

## General Description

The MY60N06D 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.

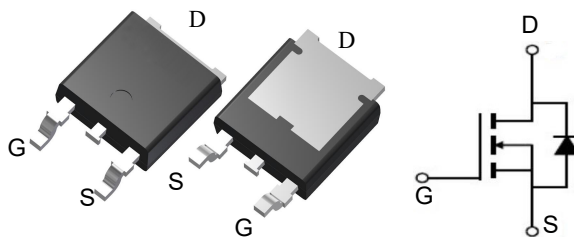


## Features

|                              |     |            |
|------------------------------|-----|------------|
| $V_{DSS}$                    | 60  | V          |
| $I_D$                        | 60  | A          |
| $R_{DS(ON)}(at V_{GS}=10V)$  | 6.5 | m $\Omega$ |
| $R_{DS(ON)}(at V_{GS}=4.5V)$ | 10  | m $\Omega$ |

## Application

- Battery protection
- Load switch
- Uninterruptible power supply



## Package Marking and Ordering Information

| Product ID | Pack      | Marking  | Qty(PCS) |
|------------|-----------|----------|----------|
| MY60N06D   | TO-252-2L | MY60N06D | 2500     |

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

| Parameter                                          | Symbol          | Value      | Unit                 |
|----------------------------------------------------|-----------------|------------|----------------------|
| Drain source voltage                               | $V_{DS}$        | 60         | V                    |
| Gate source voltage                                | $V_{GS}$        | $\pm 20$   | V                    |
| Continuous drain current <sup>1)</sup>             | $I_D$           | 60         | A                    |
| Pulsed drain current <sup>2)</sup>                 | $I_D$ , pulse   | 180        | A                    |
| Power dissipation <sup>3)</sup>                    | $P_D$           | 125        | W                    |
| Single pulsed avalanche energy <sup>4)</sup>       | EAS             | 30         | mJ                   |
| Operation and storage temperature                  | Tstg, Tj        | -55 to 150 | $^{\circ}\text{C}$   |
| Thermal resistance, junction-case                  | $R_{\theta JC}$ | 1          | $^{\circ}\text{C/W}$ |
| Thermal resistance, junction-ambient <sup>5)</sup> | $R_{\theta JA}$ | 62         | $^{\circ}\text{C/W}$ |

