

1200V, 12mΩ SiC MOSFET

SiC MOSFET in a TO-247-4L plastic package, designed for high frequency, high efficiency systems.

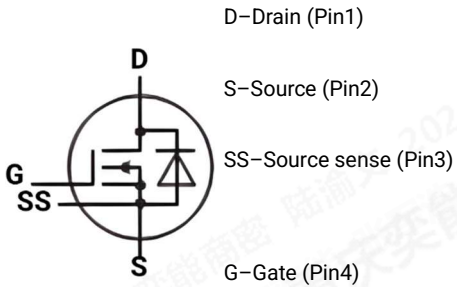
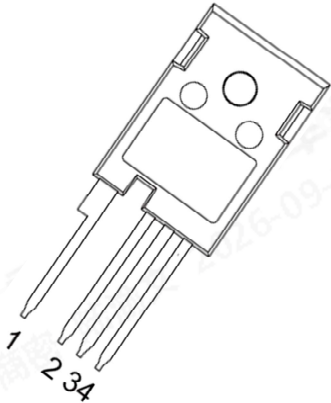
Features

- Kelvin source configuration
- Low specific on-resistance
- Reduced Gate charge
- Optimized dynamic performance
- Robust gate design
- 0V turn-off gate voltage for simple gate drive
- 100% UIS
- Tested Easy to parallel
- RoHS compliant
- High creepage design

Typical applications

- Switching mode power supplies
- UPS & Energy storage system
- Battery formation instrument
- PV MPPT and inverters
- EV Chargers
- Welding machines
- Motor Drives

|                           |              |
|---------------------------|--------------|
| <b>V<sub>DS</sub></b>     | <b>1200V</b> |
| <b>R<sub>DS(on)</sub></b> | <b>12mΩ</b>  |



| Type       | Package   | Marking    |
|------------|-----------|------------|
| IM120R012Z | TO-247-4L | IM120R012Z |

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## 1 Quick reference data

**Table 1 Absolute maximum rating**

| Parameter               | Symbol    | Note or test condition                                   | Value      | Unit               |
|-------------------------|-----------|----------------------------------------------------------|------------|--------------------|
| Drain-source voltage    | $V_{DS}$  | $25^{\circ}\text{C} \leq T_j \leq 175^{\circ}\text{C}$   | 1200       | V                  |
| Drain current           | $I_D$     | $V_{GS} = 18\text{V}; T_{mb} = 25^{\circ}\text{C}$       | 165        | A                  |
| Total power dissipation | $P_{tot}$ | $T_{mb} = 25^{\circ}\text{C}, T_j = 175^{\circ}\text{C}$ | 625        | W                  |
| Junction temperature    | $T_j$     |                                                          | -55 to 175 | $^{\circ}\text{C}$ |

**Table 2 Static characteristics**

| Parameter                        | Symbol       | Note or test condition                                            | Value |      |      | Unit       |
|----------------------------------|--------------|-------------------------------------------------------------------|-------|------|------|------------|
|                                  |              |                                                                   | Min.  | Typ. | Max. |            |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS} = 15\text{V}; I_D = 76\text{A}; T_j = 25^{\circ}\text{C}$ |       | 14   |      | m $\Omega$ |
|                                  |              | $V_{GS} = 18\text{V}; I_D = 76\text{A}; T_j = 25^{\circ}\text{C}$ |       | 12   | 20   | m $\Omega$ |

**Table 3 Dynamic characteristics**

| Parameter         | Symbol       | Note or test condition                                     | Value |      |      | Unit |
|-------------------|--------------|------------------------------------------------------------|-------|------|------|------|
|                   |              |                                                            | Min.  | Typ. | Max. |      |
| Total gate charge | $Q_{G(tot)}$ | $I_D = 76\text{A}; V_{DS} = 800\text{V};$                  |       | 244  |      | nC   |
| Gate-drain charge | $Q_{GD}$     | $V_{GS} = -4\text{V}/18\text{V}; T_j = 25^{\circ}\text{C}$ |       | 31   |      | nC   |

**Table 4 Source-drain diode**

| Parameter        | Symbol | Note or test condition                                                                                         | Value |      |      | Unit |
|------------------|--------|----------------------------------------------------------------------------------------------------------------|-------|------|------|------|
|                  |        |                                                                                                                | Min.  | Typ. | Max. |      |
| Recovered charge | $Q_r$  | $I_{SD} = 37.5\text{A}; di/dt = 1400\text{A}/\mu\text{s};$<br>$V_{DS} = 600\text{V}; T_j = 25^{\circ}\text{C}$ |       | 439  |      | nC   |

## 2 Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

**Table 5 Limiting values**

| Parameter               | Symbol       | Note or test condition                                   | Value     | Unit |
|-------------------------|--------------|----------------------------------------------------------|-----------|------|
| Drain-source voltage    | $V_{DS}$     | $25^{\circ}\text{C} \leq T_j \leq 175^{\circ}\text{C}$   | 1200      | V    |
| Gate-source voltage     | $V_{GS,max}$ | Absolute maximum values                                  | -10 to 22 | V    |
| Gate-source voltage     | $V_{GS,op}$  | Recommended operational values                           | -4 to 18  | V    |
| Total power dissipation | $P_{tot}$    | $T_{mb} = 25^{\circ}\text{C}, T_j = 175^{\circ}\text{C}$ | 625       | W    |

### 3 Thermal & mechanical characteristics

|                                        |              |                                                                 |            |             |
|----------------------------------------|--------------|-----------------------------------------------------------------|------------|-------------|
| Drain current                          | $I_D$        | $V_{GS} = 18V; T_{mb} = 25^{\circ}C$                            | 165        | A           |
|                                        |              | $V_{GS} = 18V; T_{mb} = 100^{\circ}C$                           | 116        | A           |
| Peak drain current                     | $I_{DM}$     | Pulse width $t_p$ limited by $T_{jmax}$                         | 330        | A           |
| Continuous diode current               | $I_S$        | $V_{GS} = -4V; T_{mb} = 25^{\circ}C$                            | 125        | A           |
| Pulse diode current                    | $I_{SM}$     | $V_{GS} = -4V$ ; pulse width $t_p$ limited by $T_{jmax}$        | 330        | A           |
| Single pulse drain-to-source avalanche | $E_{as}$     | $I_{AS} = 47A; L = 1mH$ ;<br>$V_{DD} = 100V; T_j = 25^{\circ}C$ | 1104       | mJ          |
| Storage temperature                    | $T_{stg}$    |                                                                 | -55 to 175 | $^{\circ}C$ |
| Junction temperature                   | $T_j$        |                                                                 | -55 to 175 | $^{\circ}C$ |
| Peak soldering temperature             | $T_{sld(M)}$ |                                                                 | 260        | $^{\circ}C$ |

### 3 Thermal & mechanical characteristics

| Parameter                                         | Symbol         | Note or test condition | Value |      |      | Unit |
|---------------------------------------------------|----------------|------------------------|-------|------|------|------|
|                                                   |                |                        | Min.  | Typ. | Max. |      |
| Thermal resistance from junction to mounting base | $R_{th(j-mb)}$ |                        |       | 0.24 |      | K/W  |
| Thermal resistance from junction to ambient       | $R_{th(j-a)}$  | In free air            |       | 40   |      | K/W  |

#### Note:

- It is recommended that a metal washer is inserted between screw head and mounting tab.
- Do not use self-tapping screws.
- Device is ESD sensitive. Handling precautions are recommended.

