

## General Description

The MY120N06P is the high cell density trench N-ch MOSFETs, which provide excellent R<sub>DS(ON)</sub> and gate charge for most of the synchronous buck converter applications.

The MY120N06P meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

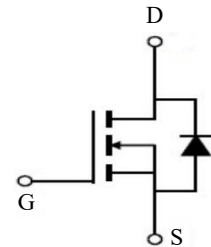
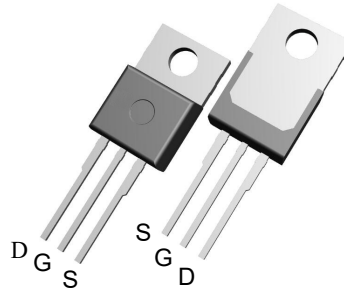


## Features

|                                                 |     |    |
|-------------------------------------------------|-----|----|
| V <sub>DSS</sub>                                | 60  | V  |
| I <sub>D</sub>                                  | 120 | A  |
| R <sub>DS(ON)</sub> (at V <sub>GS</sub> = 10V)  | 4   | mΩ |
| R <sub>DS(ON)</sub> (at V <sub>GS</sub> = 4.5V) | 5.2 | mΩ |

## Application

- Battery protection
- Load switch
- Uninterruptible power supply



## Package Marking and Ordering Information

| Product ID | Pack   | Marking | Qty(PCS) |
|------------|--------|---------|----------|
| MY120N06P  | TO-220 | 120N06P | 1000     |

## Absolute Maximum Ratings (Ta=25℃ unless otherwise noted)

| Symbol           | Parameter                                                                    |                      | Value    | Unit |
|------------------|------------------------------------------------------------------------------|----------------------|----------|------|
| V <sub>DSS</sub> | Drain-Source Voltage                                                         |                      | 60       | V    |
| I <sub>D</sub>   | Drain Current                                                                | T <sub>C</sub> =25℃  | 120      | A    |
|                  |                                                                              | T <sub>C</sub> =100℃ | 70       |      |
| V <sub>GSS</sub> | Gate-Source Voltage                                                          |                      | ±25      | V    |
| E <sub>AS</sub>  | Single Pulse Avalanche Energy (note1)                                        |                      | 550      | mJ   |
| I <sub>AR</sub>  | Avalanche Current (note2)                                                    |                      | 100      | A    |
| P <sub>D</sub>   | Power Dissipation (T <sub>C</sub> =25℃)                                      |                      | 170      | W    |
| T <sub>j</sub>   | Junction Temperature(Max)                                                    |                      | 175      | ℃    |
| T <sub>stg</sub> | Storage Temperature                                                          |                      | -55~+175 | ℃    |
| TL               | Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds |                      | 300      | ℃    |

## Thermal Characteristics

| Symbol           | Parameter                               | Typ. | Max. | Unit |
|------------------|-----------------------------------------|------|------|------|
| R <sub>θJC</sub> | Thermal Resistance, Junction to Case    | -    | 0.88 | ℃/W  |
| R <sub>θJA</sub> | Thermal Resistance, Junction to Ambient | -    | 65   | ℃/W  |
| R <sub>θCS</sub> | Thermal Resistance, Case to Sink        | -    | 0.24 | ℃/W  |

# MY120N06P

## 60V N-Channel Enhancement Mode MOSFET



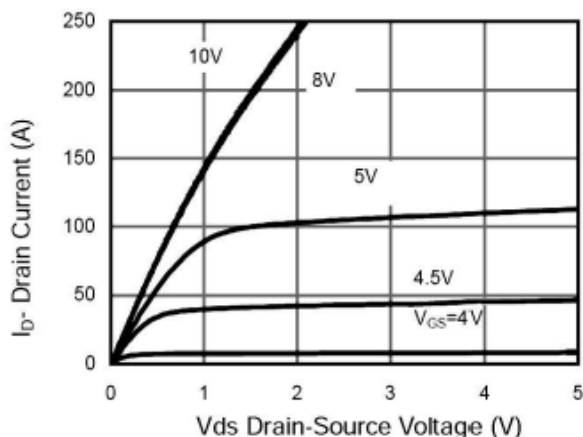
### Electrical Characteristics at $T_J=25^\circ\text{C}$ unless otherwise specified

