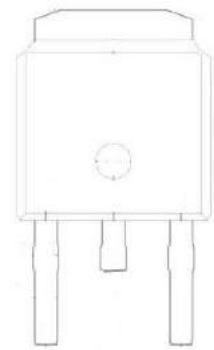
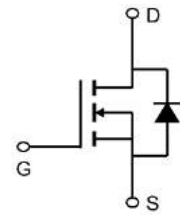


## 100V N-Channel Enhancement Mode MOSFET

### Description

The 40N10D uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



### General Features

$V_{DS} = 100V$   $I_D = 40A$

$R_{DS(ON)} < 20m\Omega$  @  $V_{GS}=10V$

### Application

Consumer electronic power supply

Motor control

Synchronous-rectification

Isolated DC



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

| Symbol              | Parameter   | Rating     | Units        |
|---------------------|---|------------|--------------|
| $V_{DS}$            | Drain source voltage                                      | 100        | V            |
| $V_{GS}$            | Gate source voltage                                       | $\pm 20$   | V            |
| $I_D$               | Continuous drain current <sup>1)</sup> , $T_C=25^\circ C$ | 40         | A            |
| $I_D, \text{pulse}$ | Pulsed drain current <sup>2)</sup> , $T_C=25^\circ C$     | 120        | A            |
| $P_D$               | Power dissipation <sup>3)</sup> , $T_C=25^\circ C$        | 71         | W            |
| EAS                 | Single pulsed avalanche energy <sup>5)</sup>              | 57         | mJ           |
| $T_{stg}, T_J$      | Operation and storage temperature                         | -55 to 150 | $^\circ C$   |
| $R_{\theta JC}$     | Thermal resistance, junction-case                         | 1.76       | $^\circ C/W$ |
| $R_{\theta JA}$     | Thermal resistance, junction-ambient <sup>4)</sup>        | 62         | $^\circ C/W$ |

## 100V N-Channel Enhancement Mode MOSFET

### Electrical Characteristics (T<sub>c</sub>=25°C unless otherwise noted)

| Symbol          | Parameter                        | Test condition   | Min. | Typ.   | Max. | Unit |
|-----------------|----------------------------------|--|------|--------|------|------|
| BVDSS           | Drain-source breakdown voltage   | V <sub>GS</sub> =0 V, I <sub>D</sub> =250 μA   | 100  | 107    |      | V    |
| VGS(th)         | Gate threshold voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250 μA  | 1.2  | 1.5    | 2.5  | V    |
| RDS(ON)         | Drain-source on-state resistance | V <sub>GS</sub> =10 V, I <sub>D</sub> =10 A  |      | 13.8   | 20.0 | mΩ   |
| RDS(ON)         | Drain-source on-state resistance | V <sub>GS</sub> =4.5 V, I <sub>D</sub> =7 A  |      | 17.4   | 26.0 | mΩ   |
| IGSS            | Gate-source leakage current      | V <sub>GS</sub> =±20 V   |      |        | ±100 | nA   |
| IDSS            | Drain-source leakage current     | V <sub>DS</sub> =100 V, V <sub>GS</sub> =0 V   |      |        | 1    | uA   |
| Ciss            | Input capacitance                | V <sub>GS</sub> =0 V,<br>V <sub>DS</sub> =50 V,<br>f=100 kHz                                     |      | 1003.9 |      | pF   |
| Coss            | Output capacitance               |  |      | 185.4  |      | pF   |
| Crss            | Reverse transfer capacitance     |  |      | 9.8    |      | pF   |
| td(on)          | Turn-on delay time               | V <sub>GS</sub> =10 V,<br>V <sub>DS</sub> =50 V,<br>R <sub>G</sub> =10 Ω,<br>I <sub>D</sub> =5 A |      | 16.6   |      | ns   |
| t <sub>r</sub>  | Rise time                        |  |      | 3.8    |      | ns   |
| td(off)         | Turn-off delay time              |  |      | 75.5   |      | ns   |
| t <sub>f</sub>  | Fall time                        |  |      | 46     |      | ns   |
| Q <sub>g</sub>  | Total gate charge                | I <sub>D</sub> =5 A,<br>V <sub>DS</sub> =50V,<br>V <sub>GS</sub> =10V                            |      | 16.2   |      | nc   |
| Q <sub>gs</sub> | Gate-source charge               |  |      | 2.8    |      | nc   |
| Q <sub>gd</sub> | Gate-drain charge                |  |      | 4.1    |      | nc   |
| Vplateau        | Gate plateau voltage             |  |      | 3      |      | V    |
| I <sub>s</sub>  | Diode forward current            | V <sub>GS</sub> <V <sub>th</sub>   |      | 30     |      | A    |
| ISP             | Pulsed source current            |  |      | 90     |      | A    |
| trr             | Reverse recovery time            | I <sub>S</sub> =1A, di/dt=100 A/μs   | 49   |        |      | ns   |
| Q <sub>rr</sub> | Reverse recovery charge          |  | 61.8 |        |      | nc   |
| Irrm            | Peak reverse recovery current    |  | 2.4  |        |      | A    |

