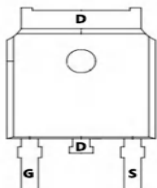
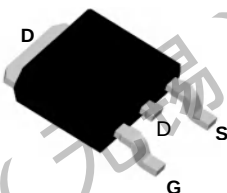
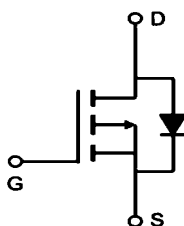


# TMG15P10D

## P-Channel Enhancement Mosfet

| <div><div>General Description</div><div><div>• Low <math>R_{DS(ON)}</math></div><div>• RoHS and Halogen-Free Compliant</div></div><div>Applications</div><div><div>• Load switch</div><div>• PWM</div></div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <div><div>General Features</div><div><div><math>V_{DS} = -100V</math> <math>I_D = -15A</math></div><div><math>R_{DS(ON)} = 115\text{ m}\Omega(\text{typ.}) @ V_{GS} = -10V</math></div></div><div><div>100% UIS Tested</div><div>100% <math>R_g</math> Tested</div></div></div> <div></div> |            |                    |                      |       |          |                      |                                     |     |          |                      |                 |                                  |                              |                                           |                      |   |                               |                                           |      |   |          |                      |     |   |                              |                         |    |   |           |                           |            |                    |       |                                      |            |                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------|----------------------|-------|----------|----------------------|-------------------------------------|-----|----------|----------------------|-----------------|----------------------------------|------------------------------|-------------------------------------------|----------------------|---|-------------------------------|-------------------------------------------|------|---|----------|----------------------|-----|---|------------------------------|-------------------------|----|---|-----------|---------------------------|------------|--------------------|-------|--------------------------------------|------------|--------------------|
| <div><div>D:TO-252-3L</div><div><div></div><div></div><div></div></div><div>Marking:G15P10</div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                |            |                    |                      |       |          |                      |                                     |     |          |                      |                 |                                  |                              |                                           |                      |   |                               |                                           |      |   |          |                      |     |   |                              |                         |    |   |           |                           |            |                    |       |                                      |            |                    |
| <div><div>Absolute Maximum Ratings</div><div>(<math>T_c = 25^{\circ}\text{C}</math> Unless Otherwise Noted)</div><table><tr><th>Symbol</th><th>Parameter</th><th>Rating</th><th>Units</th></tr><tr><td><math>V_{DS}</math></td><td>Drain-Source Voltage</td><td>-100</td><td>V</td></tr><tr><td><math>V_{GS}</math></td><td>Gate-Source Voltage</td><td><math>\pm 20</math></td><td>V</td></tr><tr><td><math>I_D@T_c=25^{\circ}\text{C}</math></td><td>Continuous Drain Current, <math>V_{GS} @ -10V</math></td><td>-15</td><td>A</td></tr><tr><td><math>I_D@T_c=100^{\circ}\text{C}</math></td><td>Continuous Drain Current, <math>V_{GS} @ -10V</math></td><td>-9.2</td><td>A</td></tr><tr><td><math>I_{DM}</math></td><td>Pulsed Drain Current</td><td>-58</td><td>A</td></tr><tr><td><math>P_D@T_c=25^{\circ}\text{C}</math></td><td>Total Power Dissipation</td><td>69</td><td>W</td></tr><tr><td><math>T_{STG}</math></td><td>Storage Temperature Range</td><td>-55 to 175</td><td><math>^{\circ}\text{C}</math></td></tr><tr><td><math>T_J</math></td><td>Operating Junction Temperature Range</td><td>-55 to 175</td><td><math>^{\circ}\text{C}</math></td></tr></table></div> |                                                                                                                                                                                                                                                                                                                                                                                | Symbol     | Parameter          | Rating               | Units | $V_{DS}$ | Drain-Source Voltage | -100                                | V   | $V_{GS}$ | Gate-Source Voltage  | $\pm 20$        | V                                | $I_D@T_c=25^{\circ}\text{C}$ | Continuous Drain Current, $V_{GS} @ -10V$ | -15                  | A | $I_D@T_c=100^{\circ}\text{C}$ | Continuous Drain Current, $V_{GS} @ -10V$ | -9.2 | A | $I_{DM}$ | Pulsed Drain Current | -58 | A | $P_D@T_c=25^{\circ}\text{C}$ | Total Power Dissipation | 69 | W | $T_{STG}$ | Storage Temperature Range | -55 to 175 | $^{\circ}\text{C}$ | $T_J$ | Operating Junction Temperature Range | -55 to 175 | $^{\circ}\text{C}$ |
| Symbol                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Parameter                                                                                                                                                                                                                                                                                                                                                                      | Rating     | Units              |                      |       |          |                      |                                     |     |          |                      |                 |                                  |                              |                                           |                      |   |                               |                                           |      |   |          |                      |     |   |                              |                         |    |   |           |                           |            |                    |       |                                      |            |                    |
| $V_{DS}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Drain-Source Voltage                                                                                                                                                                                                                                                                                                                                                           | -100       | V                  |                      |       |          |                      |                                     |     |          |                      |                 |                                  |                              |                                           |                      |   |                               |                                           |      |   |          |                      |     |   |                              |                         |    |   |           |                           |            |                    |       |                                      |            |                    |
| $V_{GS}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Gate-Source Voltage                                                                                                                                                                                                                                                                                                                                                            | $\pm 20$   | V                  |                      |       |          |                      |                                     |     |          |                      |                 |                                  |                              |                                           |                      |   |                               |                                           |      |   |          |                      |     |   |                              |                         |    |   |           |                           |            |                    |       |                                      |            |                    |
| $I_D@T_c=25^{\circ}\text{C}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Continuous Drain Current, $V_{GS} @ -10V$                                                                                                                                                                                                                                                                                                                                      | -15        | A                  |                      |       |          |                      |                                     |     |          |                      |                 |                                  |                              |                                           |                      |   |                               |                                           |      |   |          |                      |     |   |                              |                         |    |   |           |                           |            |                    |       |                                      |            |                    |
| $I_D@T_c=100^{\circ}\text{C}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Continuous Drain Current, $V_{GS} @ -10V$                                                                                                                                                                                                                                                                                                                                      | -9.2       | A                  |                      |       |          |                      |                                     |     |          |                      |                 |                                  |                              |                                           |                      |   |                               |                                           |      |   |          |                      |     |   |                              |                         |    |   |           |                           |            |                    |       |                                      |            |                    |
| $I_{DM}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Pulsed Drain Current                                                                                                                                                                                                                                                                                                                                                           | -58        | A                  |                      |       |          |                      |                                     |     |          |                      |                 |                                  |                              |                                           |                      |   |                               |                                           |      |   |          |                      |     |   |                              |                         |    |   |           |                           |            |                    |       |                                      |            |                    |
| $P_D@T_c=25^{\circ}\text{C}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Total Power Dissipation                                                                                                                                                                                                                                                                                                                                                        | 69         | W                  |                      |       |          |                      |                                     |     |          |                      |                 |                                  |                              |                                           |                      |   |                               |                                           |      |   |          |                      |     |   |                              |                         |    |   |           |                           |            |                    |       |                                      |            |                    |
| $T_{STG}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Storage Temperature Range                                                                                                                                                                                                                                                                                                                                                      | -55 to 175 | $^{\circ}\text{C}$ |                      |       |          |                      |                                     |     |          |                      |                 |                                  |                              |                                           |                      |   |                               |                                           |      |   |          |                      |     |   |                              |                         |    |   |           |                           |            |                    |       |                                      |            |                    |
| $T_J$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Operating Junction Temperature Range                                                                                                                                                                                                                                                                                                                                           | -55 to 175 | $^{\circ}\text{C}$ |                      |       |          |                      |                                     |     |          |                      |                 |                                  |                              |                                           |                      |   |                               |                                           |      |   |          |                      |     |   |                              |                         |    |   |           |                           |            |                    |       |                                      |            |                    |
| <div><div>Thermal Data</div><table><tr><th>Symbol</th><th>Parameter</th><th>Typ.</th><th>Max.</th><th>Unit</th></tr><tr><td><math>R_{\theta JA}</math></td><td>Thermal Resistance Junction-ambient</td><td>---</td><td>75</td><td><math>^{\circ}\text{C/W}</math></td></tr><tr><td><math>R_{\theta JC}</math></td><td>Thermal Resistance Junction-Case</td><td>---</td><td>1.8</td><td><math>^{\circ}\text{C/W}</math></td></tr></table></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                | Symbol     | Parameter          | Typ.                 | Max.  | Unit     | $R_{\theta JA}$      | Thermal Resistance Junction-ambient | --- | 75       | $^{\circ}\text{C/W}$ | $R_{\theta JC}$ | Thermal Resistance Junction-Case | ---                          | 1.8                                       | $^{\circ}\text{C/W}$ |   |                               |                                           |      |   |          |                      |     |   |                              |                         |    |   |           |                           |            |                    |       |                                      |            |                    |
| Symbol                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Parameter                                                                                                                                                                                                                                                                                                                                                                      | Typ.       | Max.               | Unit                 |       |          |                      |                                     |     |          |                      |                 |                                  |                              |                                           |                      |   |                               |                                           |      |   |          |                      |     |   |                              |                         |    |   |           |                           |            |                    |       |                                      |            |                    |
| $R_{\theta JA}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Thermal Resistance Junction-ambient                                                                                                                                                                                                                                                                                                                                            | ---        | 75                 | $^{\circ}\text{C/W}$ |       |          |                      |                                     |     |          |                      |                 |                                  |                              |                                           |                      |   |                               |                                           |      |   |          |                      |     |   |                              |                         |    |   |           |                           |            |                    |       |                                      |            |                    |
| $R_{\theta JC}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Thermal Resistance Junction-Case                                                                                                                                                                                                                                                                                                                                               | ---        | 1.8                | $^{\circ}\text{C/W}$ |       |          |                      |                                     |     |          |                      |                 |                                  |                              |                                           |                      |   |                               |                                           |      |   |          |                      |     |   |                              |                         |    |   |           |                           |            |                    |       |                                      |            |                    |



