig2 Transfer Characteristics**

**Fig3 Rdson-Drain current**

**Fig4 Capacitance vs  $V_{DS}$** 

**Fig5 Rdson-Gate Drain voltage**

**Fig6 Gate Charge**



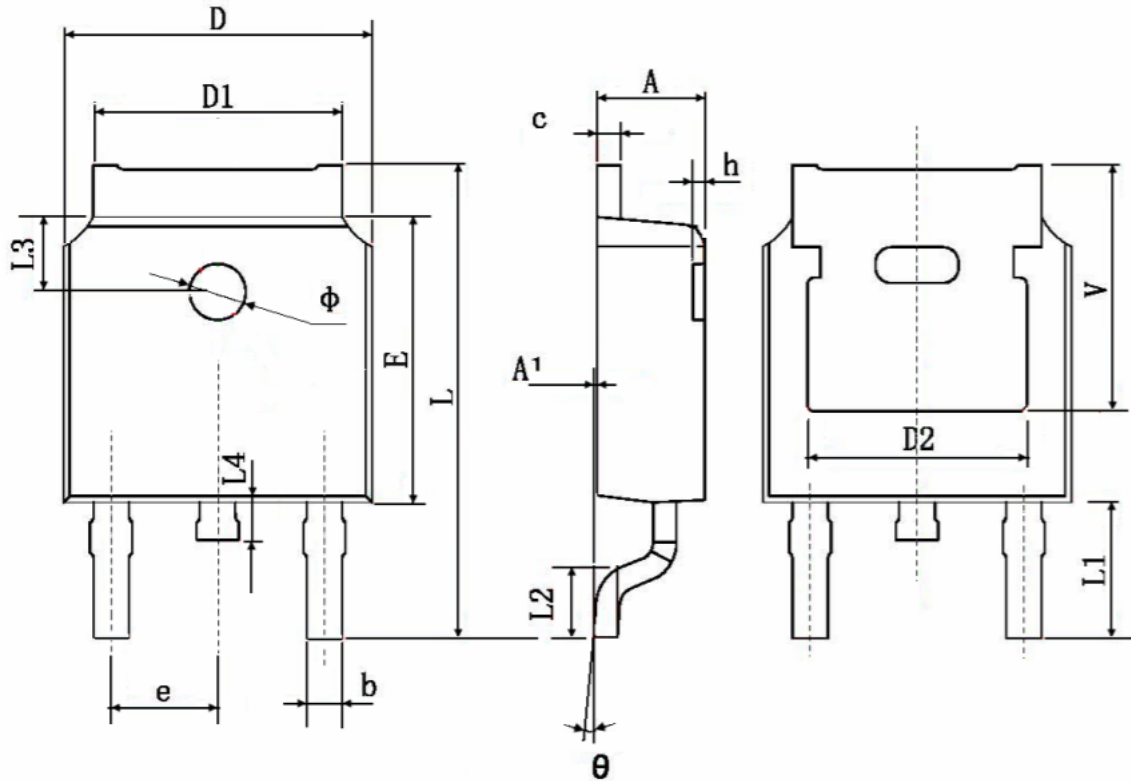
**Fig7 Power De-rating**



**Fig8 Source-Drain Diode Forward**

## Package Information

- TO-252-2L



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 2.200                     | 2.400  | 0.087                | 0.094 |
| A1     | 0.000                     | 0.127  | 0.000                | 0.005 |
| b      | 0.660                     | 0.860  | 0.026                | 0.034 |
| c      | 0.460                     | 0.580  | 0.018                | 0.023 |
| D      | 6.500                     | 6.700  | 0.256                | 0.264 |
| D1     | 5.100                     | 5.460  | 0.201                | 0.215 |
| D2     | 4.830 TYP.                |        | 0.190 TYP.           |       |
| E      | 6.000                     | 6.200  | 0.236                | 0.244 |
| e      | 2.186                     | 2.386  | 0.086                | 0.094 |
| L      | 9.800                     | 10.400 | 0.386                | 0.409 |
| L1     | 2.900 TYP.                |        | 0.114 TYP.           |       |
| L2     | 1.400                     | 1.700  | 0.055                | 0.067 |
| L3     | 1.600 TYP.                |        | 0.063 TYP.           |       |
| L4     | 0.600                     | 1.000  | 0.024                | 0.039 |
| φ      | 1.100                     | 1.300  | 0.043                | 0.051 |
| θ      | 0°                        | 8°     | 0°                   | 8°    |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| V      | 5.350 TYP.                |        | 0.211 TYP.           |       |