#### Note :

- 1、 Calculated continuous current based on maximum allowable junction temperature.
- 2、 Repetitive rating; pulse width limited by max. junction temperature.
- 3、 Pd is based on max. junction temperature, using junction-case thermal resistance.
- 4、 The value of R<sub>θja</sub> is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with T<sub>a</sub>=25 °C.
- 5、 V<sub>DD</sub>=50 V, R<sub>G</sub>=25 Ω, L=0.3 mH, starting T<sub>J</sub>=25 °C.

### Typical Characteristics

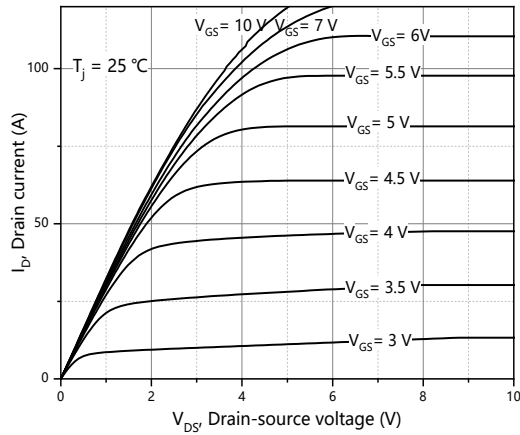


Figure 1, Typ. output characteristics

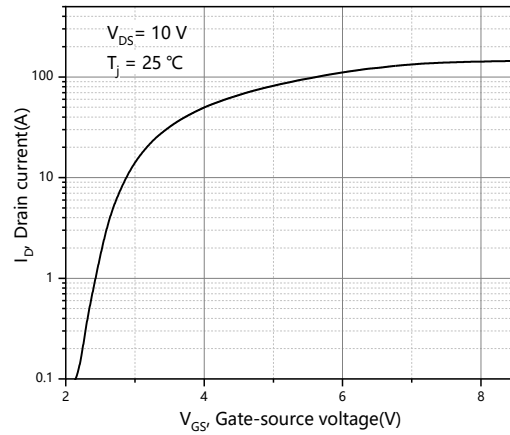


Figure 2, Typ. transfer characteristics

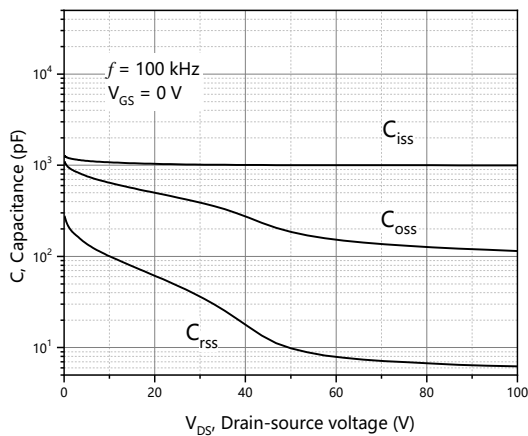


Figure 3, Typ. capacitances

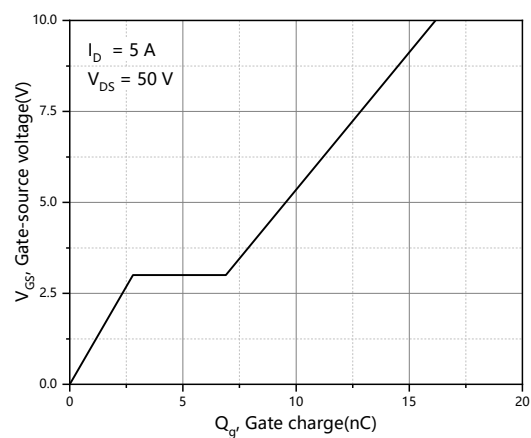


Figure 4, Typ. gate charge

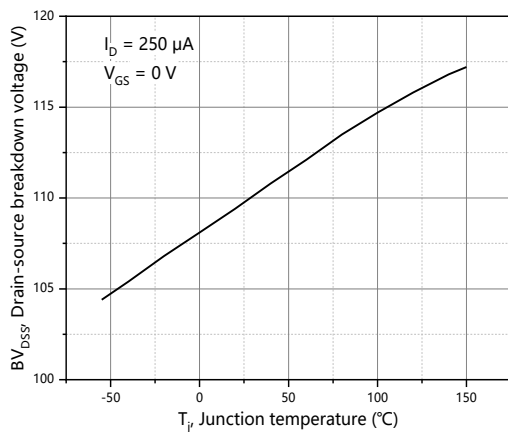


Figure 5, Drain-source breakdown voltage

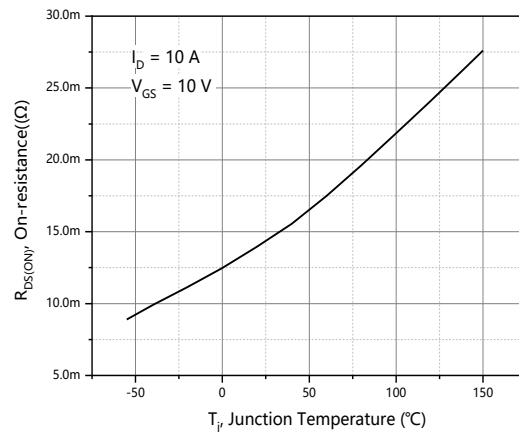


Figure 6, Drain-source on-state resistance

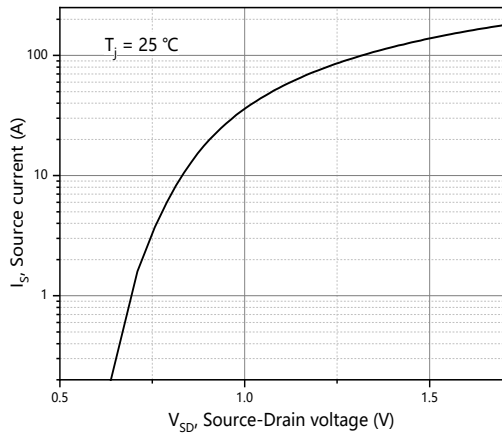
**100V N-Channel Enhancement Mode MOSFET**


