




# Power MOSFETS


## DATASHEET


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**LM30210PAI8A**

P-Channel  
Enhancement Mode MOSFET

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Quality Management Systems

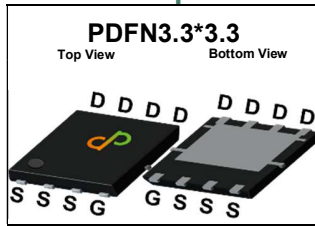
ISO 9001:2015 Certificate

# LM30210PAI8A

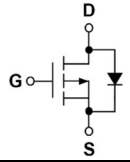


## P-Channel Enhancement Mode MOSFET

### Pin Description



### Symbol



### Product Summary

| Symbol           | P-Channel | Unit       |
|------------------|-----------|------------|
| $V_{DSS}$        | -30       | V          |
| $R_{DS(ON)-Max}$ | 23        | m $\Omega$ |
| $I_D$            | -29       | A          |

### Feature

- Reliable and Rugged
- ROHS Compliant & Halogen-Free
- 100% UIS Tested

### Applications

- Portable Equipment
- Battery Powered System

### Ordering Information

| Orderable Part Number | Package Type | Form        | Shipping           | Marking         |
|-----------------------|--------------|-------------|--------------------|-----------------|
| LM30210PAI8A          | PDFN3.3*3.3  | Tape & Reel | 5000 / Tape & Reel | 30210<br>□□□□□□ |

Note : □□□□□□ = Lot Code

### Absolute Maximum Ratings ( $T_J=25^\circ\text{C}$ Unless Otherwise Noted)

| Symbol         | Parameter                        | P-Channel               | Unit             |
|----------------|----------------------------------|-------------------------|------------------|
| $V_{DSS}$      | Drain-Source Voltage             | -30                     | V                |
| $V_{GSS}$      | Gate-Source Voltage              | $\pm 25$                |                  |
| $T_J$          | Maximum Junction Temperature     | 150                     | $^\circ\text{C}$ |
| $T_{STG}$      | Storage Temperature Range        | -55 to 150              | $^\circ\text{C}$ |
| $I_S$          | Diode Continuous Forward Current | $T_C=25^\circ\text{C}$  | A                |
| $I_{DM}^{(1)}$ | Pulse Drain Current Tested       | $T_C=25^\circ\text{C}$  | A                |
| $I_D$          | Continuous Drain Current         | $T_C=25^\circ\text{C}$  | A                |
|                |                                  | $T_C=100^\circ\text{C}$ | -19              |
| $P_D$          | Maximum Power Dissipation        | $T_C=25^\circ\text{C}$  | W                |
|                |                                  | $T_C=100^\circ\text{C}$ | 12               |
| $I_D$          | Continuous Drain Current         | $T_A=25^\circ\text{C}$  | A                |
|                |                                  | $T_A=70^\circ\text{C}$  | -6.2             |
| $P_D$          | Maximum Power Dissipation        | $T_A=25^\circ\text{C}$  | W                |
|                |                                  | $T_A=70^\circ\text{C}$  | 1.3              |
| $I_{AS}^{(2)}$ | Avalanche Current, Single pulse  | L=0.1mH                 | A                |
|                |                                  | L=0.5mH                 | -9               |
| $E_{AS}^{(2)}$ | Avalanche Energy, Single pulse   | L=0.1mH                 | mJ               |
|                |                                  | L=0.5mH                 | 22               |

### Thermal Characteristics

| Symbol                | Parameter                              | Rating       | Unit               |
|-----------------------|--|--------------|--------------------|
| $R_{\theta JC}$       | Thermal Resistance-Junction to Case    | Steady State | $^\circ\text{C/W}$ |
| $R_{\theta JA}^{(3)}$ | Thermal Resistance-Junction to Ambient | Steady State | $^\circ\text{C/W}$ |

Note ① : Max. current is limited by bonding wire

Note ② : UIS tested and pulse width are limited by maximum junction temperature  $150^\circ\text{C}$

Note ③ : Surface Mounted on  $1\text{in}^2$  FR-4 board with 1oz.

