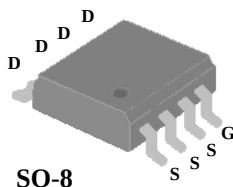




- ▼ Simple Drive Requirement
- ▼ Low On-resistance
- ▼ Fast Switching Characteristic
- ▼ RoHS Compliant

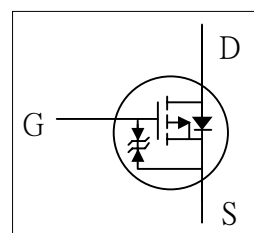


|              |               |
|--------------|---------------|
| $BV_{DSS}$   | -35V          |
| $R_{DS(ON)}$ | 7.5m $\Omega$ |
| $I_D$        | -14.5A        |

## Description

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

The SO-8 package is widely preferred for all commercial-industrial surface mount applications and suited for low voltage applications such as DC/DC converters.



## Absolute Maximum Ratings@T<sub>j</sub>=25°C(unless otherwise specified)

| Symbol                     | Parameter                                    | Rating     | Units |
|----------------------------|----------------------------------------------|------------|-------|
| $V_{DS}$                   | Drain-Source Voltage                         | -35        | V     |
| $V_{GS}$                   | Gate-Source Voltage                          | +20        | V     |
| $I_D@T_A=25^\circ\text{C}$ | Drain Current <sup>3a</sup> , $V_{GS}$ @ 10V | -14.5      | A     |
| $I_D@T_A=70^\circ\text{C}$ | Drain Current <sup>3a</sup> , $V_{GS}$ @ 10V | -12        | A     |
| $I_{DM}$                   | Pulsed Drain Current <sup>1</sup>            | -50        | A     |
| $P_D@T_A=25^\circ\text{C}$ | Total Power Dissipation                      | 2.5        | W     |
|                            | Linear Derating Factor                       | 0.02       | W/°C  |
| $T_{STG}$                  | Storage Temperature Range                    | -55 to 150 | °C    |
| $T_J$                      | Operating Junction Temperature Range         | -55 to 150 | °C    |

## Thermal Data

| Symbol | Parameter                                                  | Value | Unit |
|--------|------------------------------------------------------------|-------|------|
| Rthj-a | Maximum Thermal Resistance, Junction-ambient <sup>3a</sup> | 50    | °C/W |

THIS PRODUCT IS SENSITIVE TO ELECTROSTATIC DISCHARGE, PLEASE HANDLE WITH CAUTION.

USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT OR OTHER SIMILAR SYSTEMS IS NOT AUTHORIZED.

APEC DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

APEC RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN.