### 4 Characteristics

**Table 6** Static characteristics

| Parameter                      | Symbol        | Note or test condition                            | Value |      |      | Unit    |
|--------------------------------|---------------|---------------------------------------------------|-------|------|------|---------|
|                                |               |                                                   | Min.  | Typ. | Max. |         |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $I_D = 100\mu A; V_{GS} = 0V; T_j = 25^{\circ}C$  | 1200  |      |      | V       |
| Gate-source threshold voltage  | $V_{GS(th)}$  | $I_D = 20mA; V_{DS} = V_{GS}; T_j = 25^{\circ}C$  | 2.4   | 3.0  | 4.0  | V       |
|                                |               | $I_D = 20mA; V_{DS} = V_{GS}; T_j = 175^{\circ}C$ |       | 2.0  |      | V       |
| Drain leakage current          | $I_{DSS}$     | $V_{DS} = 1200V; V_{GS} = 0V; T_j = 25^{\circ}C$  |       |      | 100  | $\mu A$ |
|                                |               | $V_{DS} = 1200V; V_{GS} = 0V;$                    |       | 2    |      | $\mu A$ |

4 Characteristics

| Parameter                        | Symbol              | Note or test condition                                                             | Value |      |      | Unit       |
|----------------------------------|---------------------|------------------------------------------------------------------------------------|-------|------|------|------------|
|                                  |                     |                                                                                    | Min.  | Typ. | Max. |            |
|                                  |                     | $T_j = 175^{\circ}\text{C}$                                                        |       |      |      |            |
| Gate leakage current             | $I_{\text{GSS}}$    | $V_{\text{GS}} = 22\text{V}; V_{\text{DS}} = 0\text{V}; T_j = 25^{\circ}\text{C}$  |       |      | 100  | nA         |
|                                  |                     | $V_{\text{GS}} = -10\text{V}; V_{\text{DS}} = 0\text{V}; T_j = 25^{\circ}\text{C}$ |       |      | 100  | nA         |
| Drain-source on-state resistance | $R_{\text{DS(on)}}$ | $V_{\text{GS}} = 15\text{V}; I_{\text{D}} = 76\text{A}; T_j = 25^{\circ}\text{C}$  |       | 14   |      | m $\Omega$ |
|                                  |                     | $V_{\text{GS}} = 18\text{V}; I_{\text{D}} = 76\text{A}; T_j = 25^{\circ}\text{C}$  |       | 12   | 20   | m $\Omega$ |
|                                  |                     | $V_{\text{GS}} = 18\text{V}; I_{\text{D}} = 76\text{A}; T_j = 175^{\circ}\text{C}$ |       | 21   |      | m $\Omega$ |
| Gate resistance                  | $R_{\text{G}}$      | $f = 1\text{ MHz}; T_j = 25^{\circ}\text{C}$                                       |       | 1.5  |      | $\Omega$   |
| Transconductance                 | $g_{\text{fs}}$     | $V_{\text{DS}} = 20\text{V}; I_{\text{D}} = 76\text{A}; T_j = 25^{\circ}\text{C}$  |       | 67   |      | S          |

**Table 7 Dynamic characteristics**

| Parameter                        | Symbol              | Note or test condition                                                                                                                                                                  | Value |      |      | Unit          |
|----------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|------|---------------|
|                                  |                     |                                                                                                                                                                                         | Min.  | Typ. | Max. |               |
| Total gate charge                | $Q_{\text{G(tot)}}$ | $I_{\text{D}} = 76\text{A}; V_{\text{DS}} = 800\text{V};$<br>$V_{\text{GS}} = -4\text{V}/18\text{V}; T_j = 25^{\circ}\text{C}$                                                          |       | 244  |      | nC            |
| Gate-source charge               | $Q_{\text{GS}}$     |                                                                                                                                                                                         |       | 94   |      | nC            |
| Gate-drain charge                | $Q_{\text{GD}}$     |                                                                                                                                                                                         |       | 31   |      | nC            |
| Input capacitance                | $C_{\text{iSS}}$    | $V_{\text{DS}} = 800\text{V}; V_{\text{GS}} = 0\text{V};$<br>$f = 1\text{ MHz}; T_j = 25^{\circ}\text{C}$                                                                               |       | 5967 |      | pF            |
| Output capacitance               | $C_{\text{OSS}}$    |                                                                                                                                                                                         |       | 227  |      | pF            |
| Reverse transfer capacitance     | $C_{\text{rSS}}$    |                                                                                                                                                                                         |       | 9.9  |      | pF            |
| $C_{\text{OSS}}$ stored energy   | $E_{\text{OSS}}$    | $V_{\text{DS}} = 800\text{V}; V_{\text{GS}} = -4\text{ V}/18\text{V};$<br>$R_{\text{G(ext)}} = 5\Omega; I_{\text{D}} = 37.5\text{A};$<br>$L = 100\mu\text{H}; T_j = 25^{\circ}\text{C}$ |       | 73   |      | $\mu\text{J}$ |
| Turn-on delay time               | $t_{\text{d(on)}}$  |                                                                                                                                                                                         |       | 31   |      | ns            |
| Rise time                        | $t_{\text{r}}$      |                                                                                                                                                                                         |       | 32   |      | ns            |
| Turn-off delay time              | $t_{\text{d(off)}}$ |                                                                                                                                                                                         |       | 90   |      | ns            |
| Fall time                        | $t_{\text{f}}$      |                                                                                                                                                                                         |       | 7    |      | ns            |
| Turn-on energy (Body Diode FWD)  | $E_{\text{on}}$     |                                                                                                                                                                                         |       | 730  |      | $\mu\text{J}$ |
| Turn-off energy (Body Diode FWD) | $E_{\text{off}}$    |                                                                                                                                                                                         |       | 175  |      | $\mu\text{J}$ |