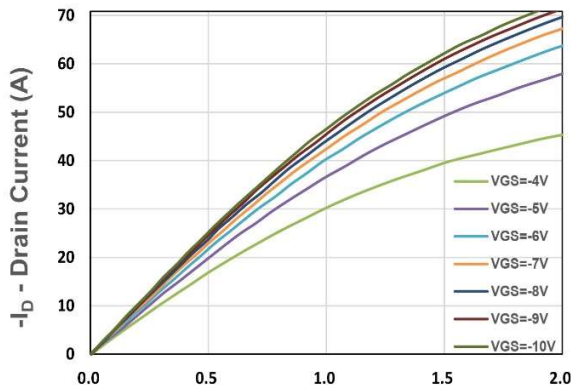
## P-Channel Electrical Characteristics (T<sub>J</sub>=25°C Unless Otherwise Noted)

| Symbol                                      | Parameter                        | Test Conditions   | Min. | Typ. | Max. | Unit |
|---|----------------------------------|---|------|------|------|------|
| <b>Static Electrical Characteristics</b>    |                                  |   |      |      |      |      |
| <b>BV<sub>DSS</sub></b>                     | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =-250uA  | -30  | -    | -    | V    |
| <b>I<sub>DSS</sub></b>                      | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V  | -    | -    | -1   | uA   |
| <b>V<sub>GS(th)</sub></b>                   | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =-250uA                              | -1   | -1.7 | -2.3 | V    |
| <b>I<sub>GSS</sub></b>                      | Gate Leakage Current1            | V <sub>GS</sub> =±25V, V <sub>DS</sub> =0V  | -    | -    | ±100 | nA   |
| <b>R<sub>DS(ON)</sub></b> <sup>④</sup>      | Drain-Source On-state Resistance | V <sub>GS</sub> =-10V, I <sub>DS</sub> =-15A  | -    | 19   | 23   | mΩ   |
|   |                                  | V <sub>GS</sub> =-4.5V, I <sub>DS</sub> =-10A   | -    | 26   | 34   |      |
| <b>gfs</b>                                  | Forward Transconductance         | V <sub>DS</sub> =-5V, I <sub>DS</sub> =-7.5A  | -    | 14   | -    | S    |
| <b>Dynamic Characteristics</b> <sup>⑤</sup> |                                  |   |      |      |      |      |
| <b>R<sub>G</sub></b>                        | Gate Resistance                  | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, Freq.=1MHz                                    | -    | 15   | -    | Ω    |
| <b>C<sub>iss</sub></b>                      | Input Capacitance                | V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, Freq.=1MHz                                  | -    | 1225 | -    | pF   |
| <b>C<sub>oss</sub></b>                      | Output Capacitance               |   | -    | 135  | -    |      |
| <b>C<sub>rss</sub></b>                      | Reverse Transfer Capacitance     |   | -    | 116  | -    |      |
| <b>t<sub>d(ON)</sub></b>                    | Turn-on Delay Time               | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-1A, R <sub>GEN</sub> =6Ω | -    | 3.2  | -    | nS   |
| <b>t<sub>r</sub></b>                        | Turn-on Rise Time                |   | -    | 22.8 | -    |      |
| <b>t<sub>d(OFF)</sub></b>                   | Turn-off Delay Time              |   | -    | 105  | -    |      |
| <b>t<sub>f</sub></b>                        | Turn-off Fall Time               |   | -    | 47.8 | -    |      |
| <b>Q<sub>g</sub></b>                        | Total Gate Charge                | V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-15A                     | -    | 13.3 | -    | nC   |
| <b>Q<sub>g</sub></b>                        | Total Gate Charge                | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-15A                      | -    | 27.3 | -    |      |
| <b>Q<sub>gs</sub></b>                       | Gate-Source Charge               |   | -    | 5.19 | -    |      |
| <b>Q<sub>gd</sub></b>                       | Gate-Drain Charge                |   | -    | 5.32 | -    |      |
| <b>Source-Drain Characteristics</b>         |                                  |   |      |      |      |      |
| <b>V<sub>SD</sub></b> <sup>④</sup>          | Diode Forward Voltage            | I <sub>SD</sub> =-7.5A, V <sub>GS</sub> =0V   | -    | -0.8 | -1.1 | V    |
| <b>t<sub>rr</sub></b>                       | Reverse Recovery Time            | I <sub>F</sub> =-7.5A, V <sub>R</sub> =-15V   | -    | 12.7 | -    | nS   |
| <b>Q<sub>rr</sub></b>                       | Reverse Recovery Charge          | dI <sub>F</sub> /dt=100A/μs   | -    | 5.5  | -    | nC   |

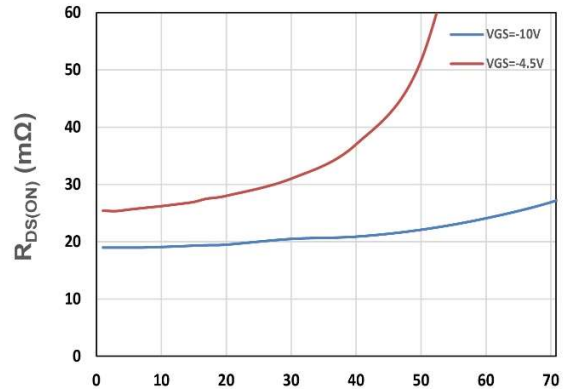
Note ④ : Pulse test (pulse width≤300us, duty cycle≤2%).