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

| Symbol        | Parameter                        | Test condition                                                                                   | Min. | Typ.   | Max. | Unit             |
|---------------|----------------------------------|--------------------------------------------------------------------------------------------------|------|--------|------|------------------|
| $BV_{DSS}$    | Drain-source breakdown voltage   | $V_{GS}=0\text{ V}$ , $I_D=250\text{ }\mu\text{A}$                                               | 60   | 71     |      | V                |
| $V_{GS(th)}$  | Gate threshold voltage           | $V_{DS}=V_{GS}$ , $I_D=250\text{ }\mu\text{A}$                                                   | 2.0  | 3.0    | 4    | V                |
| $R_{DS(ON)}$  | Drain-source on-state resistance | $V_{GS}=10\text{ V}$ , $I_D=20\text{ A}$                                                         |      | 6.5    | 8    | $\text{m}\Omega$ |
| $R_{DS(ON)}$  | Drain-source on-state resistance | $V_{GS}=4.5\text{ V}$ , $I_D=10\text{ A}$                                                        |      | 10     | 13   | $\text{m}\Omega$ |
| $I_{GSS}$     | Gate-source leakage current      | $V_{GS}=20\text{ V}$                                                                             |      |        | 100  | nA               |
|               |                                  | $V_{GS}=-20\text{ V}$                                                                            |      |        | -100 |                  |
| $I_{DSS}$     | Drain-source leakage current     | $V_{DS}=40\text{ V}$ , $V_{GS}=0\text{ V}$                                                       |      |        | 1    | $\mu\text{A}$    |
| $C_{iss}$     | Input capacitance                | $V_{GS}=0\text{ V}$ , $V_{DS}=50\text{ V}$ ,<br>$f=100\text{ kHz}$                               |      | 1182.1 |      | pF               |
| $C_{oss}$     | Output capacitance               |                                                                                                  |      | 199.5  |      | pF               |
| $C_{rss}$     | Reverse transfer capacitance     |                                                                                                  |      | 4.1    |      | pF               |
| $t_{d(on)}$   | Turn-on delay time               | $V_{GS}=10\text{ V}$ ,<br>$V_{DS}=50\text{ V}$ ,<br>$R_G=2\text{ }\Omega$ ,<br>$I_D=10\text{ A}$ |      | 17.9   |      | ns               |
| $t_r$         | Rise time                        |                                                                                                  |      | 4.0    |      | ns               |
| $t_{d(off)}$  | Turn-off delay time              |                                                                                                  |      | 34.9   |      | ns               |
| $t_f$         | Fall time                        |                                                                                                  |      | 5.5    |      | ns               |
| $Q_g$         | Total gate charge                | $I_D=10\text{ A}$ ,<br>$V_{DS}=50\text{ V}$ ,<br>$V_{GS}=10\text{ V}$                            |      | 18.4   |      | nC               |
| $Q_{gs}$      | Gate-source charge               |                                                                                                  |      | 3.3    |      | nC               |
| $Q_{gd}$      | Gate-drain charge                |                                                                                                  |      | 3.1    |      | nC               |
| $V_{plateau}$ | Gate plateau voltage             |                                                                                                  |      | 2.8    |      | V                |
| $I_S$         | Diode forward current            | $V_{GS}<V_{th}$                                                                                  |      |        | 60   | A                |
| $I_{SP}$      | Pulsed source current            |                                                                                                  |      |        | 180  |                  |
| $V_{SD}$      | Diode forward voltage            | $I_S=20\text{ A}$ , $V_{GS}=0\text{ V}$<br>$I_S=10\text{ A}$ , $di/dt=100\text{ A}/\mu\text{s}$  |      |        | 1.3  | V                |
| $t_{rr}$      | Reverse recovery time            |                                                                                                  |      | 41.8   |      | ns               |
| $Q_{rr}$      | Reverse recovery charge          |                                                                                                  |      | 36.1   |      | nC               |
| $I_{rrm}$     | Peak reverse recovery current    |                                                                                                  |      | 1.4    |      | A                |

**Note**

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating; pulse width limited by max. junction temperature.
- 3)  $P_d$  is based on max. junction temperature, using junction-case thermal resistance.
- 4)  $V_{DD}=50\text{ V}$ ,  $R_G=50\text{ }\Omega$ ,  $L=0.3\text{ mH}$ , starting  $T_J=25\text{ }^{\circ}\text{C}$ .
- 5) The value of  $R_{\theta JA}$  is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with  $T_a=25\text{ }^{\circ}\text{C}$ .

