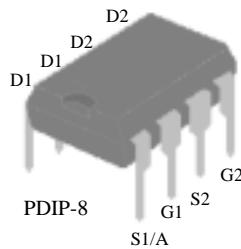


- ▼ Simple Drive Requirement
- ▼ Low On-resistance
- ▼ Fast Switching

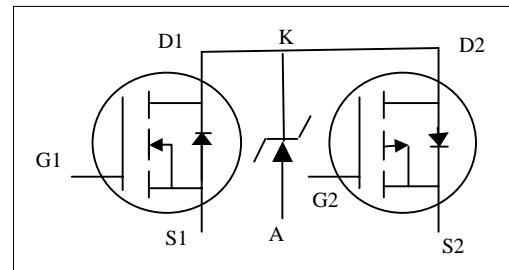


| | | |
|------|--------------|--------------|
| N-CH | BV_{DSS} | 30V |
| | $R_{DS(ON)}$ | 36m Ω |
| | I_D | 5.3A |
| P-CH | BV_{DSS} | -30V |
| | $R_{DS(ON)}$ | 60m Ω |
| | I_D | -4.2A |

Description

The Advanced Power MOSFETs from APEC provide the design with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

AP4501SSD included N , P channel enhancement mode power MOSFET and Shottky diode.



Absolute Maximum Ratings

| Symbol | Parameter | Rating | | Units |
|------------------------|---------------------------------------|------------|-----------|---------------|
| | | N-channel | P-channel | |
| V_{DS} | Drain-Source Voltage | 30 | -30 | V |
| V_{GS} | Gate-Source Voltage | ± 20 | ± 20 | V |
| $I_D @ T_A=25^\circ C$ | Continuous Drain Current ³ | 5.3 | -4.2 | A |
| $I_D @ T_A=70^\circ C$ | Continuous Drain Current ³ | 4.3 | -3.5 | A |
| I_{DM} | Pulsed Drain Current ¹ | 40 | -30 | A |
| $P_D @ T_A=25^\circ C$ | Total Power Dissipation | 2 | | W |
| | Linear Derating Factor | 0.016 | | W/ $^\circ C$ |
| T_{STG} | Storage Temperature Range | -55 to 150 | | $^\circ C$ |
| T_J | Operating Junction Temperature Range | -55 to 125 | | $^\circ C$ |

Thermal Data

| Symbol | Parameter | Value | Unit |
|---------------|--|-----------|--------------|
| $R_{thj-amb}$ | Thermal Resistance Junction-ambient ³ | Max. 62.5 | $^\circ C/W$ |



AP4501SSD

N-CH Electrical Characteristics @T_j=25°C (unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|-------------------------------------|--|--|------|-------|------|-------|
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =250uA | 30 | - | - | V |
| ΔBV _{DSS} /ΔT _j | Breakdown Voltage Temperature Coefficient | Reference to 25°C, I _D =1mA | - | 0.031 | - | V/°C |
| R _{DS(ON)} | Static Drain-Source On-Resistance ² | V _{GS} =10V, I _D =5.3A | - | - | 36 | mΩ |
| | | V _{GS} =4.5V, I _D =4A | - | - | 55 | mΩ |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =250uA | 1 | - | 3 | V |
| g _{fs} | Forward Transconductance | V _{DS} =10V, I _D =5.3A | - | 10 | - | S |
| I _{DSS} | Drain-Source Leakage Current (T _j =25°C) ⁴ | V _{DS} =30V, V _{GS} =0V | - | - | 100 | uA |
| | Drain-Source Leakage Current (T _j =70°C) | V _{DS} =24V, V _{GS} =0V | - | - | 1 | mA |
| I _{GSS} | Gate-Source Leakage | V _{GS} =±20V | - | - | ±100 | nA |
| Q _g | Total Gate Charge ² | I _D =5.3A | - | 8.2 | - | nC |
| Q _{gs} | Gate-Source Charge | V _{DS} =24V | - | 2.3 | - | nC |
| Q _{gd} | Gate-Drain ("Miller") Charge | V _{GS} =4.5V | - | 4.8 | - | nC |
| t _{d(on)} | Turn-on Delay Time ² | V _{DS} =15V | - | 6 | - | ns |
| t _r | Rise Time | I _D =1A | - | 5.2 | - | ns |
| t _{d(off)} | Turn-off Delay Time | R _G =3.3Ω, V _{GS} =10V | - | 18.8 | - | ns |
| t _f | Fall Time | R _D =15Ω | - | 4.4 | - | ns |
| C _{iss} | Input Capacitance | V _{GS} =0V | - | 645 | - | pF |
| C _{oss} | Output Capacitance | V _{DS} =25V | - | 150 | - | pF |
| C _{rss} | Reverse Transfer Capacitance | f=1.0MHz | - | 95 | - | pF |