| Parameter                                     | Symbol       | Condition                                                                 | Min | Typ  | Max       | Unit       |
|-----------------------------------------------|--------------|---------------------------------------------------------------------------|-----|------|-----------|------------|
| Off Characteristics                           |              |                                                                           |     |      |           |            |
| Drain-Source Breakdown Voltage                | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$                                                 | 60  | 65   | -         | V          |
| Zero Gate Voltage Drain Current               | $I_{DSS}$    | $V_{DS}=60V, V_{GS}=0V$                                                   | -   | -    | 1         | $\mu A$    |
| Gate-Body Leakage Current                     | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$                                               | -   | -    | $\pm 100$ | nA         |
| On Characteristics <sup>(Note 3)</sup>        |              |                                                                           |     |      |           |            |
| Gate Threshold Voltage                        | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$                                             | 2   | 3    | 4         | V          |
| Drain-Source On-State Resistance              | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=40A$                                                     | -   | 4.0  | 5.0       | m $\Omega$ |
| Forward Transconductance                      | $g_{FS}$     | $V_{DS}=10V, I_D=40A$                                                     | -   | 50   | -         | S          |
| Dynamic Characteristics <sup>(Note4)</sup>    |              |                                                                           |     |      |           |            |
| Input Capacitance                             | $C_{ISS}$    | $V_{DS}=30V, V_{GS}=0V,$<br>$F=1.0MHz$                                    | -   | 4800 | -         | PF         |
| Output Capacitance                            | $C_{OSS}$    |                                                                           | -   | 440  | -         | PF         |
| Reverse Transfer Capacitance                  | $C_{RSS}$    |                                                                           | -   | 260  | -         | PF         |
| Switching Characteristics <sup>(Note 4)</sup> |              |                                                                           |     |      |           |            |
| Turn-on Delay Time                            | $t_{d(on)}$  | $V_{DD}=30V, I_D=1A$<br>$V_{GS}=10V, R_{GEN}=2.5\Omega$                   | -   | 16.8 | -         | nS         |
| Turn-on Rise Time                             | $t_r$        |                                                                           | -   | 10.8 | -         | nS         |
| Turn-Off Delay Time                           | $t_{d(off)}$ |                                                                           | -   | 55   | -         | nS         |
| Turn-Off Fall Time                            | $t_f$        |                                                                           | -   | 13.6 | -         | nS         |
| Total Gate Charge                             | $Q_g$        | $V_{DS}=30V, I_D=30A,$<br>$V_{GS}=10V$                                    | -   | 85   | -         | nC         |
| Gate-Source Charge                            | $Q_{gs}$     |                                                                           | -   | 18   | -         | nC         |
| Gate-Drain Charge                             | $Q_{gd}$     |                                                                           | -   | 28   | -         | nC         |
| Drain-Source Diode Characteristics            |              |                                                                           |     |      |           |            |
| Diode Forward Voltage <sup>(Note 3)</sup>     | $V_{SD}$     | $V_{GS}=0V, I_S=20A$                                                      | -   | -    | 1.2       | V          |
| Diode Forward Current <sup>(Note 2)</sup>     | $I_S$        | -                                                                         | -   | -    | 120       | A          |
| Reverse Recovery Time                         | $t_{rr}$     | $T_J = 25^{\circ}C, I_F = 40A$<br>$di/dt = 100A/\mu s$ <sup>(Note3)</sup> | -   | 38   | -         | nS         |
| Reverse Recovery Charge                       | $Q_{rr}$     |                                                                           | -   | 53   | -         | nC         |
| Forward Turn-On Time                          | $t_{on}$     | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)      |     |      |           |            |

