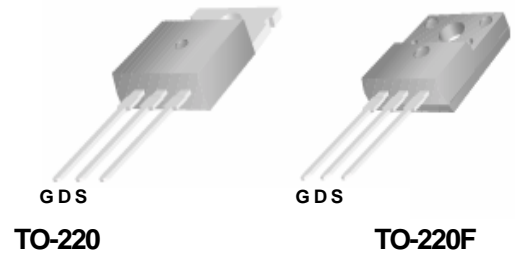
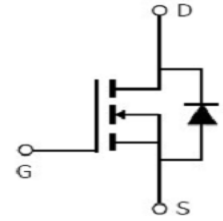


# PTP4N65/PTF4N65

650V/4A N-Channel Advanced Power MOSFET

### Features

- $R_{DS(on)}$  (Typical 2.6Ω) @  $V_{GS}=10V$
- Improved dv/dt Capability, High Ruggedness
- 100% Avalanche Tested
- Maximum Junction Temperature Range (150°C)



### Absolute Maximum Ratings

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

| Symbol   | Parameter  | Rating                 |        | Unit |
|--|--|------------------------|--------|------|
|  |  | TO-220                 | TO-22F |      |
| <b>Common Ratings (<math>T_J=25^\circ\text{C}</math> Unless Otherwise Noted)</b>             |  |                        |        |      |
| $V_{GS}$   | Gate-Source Voltage                                | ±30                    |        | V    |
| $V_{(BR)DSS}$  | Drain-Source Breakdown Voltage                     | 650                    |        | V    |
| $T_J$  | Maximum Junction Temperature                       | 50 to + 150            |        | °C   |
| $T_{STG}$  | Storage Temperature Range                          | 50 to + 150            |        | °C   |
| $I_S$  | Diode Continuous Forward Current                   | 4                      |        | A    |
| <b>Mounted on Large Heat Sink (<math>T_J=25^\circ\text{C}</math> Unless Otherwise Noted)</b> |  |                        |        |      |
| $I_{DM}$   | Pulse Drain Current Tested (Silicon Limit) (Note1) | 16                     |        | A    |
| $I_D$  | Continuous Drain current@ $V_{GS}=10V$             | $T_C=25^\circ\text{C}$ | 4      | A    |
| $P_D$  | Maximum Power Dissipation                          | 109                    | 39     | W    |
| $E_{AS}$   | Sing Pulsed Avalanche Energy (Note2)               | 200                    | 200    | mJ   |
| $R_{\theta JC}$  | Thermal Resistance Junction-to-Case                | 1.15                   | 3.2    | °C/W |
| $R_{\theta JA}$  | Thermal Resistance Junction-to-Ambient             | 65                     | 65     | °C/W |

Note :