Source-Drain Diode

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|-----------------|--|--|------|------|------|-------|
| I _S | Source Current (Body Diode) ² | V _D =V _G =0V, V _S =1.2V | - | - | 1.7 | A |
| V _{SD} | Forward On Voltage ² | I _S =1.7A, V _{GS} =0V | - | - | 1.2 | V |

Schottky Characteristics @T_j=25°C

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|-----------------|---------------------------------|---------------------|------|------|------|-------|
| V _F | Forward Voltage Drop | I _F =1A | - | - | 0.5 | V |
| I _{rm} | Maximum Reverse Leakage Current | V _r =30V | - | - | 100 | uA |

**P-CH Electrical Characteristics @T_j=25°C(unless otherwise specified)**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|-------------------------------------|--|---|------|-------|------|-------|
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =-250uA | -30 | - | - | V |
| ΔBV _{DSS} /ΔT _j | Breakdown Voltage Temperature Coefficient | Reference to 25°C, I _D =-1mA | - | -0.03 | - | V/°C |
| R _{DS(ON)} | Static Drain-Source On-Resistance ² | V _{GS} =-10V, I _D =-4.2A | - | - | 60 | mΩ |
| | | V _{GS} =-4.5V, I _D =-3A | - | - | 80 | mΩ |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =-250uA | -1 | - | -3 | V |
| g _{fs} | Forward Transconductance | V _{DS} =-10V, I _D =-4.2A | - | 7.2 | - | S |
| I _{DSS} | Drain-Source Leakage Current (T _j =25°C) | V _{DS} =-30V, V _{GS} =0V | - | - | -1 | uA |
| | Drain-Source Leakage Current (T _j =70°C) | V _{DS} =-24V, V _{GS} =0V | - | - | -25 | uA |
| I _{GSS} | Gate-Source Leakage | V _{GS} = ± 20V | - | - | ±100 | nA |
| Q _g | Total Gate Charge ² | I _D =-4.2A | - | 9 | - | nC |
| Q _{gs} | Gate-Source Charge | V _{DS} =-15V | - | 3.5 | - | nC |
| Q _{gd} | Gate-Drain ("Miller") Charge | V _{GS} =-4.5V | - | 2 | - | nC |
| t _{d(on)} | Turn-on Delay Time ² | V _{DS} =-15V | - | 12 | - | ns |
| t _r | Rise Time | I _D =-1A | - | 20 | - | ns |
| t _{d(off)} | Turn-off Delay Time | R _G =6Ω, V _{GS} =-10V | - | 45 | - | ns |
| t _f | Fall Time | R _D =15Ω | - | 27 | - | ns |
| C _{iss} | Input Capacitance | V _{GS} =0V | - | 760 | - | pF |
| C _{oss} | Output Capacitance | V _{DS} =-25V | - | 330 | - | pF |
| C _{riss} | Reverse Transfer Capacitance | f=1.0MHz | - | 90 | - | pF |

Source-Drain Diode

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|-----------------|--|--|------|------|------|-------|
| I _S | Source Current (Body Diode) ² | V _D =V _G =0V , V _S =-1.2V | - | - | -1.7 | A |
| V _{SD} | Forward On Voltage ² | I _S =-1.7A, V _{GS} =0V | - | - | -1.2 | V |

Notes:

- 1.Pulse width limited by Max. junction temperature.
- 2.Pulse width ≤300us , duty cycle ≤2%.
- 3.Mounted on 1 in² copper pad of FR4 board ; 90°C/W when mounted on Min. copper pad.
- 4.I_{DSS} is the leakage current measurement combined with Schottky diode.