**Table 8 Source-drain diode**

| Parameter                | Symbol           | Note or test condition                                                                                                       | Value |      |      | Unit |
|--------------------------|------------------|------------------------------------------------------------------------------------------------------------------------------|-------|------|------|------|
|                          |                  |                                                                                                                              | Min.  | Typ. | Max. |      |
| Source-drain voltage     | $V_{\text{SD}}$  | $V_{\text{GS}} = 0\text{V}; I_{\text{SD}} = 38\text{A}; T_j = 25^{\circ}\text{C}$                                            |       | 3.0  | 5.0  | V    |
|                          |                  | $V_{\text{GS}} = -4\text{V}; I_{\text{SD}} = 38\text{A}; T_j = 25^{\circ}\text{C}$                                           |       | 4.2  | 6.0  | V    |
|                          |                  | $V_{\text{GS}} = -4\text{V}; I_{\text{SD}} = 38\text{A}; T_j = 175^{\circ}\text{C}$                                          |       | 4.0  |      | V    |
| Reverse recovery time    | $t_{\text{rr}}$  | $I_{\text{SD}} = 37.5\text{A}; di/dt = 1400\text{A}/\mu\text{s};$<br>$V_{\text{DS}} = 600\text{V}; T_j = 25^{\circ}\text{C}$ |       | 24   |      | ns   |
| Recovered charge         | $Q_{\text{r}}$   |                                                                                                                              |       | 439  |      | nC   |
| Reverse recovery current | $I_{\text{rrm}}$ |                                                                                                                              |       | 31   |      | A    |

5 Characteristic diagrams

5 Characteristic diagrams

Figure 1 Total power dissipation as a function of mounting base temperature; maximum values