1. Repetitive Rating:Pulse width limited by maximum junction temperature.
2. IL=25mH,IAS=4 A,VDD=50V,RG=25Ω,Tj=25 °C

# PTP4N65/PTF4N65

650V/4A N-Channel Advanced Power MOSFET

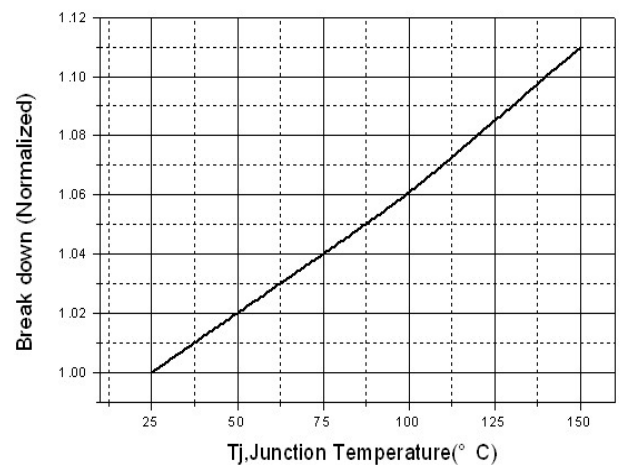
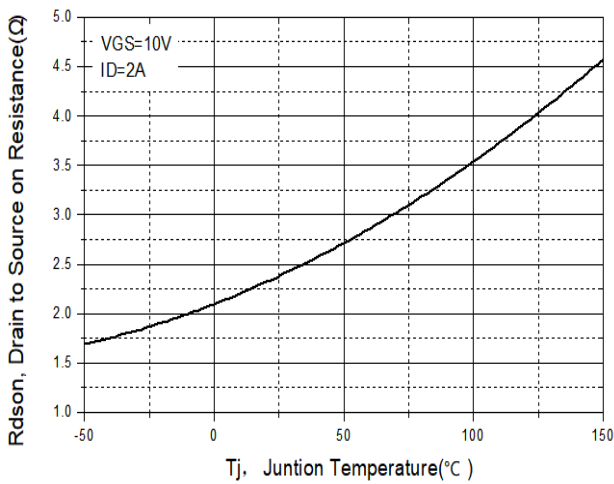
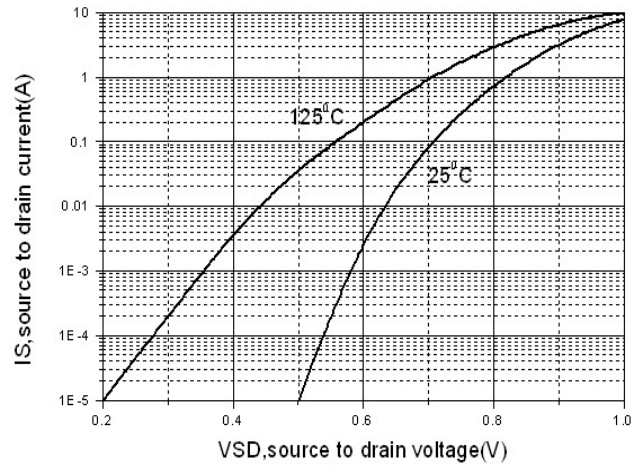
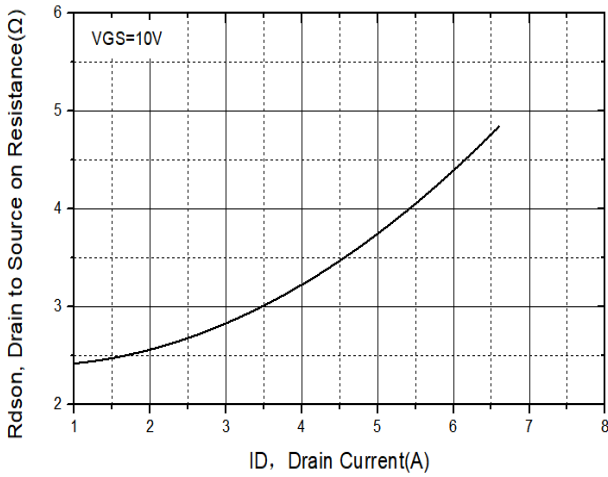
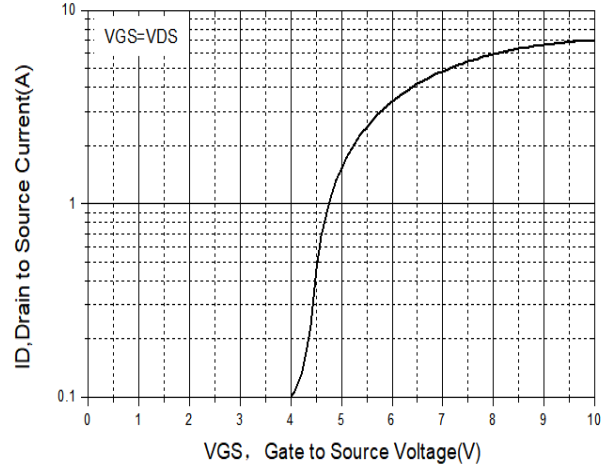
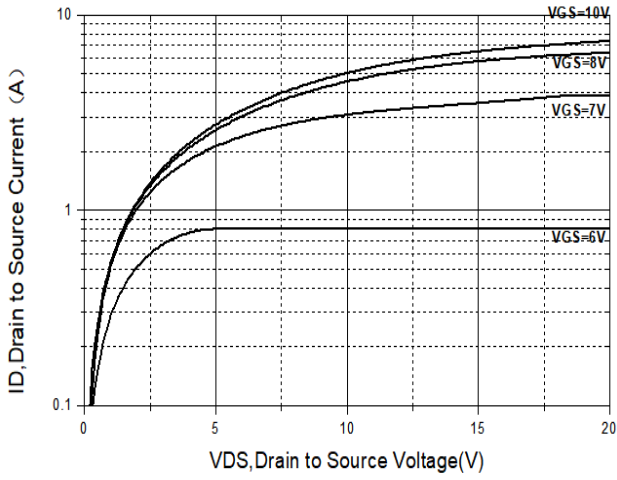
| Symbol   | Parameter                                | Condition                               | Min. | Typ. | Max. | Unit |
|--|--|---|------|------|------|------|
| <b>Static Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>                    |  |   |      |      |      |      |
| V <sub>(BR)DSS</sub>   | Drain-Source Breakdown Voltage           | VGS=0V ID=250μA                         | 650  | --   | --   | V    |
| I <sub>DSS</sub>   | Zero Gate Voltage Drain current(Tc=25°C) | VDS=650V,VGS=0V                         | --   | --   | 1    | μA   |
| I <sub>GSS</sub>   | Gate-Body Leakage Current                | VGS=±30V,VDS=0V                         | --   |      | ±100 | nA   |
| V <sub>GS(TH)</sub>  | Gate Threshold Voltage                   | VDS=VGS,ID=250μA                        | 2    | 3    | 4    | V    |
| R <sub>DS(ON)</sub>  | Drain-Source On-State Resistance note A  | VGS=10V,ID=2A                           | --   | 2.6  | 3.0  | Ω    |
| <b>Dynamic Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b> <sup>note B</sup> |  |   |      |      |      |      |
