



## Description

The IPD220N06L3 G 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

$V_{DS} = 60V$   $I_D = 50A$

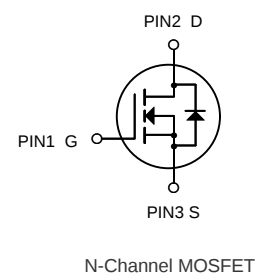
$R_{DS(ON)} < 17m\Omega$  @  $V_{GS}=10V$

## Application

Battery protection

Load switch

Uninterruptible power supply



## Package Marking and Ordering Information

| Product ID    | Pack      | Brand      | Qty(PCS) |
|---------------|-----------|------------|----------|
| IPD220N06L3 G | TO-252-2L | HXY MOSFET | 2500     |

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

| Symbol                      | Parameter                                             | Rating     | Units              |
|-----------------------------|-------------------------------------------------------|------------|--------------------|
| $V_{DS}$                    | Drain-Source Voltage                                  | 60         | V                  |
| $V_{GS}$                    | Gate-Source Voltage                                   | $\pm 20$   | V                  |
| $I_D@T_C=25^\circ\text{C}$  | Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup> | 50         | A                  |
| $I_D@T_C=100^\circ\text{C}$ | Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup> | 38         | A                  |
| $I_{DM}$                    | Pulsed Drain Current <sup>2</sup>                     | 180        | A                  |
| EAS                         | Single Pulse Avalanche Energy <sup>3</sup>            | 280        | mJ                 |
| $I_{AS}$                    | Avalanche Current                                     | 28         | A                  |
| $P_D@T_C=25^\circ\text{C}$  | Total Power Dissipation <sup>4</sup>                  | 87.7       | W                  |
| $T_{STG}$                   | Storage Temperature Range                             | -55 to 150 | $^\circ\text{C}$   |
| $T_J$                       | Operating Junction Temperature Range                  | -55 to 150 | $^\circ\text{C}$   |
| $R_{\theta JA}$             | Thermal Resistance Junction-Ambient <sup>1</sup>      | 62         | $^\circ\text{C/W}$ |



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

| Parameter                                     | Symbol              | Condition                                                                                               | Min | Typ  | Max  | Unit |
|-----------------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------|-----|------|------|------|
| Off Characteristics                           |                     |                                                                                                         |     |      |      |      |
| Drain-Source Breakdown Voltage                | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V I <sub>D</sub> =250μA                                                               | 60  | -    | -    | V    |
| Zero Gate Voltage Drain Current               | I <sub>DSS</sub>    | V <sub>DS</sub> =60V,V <sub>GS</sub> = 0V                                                               | -   | -    | 1    | μA   |
| Gate-Body Leakage Current                     | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V,V <sub>DS</sub> = 0V                                                              | -   | -    | ±100 | nA   |
| On Characteristics <sup>(Note 3)</sup>        |                     |                                                                                                         |     |      |      |      |
| Gate Threshold Voltage                        | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =250μA                                                 | 1.0 | 1.5  | 2.5  | V    |
| Drain-Source On-State Resistance              | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> = 30A                                                              | -   | 13   | 17   | mΩ   |
| Forward Transconductance                      | g <sub>FS</sub>     | V <sub>DS</sub> =5V,I <sub>D</sub> =30A                                                                 | 30  | -    | -    | S    |
| Dynamic Characteristics <sup>(Note4)</sup>    |                     |                                                                                                         |     |      |      |      |
| Input Capacitance                             | C <sub>iss</sub>    | V <sub>DS</sub> =25V,V <sub>GS</sub> =0V,<br>F=1.0MHz                                                   | -   | 2498 | -    | PF   |
| Output Capacitance                            | C <sub>oss</sub>    |                                                                                                         | -   | 185  | -    | PF   |
| Reverse Transfer Capacitance                  | C <sub>rss</sub>    |                                                                                                         | -   | 80   | -    | PF   |
| Switching Characteristics <sup>(Note 4)</sup> |                     |                                                                                                         |     |      |      |      |
| Turn-on Delay Time                            | t <sub>d(on)</sub>  | V <sub>DD</sub> =30V,I <sub>D</sub> =2A,R <sub>L</sub> =1Ω<br>V <sub>GS</sub> =10V,R <sub>GEN</sub> =3Ω | -   | 12   | -    | nS   |
| Turn-on Rise Time                             | t <sub>r</sub>      |                                                                                                         | -   | 5.2  | -    | nS   |
| Turn-Off Delay Time                           | t <sub>d(off)</sub> |                                                                                                         | -   | 38   | -    | nS   |
| Turn-Off Fall Time                            | t <sub>f</sub>      |                                                                                                         | -   | 27   | -    | nS   |
| Total Gate Charge                             | Q <sub>g</sub>      | V <sub>DS</sub> =30V,I <sub>D</sub> =30A,<br>V <sub>GS</sub> =10V                                       | -   | 36   | -    | nC   |
| Gate-Source Charge                            | Q <sub>gs</sub>     |                                                                                                         | -   | 9.9  | -    | nC   |
| Gate-Drain Charge                             | Q <sub>gd</sub>     |                                                                                                         | -   | 6.6  | -    | nC   |
| Drain-Source Diode Characteristics            |                     |                                                                                                         |     |      |      |      |
| Diode Forward Voltage <sup>(Note 3)</sup>     | V <sub>SD</sub>     | V <sub>GS</sub> =0V,I <sub>S</sub> = 30A                                                                | -   | -    | 1.2  | V    |
| Diode Forward Current <sup>(Note 2)</sup>     | I <sub>S</sub>      |                                                                                                         | -   | -    | 58   | A    |
| Reverse Recovery Time                         | t <sub>rr</sub>     | T <sub>J</sub> = 25°C, I <sub>F</sub> =30A<br>di/dt = 100A/μs <sup>(Note3)</sup>                        | -   | 35   |      | nS   |
| Reverse Recovery Charge                       | Q <sub>rr</sub>     |                                                                                                         | -   | 47   |      | nC   |
| Forward Turn-On Time                          | t <sub>on</sub>     | 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.  $E_{AS}$  condition:  $T_J=25^\circ C, V_{DD}=30V, V_G=10V, L=0.5mH, R_g=25\Omega$



