

# TM35G06NF

## N+P -Channel Enhancement Mode Mosfet

### General Description

- Low  $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

### Applications

- Load switch
- PWM

### General Features

#### N Channel

$V_{DS} = 60V$ ,  $I_D = 35A$

$R_{DS(ON)} = 12m\Omega @ V_{GS} = 10V$

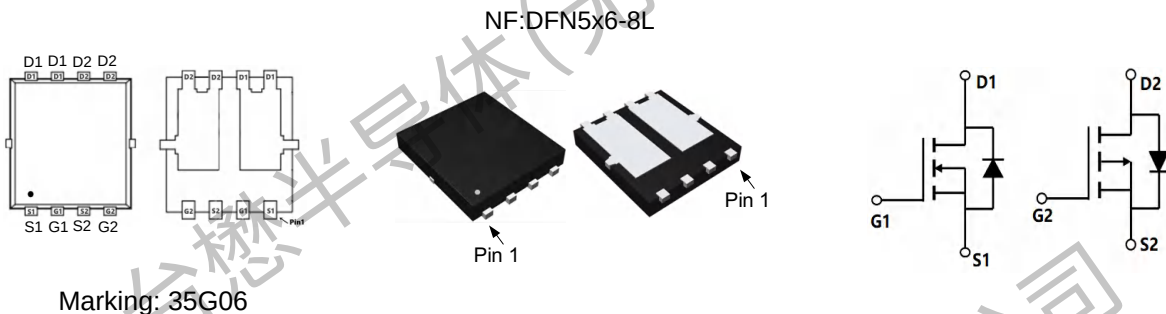
#### P Channel

$V_{DS} = -60V$ ,  $I_D = -34A$

$R_{DS(ON)} = 29m\Omega @ V_{GS} = -10V$

100% UIS Tested

100%  $R_g$  Tested



### Absolute Maximum Ratings ( $T_A = 25^\circ C$ Unless Otherwise Noted)

| Symbol                    | Parameter                                | Rating     |            | Units      |
|---------------------------|------------------------------------------|------------|------------|------------|
|                           |                                          | N-Channel  | P-Channel  |            |
| $V_{DS}$                  | Drain-Source Voltage                     | 60         | -60        | V          |
| $V_{GS}$                  | Gate-Source Voltage                      | $\pm 30$   | $\pm 20$   | V          |
| $I_D @ T_A = 25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V$ | 35         | -34        | A          |
| $I_D @ T_A = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 26         | -25        | A          |
| $I_{DM}$                  | Pulsed Drain Current                     | 180        | -140       | A          |
| $P_D$                     | Total Power Dissipation                  | 75         | 88         | W          |
| $T_{STG}$                 | Storage Temperature Range                | -55 to 175 | -55 to 175 | $^\circ C$ |
| $T_J$                     | Operating Junction Temperature Range     | -55 to 175 | -55 to 175 | $^\circ C$ |

### Thermal Data

| Symbol          | Parameter                           | Typ. | Max. | Unit         |
|-----------------|-------------------------------------|------|------|--------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient | ---  | ---  | $^\circ C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case    | ---  | 1.67 | $^\circ C/W$ |

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N-CH Electrical Characteristics: ( $T_C=25^{\circ}\text{C}$  unless otherwise noted)