**Typical Characteristics**

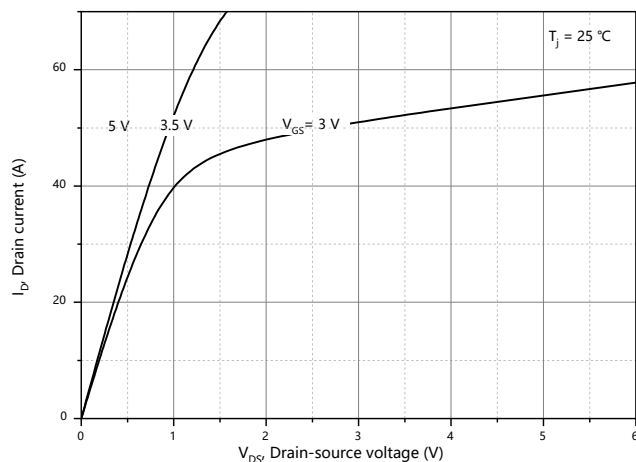


Figure 1, Typ. output characteristics

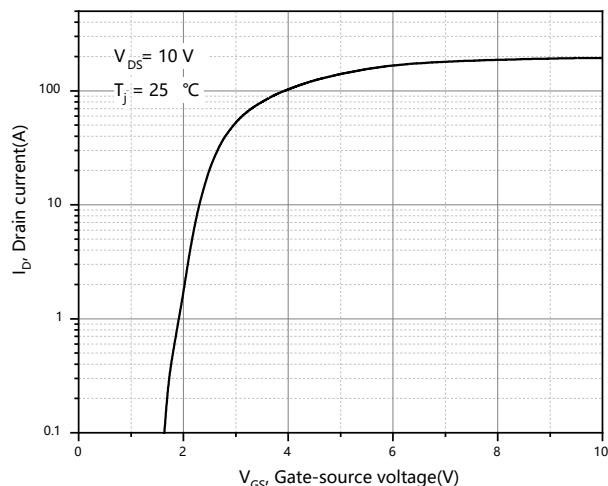


Figure 2, Typ. transfer characteristics

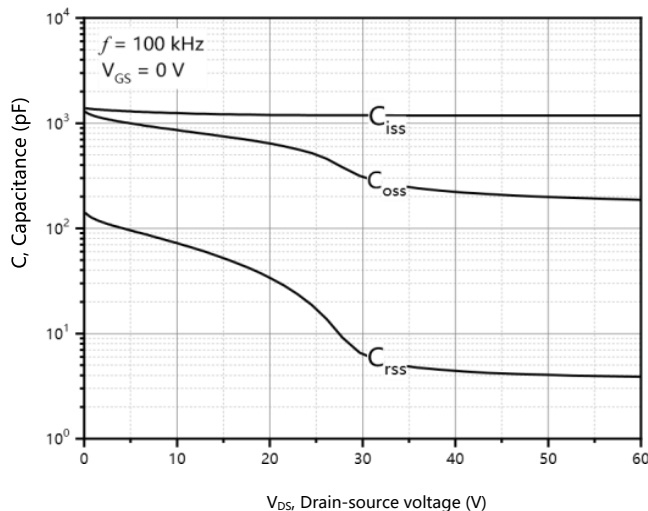


Figure 3, Typ. capacitances

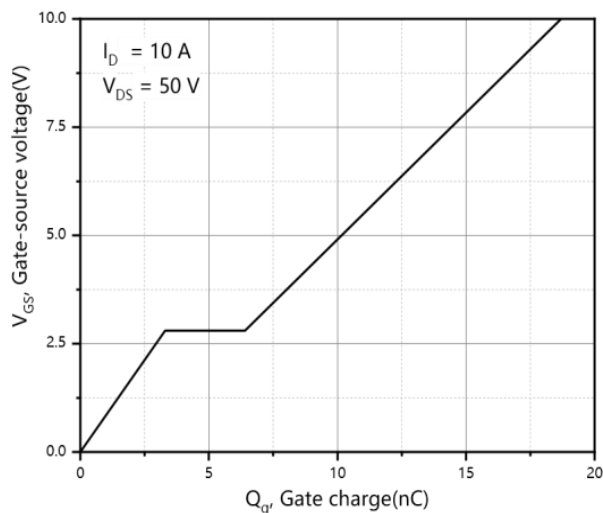


Figure 4, Typ. gate charge

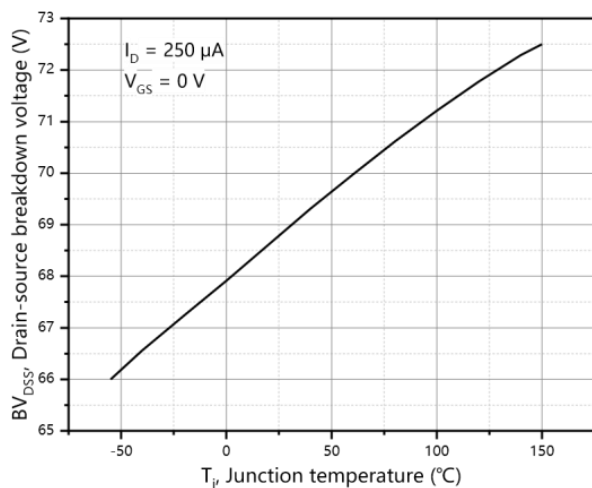


Figure 5, Drain-source breakdown voltage

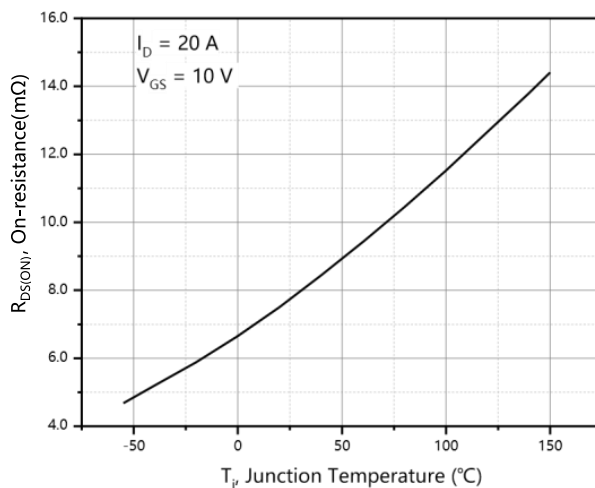