### Typical Electrical and Thermal Characteristics (Curves)

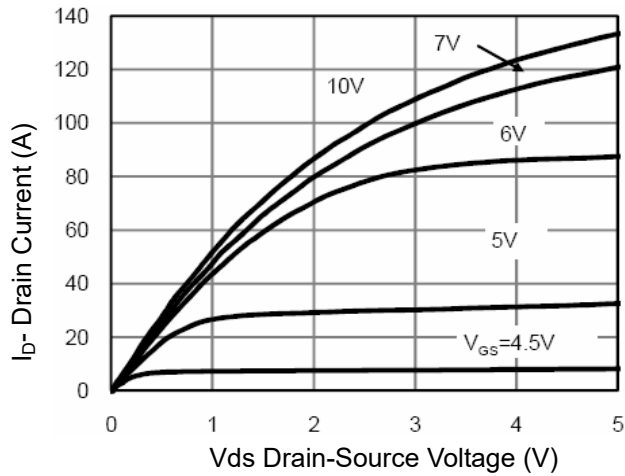


Figure 1 Output Characteristics

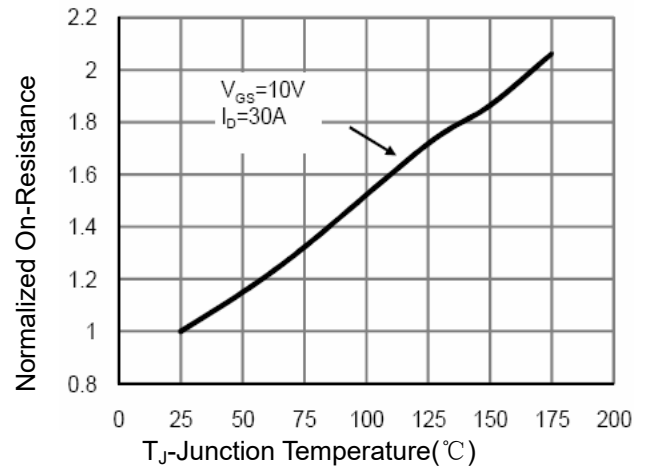


Figure 4 Rdson-Junction Temperature

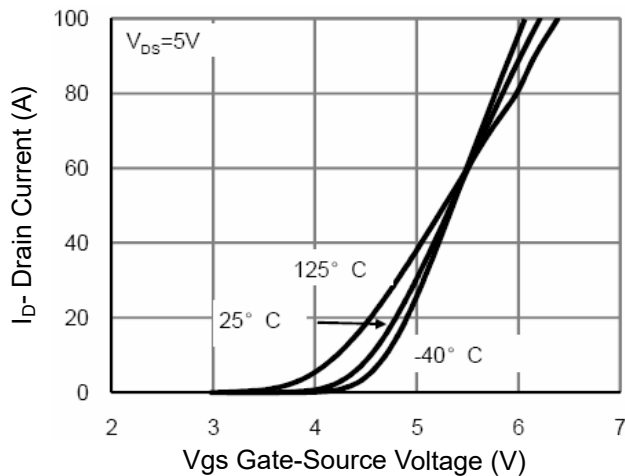


Figure 2 Transfer Characteristics

