

### General Description

The ZM120P04D combines advanced trench MOSFET technology with a low resistance package to provide extremely low  $R_{DS(ON)}$ . This device is ideal for load switch and battery protection applications.

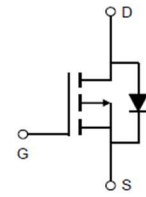
### Features

- Advance high cell density Trench technology
- Low  $R_{DS(ON)}$  to minimize conductive loss
- Low Gate Charge for fast switching
- Low Thermal resistance

### Application

- MB/VGA Vcore
- SMPS 2<sup>nd</sup> Synchronous Rectifier
- POL application
- BLDC Motor driver

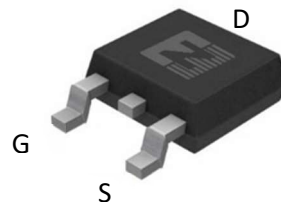
### Product Summary



$$V_{DS} = -40V$$

$$R_{DS(ON)} = 12m\Omega$$

$$I_D = -45A$$



TO-252



### Ordering Information:

|                           |           |
|---------------------------|-----------|
| Part NO.                  | ZM120P04D |
| Marking                   | ZM120P04  |
| Packing Information       | REEL TAPE |
| Basic ordering unit (pcs) | 2500      |

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

| Parameter                                     | Symbol                    | Rating     | Unit       |
|-----------------------------------------------|---------------------------|------------|------------|
| Drain-Source Voltage                          | $V_{DS}$                  | -40        | V          |
| Gate-Source Voltage                           | $V_{GS}$                  | $\pm 20$   | V          |
| Continuous Drain Current                      | $I_D @ T_C = 25^\circ C$  | -45        | A          |
|                                               | $I_D @ T_C = 75^\circ C$  | -34        | A          |
|                                               | $I_D @ T_C = 100^\circ C$ | -28        | A          |
| Pulsed Drain Current <sup>①</sup>             | $I_{DM}$                  | -135       | A          |
| Total Power Dissipation( $T_C = 25^\circ C$ ) | $P_D @ T_C = 25^\circ C$  | 50         | W          |
| Total Power Dissipation( $T_A = 25^\circ C$ ) | $P_D @ T_A = 25^\circ C$  | 1.25       | W          |
| Operating Junction Temperature                | $T_J$                     | -55 to 150 | $^\circ C$ |
| Storage Temperature                           | $T_{STG}$                 | -55 to 150 | $^\circ C$ |

|                               |          |     |    |
|-------------------------------|----------|-----|----|
| Single Pulse Avalanche Energy | $E_{AS}$ | 125 | mJ |
|-------------------------------|----------|-----|----|

#### •Thermal resistance

| Parameter                                    | Symbol     | Min. | Typ. | Max. | Unit  |
|----------------------------------------------|------------|------|------|------|-------|
| Thermal resistance, junction - case          | $R_{thJC}$ | -    | -    | 2.4  | ° C/W |
| Thermal resistance, junction - ambient       | $R_{thJA}$ | -    | -    | 65   | ° C/W |
| Soldering temperature, wavesoldering for 10s | $T_{sold}$ | -    | -    | 265  | ° C   |

#### •Electronic Characteristics

| Parameter                         | Symbol       | Condition                          | Min. | Typ | Max.      | Unit       |
|-----------------------------------|--------------|------------------------------------|------|-----|-----------|------------|
| Drain-Source Breakdown Voltage    | $BV_{DSS}$   | $V_{GS} = 0V, I_D = -250\mu A$     | -40  |     |           | V          |
| Gate Threshold Voltage            | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = -250\mu A$ | -1.2 |     | -2.5      | V          |
| Drain-Source Leakage Current      | $I_{DSS}$    | $V_{DS} = -40V, V_{GS} = 0V$       |      |     | 1.0       | $\mu A$    |
| Gate- Source Leakage Current      | $I_{GSS}$    | $V_{GS} = \pm 20V, V_{DS} = 0V$    |      |     | $\pm 100$ | nA         |
| Static Drain-source On Resistance | $R_{DS(ON)}$ | $V_{GS} = -10V, I_D = -3A$         |      | 12  | 15.6      | m $\Omega$ |
|                                   |              | $V_{GS} = -4.5V, I_D = -2A$        |      | 15  | 19.5      | m $\Omega$ |
| Forward Transconductance          | $g_{FS}$     | $V_{DS} = -10V, I_D = -2A$         |      | 18  |           | s          |