AP4501SSD

N-Channel

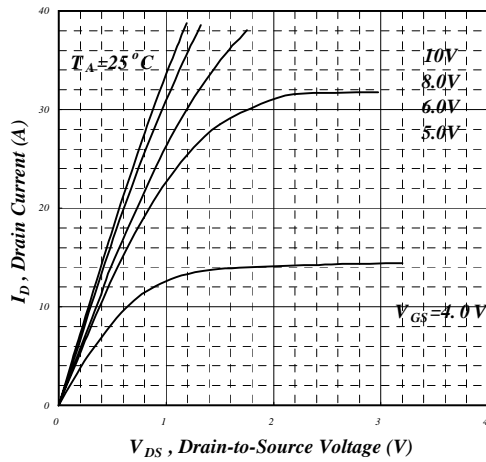


Fig 1. Typical Output Characteristics

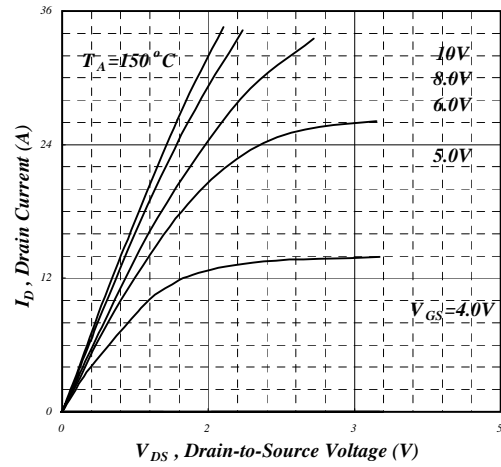


Fig 2. Typical Output Characteristics

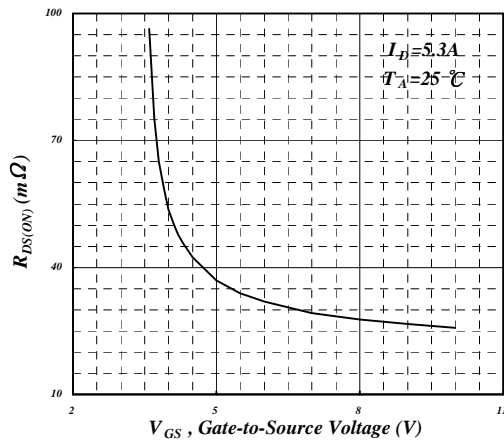


Fig 3. On-Resistance v.s. Gate Voltage

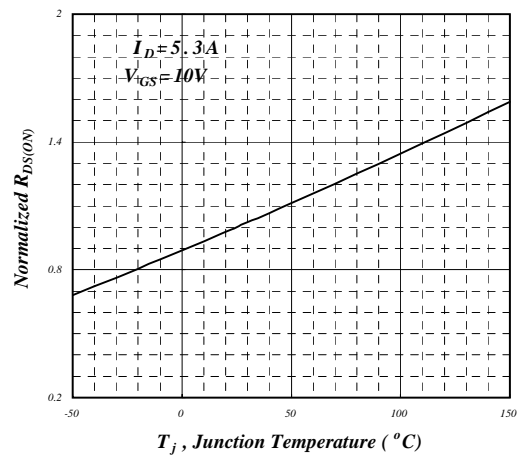


Fig 4. Normalized On-Resistance v.s. Junction Temperature

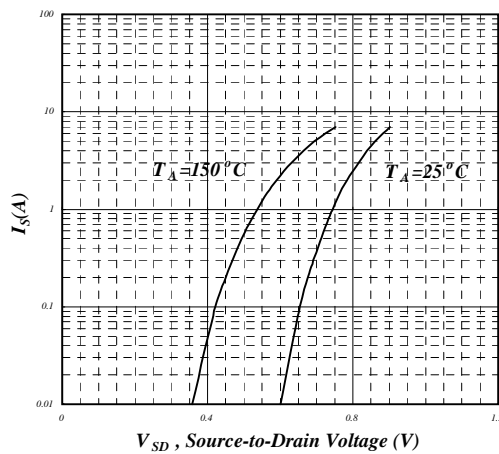