Figure 7, Forward characteristic of body diode

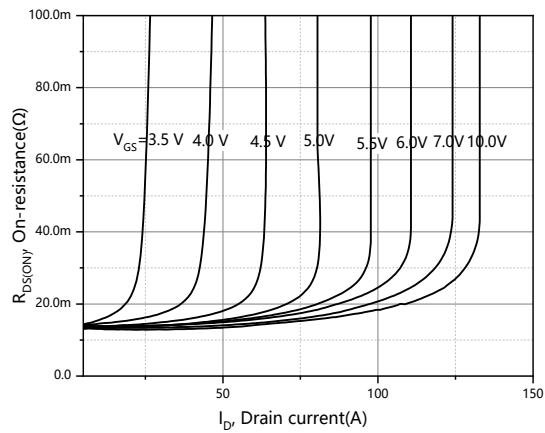


Figure 8, Drain-source on-state resistance

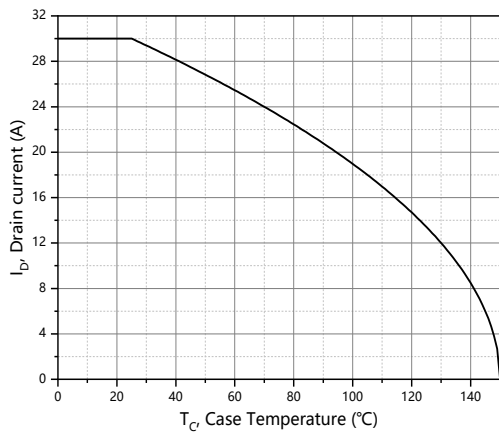