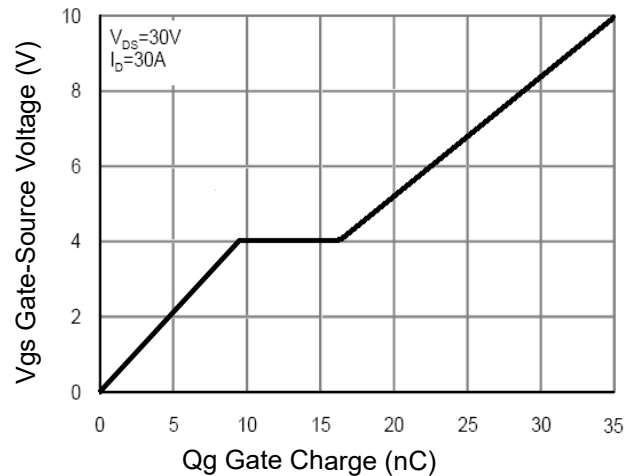


Figure 5 Gate Charge

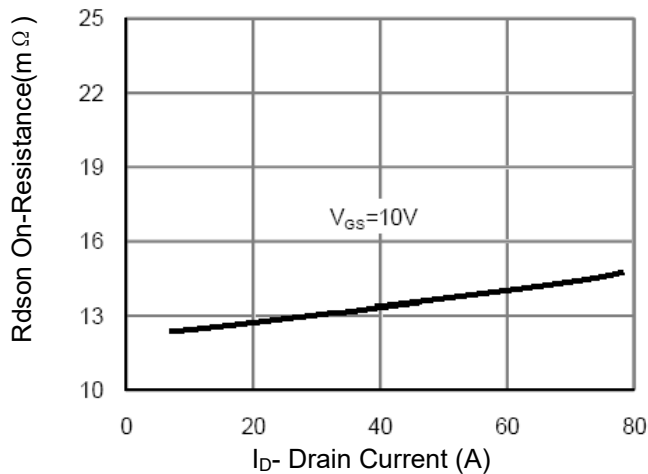


Figure 3 Rdson- Drain Current

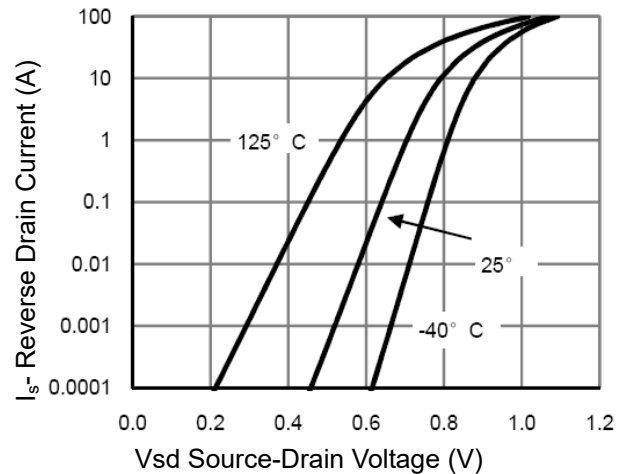


Figure 6 Source- Drain Diode Forward

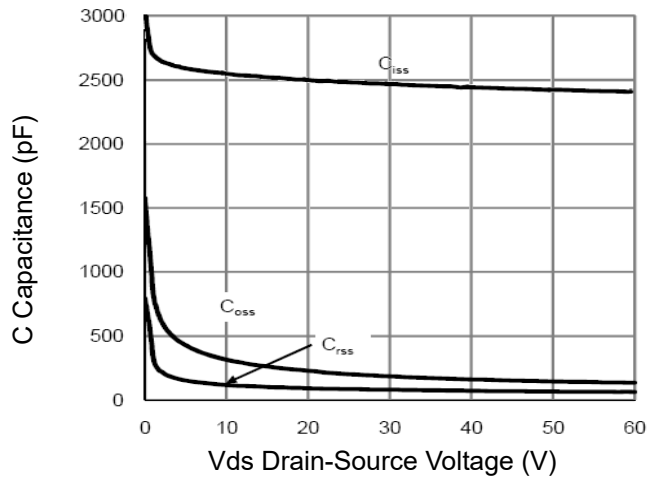