| Symbol                             | Parameter                        | Conditions                                                                                   | Min | Typ   | Max   | Units |
|------------------------------------|----------------------------------|----------------------------------------------------------------------------------------------|-----|-------|-------|-------|
| Off Characteristics                |                                  |                                                                                              |     |       |       |       |
| BV <sub>DSS</sub>                  | Drain-Sourctce Breakdown Voltage | V <sub>GS</sub> =0V, I <sub>D</sub> =250 μ A                                                 | 60  | ---   | ---   | V     |
| I <sub>DSS</sub>                   | Zero Gate Voltage Drain Current  | V <sub>GS</sub> =0V, V <sub>DS</sub> =60V                                                    | --- | ---   | 1     | μ A   |
| I <sub>GSS</sub>                   | Gate-Source Leakage Current      | V <sub>GS</sub> =± 20V, V <sub>DS</sub> =0A                                                  | --- | ---   | ± 100 | nA    |
| On Characteristics                 |                                  |                                                                                              |     |       |       |       |
| V <sub>GS(th)</sub>                | Gate-Source Threshold Voltage    | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250 μ A                                   | 1   | 2     | 3     | V     |
| R <sub>DS(on)</sub>                | Drain-Source On Resistance       | V <sub>GS</sub> =10V, I <sub>D</sub> =30A                                                    | --- | 12    | 15    | m Ω   |
|                                    |                                  | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A                                                   | --- | 18    | 23    | m Ω   |
| Dynamic Characteristics            |                                  |                                                                                              |     |       |       |       |
| C <sub>iss</sub>                   | Input Capacitance                | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz                                            | --- | 1928  | ---   | pF    |
| C <sub>oss</sub>                   | Output Capacitance               |                                                                                              | --- | 136   | --    |       |
| C <sub>rss</sub>                   | Reverse Transfer Capacitance     |                                                                                              | --- | 120   | ---   |       |
| Switching Characteristics          |                                  |                                                                                              |     |       |       |       |
| t <sub>d(on)</sub>                 | Turn-On Delay Time               | V <sub>DS</sub> =30V, I <sub>D</sub> =30A,<br>R <sub>ENG</sub> =1.8 Ω , V <sub>GS</sub> =10V | --- | 10    | ---   | ns    |
| t <sub>r</sub>                     | Rise Time                        |                                                                                              | --- | 82    | ---   | ns    |
| t <sub>d(off)</sub>                | Turn-Off Delay Time              |                                                                                              | --- | 31    | ---   | ns    |
| t <sub>f</sub>                     | Fall Time                        |                                                                                              | --- | 101   | ---   | ns    |
| Q <sub>g</sub>                     | Total Gate Charge                | V <sub>GS</sub> =10V, V <sub>DS</sub> =30V,<br>I <sub>D</sub> =30A                           | --- | 47    | ---   | nc    |
| Q <sub>gs</sub>                    | Gate-Source Charge               |                                                                                              | --- | 8.4   | ---   | nc    |
| Q <sub>gd</sub>                    | Gate-Drain “Miller” Charge       |                                                                                              | --- | 11.55 | ---   | nc    |
| Drain-Source Diode Characteristics |                                  |                                                                                              |     |       |       |       |
| V <sub>SD</sub>                    | Diode Forward Voltage            | V <sub>GS</sub> =0V, I <sub>SD</sub> =30A                                                    | --- | ---   | 1.2   | V     |
| I <sub>S</sub>                     | Continuous Drain Curren          | V <sub>D</sub> =V <sub>G</sub> =0V                                                           | --- | ---   | 35    | A     |
| I <sub>SM</sub>                    | Pulsed Drain Current             |                                                                                              | --- | ---   | 140   | A     |
| T <sub>rr</sub>                    | Reverse Recovery Time            | I <sub>F</sub> =30A, T <sub>J</sub> =25 °C                                                   | --- | 14    | ---   | ns    |
| Q <sub>rr</sub>                    | Reverse Recovery Charge          | dI/dt=100A/us                                                                                | --- | 20    | ---   | nc    |

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Typical Characteristics: ( $T_c=25^{\circ}\text{C}$  unless otherwise noted)