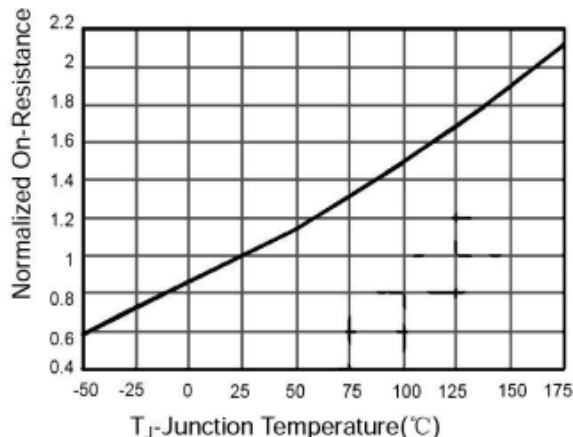
#### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$
4. Guaranteed by design, not subject to production
5. EAS condition:  $T_J=25^\circ C, V_{DD}=30V, V_G=10V, L=0.5mH, R_g=25\Omega$

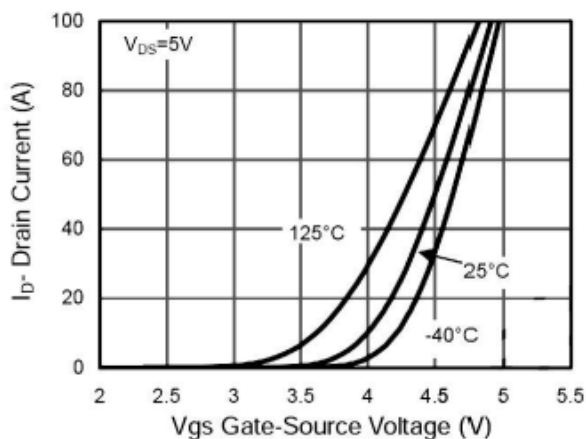
## Typical Characteristics



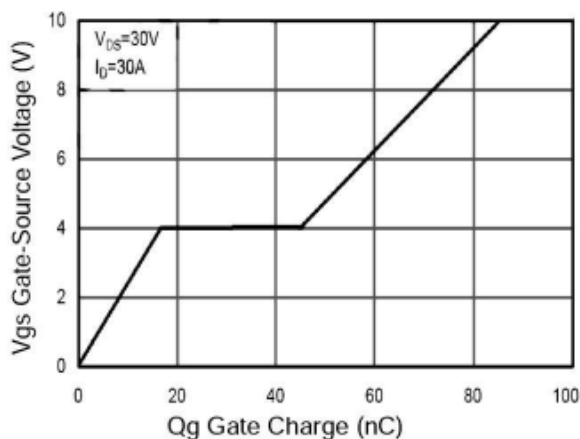
**Figure 1 Output Characteristics**



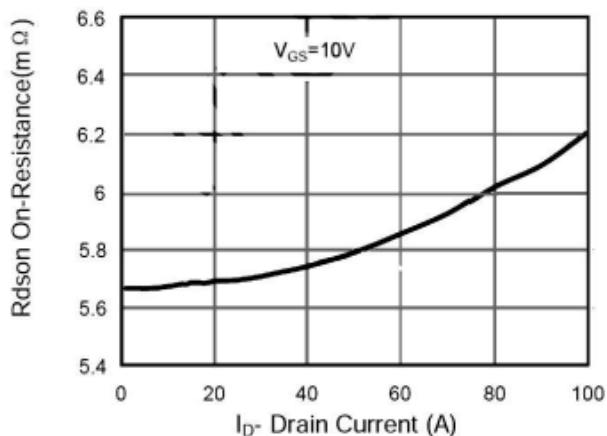