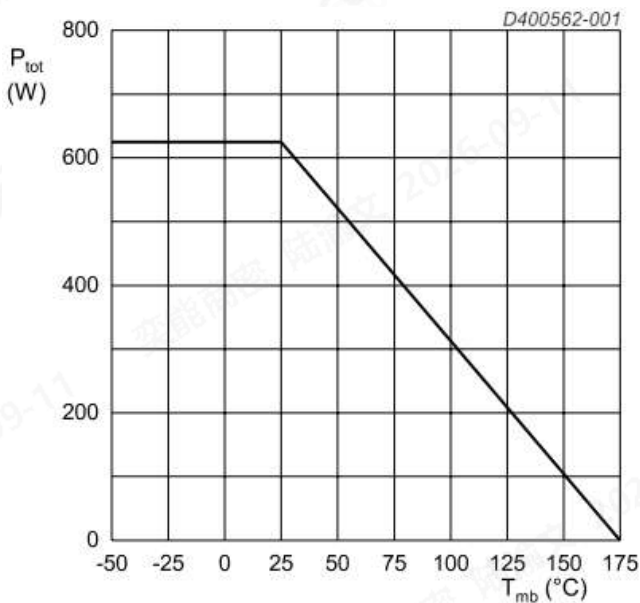


Figure 2 Continuous Drain Current as a function of mounting base temperature

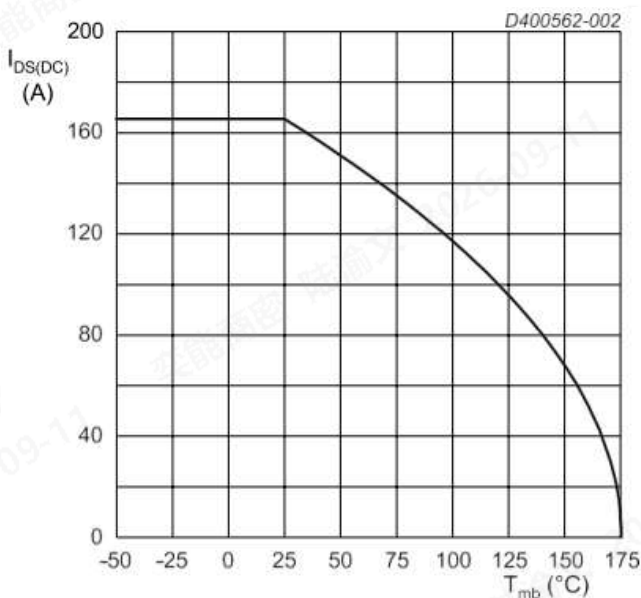
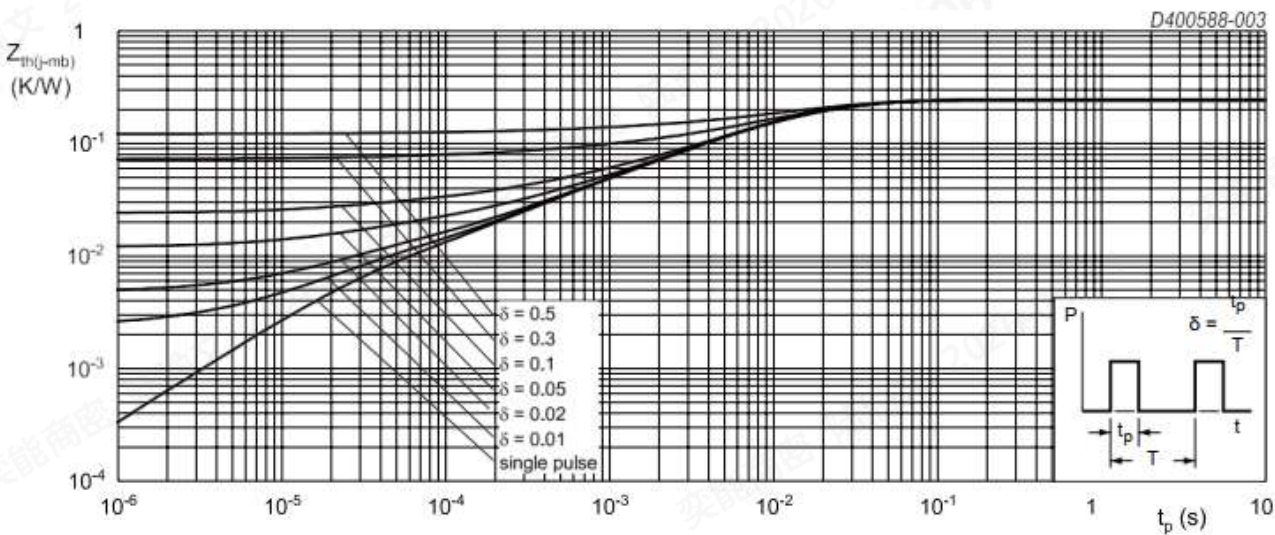
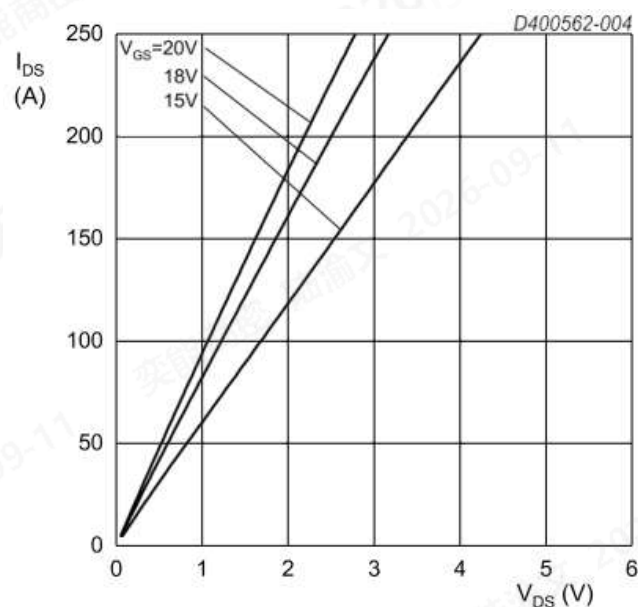
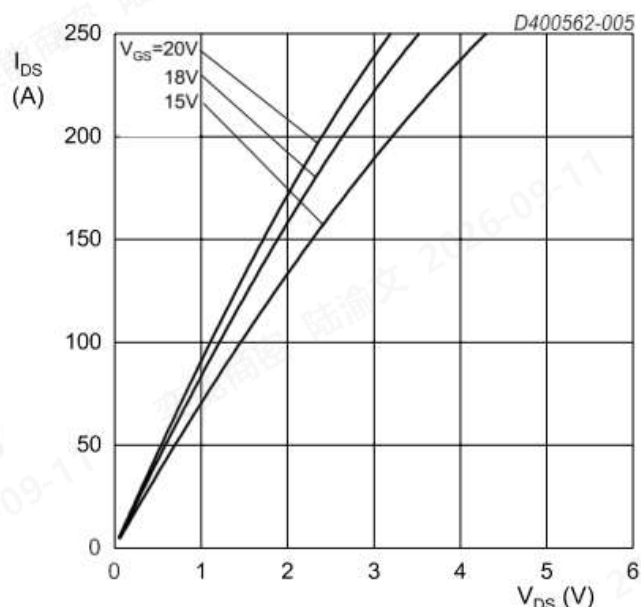
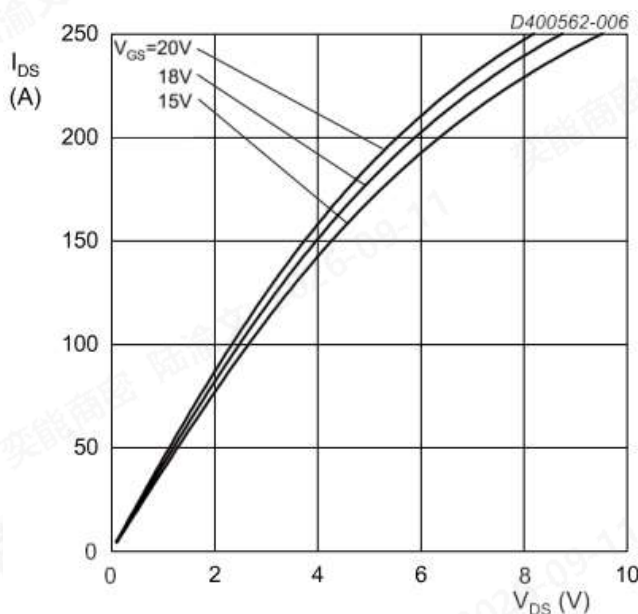
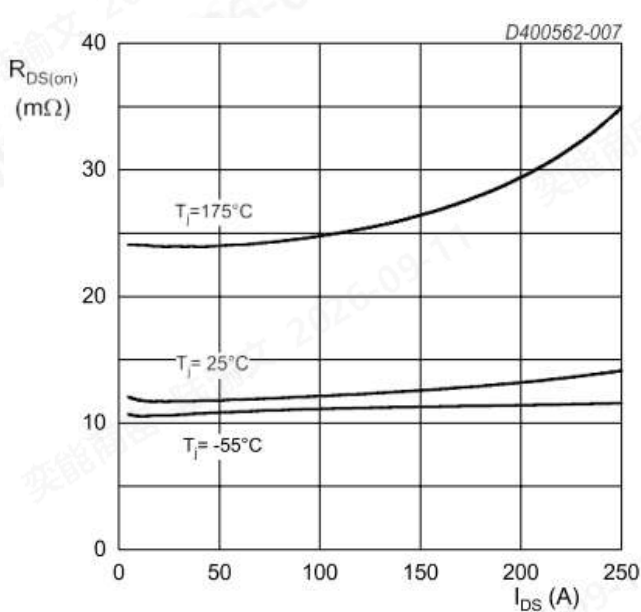