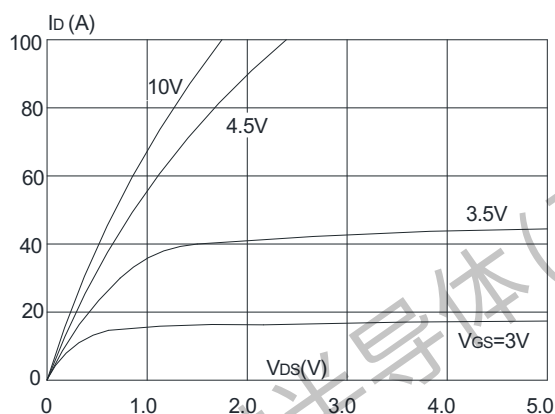


Figure 1: Output Characteristics

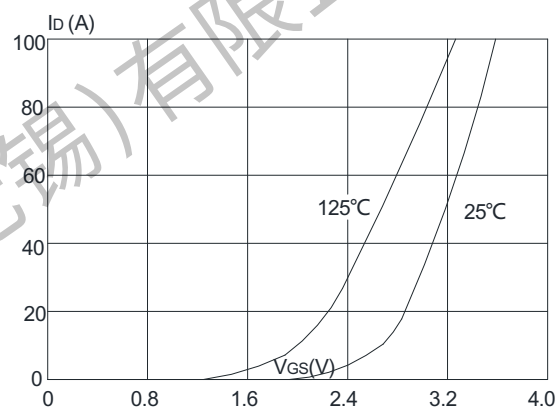


Figure 2: Typical Transfer Characteristics

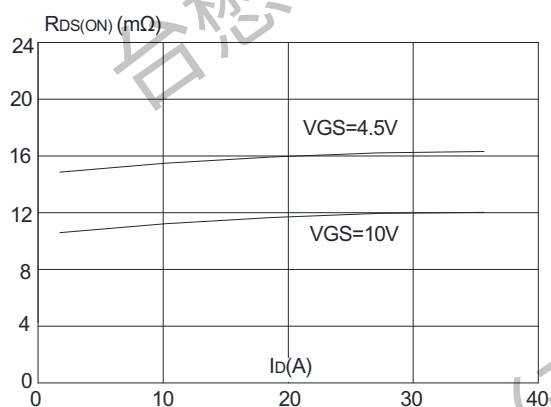


Figure 3: On-resistance vs. Drain Current

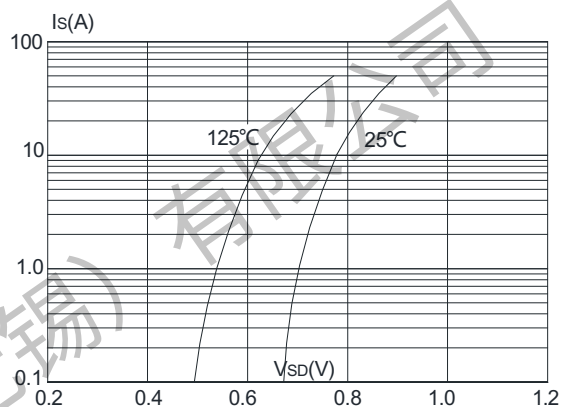


Figure 4: Body Diode Characteristics

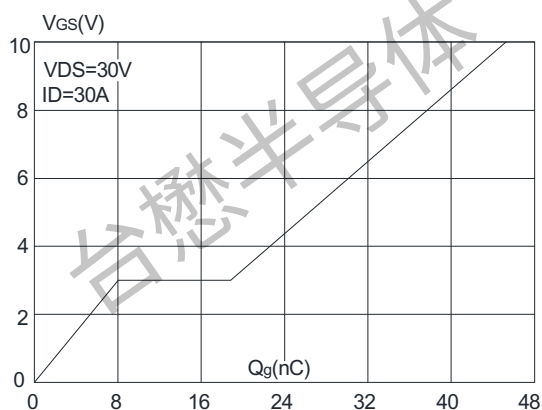


Figure 5: Gate Charge Characteristics

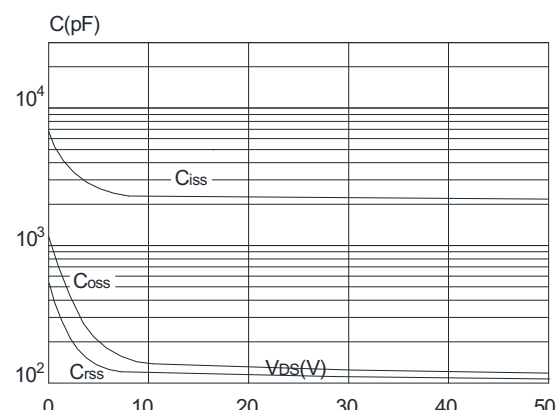
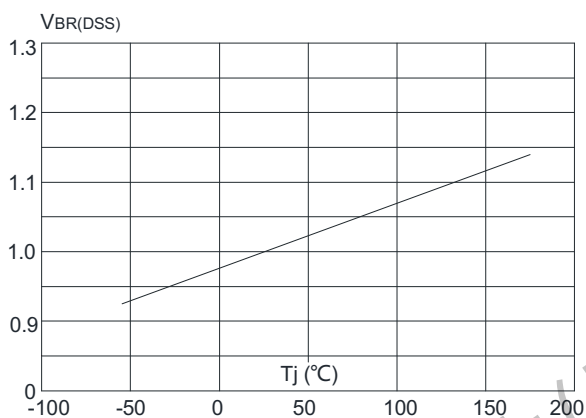


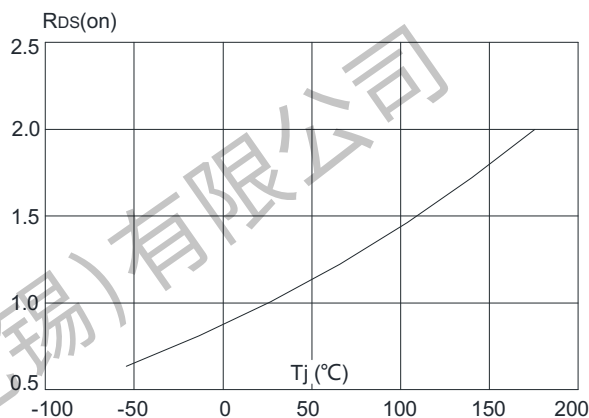
Figure 6: Capacitance Characteristics

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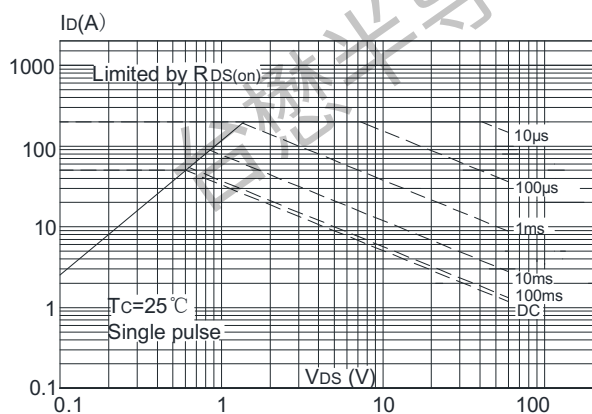
## N+P -Channel Enhancement Mode Mosfet