Note ⑤ : Guaranteed by design, not subject to production testing.

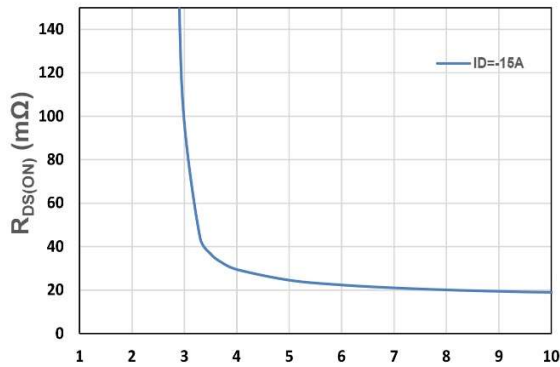
## P-Channel Typical Characteristics



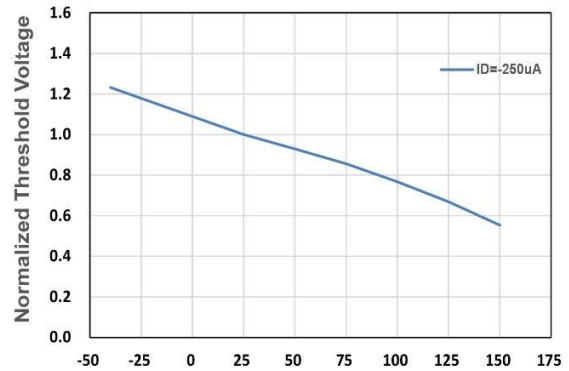
-V<sub>DS</sub> - Drain - Source Voltage (V)  
Figure 1. Output Characteristics



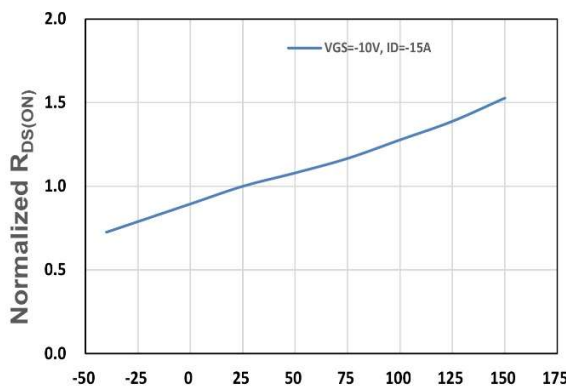
-ID - Drain Current (A)  
Figure 2. On-Resistance vs. ID



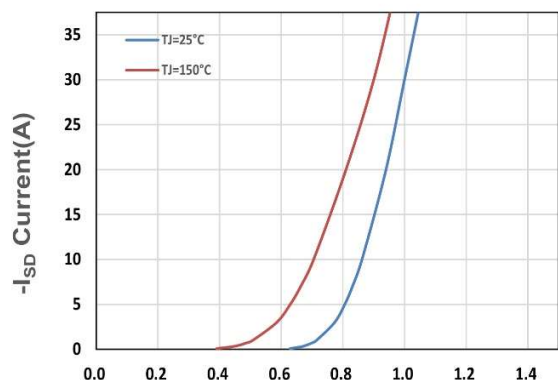
-V<sub>GS</sub> - Gate - Source Voltage (V)  
Figure 3. On-Resistance vs. VGS