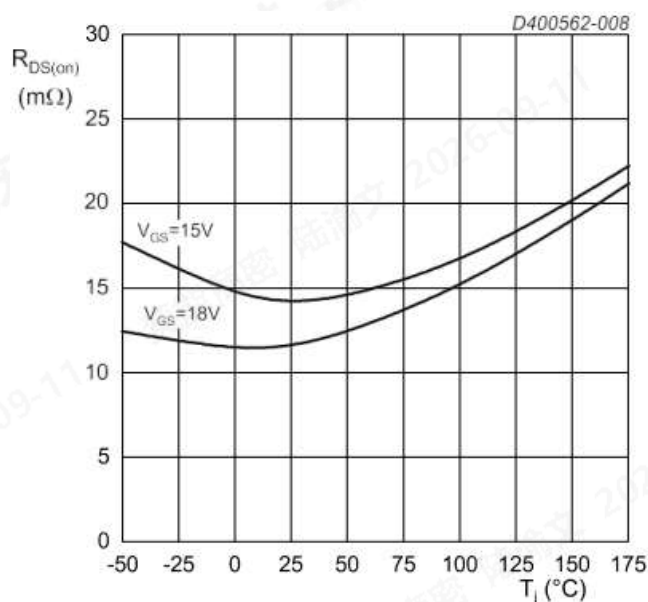
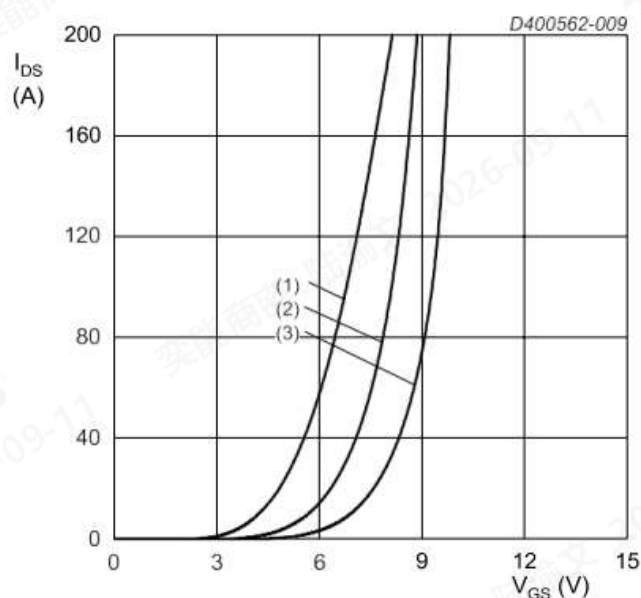
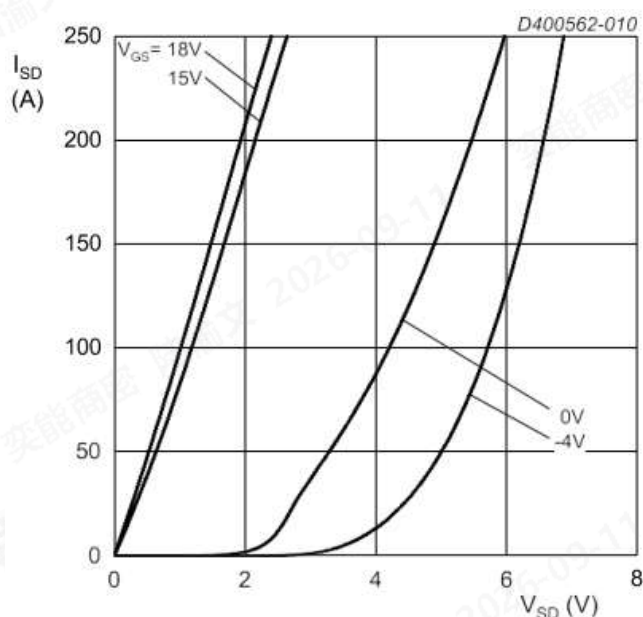
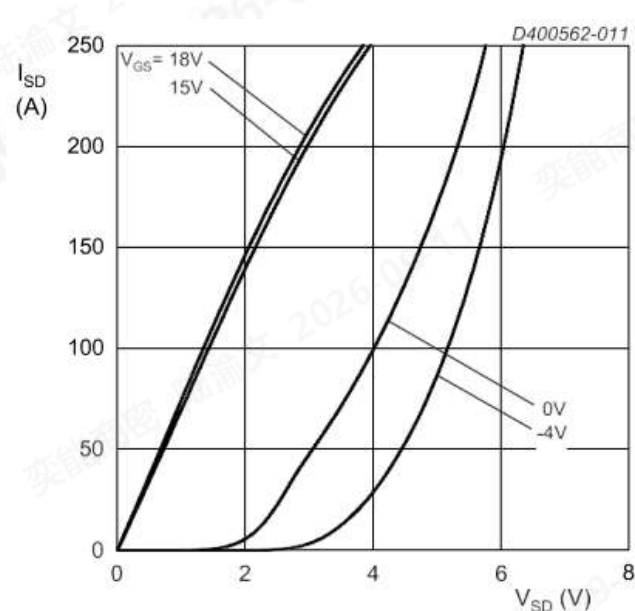
Figure 3 Transient thermal impedance from junction to mounting base as a function of pulse duration



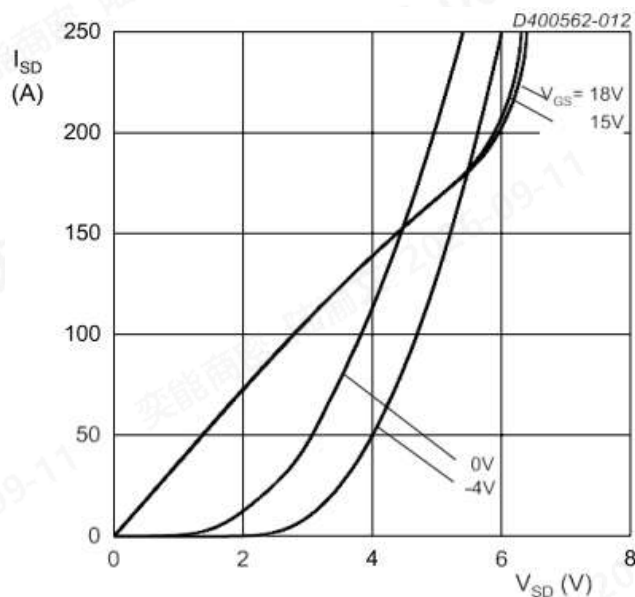
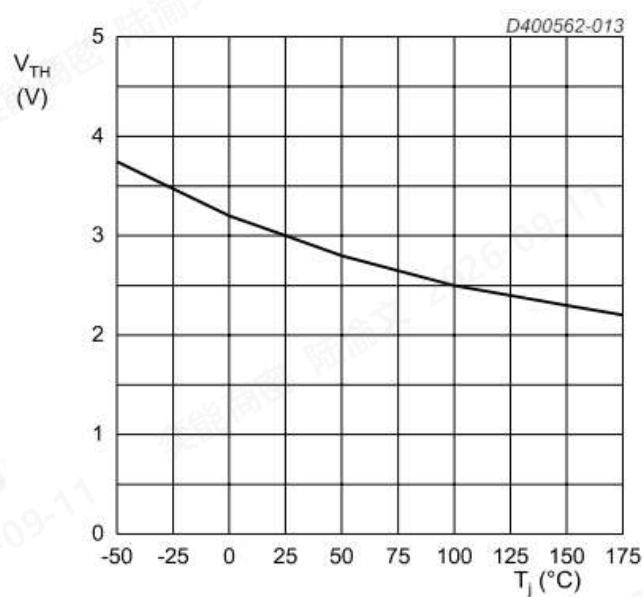
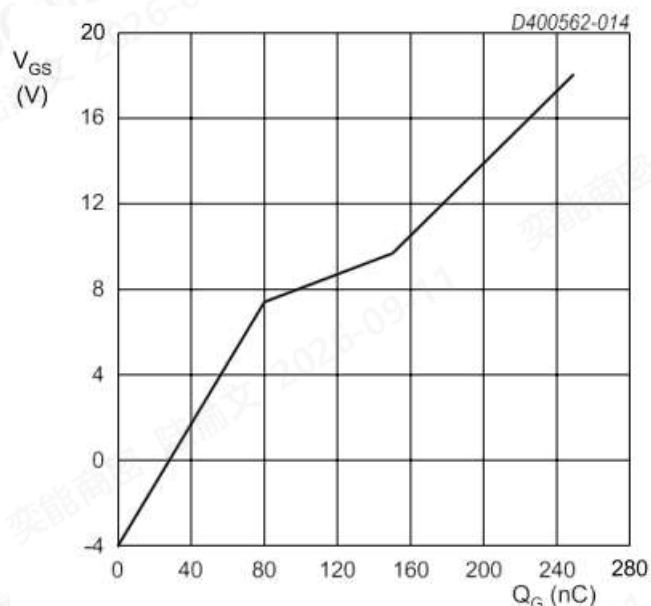
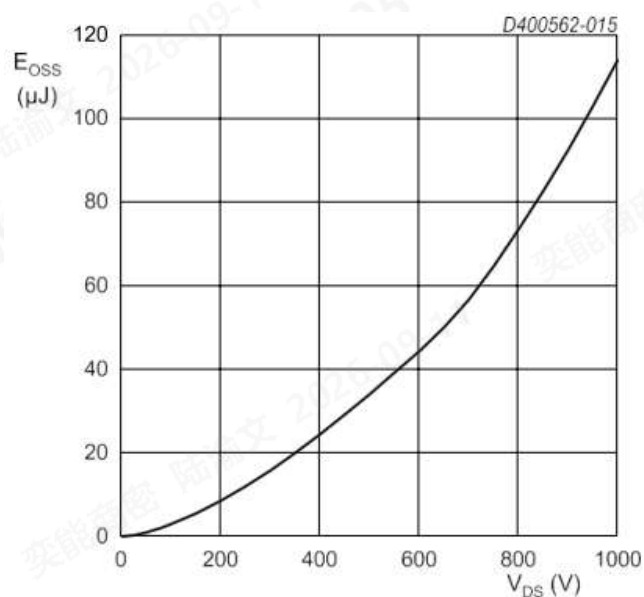
## 5 Characteristic diagrams