Figure 6, Drain-source on-state resistance

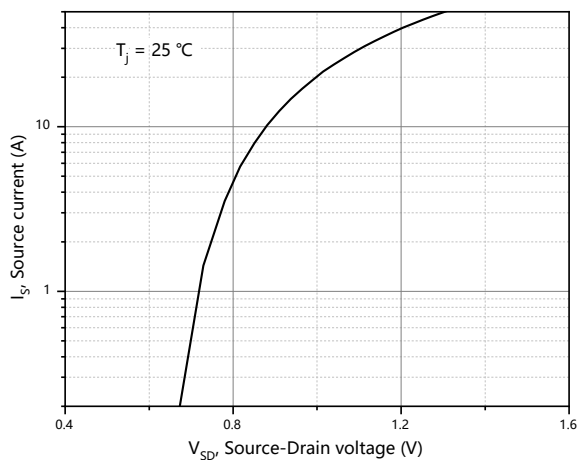


Figure 7, Forward characteristic of body diode

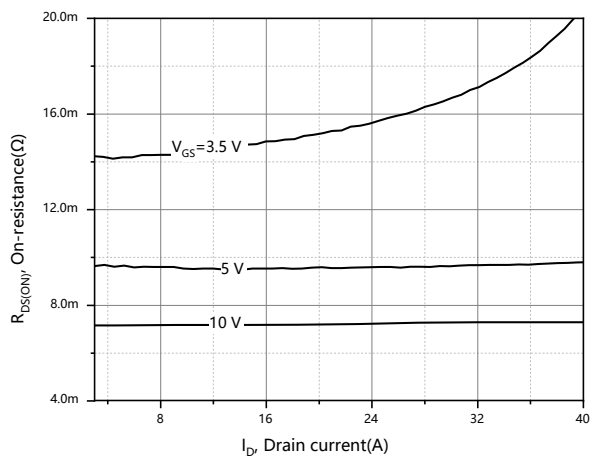


Figure 8, Drain-source on-state resistance

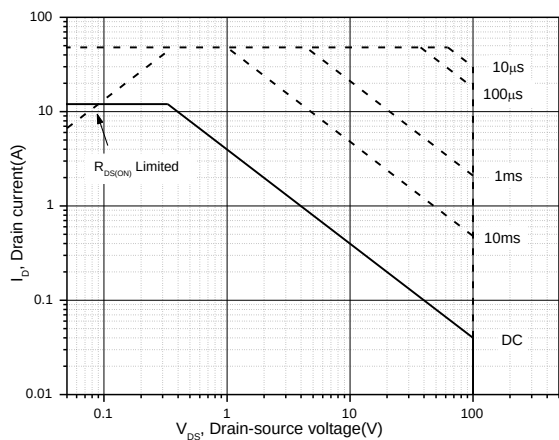


Figure 9, Safe operation area  $T_C=25\text{ }^{\circ}\text{C}$

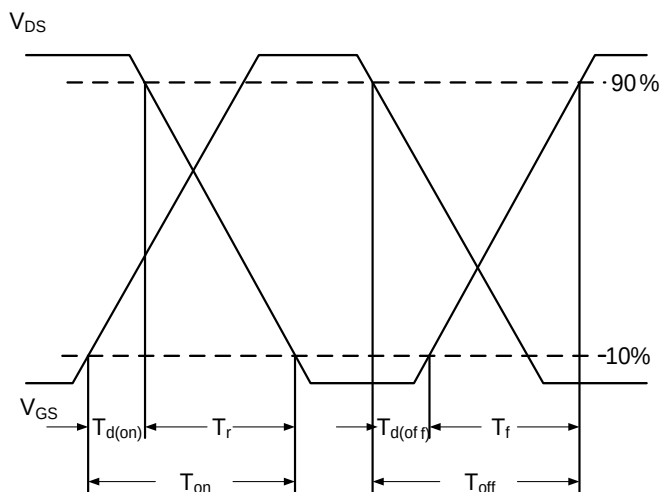


Fig.10 Switching Time Waveform

$$EAS = \frac{1}{2} L \times I_{AS}^2 \times \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

