

## General Description

It combines advanced trench MOSFET technology with a low resistance package to provide extremely low  $R_{DS(ON)}$ .

## Features

- Low  $R_{DS(ON)}$  to minimize conductive loss
- Low Gate Charge for fast switching
- Low Thermal resistance

## Application

- BLDC Motor driver
- DC-DC
- Load Switch

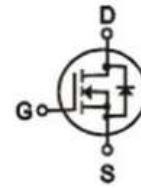
## Ordering Information:

|                           |             |
|---------------------------|-------------|
| Part NO.                  | ZMS030N10HR |
| Marking                   | ZMS030N10H  |
| Packing Information       | REEL TAPE   |
| Basic ordering unit (pcs) | 2000        |

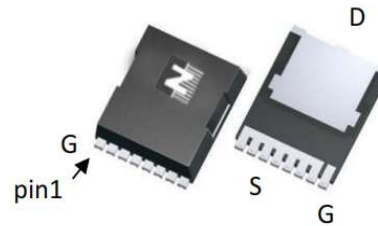
## Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ )

| Parameter                         | Symbol    | Conditions                                                        | Value       | Unit             |
|-----------------------------------|-----------|-------------------------------------------------------------------|-------------|------------------|
| Drain-Source Voltage              | $V_{DS}$  | $25^\circ\text{C} \leq T_J \leq 175^\circ\text{C}$                | 100         | V                |
| Gate-Source Voltage <sup>①</sup>  | $V_{GS}$  |                                                                   | $\pm 20$    | V                |
| Continuous Drain Current          | $I_D$     | $T_C=25^\circ\text{C}$                                            | 200         | A                |
|                                   | $I_D$     | $T_C=75^\circ\text{C}$                                            | 165         | A                |
|                                   | $I_D$     | $T_C=100^\circ\text{C}$                                           | 143         | A                |
| Pulsed Drain Current <sup>①</sup> | $I_{DM}$  | Pulsed; $t_p \leq 10 \mu\text{s}$ ; $T_{mb} = 25^\circ\text{C}$ ; | 800         | A                |
| Total Power Dissipation           | $P_D$     | $T_C=25^\circ\text{C}$                                            | 250         | W                |
| Total Power Dissipation           | $P_D$     | $T_A=25^\circ\text{C}$                                            | 3.5         | W                |
| Operating Junction Temperature    | $T_J$     |                                                                   | -55 to +175 | $^\circ\text{C}$ |
| Storage Temperature               | $T_{STG}$ |                                                                   | -55 to +175 | $^\circ\text{C}$ |
| Single Pulse Avalanche Energy     | $E_{AS}$  | $L=0.1\text{mH}$ , $V_{GS}=10\text{V}$ , $R_g=25\Omega$ ,         | 312         | mJ               |
|                                   |           | $L=0.5\text{mH}$ , $V_{GS}=10\text{V}$ , $R_g=25\Omega$ ,         | 562         | mJ               |
| ESD Level (HBM)                   | CLASS 2   |                                                                   |             |                  |

## Product Summary



$V_{DS} = 100\text{V}$   
 $R_{DS(ON)} = 2.6\text{m}\Omega$   
 $I_D = 200\text{A}$



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**•Thermal resistance**

| Parameter                              | Symbol             | Min. | Typ. | Max. | Unit |
|----------------------------------------|--------------------|------|------|------|------|
| Thermal resistance, junction - case    | RthJC              |      | -    | 0.5  | °C/W |
| Thermal resistance, junction-ambient   | RthJA <sup>②</sup> |      | -    | 36   | °C/W |
| Soldering temperature (total time<10s) | Tsold              |      | -    | 265  | °C   |