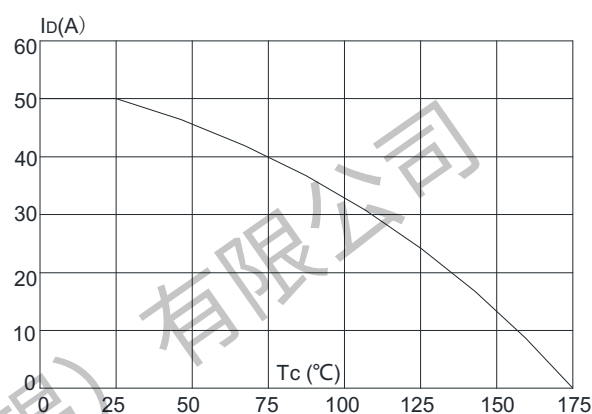
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



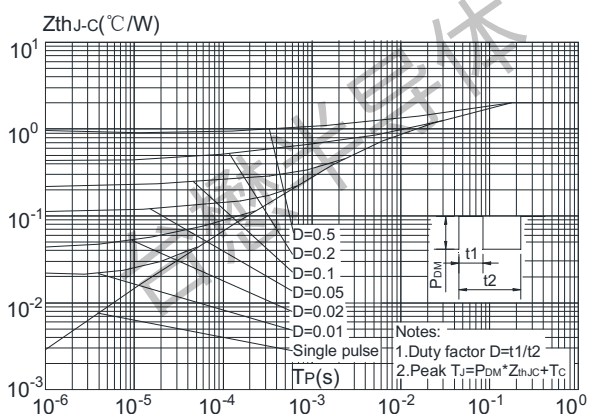
**Figure 8:** Normalized on Resistance vs. Junction Temperature



**Figure 9:** Maximum Safe Operating Area



**Figure 10:** Maximum Continuous Drain Current vs. Case Temperature



**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case

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## N+P -Channel Enhancement Mode Mosfet

P-CH Electrical Characteristics: ( $T_C=25^{\circ}\text{C}$  unless otherwise noted)

| Symbol                             | Parameter                          | Conditions                                      | Min | Typ   | Max       | Units      |
|------------------------------------|------------------------------------|-------------------------------------------------|-----|-------|-----------|------------|
| Off Characteristics                |                                    |                                                 |     |       |           |            |
| $BV_{DSS}$                         | Drain-Source Breakdown Voltage     | $V_{GS}=0V, I_D=250\mu A$                       | -60 | ---   | ---       | V          |
| $I_{DSS}$                          | Zero Gate Voltage Drain Current    | $V_{GS}=0V, V_{DS}=-60V$                        | --- | ---   | -1        | $\mu A$    |
| $I_{GSS}$                          | Gate-Source Leakage Current        | $V_{GS}=\pm 20V, V_{DS}=0A$                     | --- | ---   | $\pm 100$ | nA         |
| On Characteristics                 |                                    |                                                 |     |       |           |            |
| $V_{GS(th)}$                       | Gate-Source Threshold Voltage      | $V_{GS}=V_{DS}, I_D=250\mu A$                   | -1  | -2    | -3        | V          |
| $R_{DS(ON)}$                       | Drain-Source On Resistance         | $V_{GS}=-10V, I_D=-15A$                         | --- | 29    | 36        | m $\Omega$ |
|                                    |                                    | $V_{GS}=-4.5V, I_D=-10A$                        | --- | 35    | 45        |            |
| $G_{FS}$                           | Forward Transconductance           | $V_{DS}=-5V, I_D=-15A$                          | --- | 35    | ---       | S          |
| Dynamic Characteristics            |                                    |                                                 |     |       |           |            |
| $C_{iss}$                          | Input Capacitance                  | $V_{DS}=-25V, V_{GS}=0V, f=1MHz$                | --- | 4025  | ---       | pF         |
| $C_{oss}$                          | Output Capacitance                 |                                                 | --- | 133   | ---       |            |
| $C_{rss}$                          | Reverse Transfer Capacitance       |                                                 | --- | 97    | ---       |            |
| Switching Characteristics          |                                    |                                                 |     |       |           |            |
| $t_{d(on)}$                        | Turn-On Delay Time                 | $V_{DD}=-30V$<br>$R_{GEN}=3\Omega, V_{GS}=-10V$ | --- | 12    | ---       | ns         |
| $t_r$                              | Rise Time                          |                                                 | --- | 9     | ---       | ns         |
| $t_{d(off)}$                       | Turn-Off Delay Time                |                                                 | --- | 63    | ---       | ns         |
| $t_f$                              | Fall Time                          |                                                 | --- | 13    | ---       | ns         |
| $Q_g$                              | Total Gate Charge                  | $V_{GS}=-10V, V_{DS}=-30V,$<br>$I_D=-20A$       | --- | 53    | ---       | nC         |
| $Q_{gs}$                           | Gate-Source Charge                 |                                                 | --- | 10    | ---       | nC         |
| $Q_{gd}$                           | Gate-Drain "Miller" Charge         |                                                 | --- | 12    | ---       | nC         |
| Drain-Source Diode Characteristics |                                    |                                                 |     |       |           |            |
| $V_{SD}$                           | Source-Drain Diode Forward Voltage | $V_{GS}=0V, I_S=-15A, T_J=25^{\circ}C$          | --- | -0.88 | -1.2      | V          |
| $I_S$                              | Continuous Drain Current           | $V_D=V_G=0V$                                    | --- | ---   | -34       | A          |
| $I_{SM}$                           | Pulsed Drain Current               | $V_D=V_G=0V$                                    | --- | ---   | -125      | A          |
| $t_{rr}$                           | Reverse Recovery Time              | $I_{sd}=-20A, V_{GS}=0V$                        | --- | 26    | ---       | ns         |
| $Q_{rr}$                           | Reverse Recovery Charge            | $dI/dt=-500A/\mu s$                             | --- | 29    | ---       | nC         |