**Figure 4** Output characteristics; drain current as a function of drain-source voltage; typical values $T_j = -55^\circ\text{C}$ ;  $t_p < 200\mu\text{s}$ **Figure 5** Output characteristics; drain current as a function of drain-source voltage; typical values $T_j = 25^\circ\text{C}$ ;  $t_p < 200\mu\text{s}$ **Figure 6** Output characteristics; drain current as a function of drain-source voltage; typical values $T_j = 175^\circ\text{C}$ ;  $t_p < 200\mu\text{s}$ **Figure 7** Drain-source on-state resistance as a function of drain current; typical values $V_{GS} = 18\text{V}$ ;  $t_p < 200\mu\text{s}$ 

## 5 Characteristic diagrams

**Figure 8 Drain-source on-state resistance as a function of junction temperature** $I_{DS} = 76A$ ;  $t_p < 200\mu s$ **Figure 9 Transfer characteristics; drain current as a function of gate-source voltage; typical values** $V_{DS} = 20V$ ;  $t_p < 200\mu s$ (1)  $T_j = 175^{\circ}C$ ; (2)  $T_j = 25^{\circ}C$ ; (3)  $T_j = -55^{\circ}C$ **Figure 10 Body diode forward characteristics; typical values** $T_j = -55^{\circ}C$ ;  $t_p < 200\mu s$ **Figure 11 Body diode forward characteristics; typical values** $T_j = 25^{\circ}C$ ;  $t_p < 200\mu s$ 

## 5 Characteristic diagrams

**Figure 12 Body diode forward characteristics; typical values** $T_j = 175^\circ\text{C}$ ;  $t_p < 200\mu\text{s}$ **Figure 13 Threshold voltage as a function of junction temperature** $V_{DS} = V_{GS}$ ;  $I_{DS} = 20\text{mA}$ **Figure 14 Gate-source voltage as a function of gate charge** $I_{DS} = 76\text{A}$ ;  $I_{GS} = 0.1\text{mA}$ ;  $V_{DS} = 800\text{V}$ ;  $T_j = 25^\circ\text{C}$ **Figure 15 Output capacitor stored energy as a function of drain-source voltage**

## 5 Characteristic diagrams

**Figure 16 Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values**

$V_{DS} = 0 - 1000V$   
 $T_j = 25^\circ C$ ;  $V_{AC} = 25mV$ ;  $f = 1MHz$

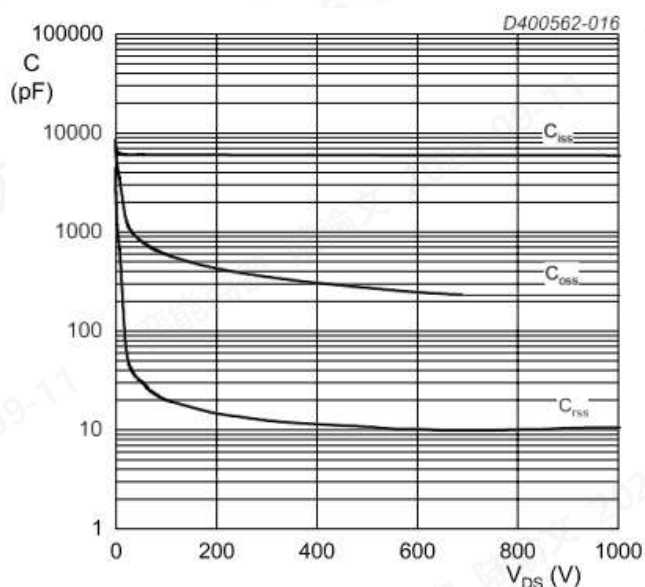


**Figure 17 Forward bias safe operating area**

$T_j = 25^\circ C$ ;  $D = 0$

Parameter:  $t_p$

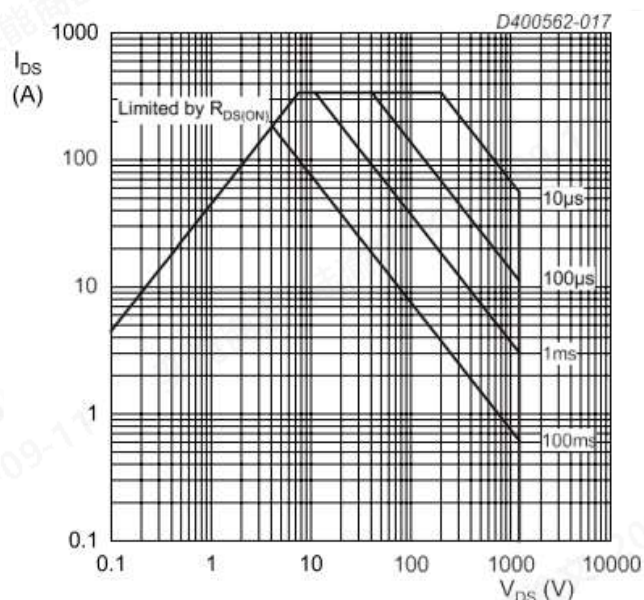


**Figure 18 Clamped Inductive Switching Energy as a function of drain current**

$T_j = 25^\circ C$ ;  $V_{DD} = 800V$ ;  $R_{G(ext)} = 10\Omega$ ;  
 $V_{GS} = -4 V/18V$ ;  $L = 100\mu H$