**•Electronic Characteristics**

| Parameter                         | Symbol              | Condition                                                | Min. | Typ. | Max. | Unit |
|-----------------------------------|---------------------|----------------------------------------------------------|------|------|------|------|
| Drain-Source Breakdown Voltage    | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA               | 100  |      |      | V    |
| Gate Threshold Voltage            | V <sub>GS(TH)</sub> | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA | 2.0  | 2.7  | 4.0  | V    |
| Drain-Source Leakage Current      | I <sub>DSS</sub>    | V <sub>GS</sub> =0V, V <sub>DS</sub> = 100V              |      |      | 1.0  | uA   |
| Gate- Source Leakage Current      | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> = 0V              |      |      | 100  | nA   |
| Static Drain-source On Resistance | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> = 40A               |      | 2.6  | 3.4  | mΩ   |
| Forward Transconductance          | g <sub>FS</sub>     | V <sub>GS</sub> =5V, I <sub>SD</sub> = 15A               |      | 30   |      | s    |
| Diode Forward Voltage             | V <sub>FSD</sub>    | V <sub>GS</sub> =0V, I <sub>SD</sub> = 40A               |      |      | 1.3  | V    |

**•Dynamic characteristics**

| Parameter                    | Symbol              | Condition                                                                                | Min. | Typ. | Max. | Unit |
|------------------------------|---------------------|------------------------------------------------------------------------------------------|------|------|------|------|
| Input capacitance            | Ciss                | f = 1MHz, V <sub>DS</sub> =25V                                                           | -    | 5490 | -    | pF   |
| Output capacitance           | Coss                |                                                                                          | -    | 3060 | -    |      |
| Reverse transfer capacitance | Crss                |                                                                                          | -    | 309  | -    |      |
| Gate Resistance              | Rg                  | f = 1MHz                                                                                 | -    | 1.5  |      | Ω    |
| Total gate charge            | Qg                  | V <sub>DD</sub> = 15V,<br>I <sub>D</sub> = 20A,<br>V <sub>GS</sub> = 10V                 | -    | 97   | -    | nC   |
| Gate - Source charge         | Qgs                 |                                                                                          | -    | 30   | -    |      |
| Gate - Drain charge          | Qgd                 |                                                                                          | -    | 19   | -    |      |
| Turn-ON Delay time           | t <sub>D(on)</sub>  | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V,<br>R <sub>G</sub> =3.3Ω, I <sub>D</sub> =20A | -    | 11   | -    | ns   |
| Turn-ON Rise time            | t <sub>r</sub>      |                                                                                          | -    | 42   | -    | ns   |
| Turn-Off Delay time          | t <sub>D(off)</sub> |                                                                                          | -    | 84   | -    | ns   |
| Turn-Off Fall time           | t <sub>f</sub>      |                                                                                          | -    | 63   | -    | ns   |
| Reverse Recovery Time        | t <sub>RR</sub>     | V <sub>DD</sub> =20V, dI <sub>S</sub> /dt = 100A/s,<br>I <sub>S</sub> =50A               | -    | 75   | -    | ns   |
| Reverse Recovery Charge      | Q <sub>RR</sub>     |                                                                                          | -    | 122  | -    | nC   |