Fig 5. Forward Characteristic of Reverse Diode

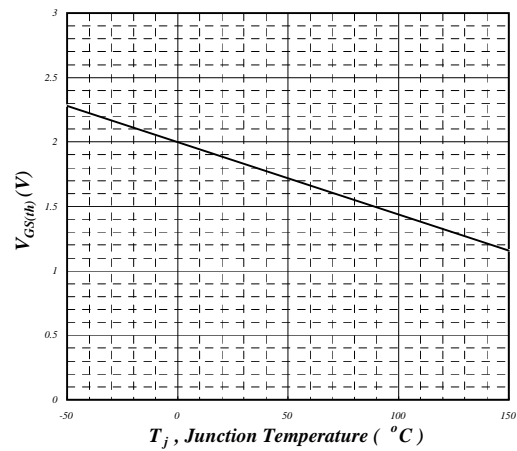


Fig 6. Gate Threshold Voltage v.s. Junction Temperature



N-Channel

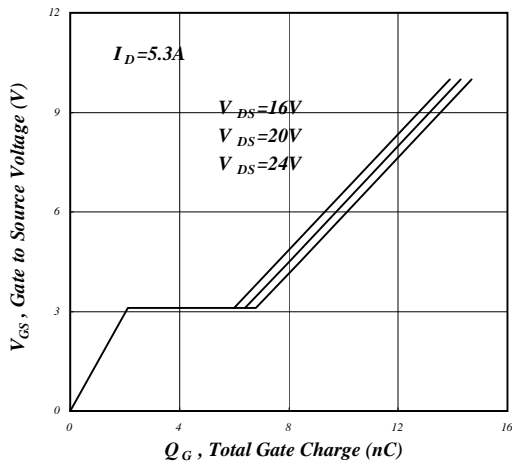


Fig 7. Gate Charge Characteristics

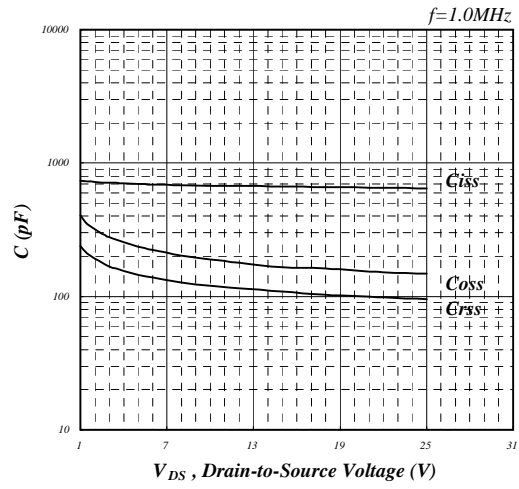


Fig 8. Typical Capacitance Characteristics

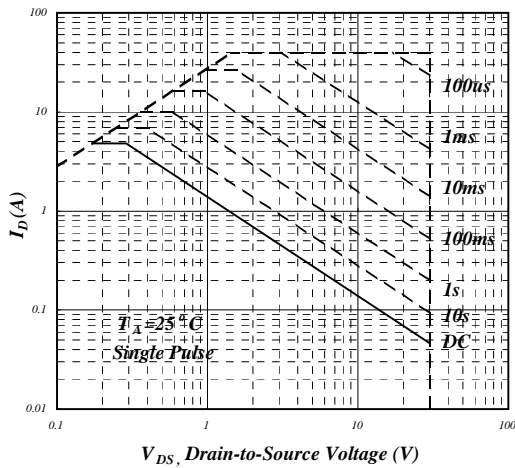


Fig 9. Maximum Safe Operating Area

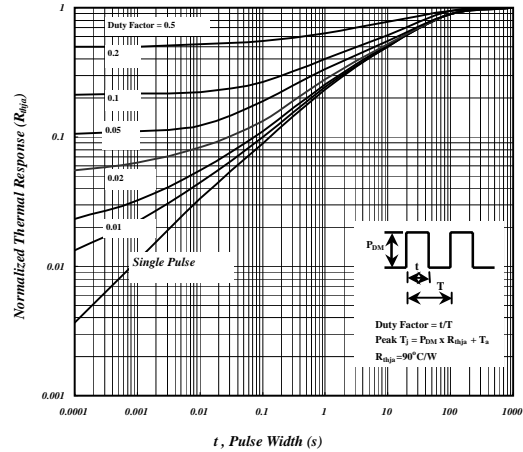