Figure 7 Capacitance vs Vds

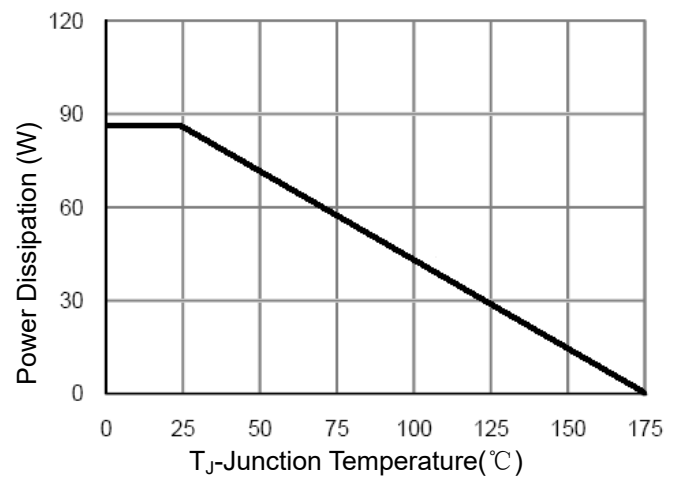


Figure 9 Power De-rating

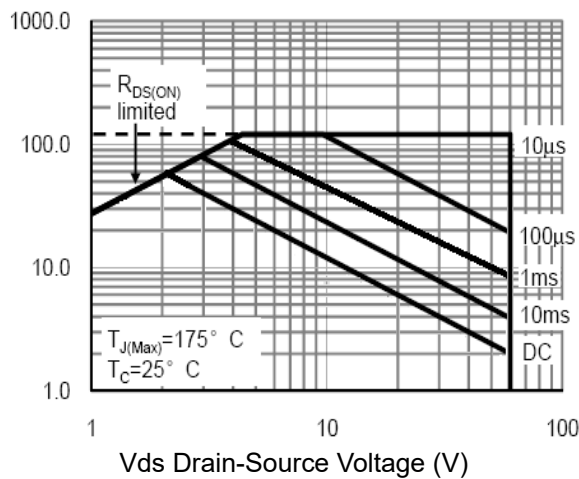


Figure 8 Safe Operation Area

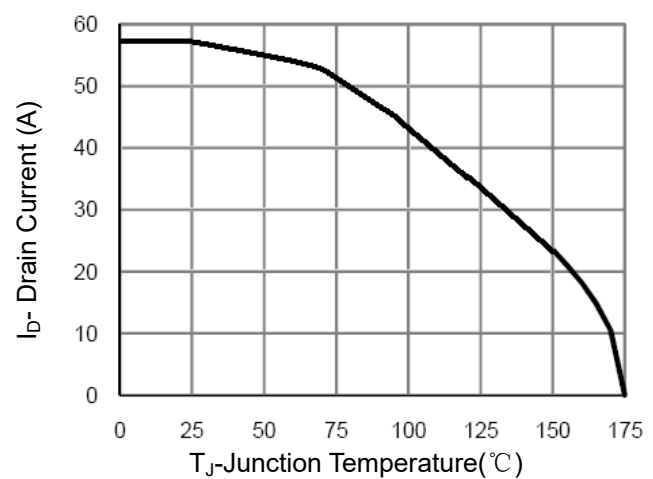
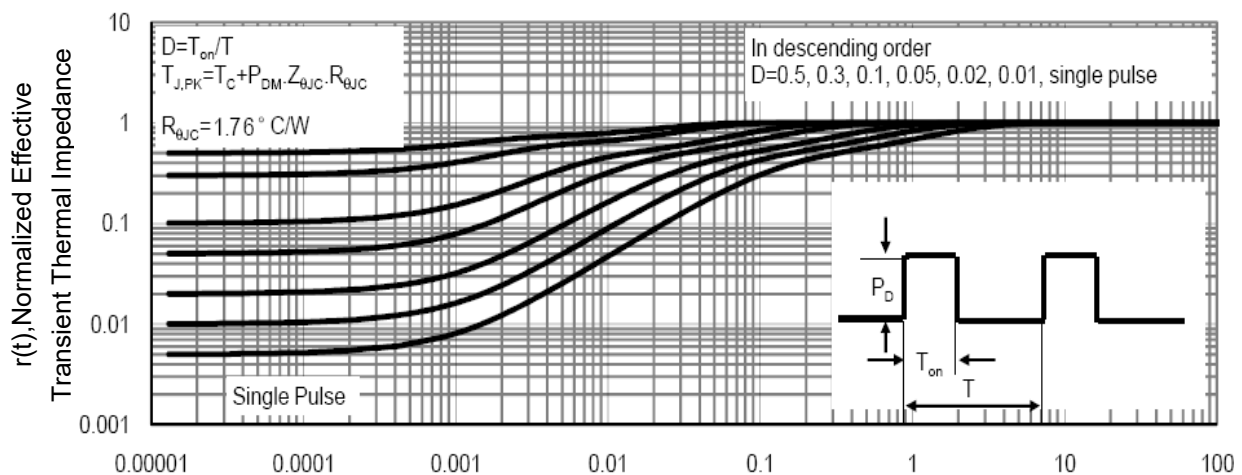
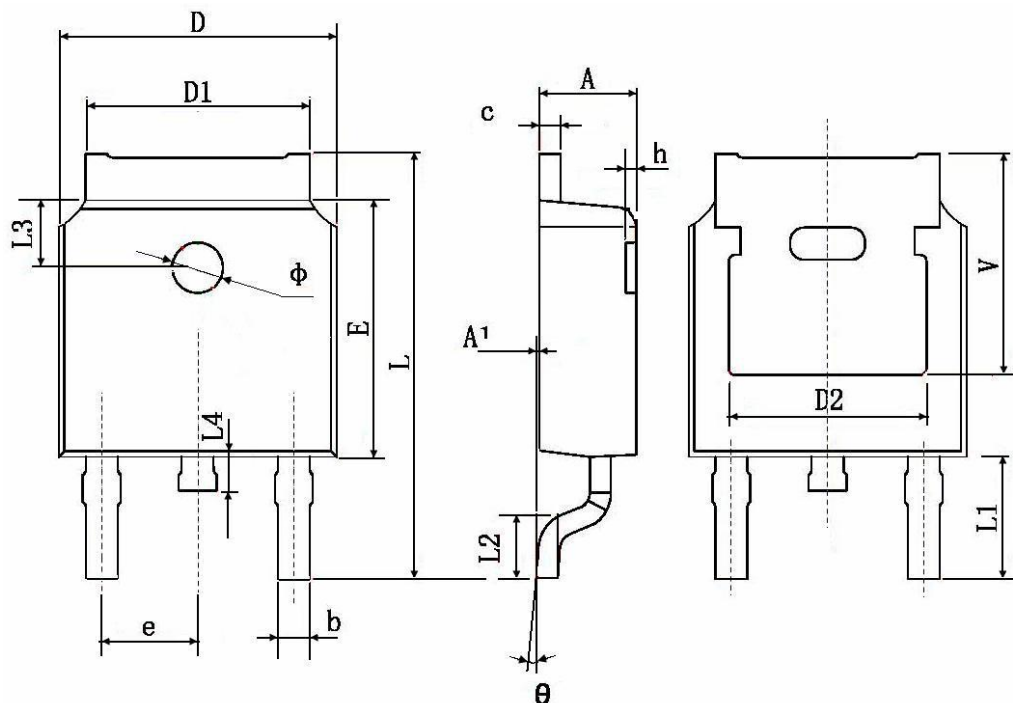


Figure 10 ID Current- Junction Temperature





### TO-252-2L Package Information



| 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     | 0.483 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.           |       |



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