# TMG15P10D

# P-Channel Enhancement Mosfet

Electrical Characteristics ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)

| Static Characteristics |                                   |                                |       |      |      |           |
|------------------------|-----------------------------------|--------------------------------|-------|------|------|-----------|
| Symbol                 | Parameter                         | Test Conditions                | Value |      |      | Units     |
|                        |                                   |                                | Min.  | Typ. | Max. |           |
| $V_{DSS}$              | Drain to Source Breakdown Voltage | $V_{GS}=0V, I_D=-250\mu A$     | -100  | --   | --   | V         |
| $I_{DSS}$              | Drain to Source Leakage Current   | $V_{DS}=-100V, V_{GS}=0V$      | --    | --   | 1    | $\mu A$   |
| $I_{GSS(F)}$           | Gate to Source Forward Leakage    | $V_{GS}=-20V, V_{DS}=0V$       | --    | --   | 100  | nA        |
| $I_{GSS(R)}$           | Gate to Source Reverse Leakage    | $V_{GS}=+20V, V_{DS}=0V$       | --    | --   | -100 | nA        |
| $V_{GS(TH)}$           | Gate Threshold Voltage            | $V_{DS}=V_{GS}, I_D=-250\mu A$ | -1    | -2   | 3    | V         |
| $R_{DS(ON)1}$          | Drain-to-Source On-Resistance     | $V_{GS}=-10V, I_D=-5A$         | --    | 115  | 150  | $m\Omega$ |
| $R_{DS(ON)2}$          | Drain-to-Source On-Resistance     | $V_{GS}=-4.5V, I_D=-5A$        | --    | ---  | ---  | $m\Omega$ |

| Dynamic Characteristics |                              |                 |       |      |      |       |
|-------------------------|------------------------------|-----------------|-------|------|------|-------|
| Symbol                  | Parameter                    | Test Conditions | Value |      |      | Units |
|                         |                              |                 | Min.  | Typ. | Max. |       |
| $C_{iss}$               | Input Capacitance            | $V_{GS} = 0V$   | --    | 700  | --   | pF    |
| $C_{oss}$               | Output Capacitance           | $V_{DS} = -50V$ | --    | 56   | --   |       |
| $C_{rss}$               | Reverse Transfer Capacitance | $f = 1.0MHz$    | --    | 8.6  | --   |       |