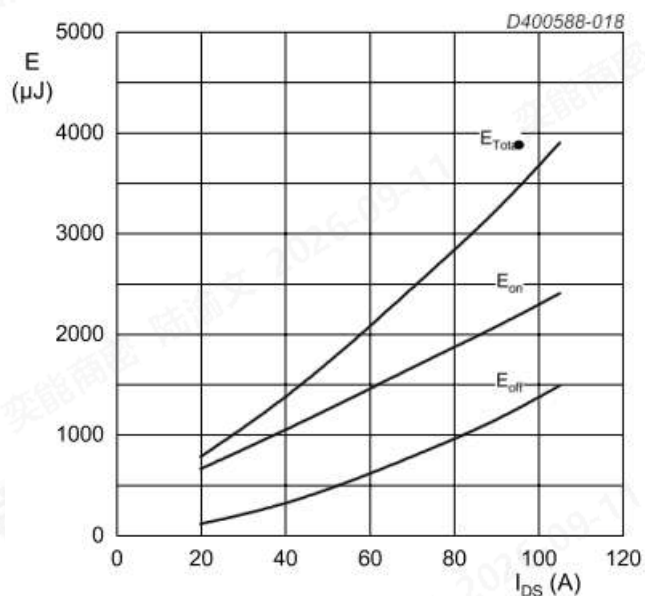
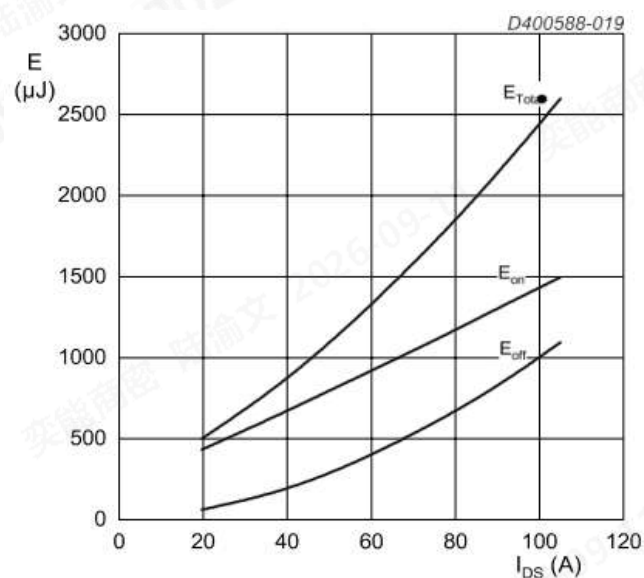


**Figure 19 Clamped Inductive Switching Energy as a function of drain current**

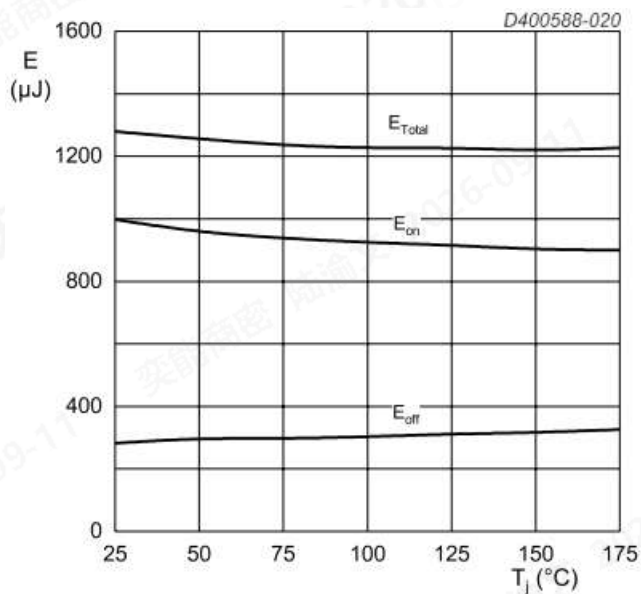
$T_j = 25^\circ C$ ;  $V_{DD} = 600V$ ;  $R_{G(ext)} = 10\Omega$ ;  
 $V_{GS} = -4 V/18V$ ;  $L = 100\mu H$