#### •Electronic Characteristics

| Parameter                    | Symbol    | Condition            | Min. | Typ  | Max. | Unit |
|------------------------------|-----------|----------------------|------|------|------|------|
| Input capacitance            | $C_{iss}$ | f = 1MHz<br>VDS=-25V | -    | 2750 | -    | pF   |
| Output capacitance           | $C_{oss}$ |                      | -    | 185  | -    |      |
| Reverse transfer capacitance | $C_{rss}$ |                      | -    | 135  | -    |      |

#### •Gate Charge characteristics( $T_a = 25^\circ C$ )

| Parameter            | Symbol   | Condition  | Min. | Typ | Max. | Unit |
|----------------------|----------|------------|------|-----|------|------|
| Total gate charge    | $Q_g$    | VDD = -25V | -    | 30  | -    | nC   |
| Gate - Source charge | $Q_{gs}$ | ID = -5A   | -    | 9   | -    |      |
| Gate - Drain charge  | $Q_{gd}$ | VGS = -10V | -    | 15  | -    |      |

Note: ① Pulse Test : Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$  ;

Fig.1 Gate-Charge Characteristics

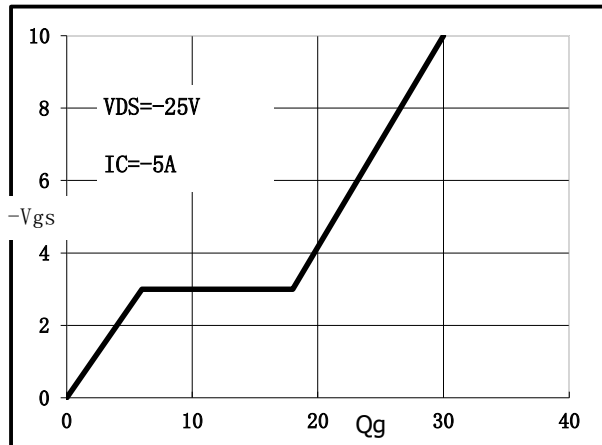


Fig.2 Capacitance Characteristics

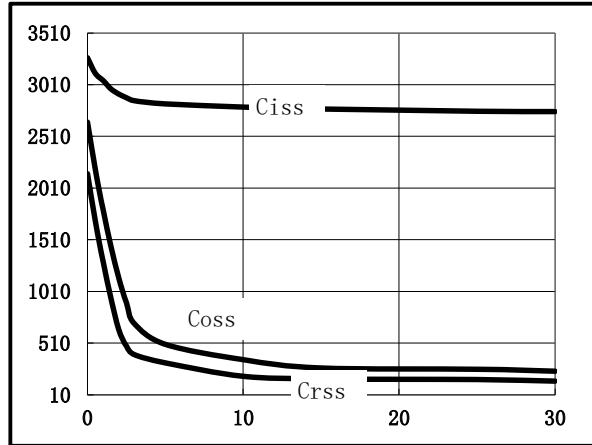


Fig.3 Power Dissipation Derating Curve

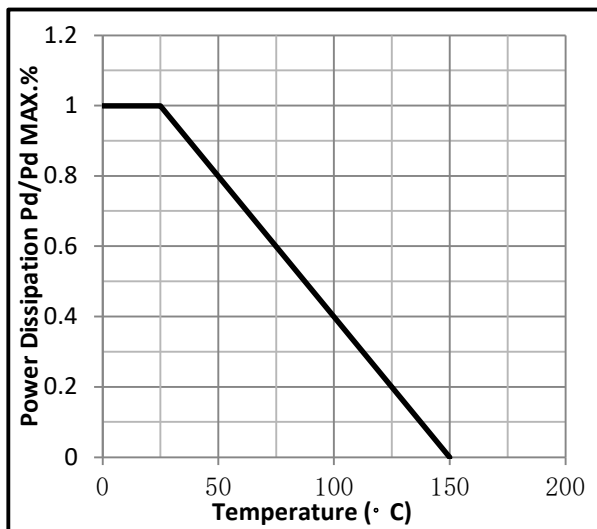


Fig.4 Typical output Characteristics

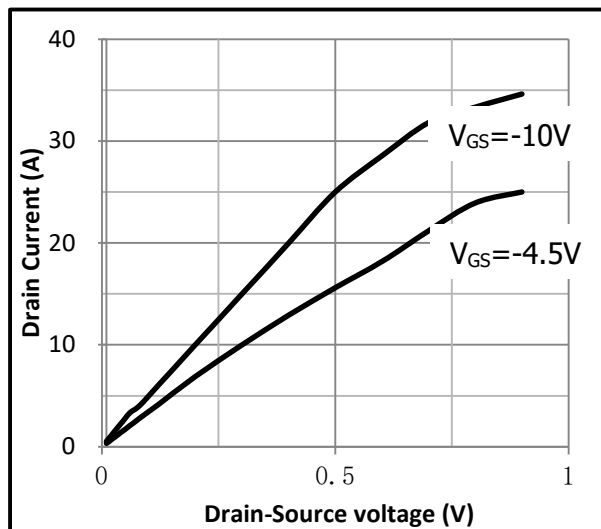