Fig 10. Effective Transient Thermal Impedance

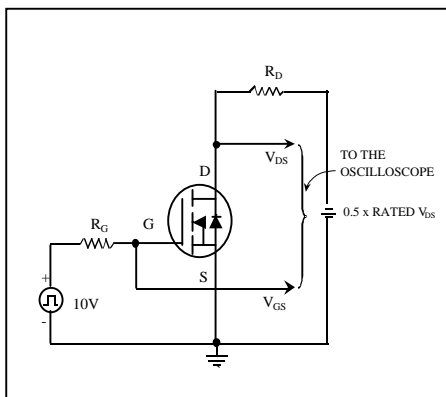


Fig 11. Switching Time Circuit

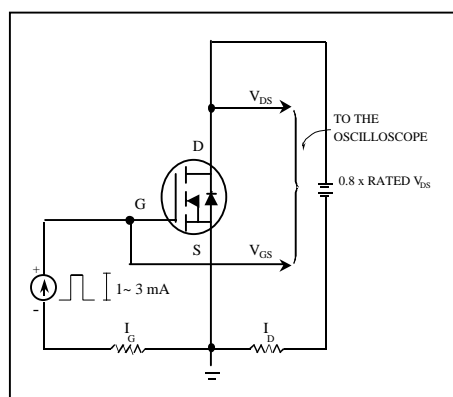


Fig 12. Gate Charge Circuit



AP4501SSD

P-Channel

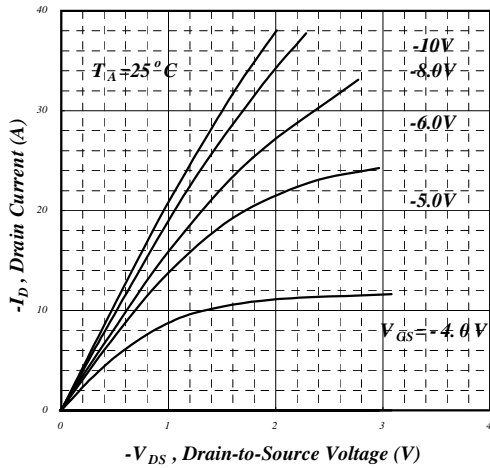


Fig 1. Typical Output Characteristics

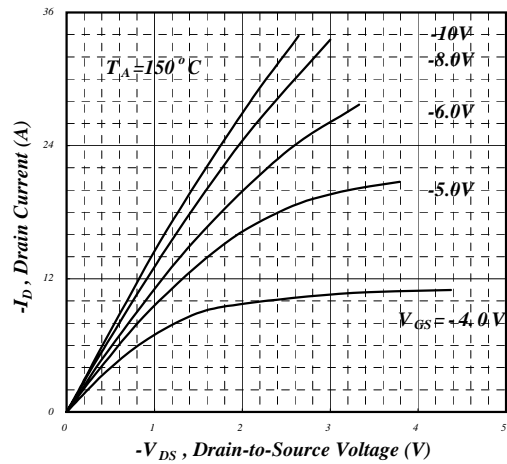


Fig 2. Typical Output Characteristics

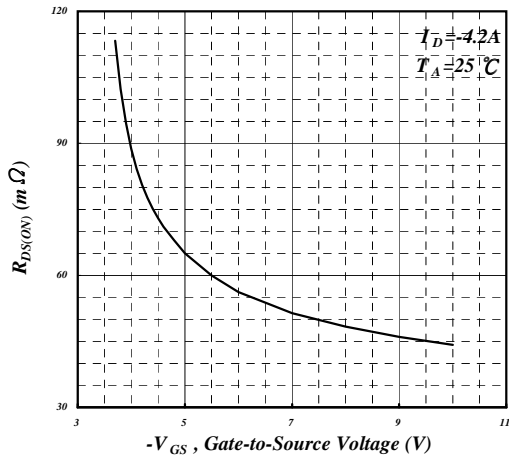