**Figure 4 Rdson-Junction Temperature**



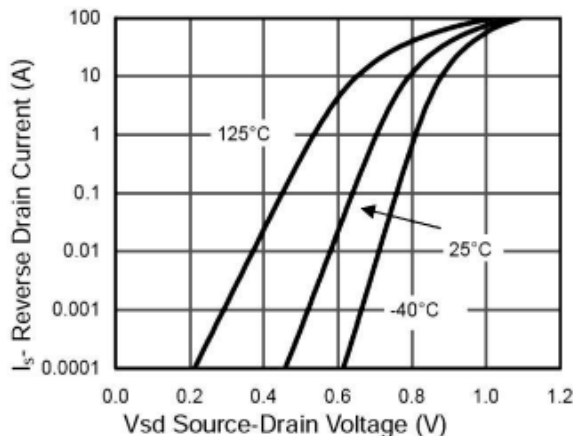
**Figure 2 Transfer Characteristics**



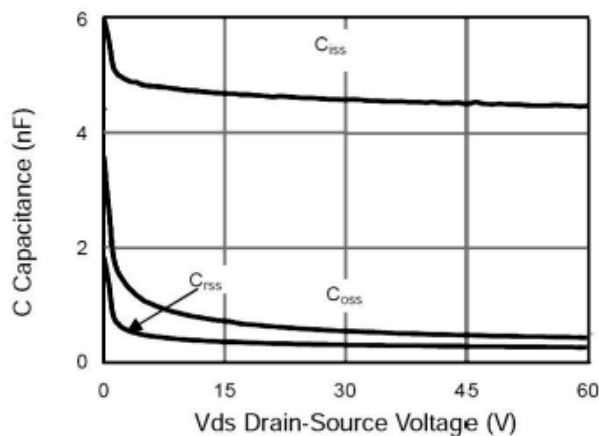
**Figure 5 Gate Charge**



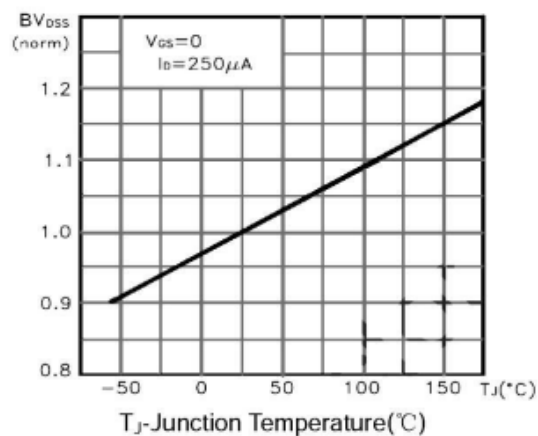
**Figure 3 Rdson- Drain Current**



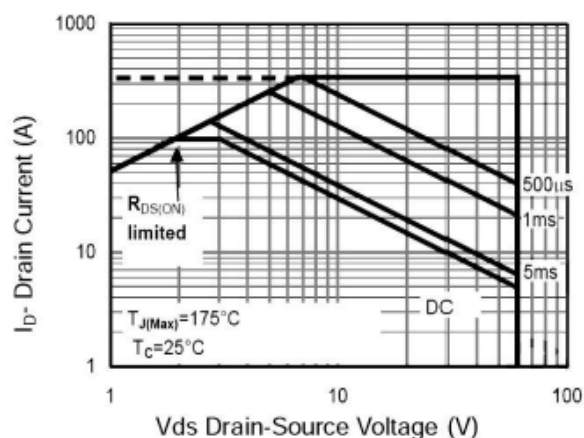
**Figure 6 Source- Drain Diode Forward**