Fig.1 Gate-Charge Characteristics

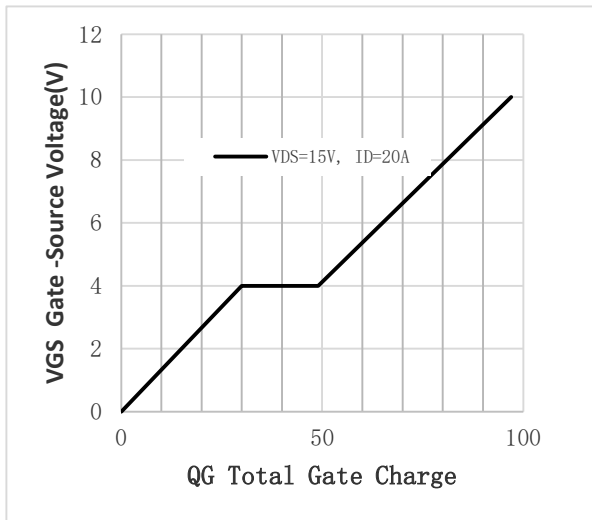


Fig.2 Capacitance Characteristics

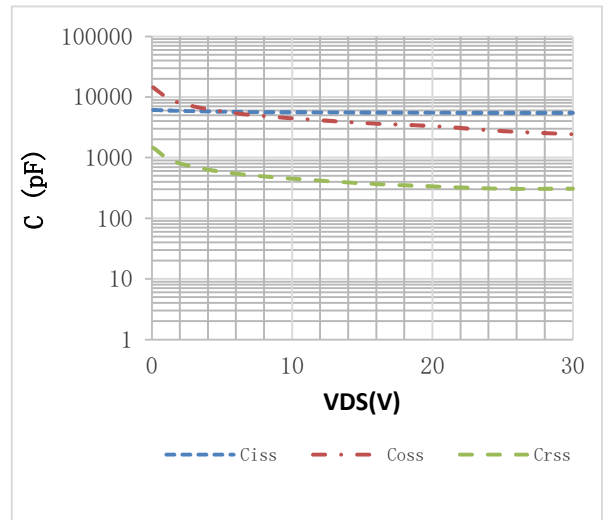


Fig.3 Power Dissipation

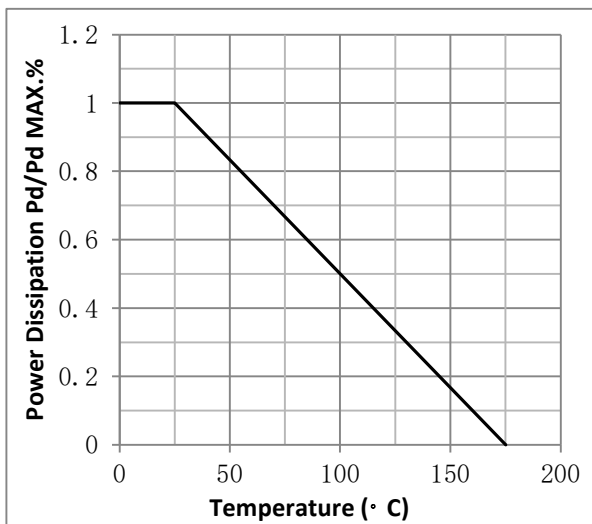


Fig.4 Typical output Characteristics

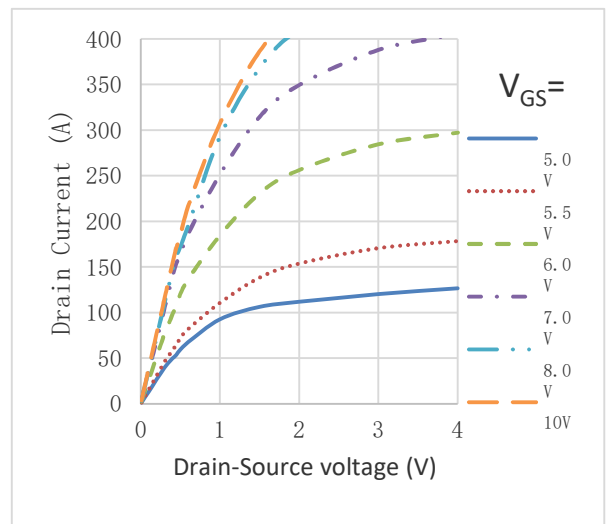


Fig.5 Threshold Voltage V.S Junction Temperature