Fig 3. On-Resistance v.s. Gate Voltage

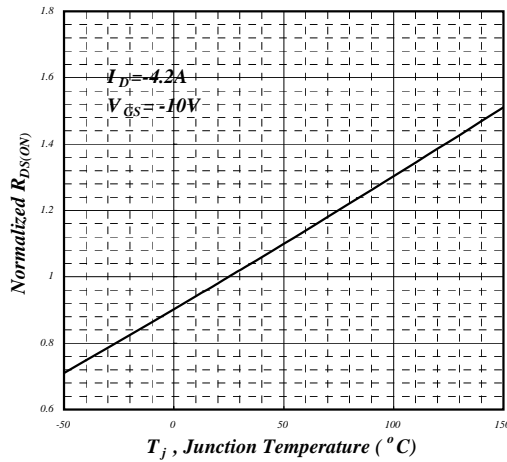


Fig 4. Normalized On-Resistance v.s. Junction Temperature

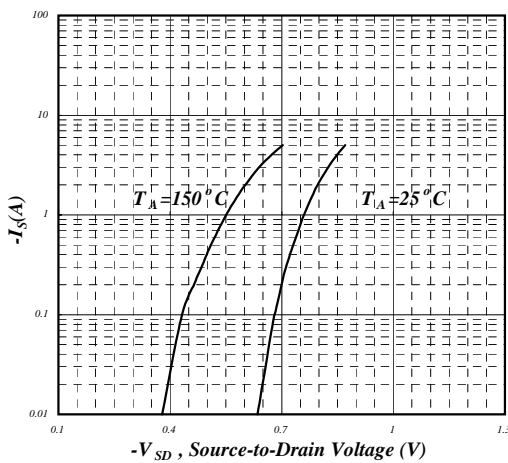


Fig 5. Forward Characteristic of Reverse Diode

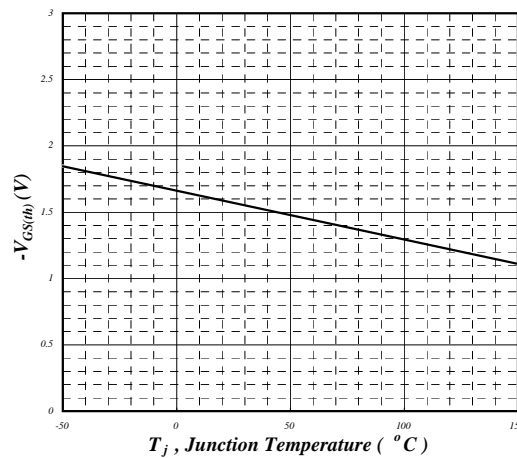


Fig 6. Gate Threshold Voltage v.s. Junction Temperature



P-Channel

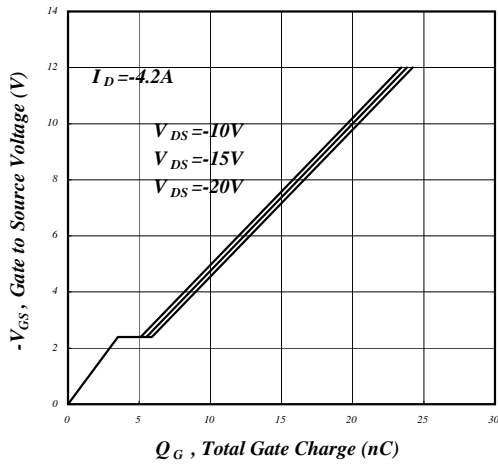