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Typical Characteristics: ( $T_C=25^{\circ}\text{C}$  unless otherwise noted)

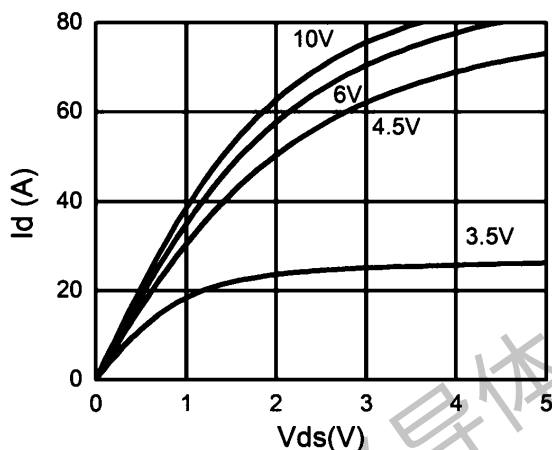


Figure 1. Output Characteristics

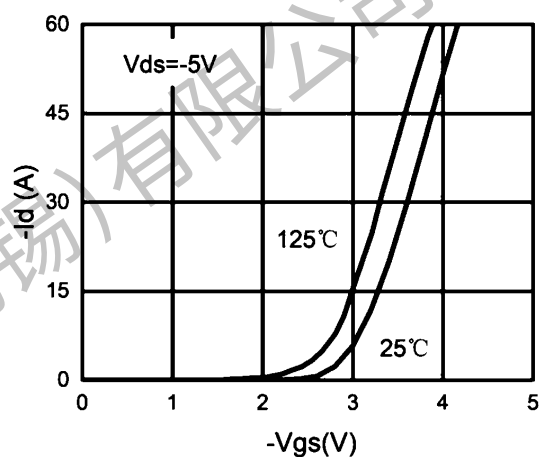


Figure 2. Transfer Characteristics

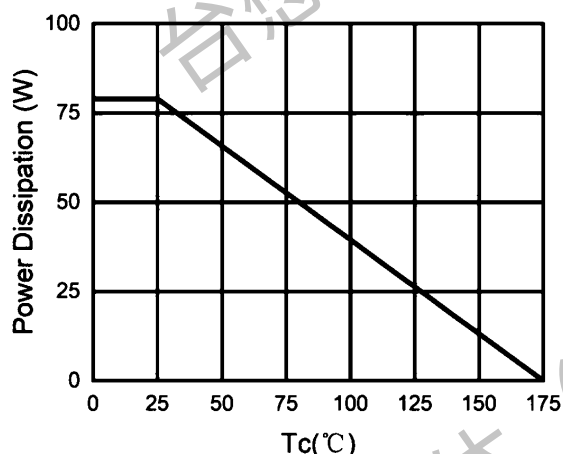


Figure 3. Power Dissipation

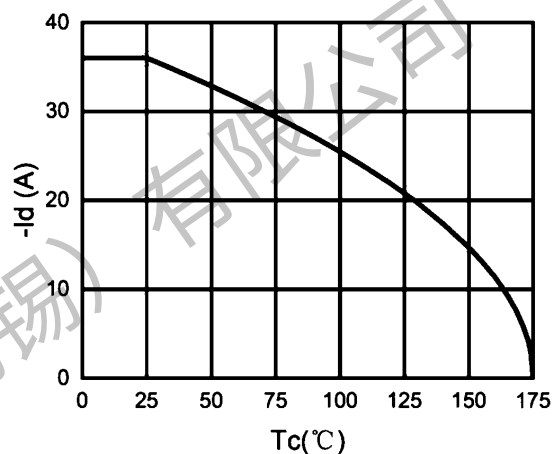


Figure 4. Drain Current

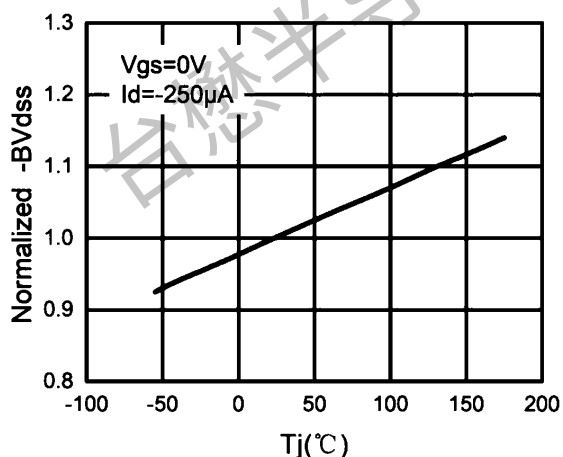


Figure 5.  $BV_{DSS}$  vs Junction Temperature

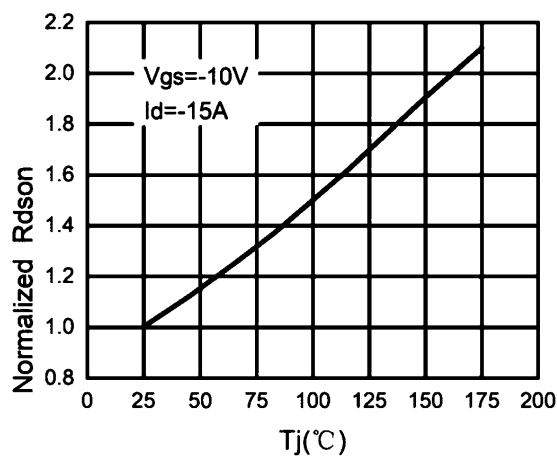


Figure 6.  $R_{DS(ON)}$  vs Junction Temperature

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## N+P -Channel Enhancement Mode Mosfet