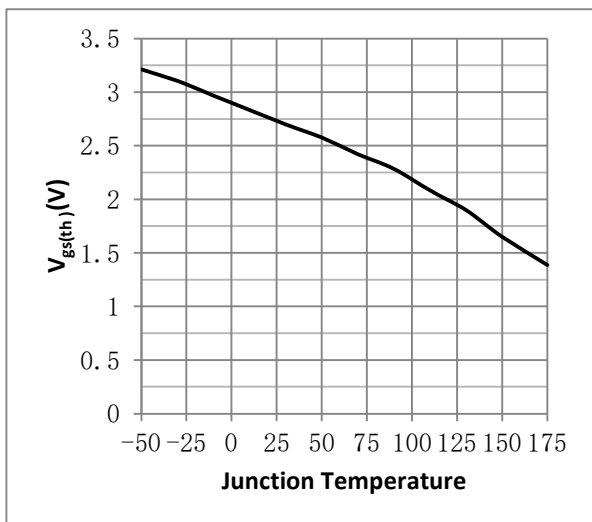


Fig.6 Resistance V.S Drain Current

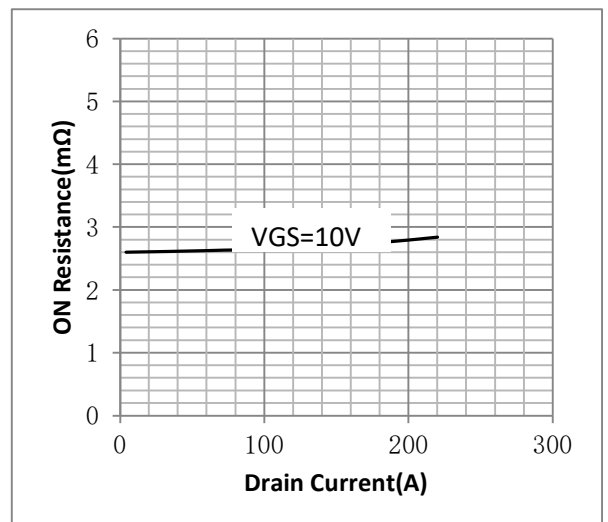


Fig.7 On-Resistance VS Gate Source Voltage

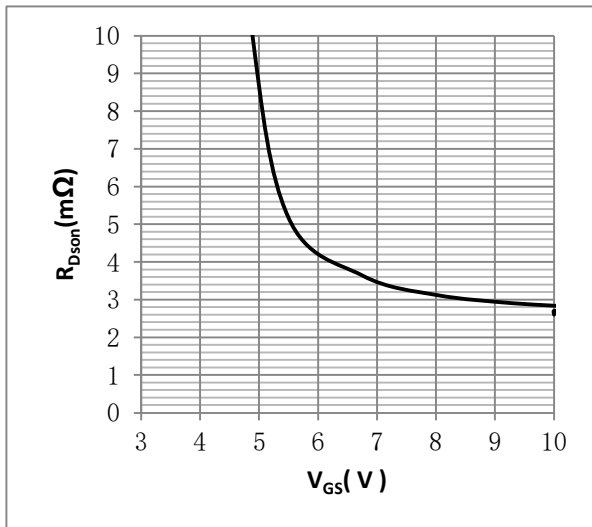


Fig.8 On-Resistance V.S Junction Temperature

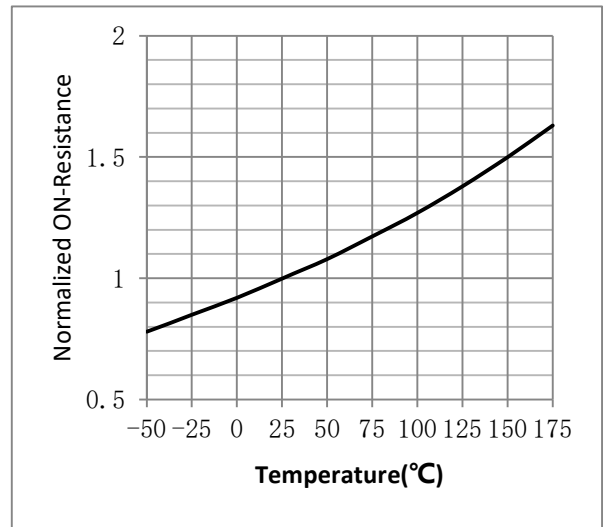


Figure 9. Diode Forward Voltage vs. Current