Fig 7. Gate Charge Characteristics

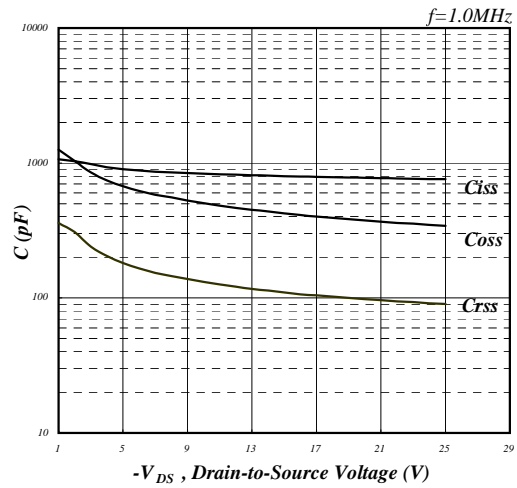


Fig 8. Typical Capacitance Characteristics

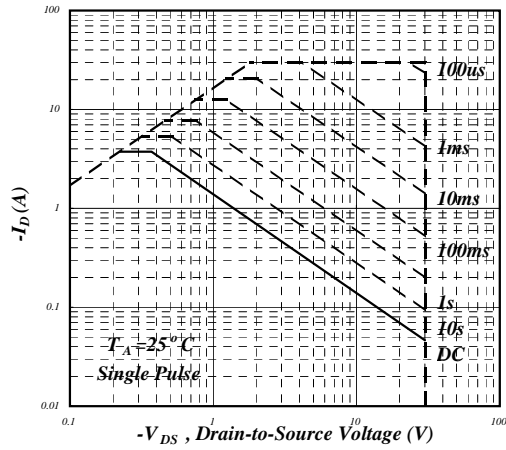


Fig 9. Maximum Safe Operating Area

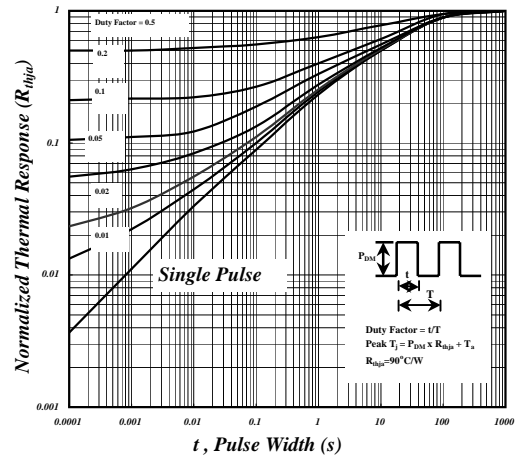


Fig 10. Effective Transient Thermal Impedance

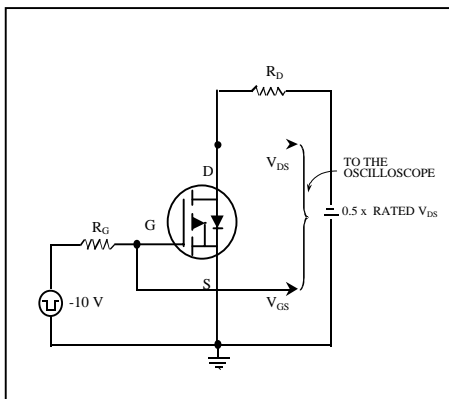


Fig 11. Switching Time Circuit

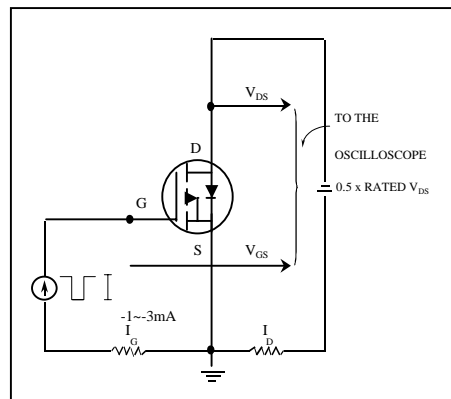


Fig 12. Gate Charge Circuit