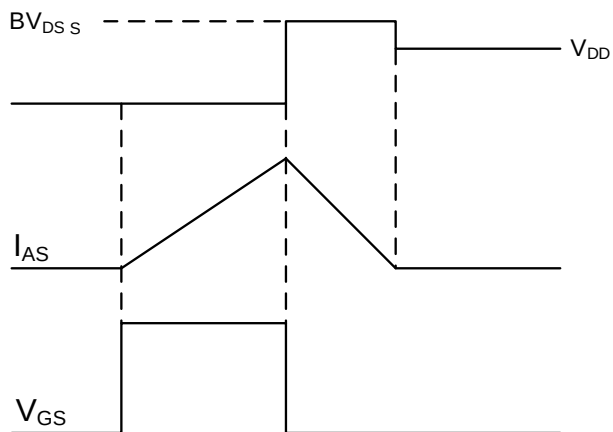
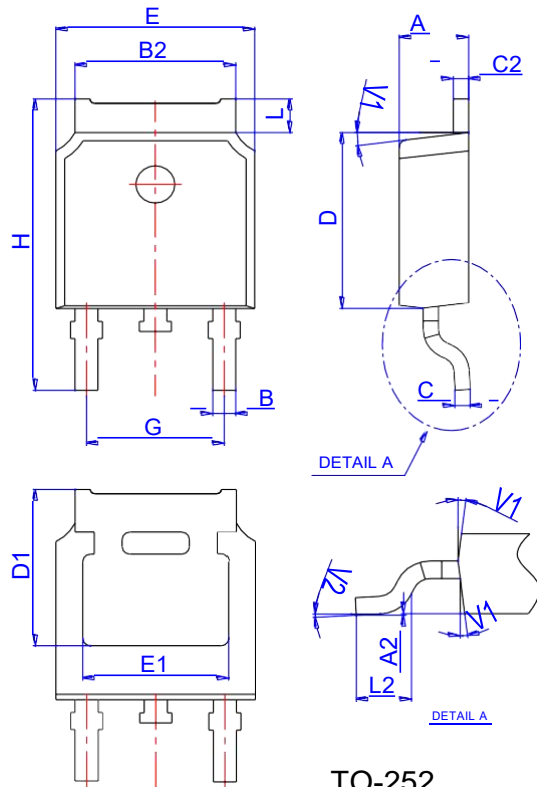


Fig.11 Unclamped Inductive Switching Waveform

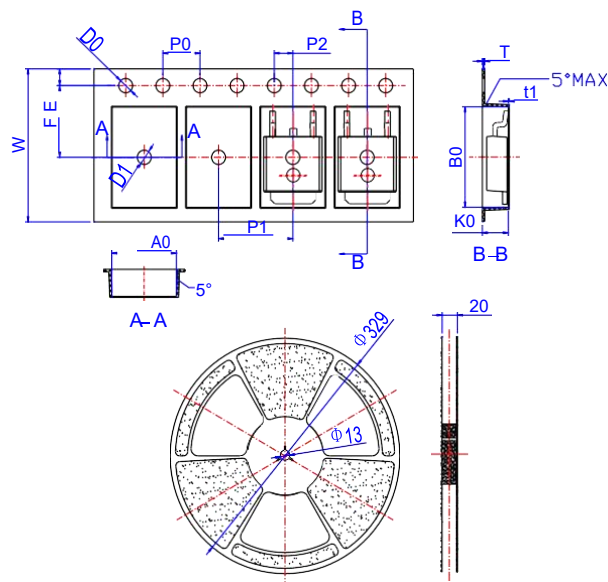
**Package Mechanical Data-TO-252-JQ Single**



TO-252

| 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 |