## AP4409AGEM-HF

### Electrical Characteristics@T<sub>j</sub>=25°C(unless otherwise specified)

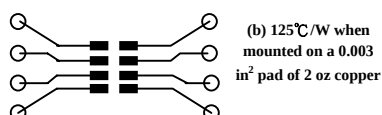
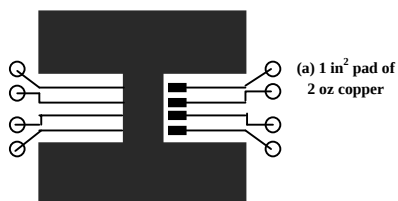
| Symbol              | Parameter                                           | Test Conditions                                           | Min. | Typ. | Max. | Units |
|---------------------|-----------------------------------------------------|-----------------------------------------------------------|------|------|------|-------|
| BV <sub>DSS</sub>   | Drain-Source Breakdown Voltage                      | V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA               | -35  | -    | -    | V     |
| R <sub>DS(ON)</sub> | Static Drain-Source On-Resistance <sup>2</sup>      | V <sub>GS</sub> =-10V, I <sub>D</sub> =-7A                | -    | -    | 7.5  | mΩ    |
|                     |                                                     | V <sub>GS</sub> =-4V, I <sub>D</sub> =-7A                 | -    | -    | 15   | mΩ    |
| V <sub>GS(th)</sub> | Gate Threshold Voltage                              | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250uA | -1   | -    | -3   | V     |
| g <sub>fs</sub>     | Forward Transconductance                            | V <sub>DS</sub> =-10V, I <sub>D</sub> =-7A                | -    | 7    | -    | S     |
| I <sub>DSS</sub>    | Drain-Source Leakage Current                        | V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V                | -    | -    | -10  | uA    |
|                     | Drain-Source Leakage Current (T <sub>j</sub> =70°C) | V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V                | -    | -    | -25  | uA    |
| I <sub>GSS</sub>    | Gate-Source Leakage                                 | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                | -    | -    | ±30  | uA    |
| Q <sub>g</sub>      | Total Gate Charge <sup>2</sup>                      | I <sub>D</sub> =-14A                                      | -    | 58   | 90   | nC    |
| Q <sub>gs</sub>     | Gate-Source Charge                                  | V <sub>DS</sub> =-30V                                     | -    | 7    | -    | nC    |
| Q <sub>gd</sub>     | Gate-Drain ("Miller") Charge                        | V <sub>GS</sub> =-4.5V                                    | -    | 37   | -    | nC    |
| t <sub>d(on)</sub>  | Turn-on Delay Time <sup>2</sup>                     | V <sub>DS</sub> =-15V                                     | -    | 15   | -    | ns    |
| t <sub>r</sub>      | Rise Time                                           | I <sub>D</sub> =-1A                                       | -    | 13   | -    | ns    |
| t <sub>d(off)</sub> | Turn-off Delay Time                                 | R <sub>G</sub> =3.3Ω                                      | -    | 76   | -    | ns    |
| t <sub>f</sub>      | Fall Time                                           | V <sub>GS</sub> =-10V                                     | -    | 60   | -    | ns    |
| C <sub>iss</sub>    | Input Capacitance                                   | V <sub>GS</sub> =0V                                       | -    | 4100 | 6600 | pF    |
| C <sub>oss</sub>    | Output Capacitance                                  | V <sub>DS</sub> =-25V                                     | -    | 640  | -    | pF    |
| C <sub>rss</sub>    | Reverse Transfer Capacitance                        | f=1.0MHz                                                  | -    | 530  | -    | pF    |