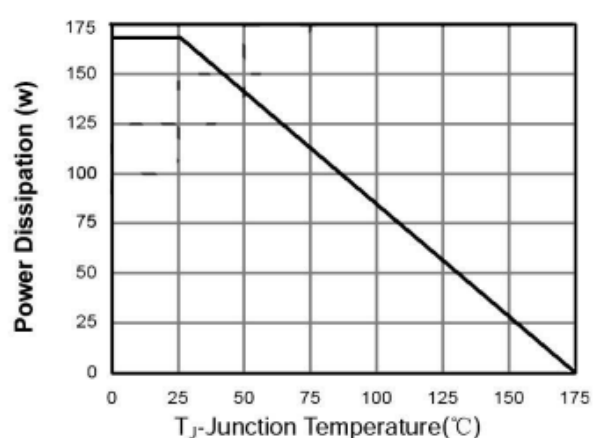
**Figure 7 Capacitance vs Vds**



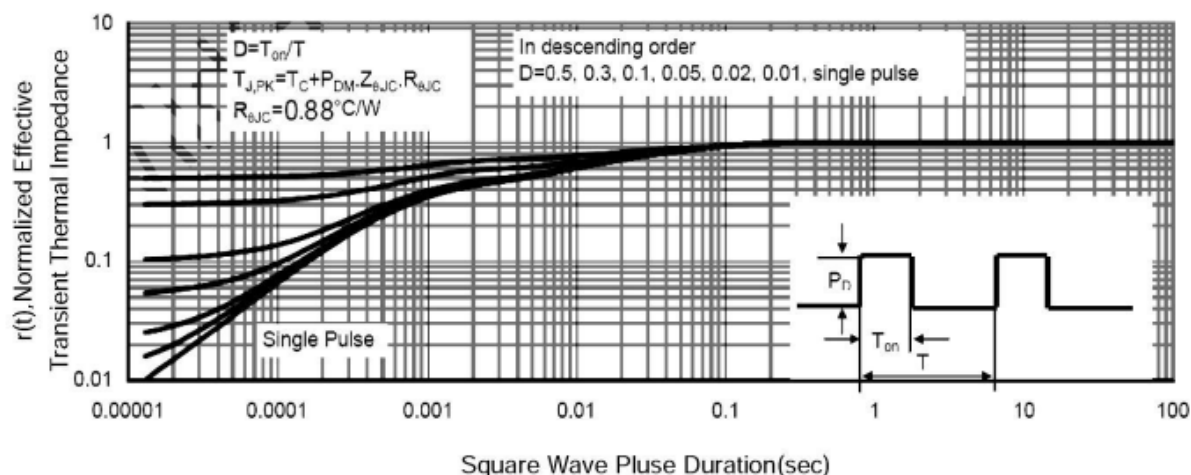
**Figure 9  $BV_{DSS}$  vs Junction Temperature**



**Figure 8 Safe Operation Area**



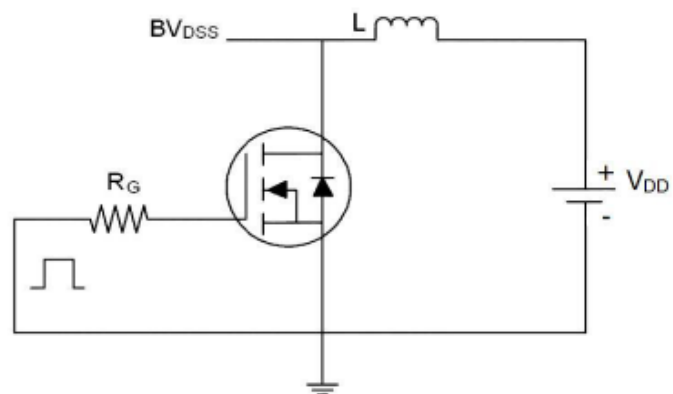
**Figure 10 Power De-rating**



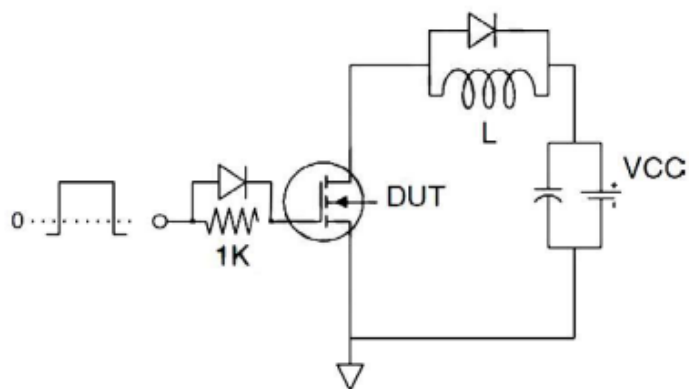
**Figure 11 Normalized Maximum Transient Thermal Impedance**