Fig.5 Threshold Voltage V.S Junction Temperature

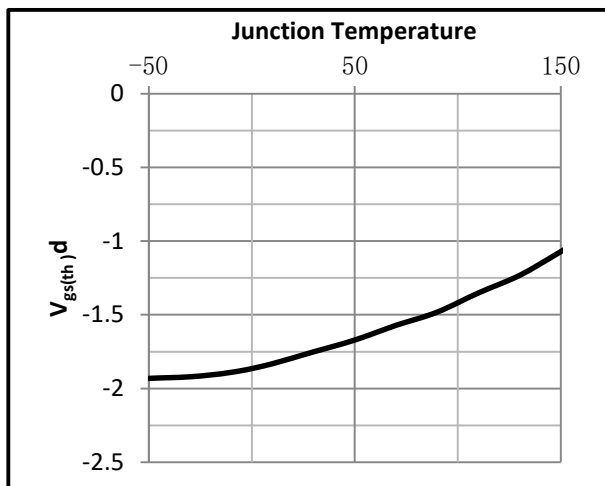


Fig.6 Resistance V.S Drain Current

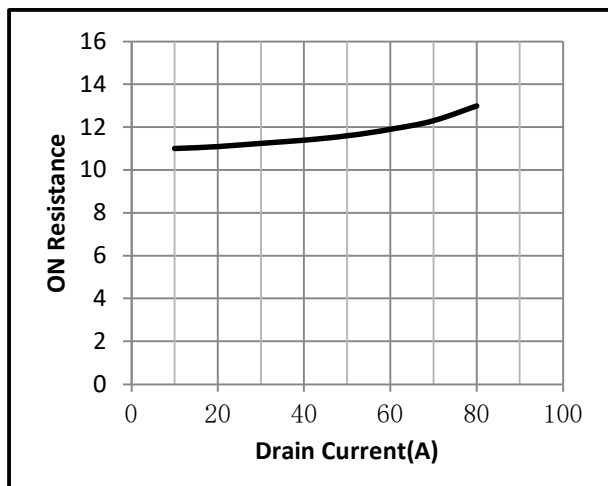


Fig.7 On-Resistance VS Gate Source Voltage

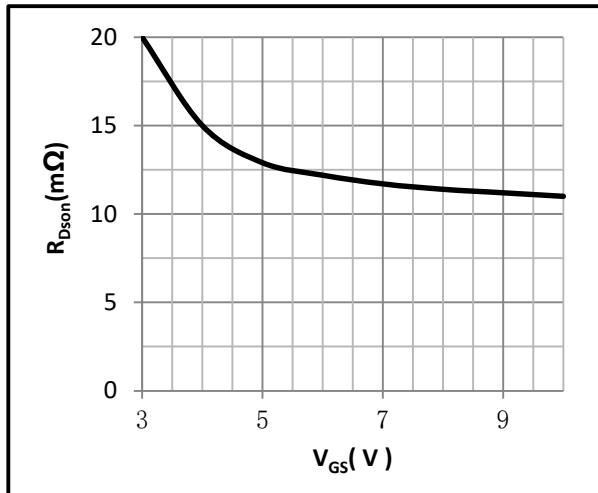


Fig.8 On-Resistance V.S Junction Temperature

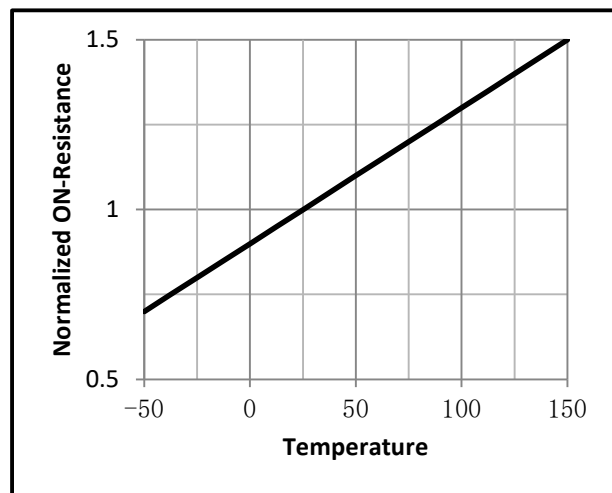


Fig.7 Gate Charge Measurement Circuit

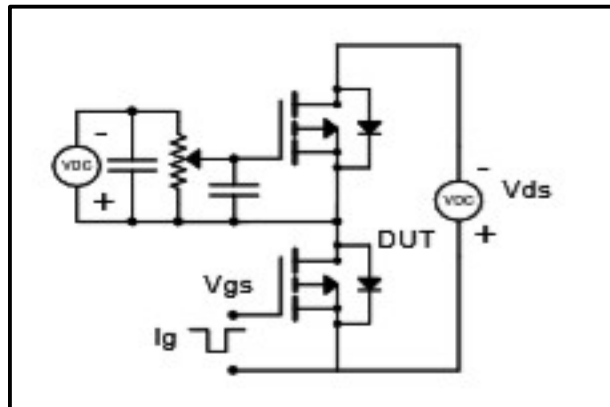


Fig.8 Gate Charge Waveform

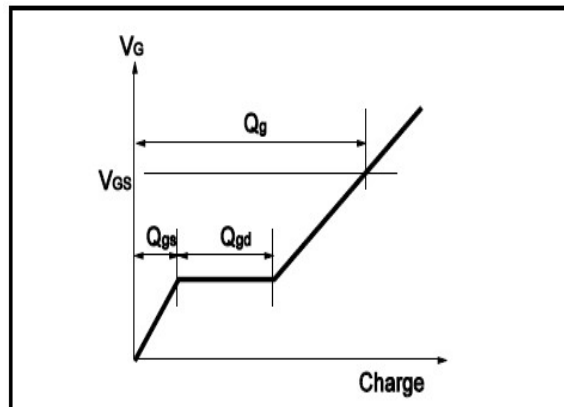


Fig.9 Switching Time Measurement Circuit

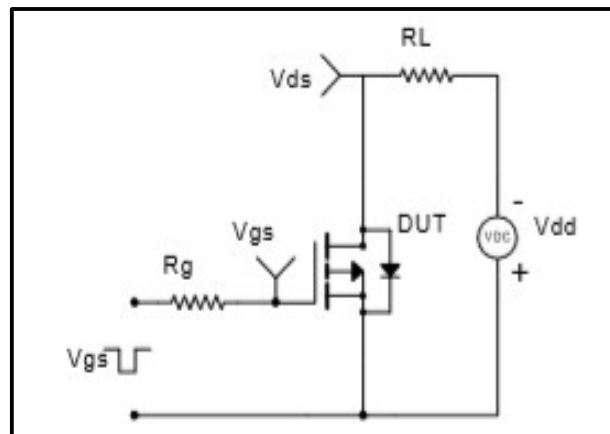


Fig.10 Switching Time Waveform

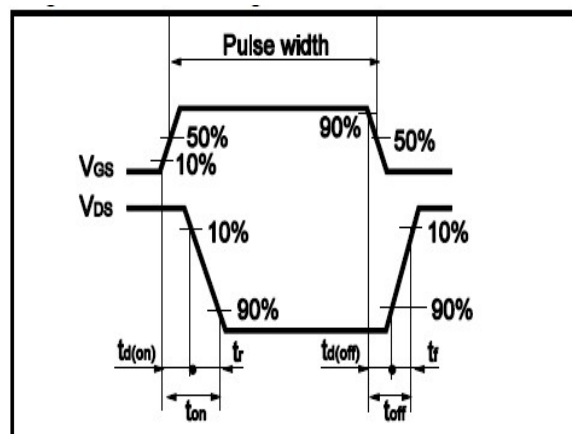