| C <sub>iss</sub>   | Input Capacitance                        | VDS=25V,VGS=0V,<br>f=1MHz               | --   | 550  | --   | pF   |
| C <sub>oss</sub>   | Output Capacitance                       |   | --   | 46   | --   | pF   |
| C <sub>rss</sub>   | Reverse Transfer Capacitance             |   | --   | 2.3  | --   | pF   |
| Q <sub>g</sub>   | Total Gate Charge                        | VDS=480V,ID=4A<br>VGS=10V               | --   | 10.2 | --   | nC   |
| Q <sub>gs</sub>  | Gate-Source Charge                       |   | --   | 2.3  | --   | nC   |
| Q <sub>gd</sub>  | Gate-Drain Charge                        |   | --   | 2.1  | --   | nC   |
| <b>Switching Characteristics</b> <sup>note B</sup>   |  |   |      |      |      |      |
| t <sub>d(on)</sub>   | Turn-on Delay Time                       | VDS=300V<br>ID=4A,<br>RG=25Ω<br>VGS=10V | --   | 15.5 | --   | nS   |
| t <sub>r</sub>   | Turn-on Rise Time                        |   | --   | 13   | --   | nS   |
| t <sub>d(off)</sub>  | Turn-Off Delay Time                      |   | --   | 40   | --   | nS   |
| t <sub>f</sub>   | Turn-Off Fall Time                       |   | --   | 16   | --   | nS   |
| <b>Source- Drain Diode Characteristics@ T<sub>J</sub> = 25°C (unless otherwise stated)</b>                   |  |   |      |      |      |      |
| V <sub>SD</sub>  | Forward on voltage                       | IS= 4 A,VGS=0V                          | --   | 0.8  | 1.4  | V    |