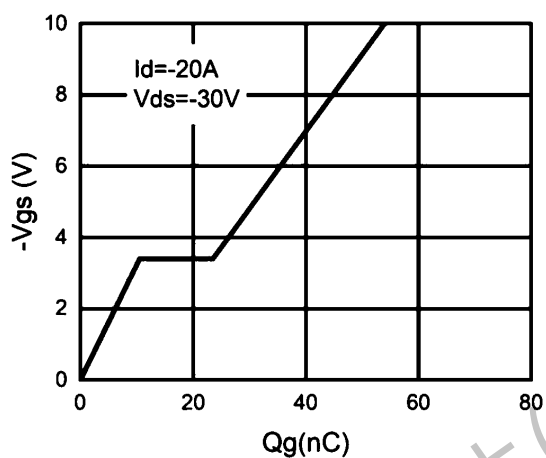


Figure 7. Gate Charge Waveforms

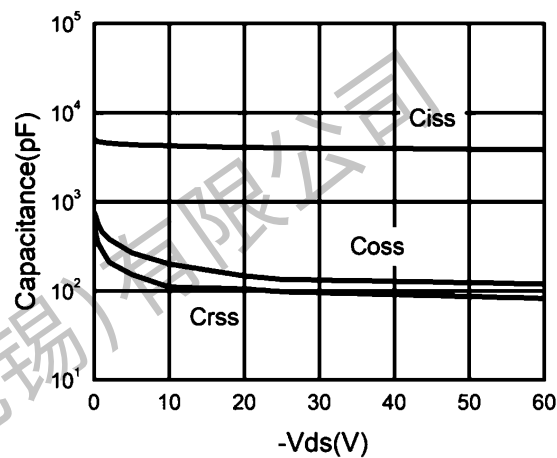


Figure 8. Capacitance

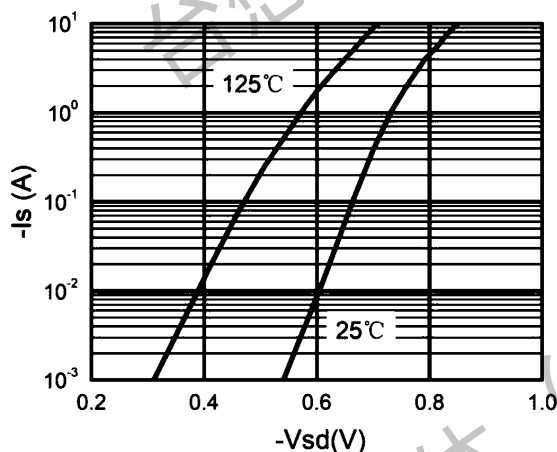


Figure 9. Body-Diode Characteristics

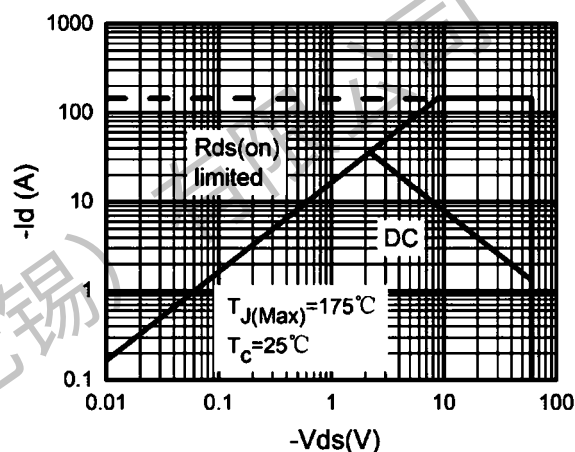


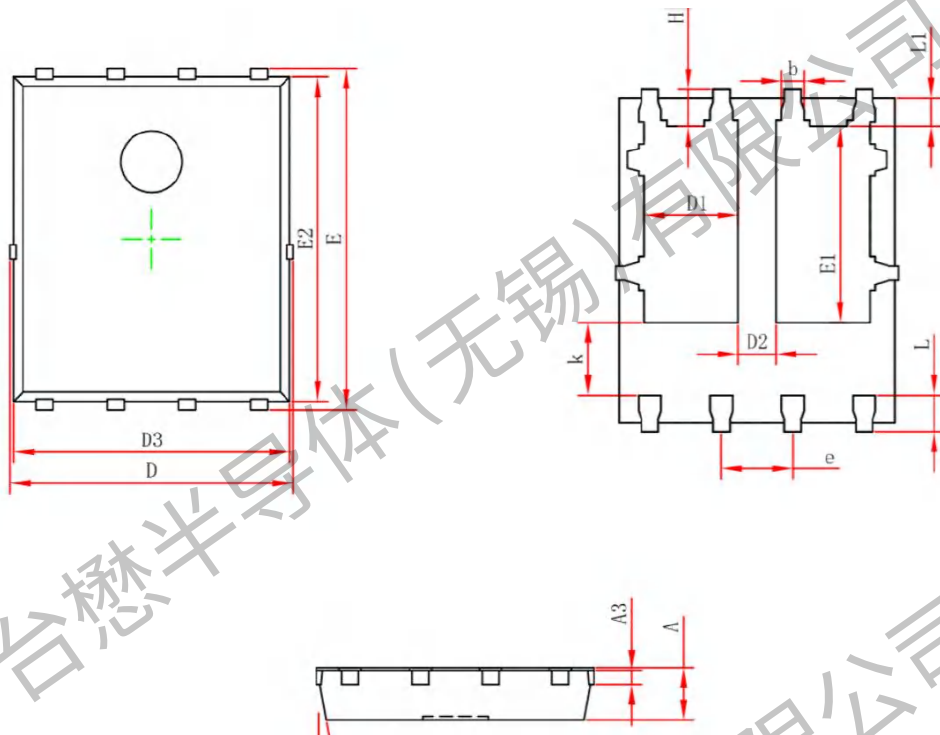
Figure 10. Maximum Safe Operating Area



# TM35G06NF

## N+P -Channel Enhancement Mode Mosfet

### Package Mechanical Data:DFN5x6-8L



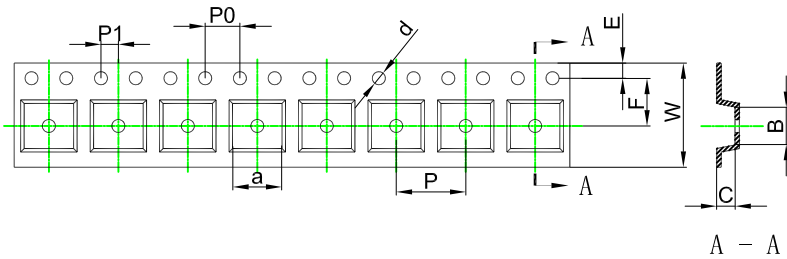
| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 0.900                     | 1.000 | 0.035                | 0.039 |
| A3     | 0.154REF.                 |       | 0.006REF.            |       |
| D      | 4.944                     | 5.096 | 0.195                | 0.201 |
| E      | 5.974                     | 6.126 | 0.235                | 0.241 |
| D1     | 1.470                     | 1.870 | 0.058                | 0.074 |
| D2     | 0.470                     | 0.870 | 0.019                | 0.034 |
| E1     | 3.375                     | 3.575 | 0.133                | 0.141 |
| D3     | 4.824                     | 4.976 | 0.190                | 0.196 |
| E2     | 5.674                     | 5.826 | 0.223                | 0.229 |
| k      | 1.190                     | 1.390 | 0.047                | 0.055 |
| b      | 0.350                     | 0.450 | 0.014                | 0.018 |
| e      | 1.270TYP.                 |       | 0.050TYP.            |       |
| L      | 0.559                     | 0.711 | 0.022                | 0.028 |
| L1     | 0.424                     | 0.576 | 0.017                | 0.023 |
| H      | 0.574                     | 0.726 | 0.023                | 0.029 |
| θ      | 10°                       | 12°   | 10°                  | 12°   |