| Resistive Switching Characteristics |                     |                 |       |      |      |       |
|-------------------------------------|---------------------|-----------------|-------|------|------|-------|
| Symbol                              | Parameter           | Test Conditions | Value |      |      | Units |
|                                     |                     |                 | Min.  | Typ. | Max. |       |
| $t_{d(ON)}$                         | Turn-on Delay Time  | $I_D = -5A$     | --    | 5.9  | --   | ns    |
| $t_r$                               | Rise Time           | $V_{DS} = -50V$ | --    | 3.7  | --   |       |
| $t_{d(OFF)}$                        | Turn-Off Delay Time | $V_{GS} = -10V$ | --    | 39.5 | --   |       |
| $t_f$                               | Fall Time           | $R_G = 5\Omega$ | --    | 24.6 | --   |       |
| $Q_g$                               | Total Gate Charge   | $V_{GS} = -10V$ | --    | 12.7 | --   | nC    |
| $Q_{gs}$                            | Gate Source Charge  | $V_{DS} = -50V$ | --    | 2.1  | --   |       |
| $Q_{gd}$                            | Gate Drain Charge   | $I_D = -5A$     | --    | 2.3  | --   |       |

| Source-Drain Diode Characteristics |                         |                        |       |      |      |       |
|------------------------------------|-------------------------|------------------------|-------|------|------|-------|
| Symbol                             | Parameter               | Test Conditions        | Value |      |      | Units |
|                                    |                         |                        | Min.  | Typ. | Max. |       |
| $V_{SD}$                           | Diode Forward Voltage   | $I_S=-5A, V_{GS}=0V$   | --    | --   | -1.2 | V     |
| $t_{rr}$                           | Reverse Recovery time   | $I_S=-5A, V_{DD}=-50V$ | --    | 66   | --   | ns    |
| $Q_{rr}$                           | Reverse Recovery Charge | $dI/dt=100A/\mu s$     | --    | 214  | --   | nC    |