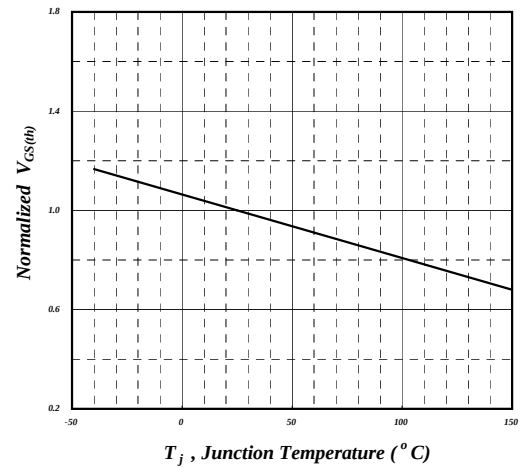
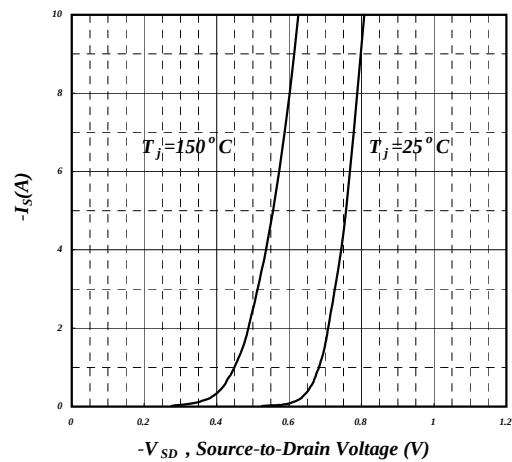
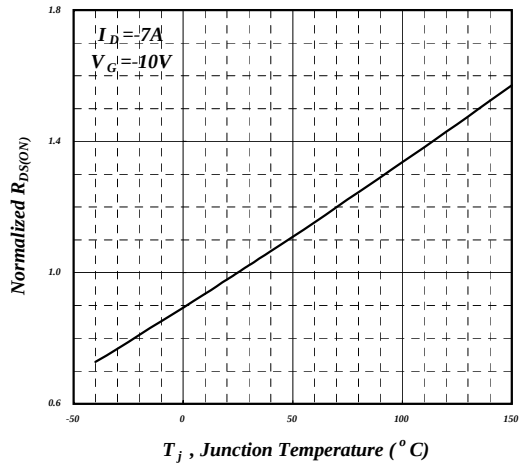
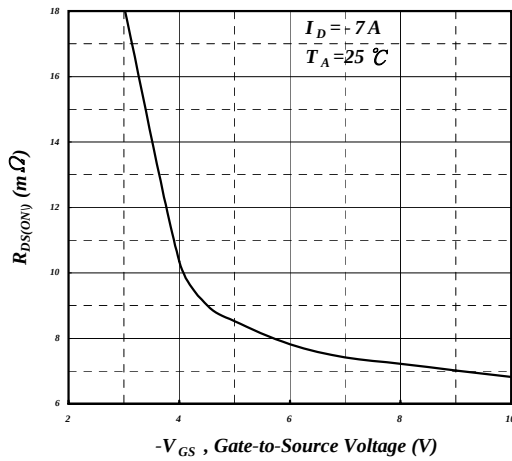
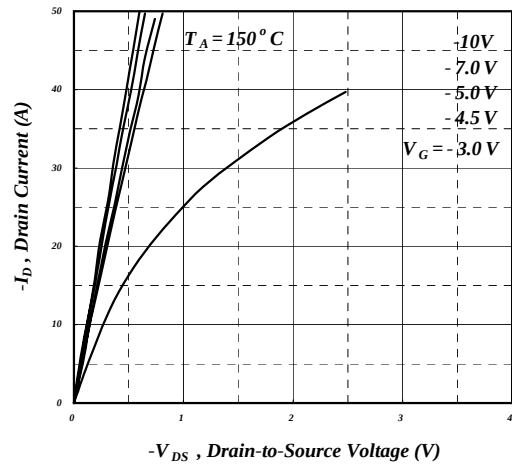
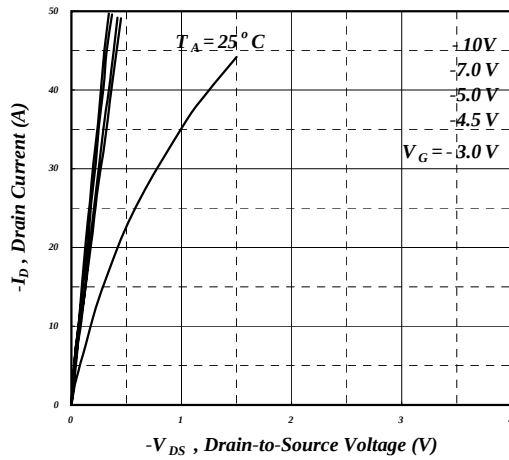
### Source-Drain Diode

| Symbol          | Parameter                          | Test Conditions                                             | Min. | Typ. | Max. | Units |
|-----------------|------------------------------------|-------------------------------------------------------------|------|------|------|-------|
| V <sub>SD</sub> | Forward On Voltage <sup>2</sup>    | I <sub>S</sub> =-14A, V <sub>GS</sub> =0V                   | -    | -    | -1.3 | V     |
| t <sub>rr</sub> | Reverse Recovery Time <sup>2</sup> | I <sub>S</sub> =-14A, V <sub>GS</sub> =0V,<br>dI/dt=100A/μs | -    | 46   | -    | ns    |
| Q <sub>rr</sub> | Reverse Recovery Charge            |                                                             | -    | 44   | -    | nC    |

#### Notes:

- 1.Pulse width limited by Max. junction temperature.
- 2.Pulse test
- 3.Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board (a) , t ≤10sec