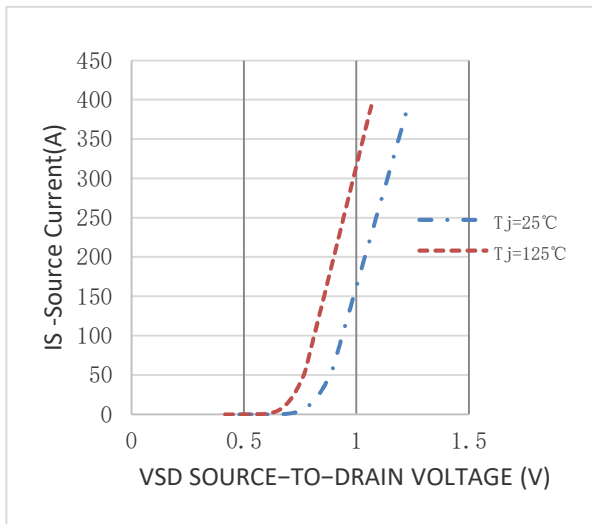


Figure 10. Transfer Characteristics

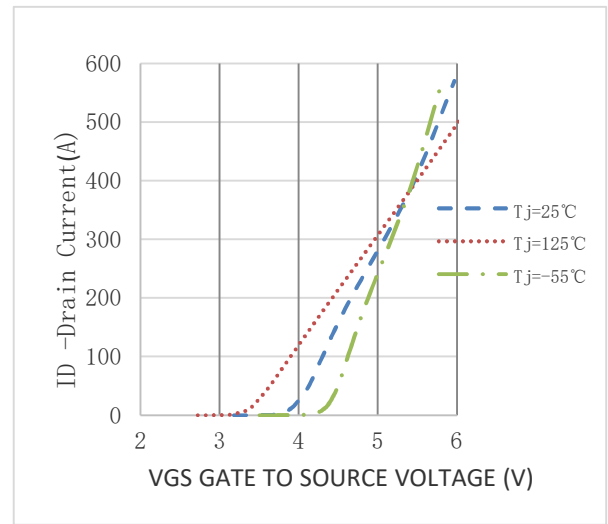


Fig.11 SOA Maximum Safe Operating Area

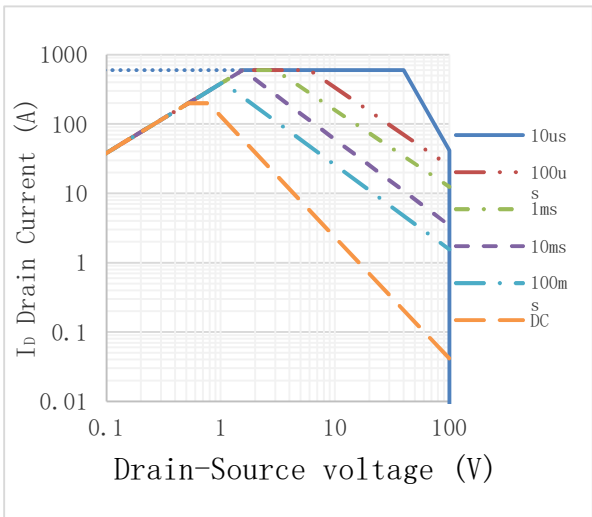
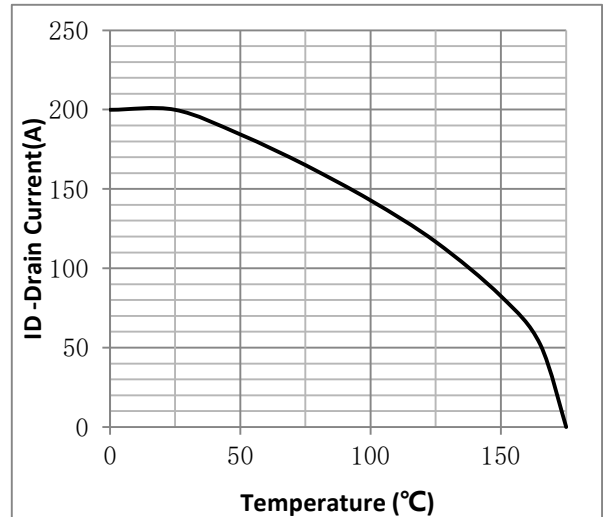
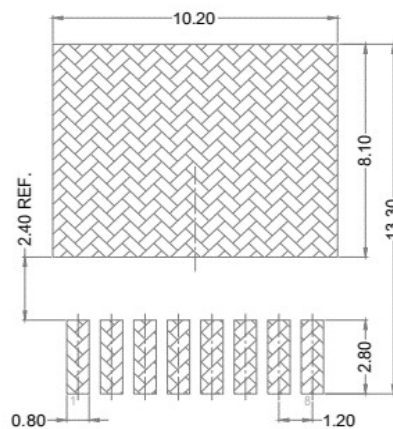
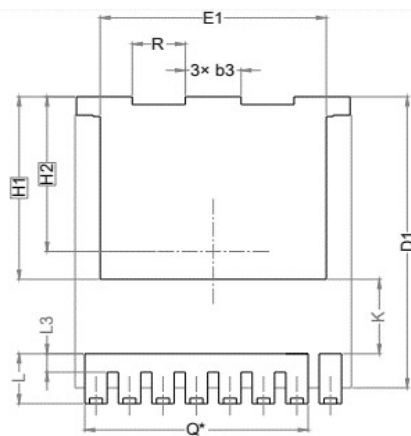
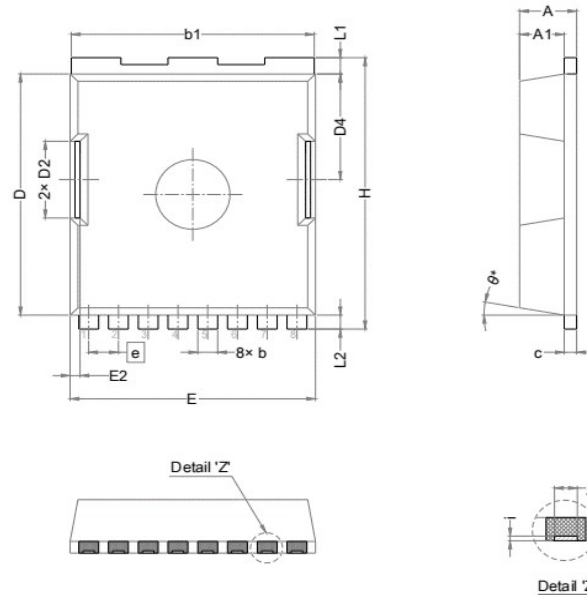