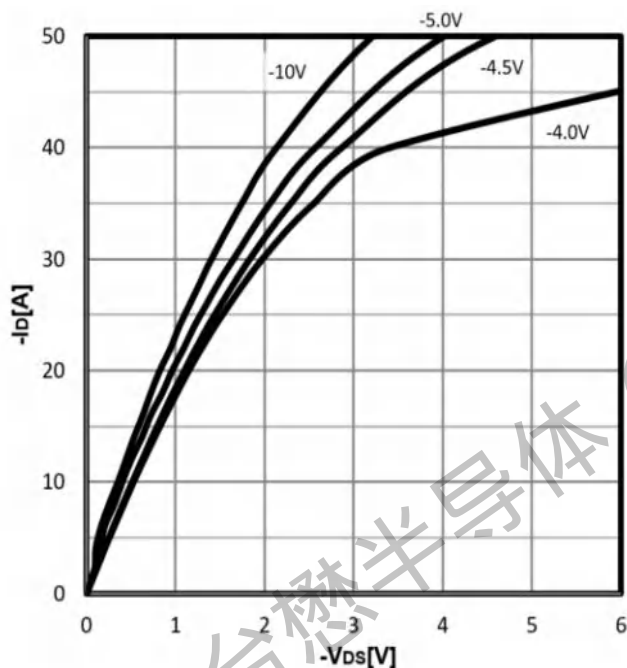
# TMG15P10D

## P-Channel Enhancement Mosfet

### Characteristics Curve:

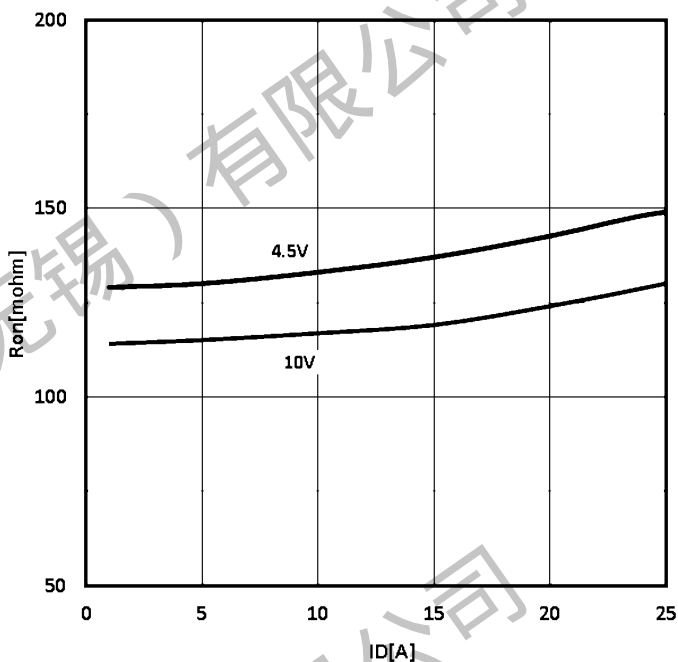
**Typ. output characteristics**

$$-I_D = f(-V_{DS})$$



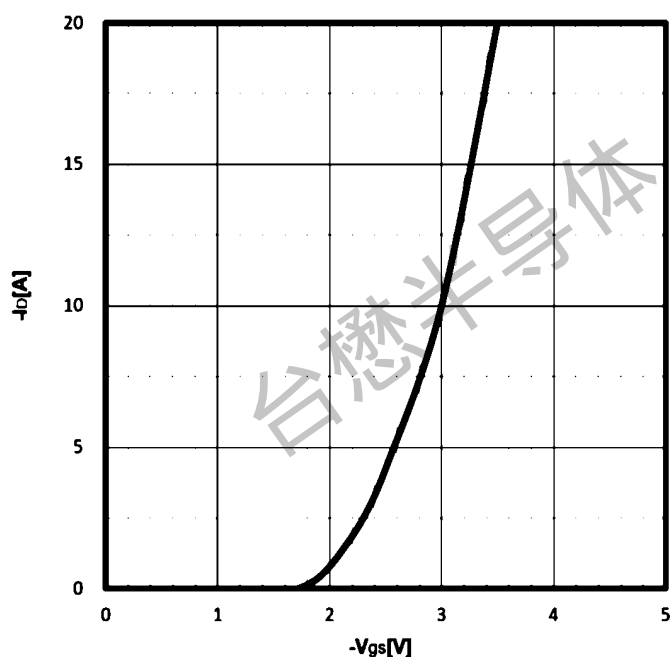
**Typ. drain-source on resistance**

$$R_{DS(on)} = f(-I_D)$$



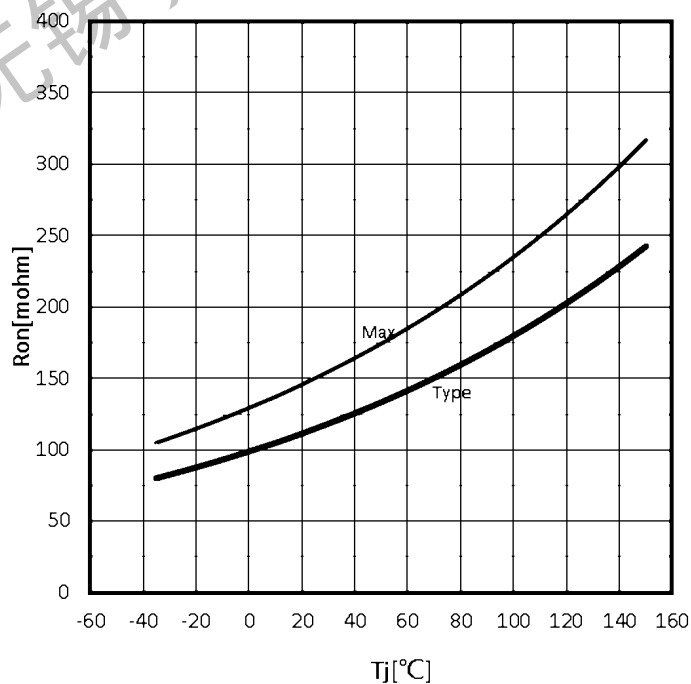
**Typ. transfer characteristics**

$$-I_D = f(-V_{GS})$$



**Drain-source on-state resistance**

$$R_{DS(on)} = f(T_j); I_D = -5A; V_{GS} = -10V$$



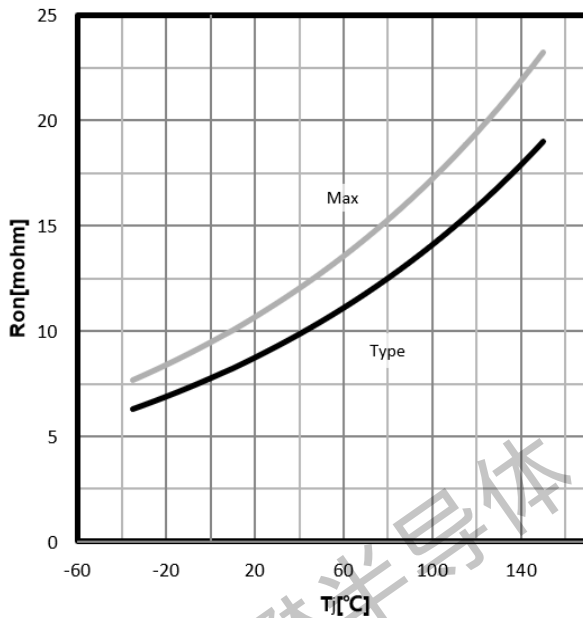


## TMG15P10D

## P-Channel Enhancement Mosfet

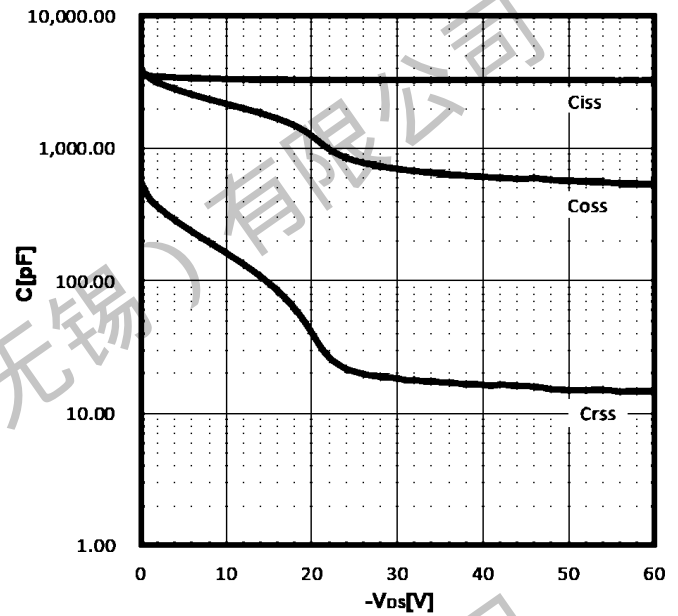
### Drain-source on-state resistance

$$R_{DS(on)} = f(T_j); I_D = -20A; V_{GS} = -10V$$



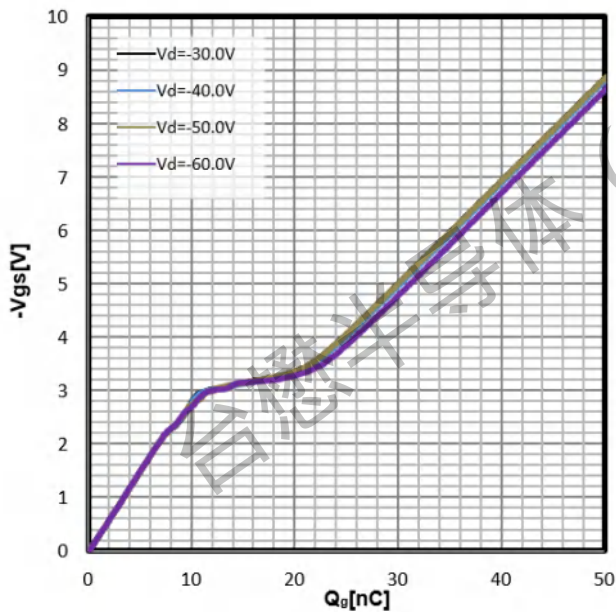
### Typ. capacitances

$$C = f(V_{DS}); V_{GS} = 0V; f = 1MHz$$



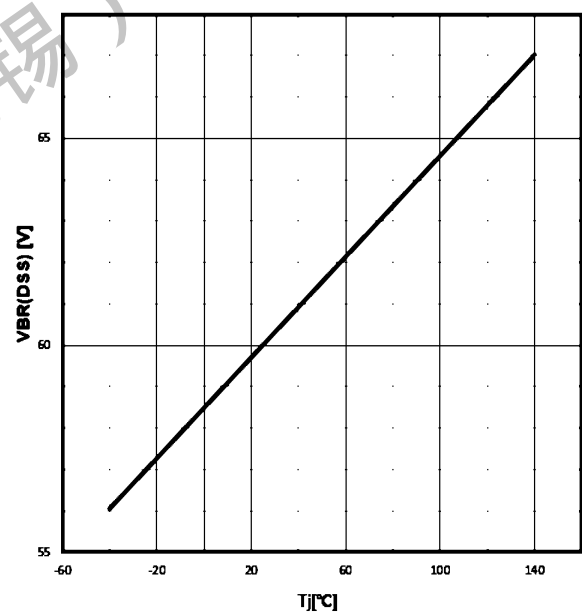
### Typ. gate charge

$$V_{GS} = f(Q_{gate}); I_D = -20A$$