T<sub>j</sub>, Junction Temperature(°C)  
Figure 4. Gate Threshold Voltage

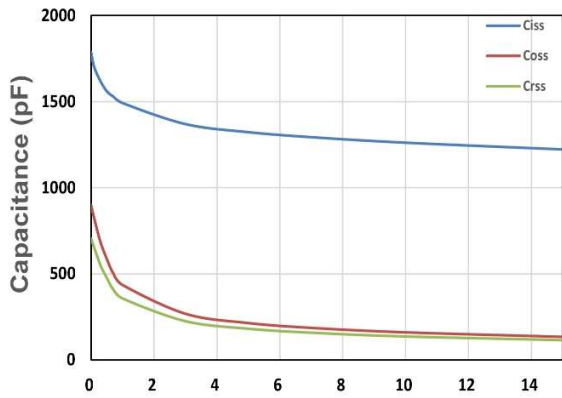


T<sub>j</sub>, Junction Temperature(°C)  
Figure 5. Drain-Source On Resistance

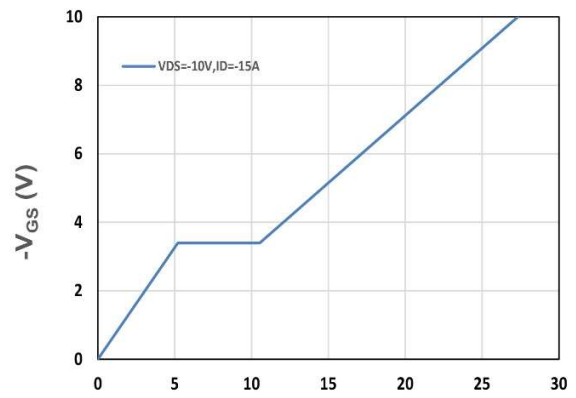


-V<sub>SD</sub>, Source-Drain Voltage(V)  
Figure 6. Source-Drain Diode Forward

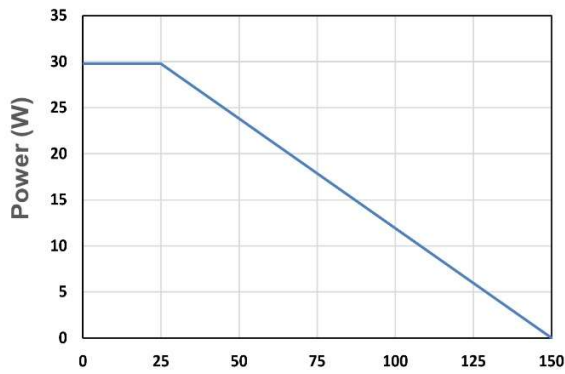
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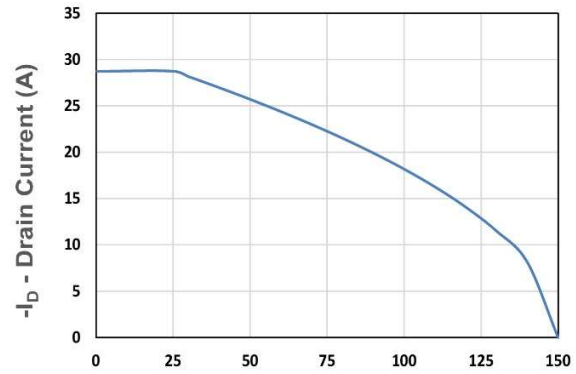
$-V_{DS}$  - Drain - Source Voltage (V)  
Figure 7. Capacitance



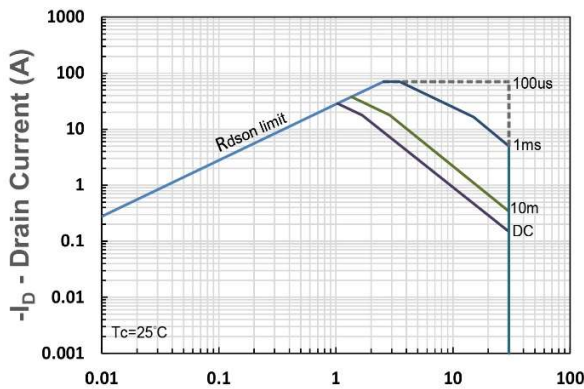
$Q_g$ , Total Gate Charge (nC)  
Figure 8. Gate Charge Characteristics



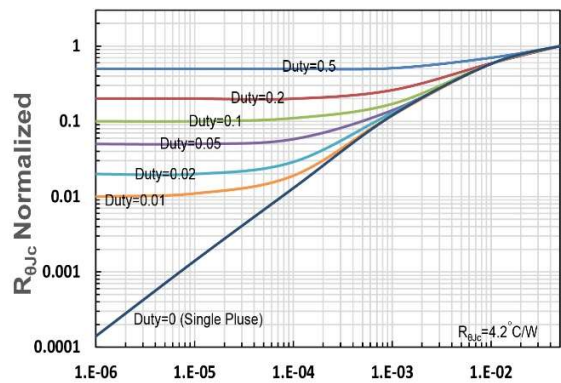
$T_c$  - Case Temperature (°C)  
Figure 9. Power Dissipation



$T_c$  - Case Temperature (°C)  
Figure 10. Drain Current



$-V_{DS}$  - Drain-Source Voltage (V)  
Figure 11. Safe Operating Area



$t_1$ , Square Wave Pulse Duration(s)  
Figure 12.  $R_{thjC}$  Transient Thermal Impedance