Note:

A: Pulse Test: pulse width ≤ 300 us, duty cycle ≤ 2%

B: Guaranteed by design, not subject to production testing.

Typical characteristic curve:



# PTP4N65/PTF4N65

650V/4A N-Channel Advanced Power MOSFET

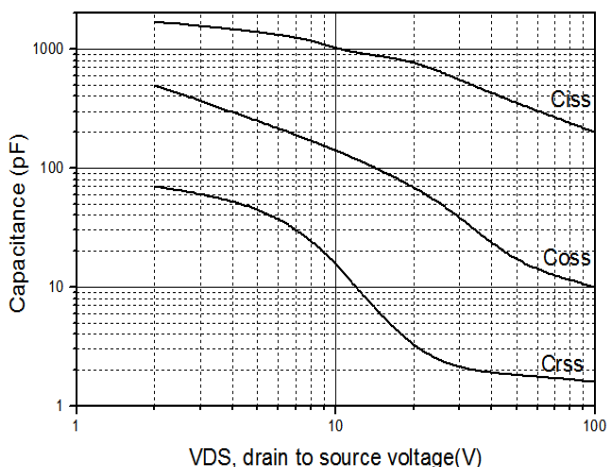


图 7: 电容特性

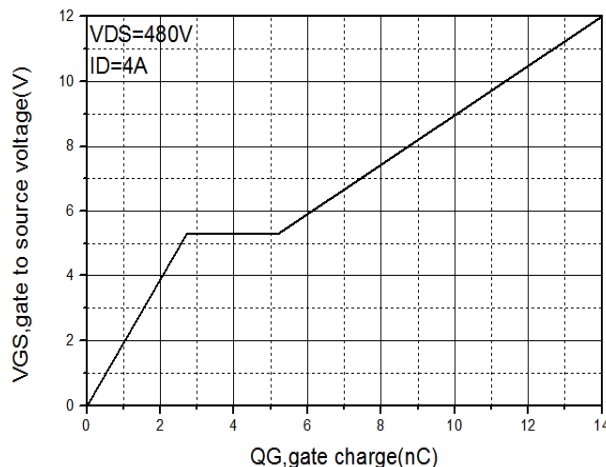


图 8: 栅电荷特性

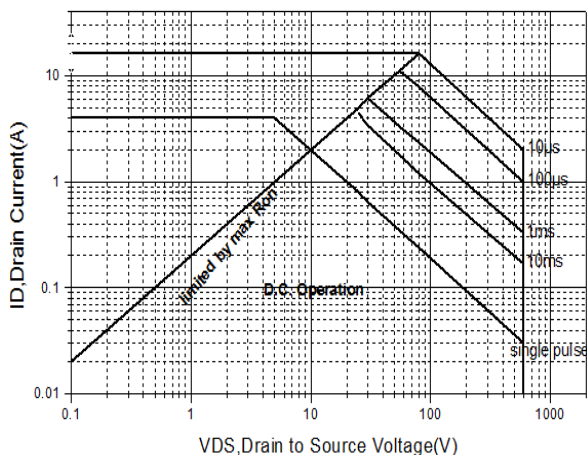


图 9: 安全工作区

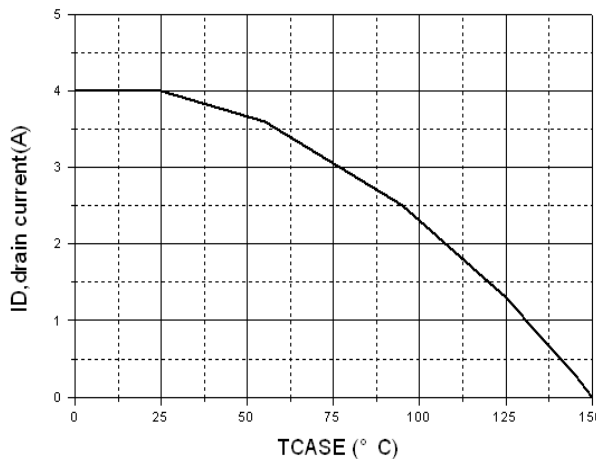
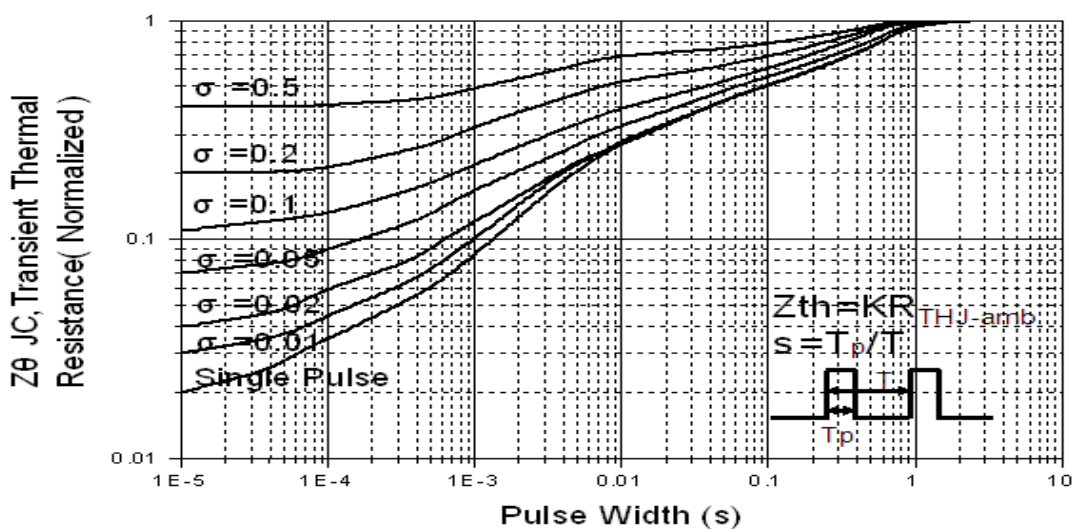
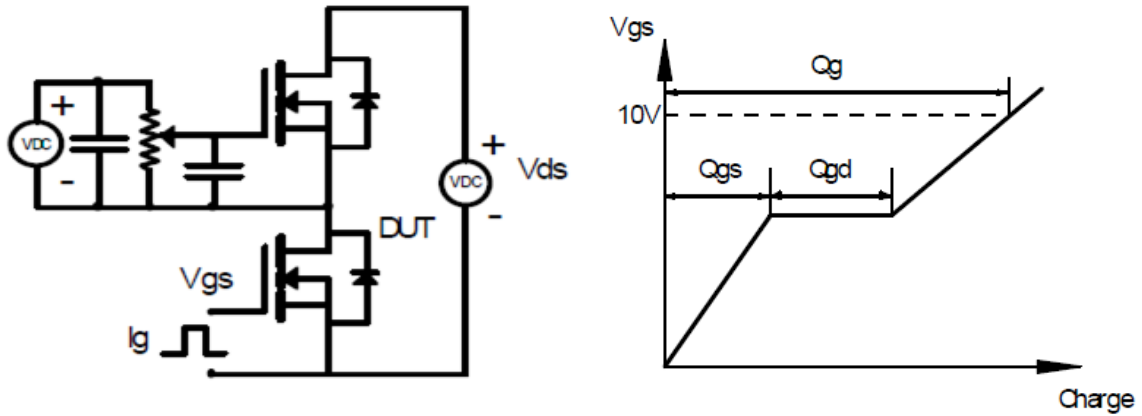