Fig.11 Avalanche Measurement Circuit

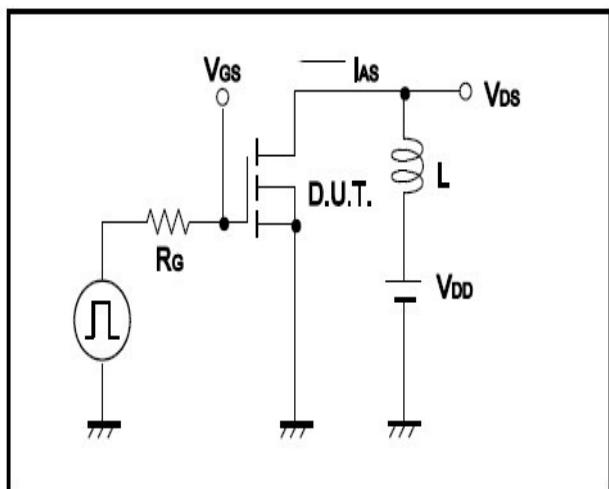
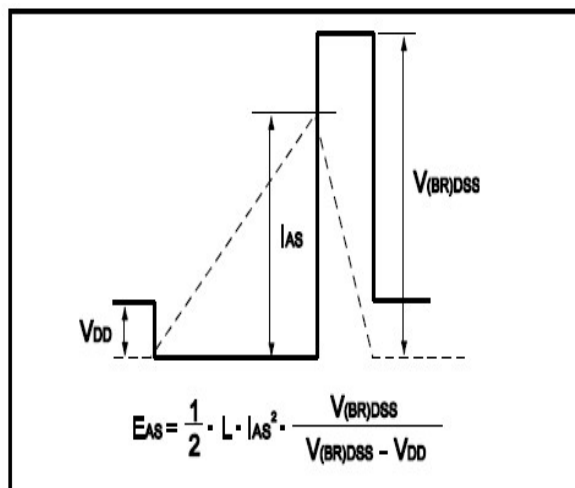


Fig.12 Avalanche Waveform



•Dimensions(TO-252)

Unit: mm

| SYMBOL | min  | max   | SYMBOL | min  | max  |
|--------|------|-------|--------|------|------|
| A      | 2.10 | 2.50  | B      | 0.85 | 1.25 |
| b      | 0.50 | 0.80  | b1     | 0.50 | 0.90 |
| b2     | 0.45 | 0.70  | C      | 0.45 | 0.70 |
| D      | 6.30 | 6.75  | D1     | 5.10 | 5.50 |
| E      | 5.30 | 6.30  | e1     | 2.25 | 2.35 |
| L1     | 9.20 | 10.60 | e2     | 4.45 | 4.75 |
| L2     | 0.90 | 1.75  | L3     | 0.60 | 1.10 |
| K      | 0.00 | 0.23  |        |      |      |