# AP4409AGEM-HF

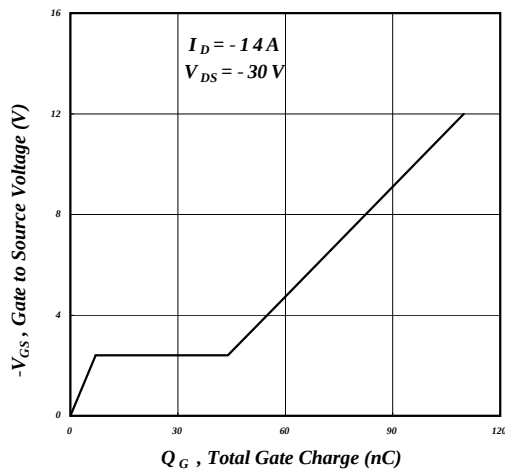


Fig 7. Gate Charge Characteristics

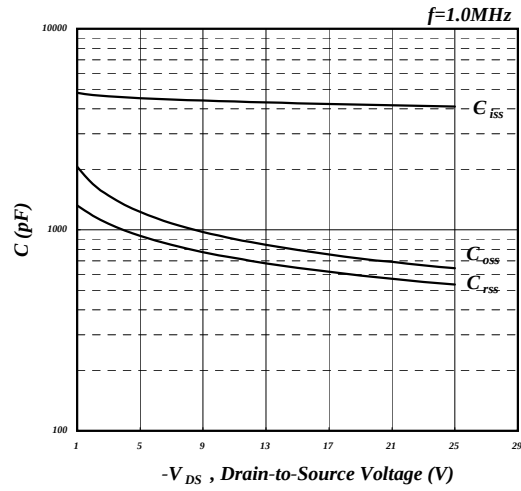


Fig 8. Typical Capacitance Characteristics

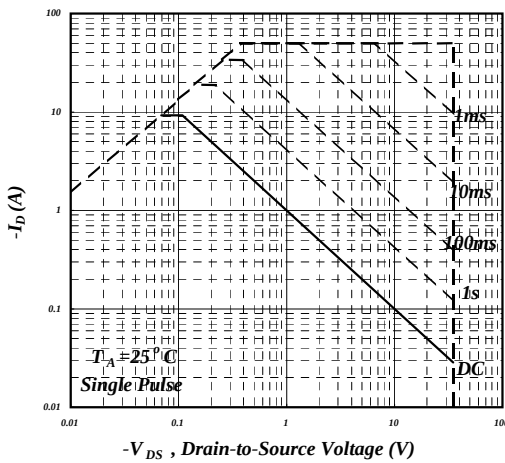


Fig 9. Maximum Safe Operating Area

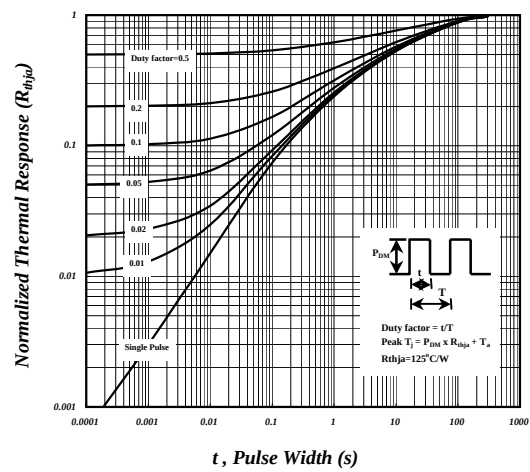


Fig 10. Effective Transient Thermal Impedance

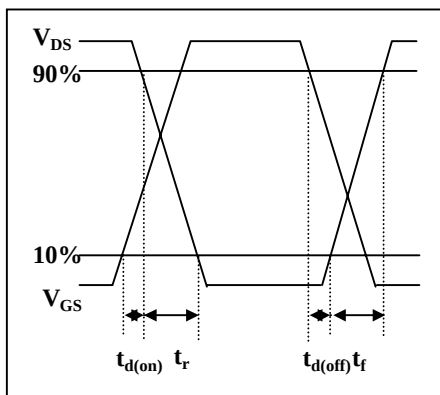


Fig 11. Switching Time Waveform

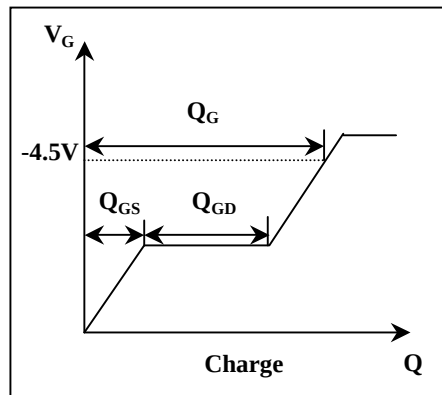
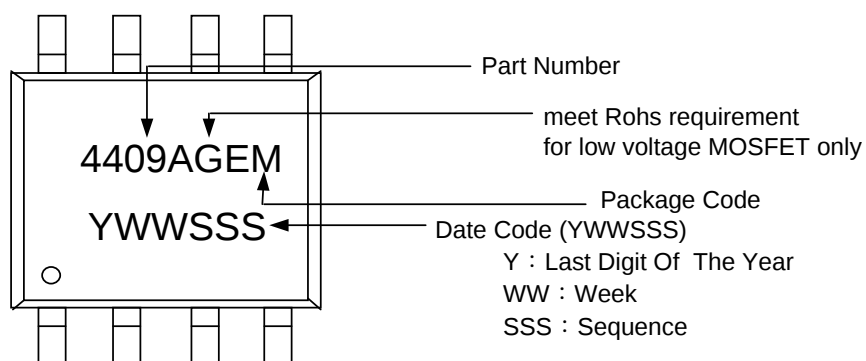


Fig 12. Gate Charge Waveform

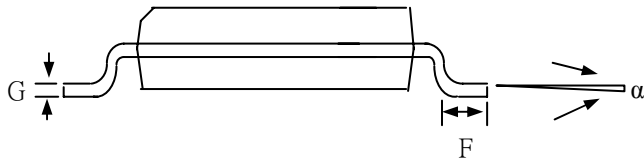
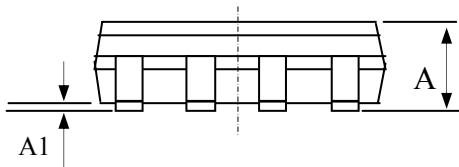
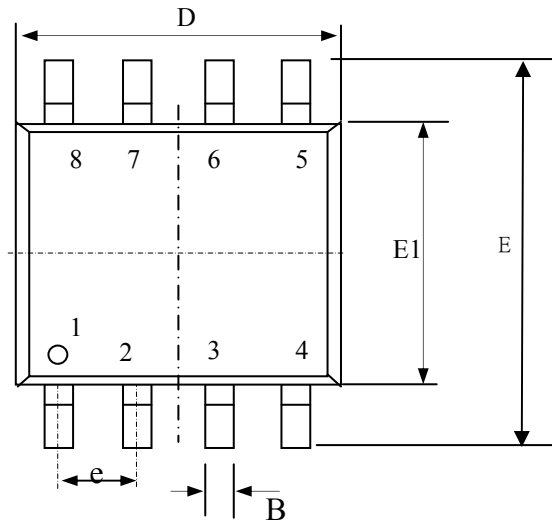


## MARKING INFORMATION





## Package Outline : SO-8



| SYMBOLS  | Millimeters |      |      |
|----------|-------------|------|------|
|          | MIN         | NOM  | MAX  |
| A        | 1.35        | 1.55 | 1.75 |
| A1       | 0.05        | 0.15 | 0.25 |
| B        | 0.30        | 0.41 | 0.51 |
| D        | 4.80        | 5.05 | 5.30 |
| E        | 5.79        | 6.00 | 6.20 |
| E1       | 3.70        | 3.90 | 4.10 |
| e        | 1.27 TYP    |      |      |
| G        | 0.17        | 0.21 | 0.25 |
| F        | 0.38        | 0.83 | 1.27 |
| $\alpha$ | 0°          | 4°   | 8°   |

1.All Dimension Are In Millimeters.

2.Dimension Does Not Include Mold Protrusions.



SO-8 FOOTPRINT :