### Test circuit

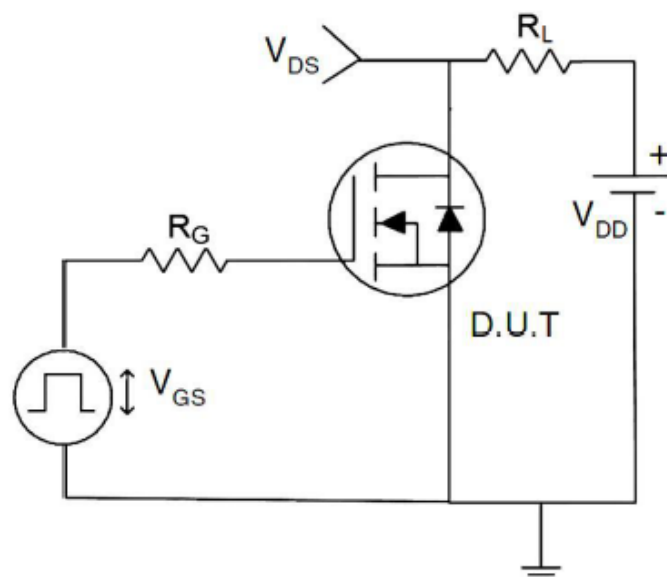
#### 1) $E_{AS}$ test Circuits



#### 2) Gate charge test Circuit:

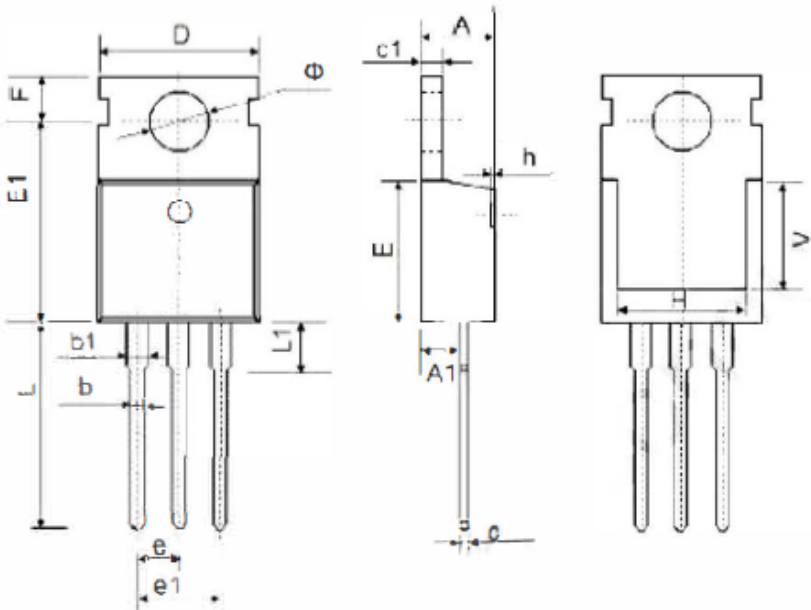


#### 3) Switch Time Test Circuit:



**Package Dimension**

**TO-220**



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 4.30                      | 4.80  | 0.169                | 0.189 |
| A1     | 2.20                      | 2.70  | 0.087                | 0.106 |
| b      | 0.70                      | 0.95  | 0.276                | 0.037 |
| b1     | 1.10                      | 1.50  | 0.043                | 0.059 |
| c      | 0.40                      | 0.65  | 0.016                | 0.026 |
| c1     | 1.20                      | 1.45  | 0.047                | 0.057 |
| D      | 9.70                      | 10.30 | 0.382                | 0.406 |
| E      | 8.75                      | 9.65  | 0.344                | 0.380 |
| E1     | 12.50                     | 13.10 | 0.492                | 0.516 |
| e      | 2.540 Typ.                |       | 0.100 Typ.           |       |
| e1     | 4.98                      | 5.18  | 0.196                | 0.204 |
| F      | 2.60                      | 3.00  | 0.102                | 0.118 |
| H      | 7.00                      | 8.40  | 0.276                | 0.331 |
| h      | 0                         | 0.3   | 0                    | 0.012 |
| L      | 12.75                     | 13.90 | 0.502                | 0.547 |
| L1     | 2.85                      | 3.40  | 0.112                | 0.134 |
| V      | 6.700Ref.                 |       | 0.264Ref.            |       |
| Φ      | 3.50                      | 3.80  | 0.138                | 0.150 |