### Drain-source breakdown voltage

$$V_{BR(DSS)} = f(T_j); I_D = -250\mu A$$

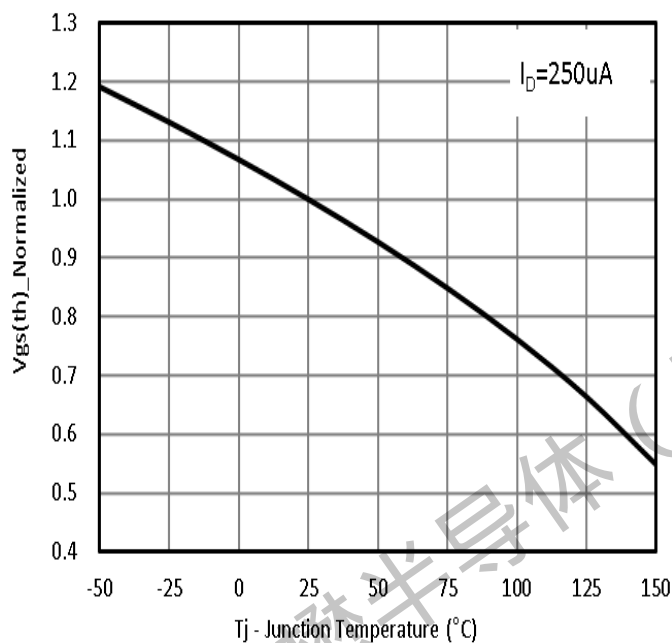


# TMG15P10D

## P-Channel Enhancement Mosfet

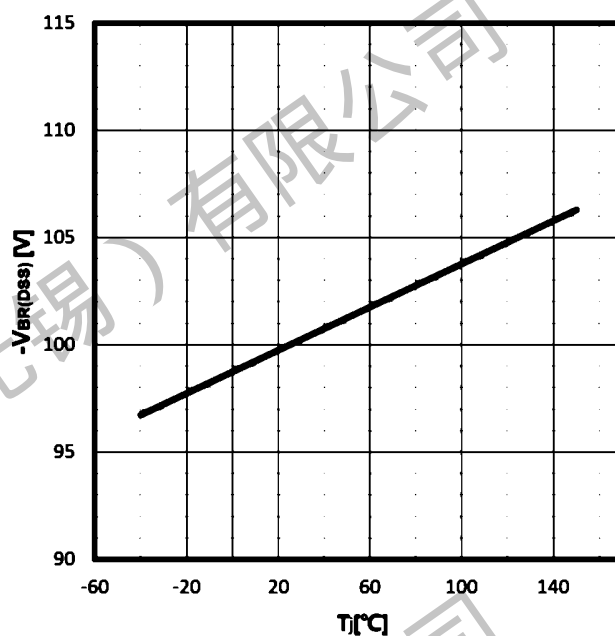
### Gate Threshold Voltage

$$-V_{TH}=f(T_j); I_D=-250\mu A$$



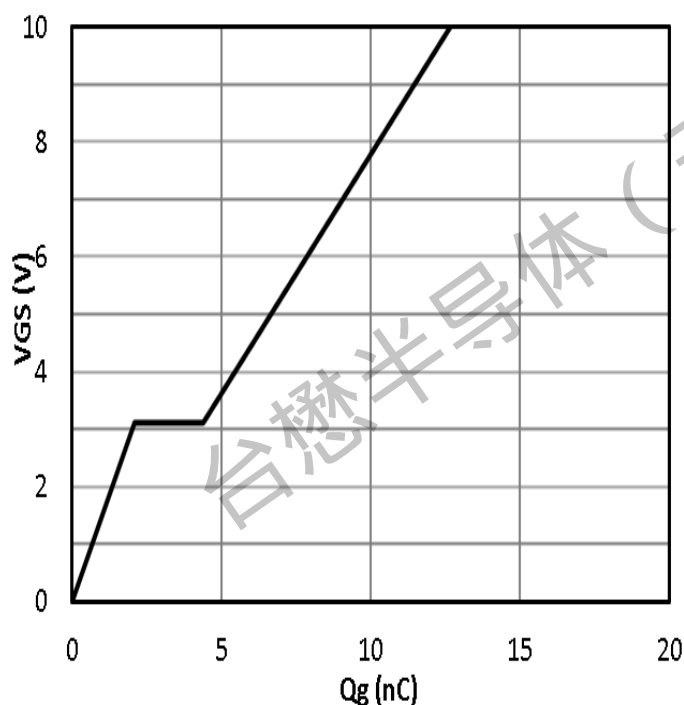
### Drain-source breakdown voltage

$$-V_{BR(DSS)}=f(T_j); I_D=-250\mu A$$



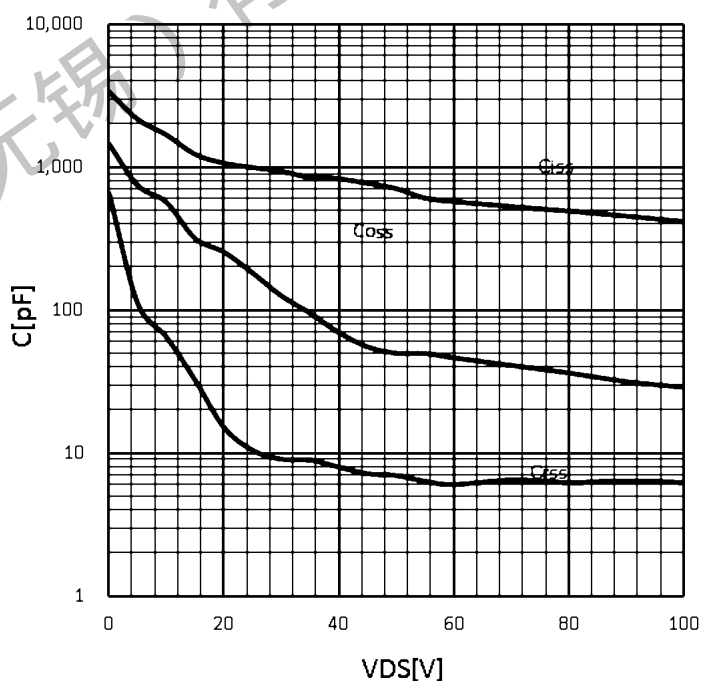
### Typ. gate charge

$$-V_{GS}=f(Q_g); I_D=-5A$$



### Typ. capacitances

$$C=f(-V_{DS}); V_{GS}=0V; f=1MHz$$

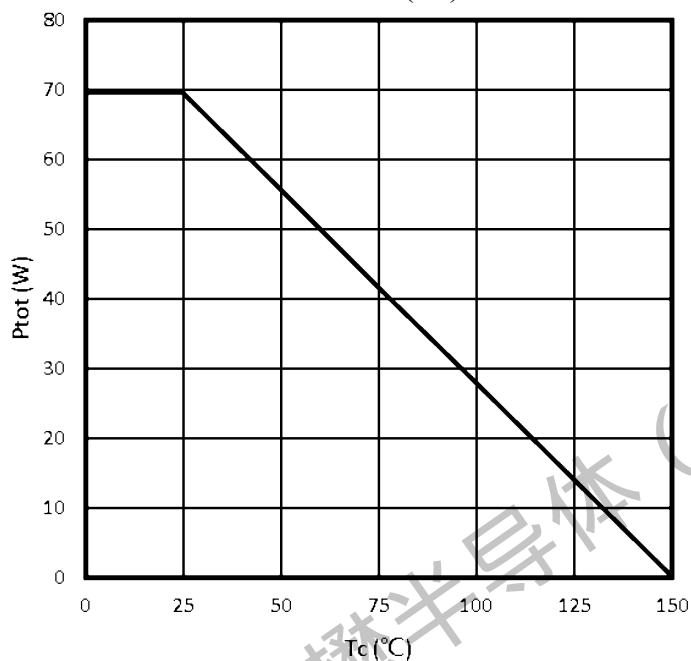


# TMG15P10D

## P-Channel Enhancement Mosfet

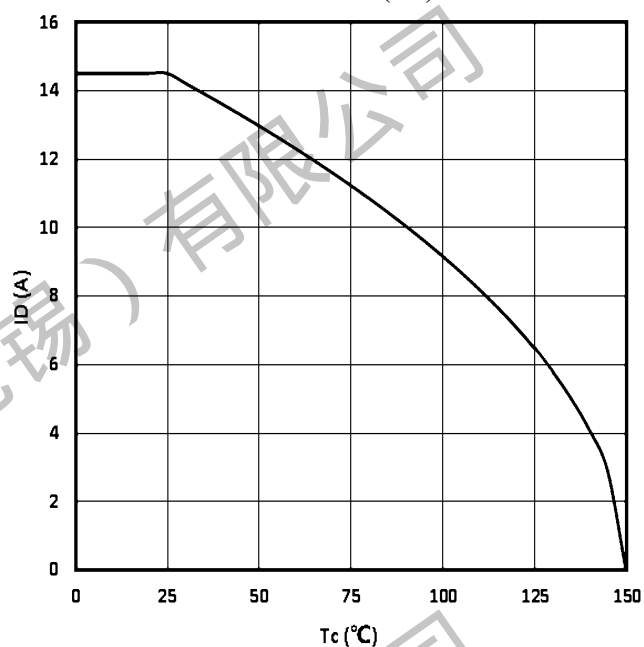
**Power Dissipation**

$$P_{tot}=f(T_C)$$



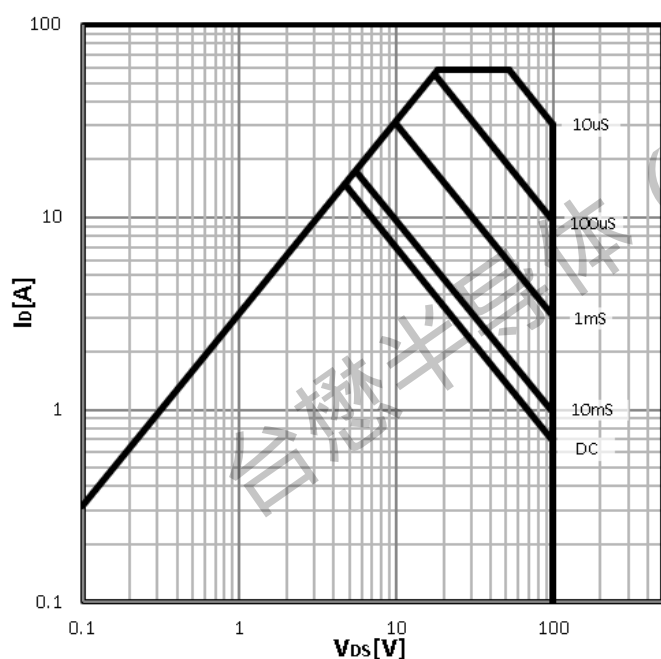
**Maximum Drain Current**

$$-I_D=f(T_C)$$



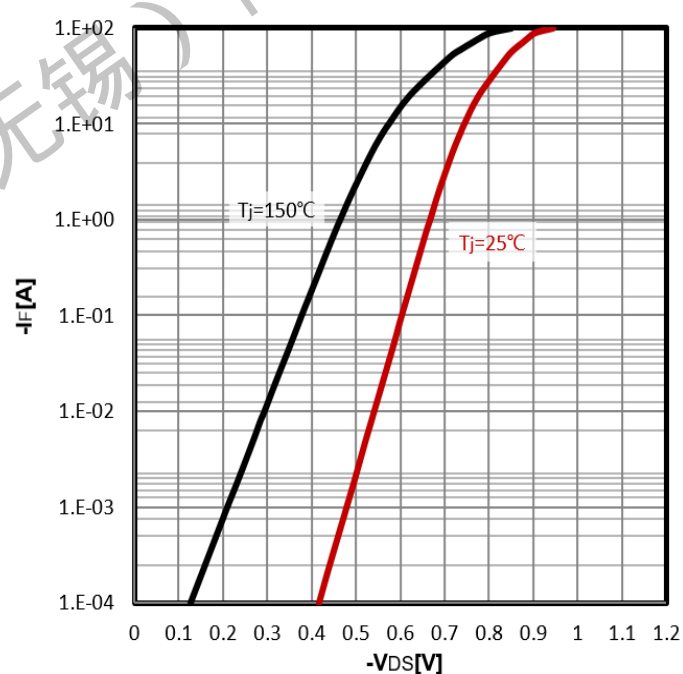
**Safe operating area**

$$-I_D=f(-V_{DS})$$



**Body Diode Forward Voltage Variation**

$$-I_F=f(-V_{DS})$$