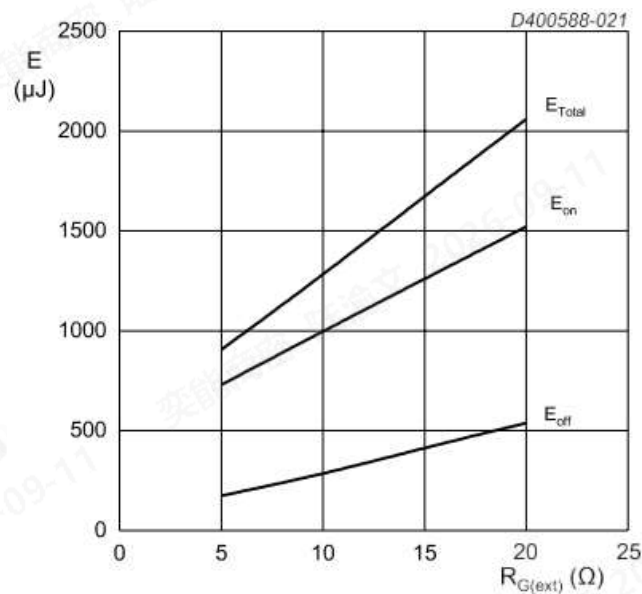
## 5 Characteristic diagrams

**Figure 20 Clamped Inductive Switching Energy as a function of junction temperature**

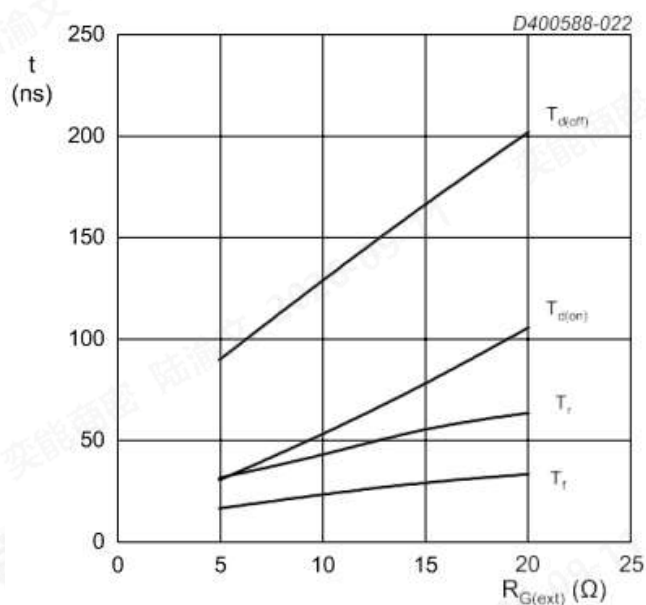
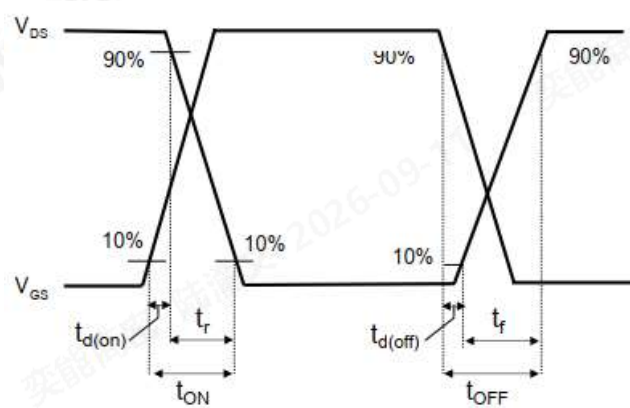
$I_{DS} = 37.5A$ ;  $V_{DD} = 800V$ ;  $R_{G(ext)} = 10\Omega$ ;  
 $V_{GS} = -4V/18V$ ;  $L = 100\mu H$

**Figure 21 Clamped Inductive Switching Energy as a function of external gate resistance**

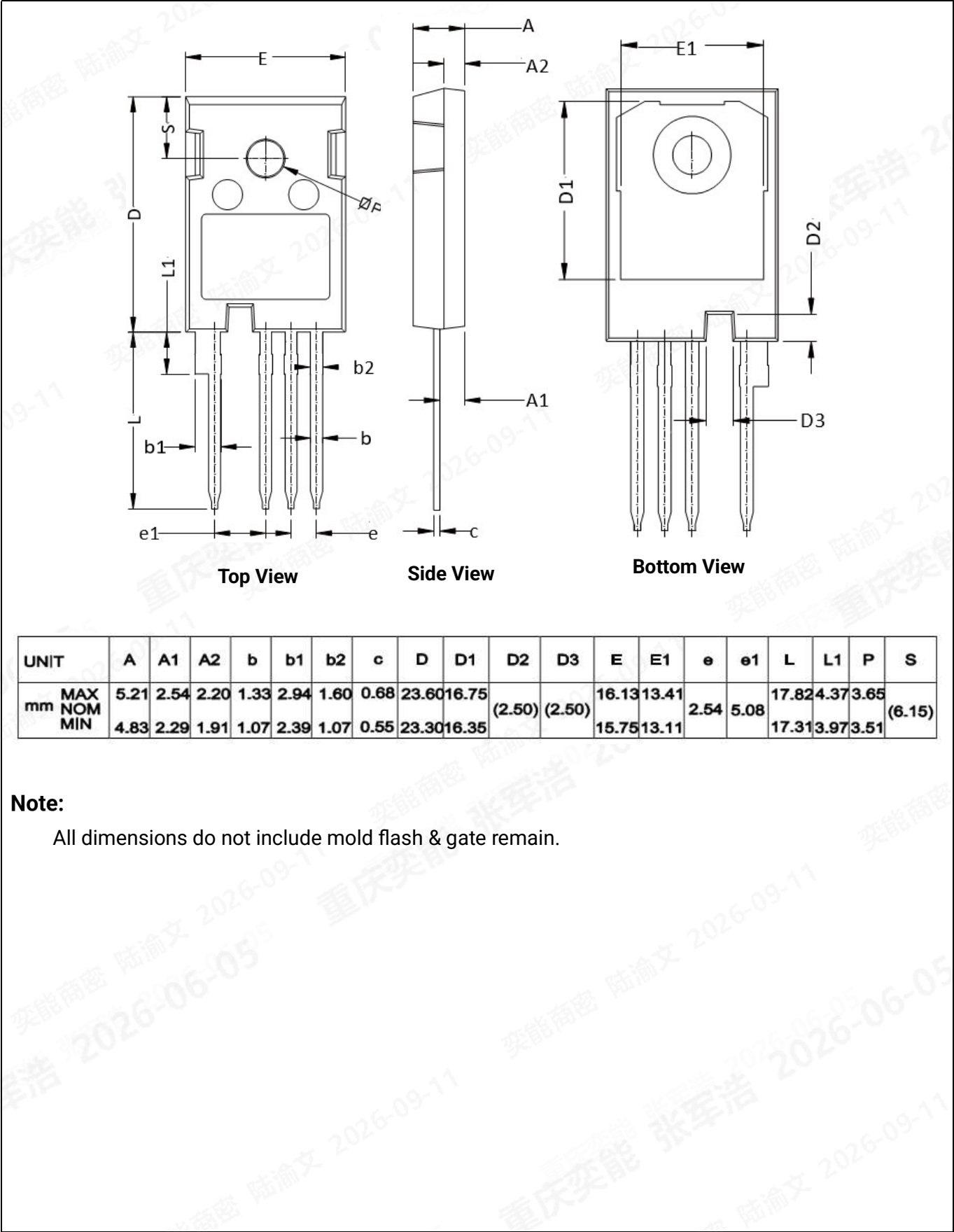
$T_j = 25^{\circ}C$ ;  $V_{DD} = 800V$ ;  $I_{DS} = 37.5A$ ;  
 $V_{GS} = -4V/18V$ ;  $L = 100\mu H$

**Figure 22 Switching time as a function of external gate resistance**

$T_j = 25^{\circ}C$ ;  $V_{DD} = 800V$ ;  $I_{DS} = 37.5A$ ;  
 $V_{GS} = -4V/18V$ ;  $L = 100\mu H$

**Figure 23 Switching time definition**

6 Package outlines



Revision history

Revision history

| Document revision | Date of release | Description of changes |
|-------------------|-----------------|------------------------|
| 1.1               | 2026-04-29      | Update parameters      |
| 1.0               | 2025-12-03      | Initial version        |

IMPORTANT NOTICE:

This Product Datasheet describes the characteristics of Innoevsic product. The data contained in this document is exclusively intended for technically trained staff. You and your technical departments should be responsible for evaluating the suitability of product for the intended application and the completeness of the data contained in this document.

Due to technical requirements, components of the product may contain dangerous substances. For information on the types in question, please contact the sales staff responsible for you.

In no event shall this Product Datasheet and/or any information contained thereof be regard as a guarantee of conditions or characteristics.

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For more information of the product, please contact the sales staff.