# TM35G06NF

## N+P -Channel Enhancement Mode Mosfet

### PDFN5×6-8L Embossed Carrier Tape



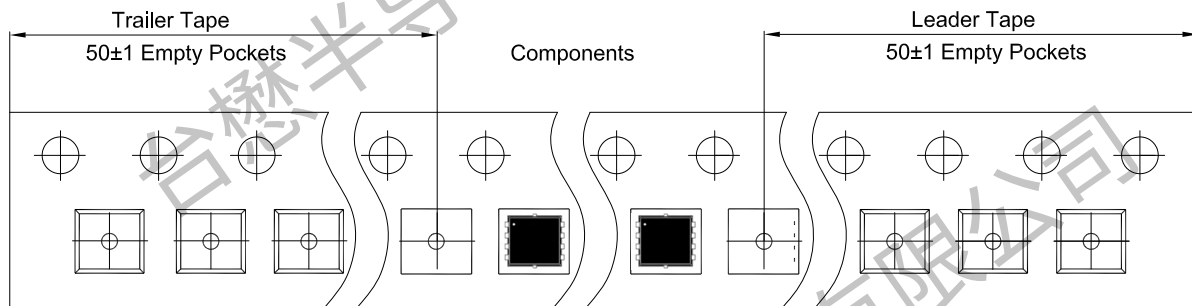
#### Packaging Description:

SOP-8L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 2,500 units per 13" or 33cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

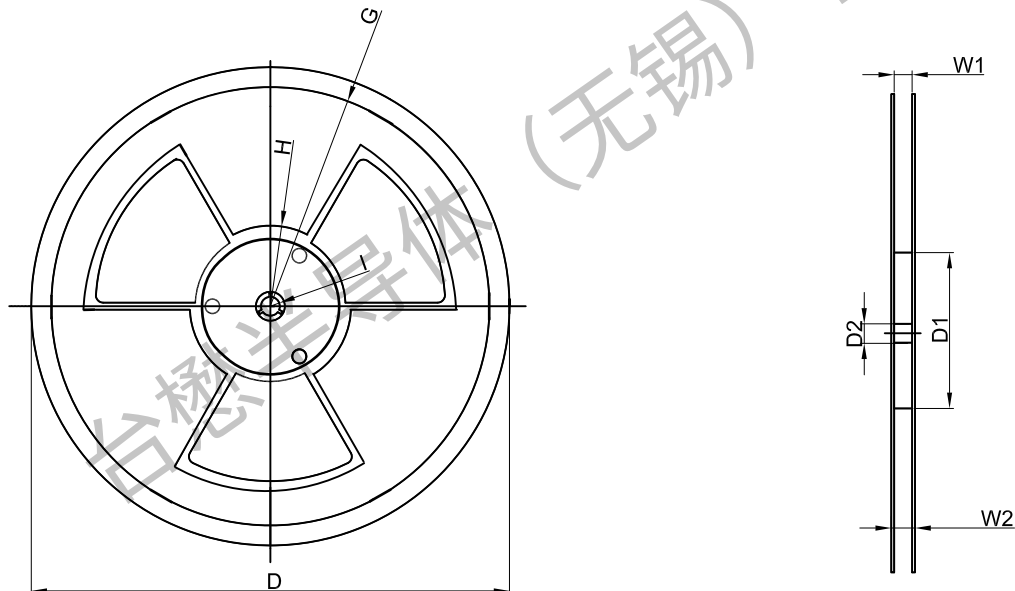
ALL DIM IN mm

| Dimensions are in millimeter |      |      |      |       |      |      |      |      |      |       |
|------------------------------|------|------|------|-------|------|------|------|------|------|-------|
| Pkg type                     | a    | B    | C    | d     | E    | F    | P0   | P    | P1   | W     |
| PDFN5×6-8L                   | 6.40 | 5.40 | 2.10 | Ø1.50 | 1.75 | 5.50 | 4.00 | 8.00 | 2.00 | 12.00 |

### PDFN5×6-8L Tape Leader and Trailer



### PDFN5×6-8L Reel



| Dimensions are in millimeter |         |        |       |         |        |       |       |       |
|------------------------------|---------|--------|-------|---------|--------|-------|-------|-------|
| Reel Option                  | D       | D1     | D2    | G       | H      | I     | W1    | W2    |
| 13"Dia                       | Ø330.00 | 100.00 | 13.00 | R135.00 | R55.00 | R6.50 | 12.00 | 14.00 |

| REEL      | Reel Size | Box        | Box Size(mm) | Carton     | Carton Size(mm) | G.W.(kg) |
|-----------|-----------|------------|--------------|------------|-----------------|----------|
| 5,000 pcs | 13 inch   | 10,000 pcs | 370×355×52   | 50,000 pcs | 400×360×368     |          |

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Revision history:

| Date       | Rev   | Description | Page |
|------------|-------|-------------|------|
| 2023.05.24 | 23.05 | Original    |      |