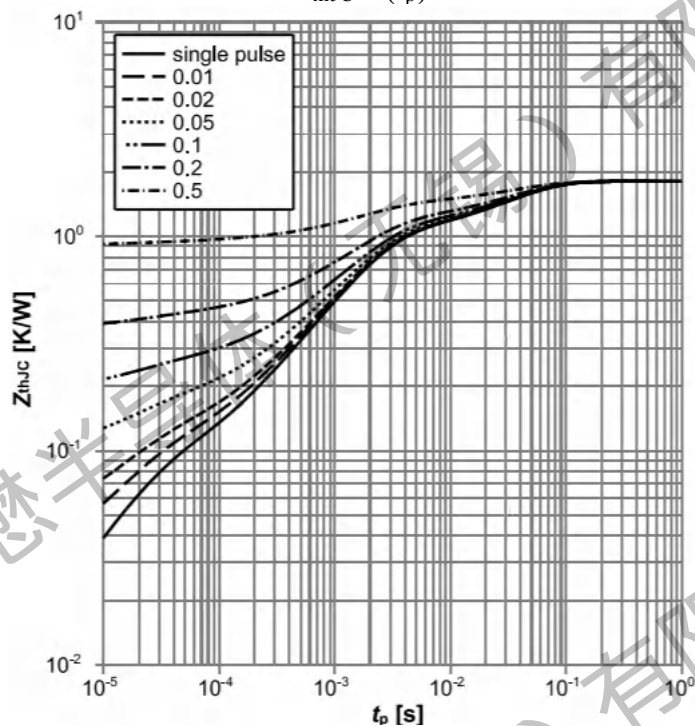


TMG15P10D

P-Channel Enhancement Mosfet

Max. transient thermal impedance

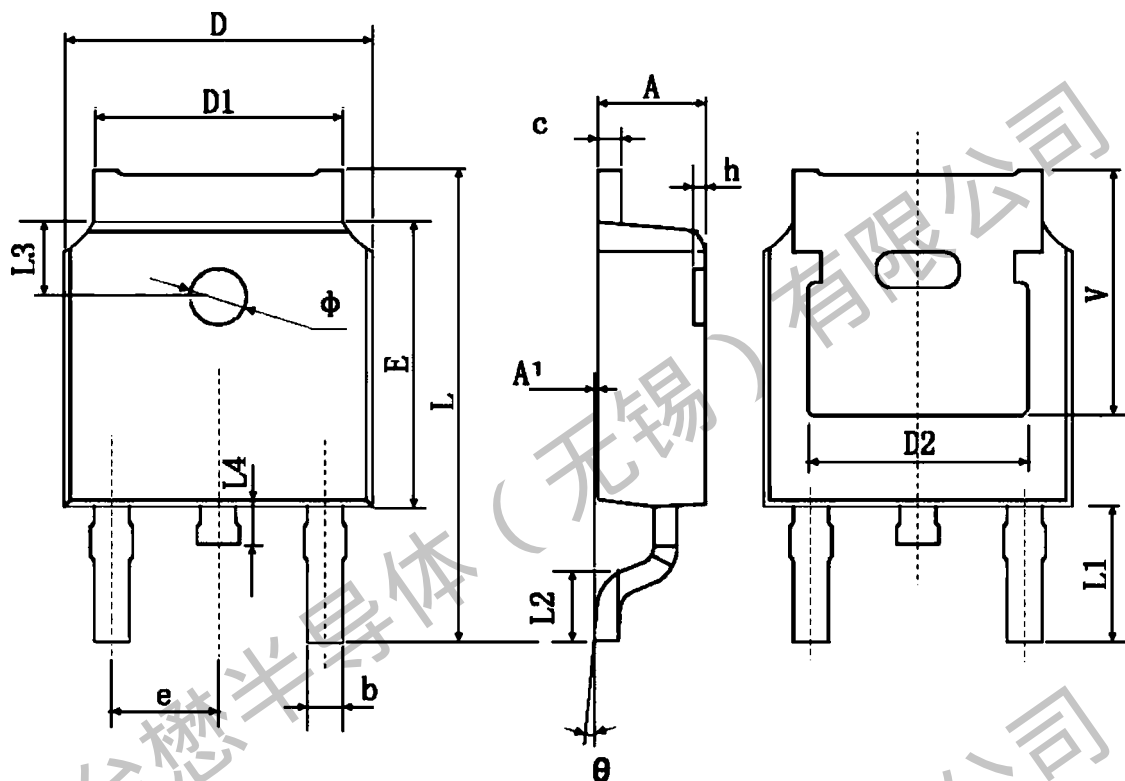
$$Z_{thJC}=f(t_p)$$



# TMG15P10D

## P-Channel Enhancement Mosfet

### Package Mechanical Data: TO-252-3L

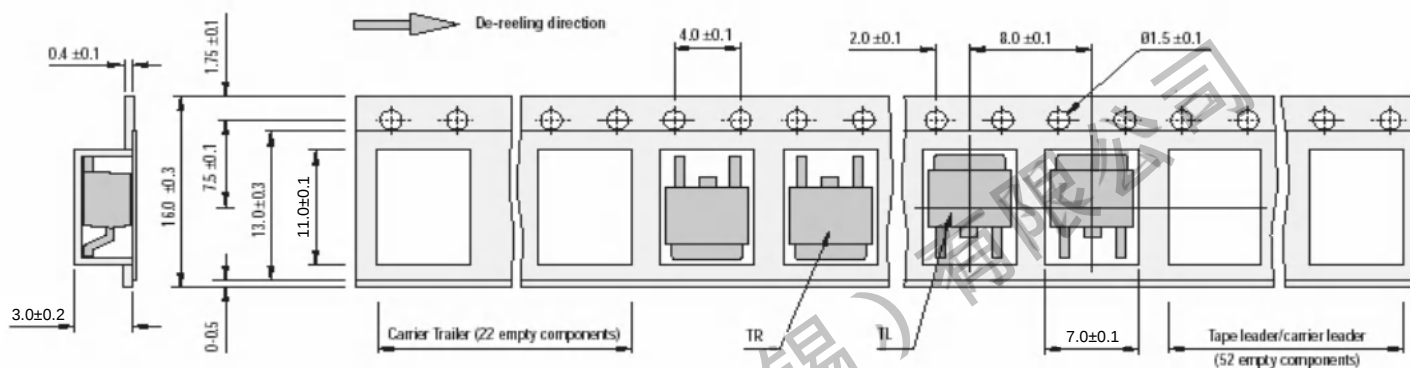


| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 2.200                     | 2.400  | 0.087                | 0.094 |
| A1     | 0.000                     | 0.127  | 0.000                | 0.005 |
| b      | 0.660                     | 0.860  | 0.026                | 0.034 |
| c      | 0.460                     | 0.580  | 0.018                | 0.023 |
| D      | 6.500                     | 6.700  | 0.256                | 0.264 |
| D1     | 5.100                     | 5.460  | 0.201                | 0.215 |
| D2     | 4.830 TYP.                |        | 0.190 TYP.           |       |
| E      | 6.000                     | 6.200  | 0.236                | 0.244 |