图 10: 最大电流衰减

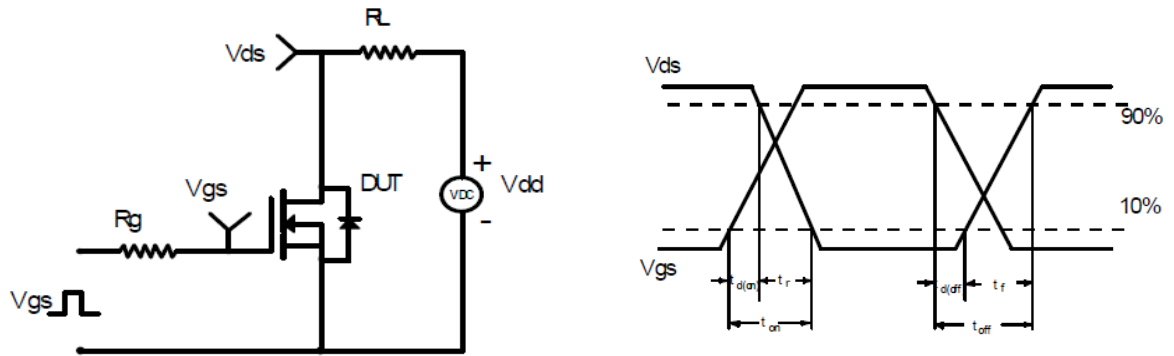


Test Circuit and Waveform

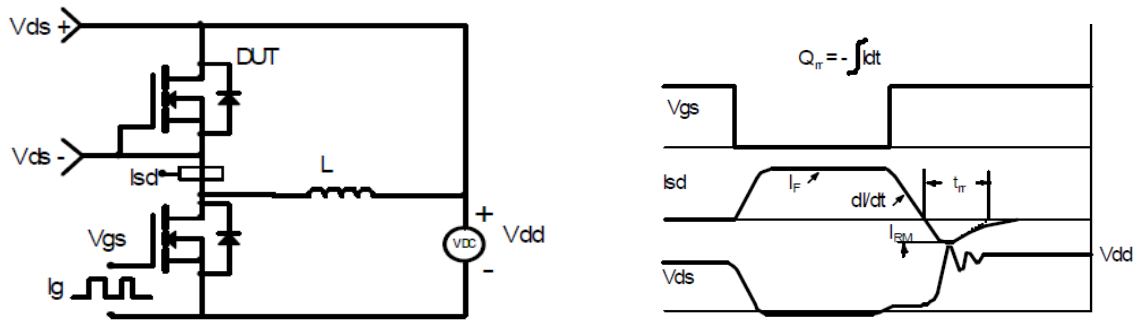
Gate Charge Test Circuit and Waveform



Switching time test circuit and waveform



Reverse Recovery Test Circuit and Waveform



Avalanche Test Circuit and Waveform