Figure 9, Drain current

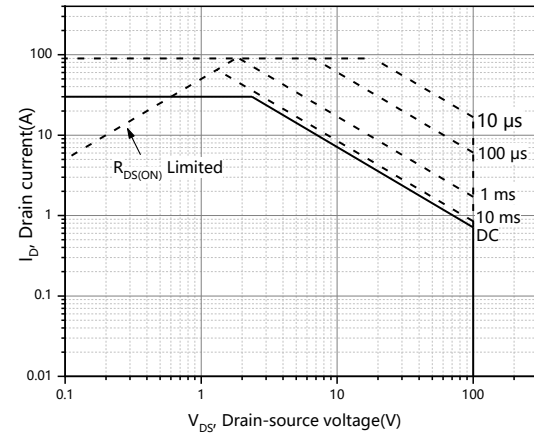
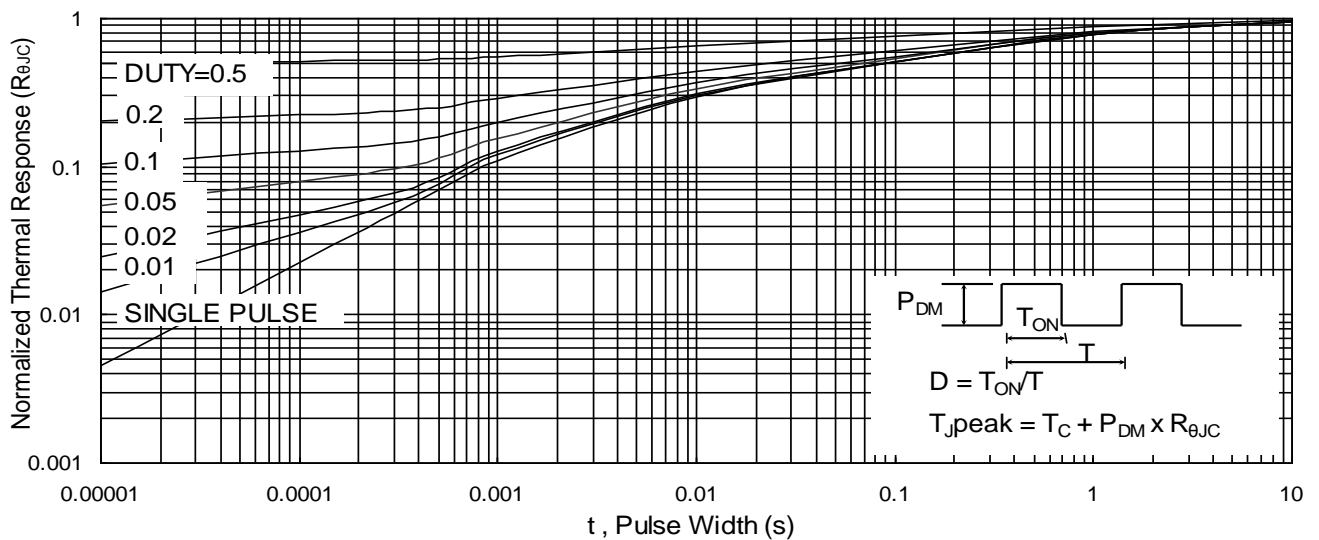
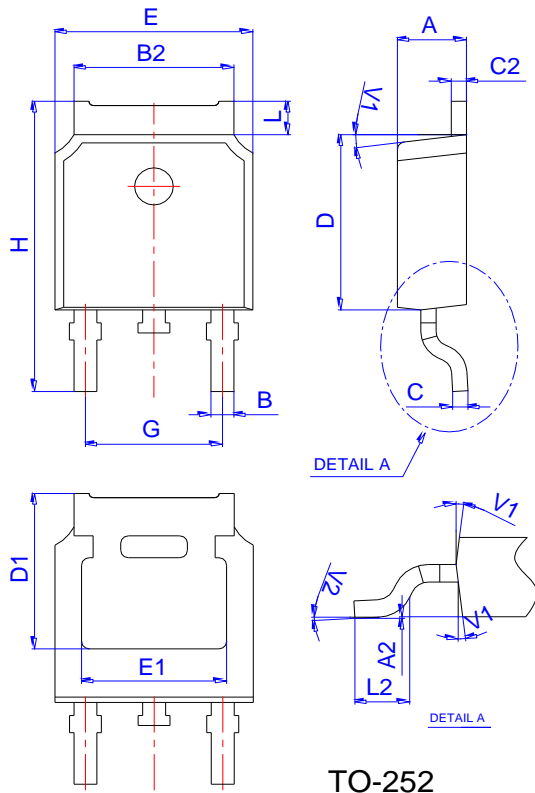