| e      | 2.186                     | 2.386  | 0.086                | 0.094 |
| L      | 9.800                     | 10.400 | 0.386                | 0.409 |
| L1     | 2.900 TYP.                |        | 0.114 TYP.           |       |
| L2     | 1.400                     | 1.700  | 0.055                | 0.067 |
| L3     | 1.600 TYP.                |        | 0.063 TYP.           |       |
| L4     | 0.600                     | 1.000  | 0.024                | 0.039 |
| Φ      | 1.100                     | 1.300  | 0.043                | 0.051 |
| θ      | 0°                        | 8°     | 0°                   | 8°    |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| V      | 5.350 TYP.                |        | 0.211 TYP.           |       |

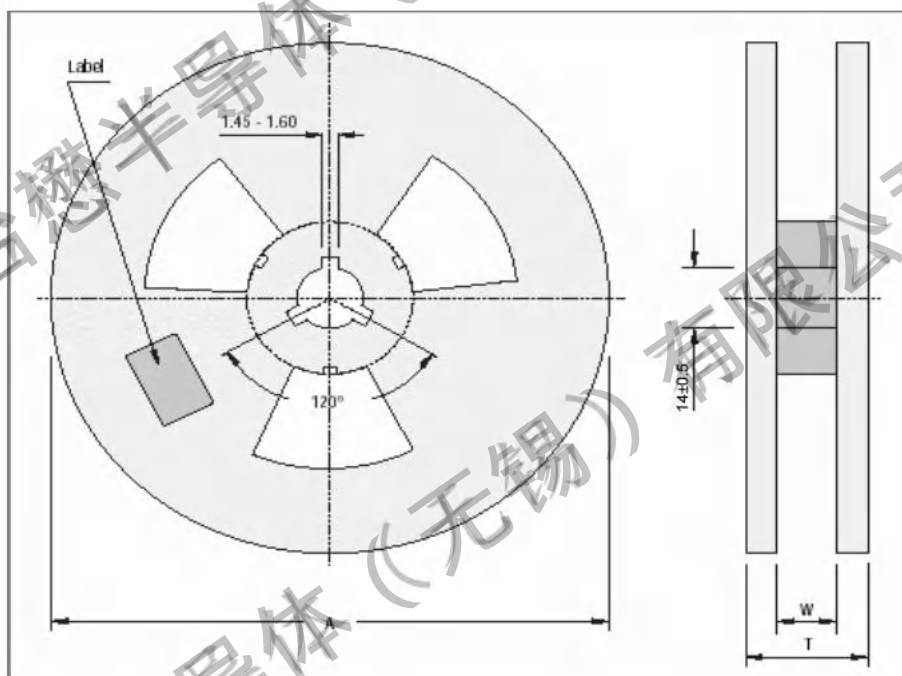
# TMG15P10D

## P-Channel Enhancement Mosfet

### TO-252-3L Embossed Carrier Tape



### TO-252-3L Reel



All Dimensions are in mm.

| Reel Specifications |            |                      |                       |                           |
|---------------------|------------|----------------------|-----------------------|---------------------------|
| Package             | Tape Width | Reel Dia.<br>A - Max | Inside Thickness<br>W | Reel Thickness<br>T - max |
| TO-252-3L           | 16         | 330                  | $18.0 \pm 1.5$        | 20                        |

### Packaging Information

| REEL      | Reel Size | Box       | Box Size(mm) | Carton     | Carton Size(mm) | G.W.(kg) |
|-----------|-----------|-----------|--------------|------------|-----------------|----------|
| 2,500 pcs | 13 inch   | 5,000 pcs | 355×370×50   | 25,000 pcs | 380×275×380     |          |

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Revision history:

| Date       | Rev   | Description | Page |
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| 2023.04.21 | 23.04 | Original    |      |