Fig.12 ID vs. Junction Temperature<sup>③</sup>



•TOLL Package Outline



| SYMBOL | DIMENSIONS |       |       |
|--------|------------|-------|-------|
|        | MIN.       | NOM.  | MAX.  |
| A      | 2.20       | 2.30  | 2.40  |
| A1     | 1.70       | 1.80  | 1.90  |
| b      | 0.70       | 0.80  | 0.90  |
| b1     | 9.70       | 9.80  | 9.90  |
| b3     | 1.90       | 2.00  | 2.10  |
| c      | 0.40       | 0.50  | 0.60  |
| D      | 10.28      | 10.38 | 10.48 |
| D1     | 10.98      | 11.08 | 11.18 |
| D2     | 3.20       | 3.30  | 3.40  |
| D4     | 4.45       | 4.55  | 4.65  |
| E      | 9.80       | 9.90  | 10.00 |
| E1     | 8.00       | 8.10  | 8.20  |
| E2     | 0.30       | 0.40  | 0.50  |
| e      | 1.20 BSC   |       |       |
| H      | 11.58      | 11.68 | 11.78 |
| H1     | 6.95 BSC   |       |       |
| H2     | 5.89 BSC   |       |       |
| i      | 0.10 REF.  |       |       |
| j      | 0.46 REF.  |       |       |
| K      | 2.80 REF.  |       |       |
| L      | 1.60       | 1.90  | 2.10  |
| L1     | 0.60       | 0.70  | 0.80  |
| L2     | 0.50       | 0.60  | 0.70  |
| L3     | 0.60       | 0.70  | 0.80  |
| N      | 8          |       |       |
| Q      | 6.80 REF.  |       |       |
| R      | 1.80       | 1.90  | 2.00  |
| θ      | 10° REF.   |       |       |

**Note:**

- ① Pulse :  $V_{GS}=+20V/-20V$ , Duty cycle=50%,  $T_j=175^{\circ}C$ ,  $t=1000$  hours; For DC , the following test conditions can be passed:  $V_{GS}=+20V/-10V$ ,  $T_j=175^{\circ}C$ ,  $t=1000$  hours;
- ② Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate;
- ③ Practically the current will be limited by PCB, thermal design and operating temperature.  $V_{GS}=10V$ .

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## Revision History

| Version | Date         | Change                                                                                                                                             |
|---------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| A       | 2022. 1. 6   | New                                                                                                                                                |
| B       | 2022. 5. 5   | 1. Fig. 1~Fig11 modify 2. Idm corrected 3. Add Reach, HF figure 4. add "It is suitable for automotive application." 5. modify as "total time<10s)" |
| C       | 2022. 11. 15 | 1. Modify ID and IDcurve                                                                                                                           |
|         |              |                                                                                                                                                    |
|         |              |                                                                                                                                                    |
|         |              |                                                                                                                                                    |
|         |              |                                                                                                                                                    |
|         |              |                                                                                                                                                    |