 Figure 10, Safe operation area  $T_C=25\text{ }^\circ\text{C}$ 


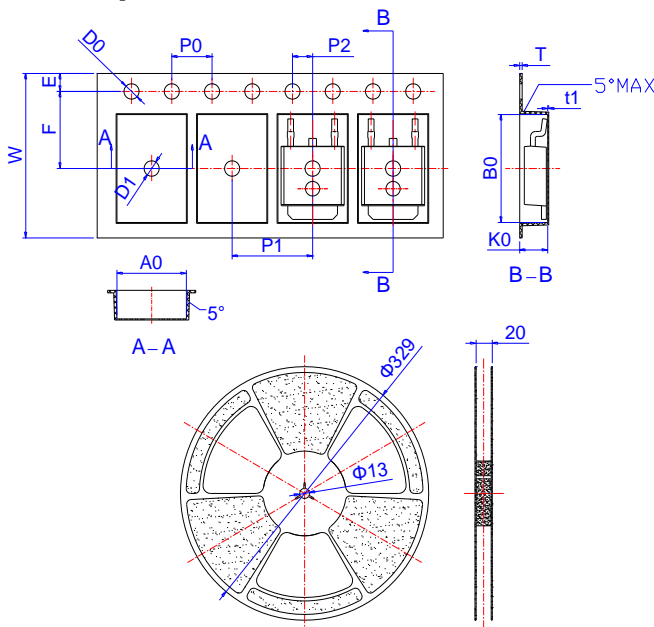
Fig11. Normalized Maximum Transient Thermal Impedance

### Package Mechanical Data: TO-252-3L



| Ref. | Dimensions  |      |       |          |      |       |
|------|-------------|------|-------|----------|------|-------|
|      | Millimeters |      |       | Inches   |      |       |
|      | Min.        | Typ. | Max.  | Min.     | Typ. | Max.  |
| A    | 2.10        |      | 2.50  | 0.083    |      | 0.098 |
| A2   | 0           |      | 0.10  | 0        |      | 0.004 |
| B    | 0.66        |      | 0.86  | 0.026    |      | 0.034 |
| B2   | 5.18        |      | 5.48  | 0.202    |      | 0.216 |
| C    | 0.40        |      | 0.60  | 0.016    |      | 0.024 |
| C2   | 0.44        |      | 0.58  | 0.017    |      | 0.023 |
| D    | 5.90        |      | 6.30  | 0.232    |      | 0.248 |
| D1   | 5.30REF     |      |       | 0.209REF |      |       |
| E    | 6.40        |      | 6.80  | 0.252    |      | 0.268 |
| E1   | 4.63        |      |       | 0.182    |      |       |
| G    | 4.47        |      | 4.67  | 0.176    |      | 0.184 |
| H    | 9.50        |      | 10.70 | 0.374    |      | 0.421 |
| L    | 1.09        |      | 1.21  | 0.043    |      | 0.048 |
| L2   | 1.35        |      | 1.65  | 0.053    |      | 0.065 |
| V1   |             | 7°   |       |          | 7°   |       |
| V2   |             | 0°   | 6°    | 0°       |      | 6°    |

### Reel Specification-TO-252



| Ref. | Dimensions  |       |       |        |       |       |
|------|-------------|-------|-------|--------|-------|-------|
|      | Millimeters |       |       | Inches |       |       |
|      | Min.        | Typ.  | Max.  | Min.   | Typ.  | Max.  |
| W    | 15.90       | 16.00 | 16.10 | 0.626  | 0.630 | 0.634 |
| E    | 1.65        | 1.75  | 1.85  | 0.065  | 0.069 | 0.073 |
| F    | 7.40        | 7.50  | 7.60  | 0.291  | 0.295 | 0.299 |
| D0   | 1.40        | 1.50  | 1.60  | 0.055  | 0.059 | 0.063 |
| D1   | 1.40        | 1.50  | 1.60  | 0.055  | 0.059 | 0.063 |
| P0   | 3.90        | 4.00  | 4.10  | 0.154  | 0.157 | 0.161 |
| P1   | 7.90        | 8.00  | 8.10  | 0.311  | 0.315 | 0.319 |
| P2   | 1.90        | 2.00  | 2.10  | 0.075  | 0.079 | 0.083 |
| A0   | 6.85        | 6.90  | 7.00  | 0.270  | 0.271 | 0.276 |
| B0   | 10.45       | 10.50 | 10.60 | 0.411  | 0.413 | 0.417 |
| K0   | 2.68        | 2.78  | 2.88  | 0.105  | 0.109 | 0.113 |
| T    | 0.24        |       | 0.27  | 0.009  |       | 0.011 |
| t1   | 0.10        |       |       | 0.004  |       |       |
| 10P0 | 39.80       | 40.00 | 40.20 | 1.567  | 1.575 | 1.583 |