

### • General Description

The ZMS040N10HP combines advanced SGT MOSFET technology with a low resistance package to provide extremely low  $R_{DS(ON)}$ .

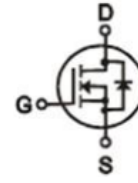
### • Features

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

### • Application

- Synchronous Rectification for AC-DC/DC-DC converter
- Oring switches
- Power Tools

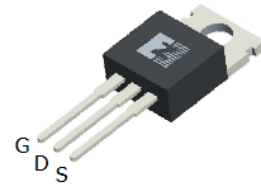
### • Product Summary



$$V_{DS} = 100V$$

$$R_{DS(ON)} = 4.2m\Omega$$

$$I_D = 160A$$



TO-220

### • Ordering Information:

|                           |             |
|---------------------------|-------------|
| Part NO.                  | ZMS040N10HP |
| Marking                   | ZMS040N10H  |
| Packing Information       | Bulk Tube   |
| Basic ordering unit (pcs) | 1000        |

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

| Parameter                             | Symbol                  | Rating     | Unit       |
|---------------------------------------|-------------------------|------------|------------|
| Drain-Source Voltage                  | $V_{DS}$                | 100        | V          |
| Gate-Source Voltage                   | $V_{GS}$                | $\pm 20$   | V          |
| Continuous Drain Current              | $I_{D@T_C=25^\circ C}$  | 160        | A          |
|                                       | $I_{D@T_C=75^\circ C}$  | 121        | A          |
|                                       | $I_{D@T_C=100^\circ C}$ | 100        | A          |
| Pulsed Drain Current <sup>①</sup>     | $I_{DM}$                | 480        | A          |
| Total Power Dissipation               | $P_D@T_C=25^\circ C$    | 113        | W          |
| Total Power Dissipation               | $P_D@T_A=25^\circ C$    | 3.4        | W          |
| Operating Junction Temperature        | $T_J$                   | -55 to 150 | $^\circ C$ |
| Storage Temperature                   | $T_{STG}$               | -55 to 150 | $^\circ C$ |
| Single Pulse Avalanche Energy@L=0.1mH | $E_{AS}$                | 200        | mJ         |
| Avalanche Current@L=0.1mH             | $I_{AS}$                | 35         | A          |

### •Thermal resistance

| Parameter                                     | Symbol     | Min. | Typ. | Max. | Unit  |
|-----------------------------------------------|------------|------|------|------|-------|
| Thermal resistance, junction - case           | $R_{thJC}$ | -    | -    | 1.1  | ° C/W |
| Thermal resistance, junction - ambient        | $R_{thJA}$ | -    | -    | 37   | ° C/W |
| Soldering temperature, wave soldering for 10s | $T_{sold}$ | -    | -    | 265  | ° C   |

### •Electronic Characteristics

| Parameter                         | Symbol       | Condition                     | Min. | Typ | Max.      | Unit       |
|-----------------------------------|--------------|-------------------------------|------|-----|-----------|------------|
| Drain-Source Breakdown Voltage    | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$     | 100  |     |           | V          |
| Gate Threshold Voltage            | $V_{GS(TH)}$ | $V_{GS}=V_{DS}, I_D=250\mu A$ | 2.0  |     | 4.0       | V          |
| Drain-Source Leakage Current      | $I_{DSS}$    | $V_{DS}=100V, V_{GS}=0V$      |      |     | 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 | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=25A$         |      | 4.2 | 5.2       | m $\Omega$ |
| Forward Transconductance          | $g_{FS}$     | $V_{DS}=25V, I_D=10A$         |      | 28  |           | s          |
| Source-drain voltage              | $V_{SD}$     | $I_S=25A$                     |      |     | 1.28      | V          |

### •Dynamic Characteristics

| Parameter                          | Symbol    | Condition                                | Min. | Typ  | Max. | Unit |
|------------------------------------|-----------|------------------------------------------|------|------|------|------|
| Input capacitance                  | $C_{iss}$ | $V_{GS}=0V, V_{DS}=25V$<br>$f = 1MHz$    | -    | 4028 | -    | pF   |
| Output capacitance                 | $C_{oss}$ |                                          | -    | 1787 | -    |      |
| Reverse transfer capacitance       | $C_{rss}$ |                                          | -    | 91   | -    |      |
| Total gate charge                  | $Q_g$     | $V_{DD}=25V$<br>$I_D=8A$<br>$V_{GS}=10V$ | -    | 48   | -    | nC   |
| Gate - Source charge               | $Q_{gs}$  |                                          | -    | 16   | -    |      |
| Gate - Drain charge                | $Q_{gd}$  |                                          | -    | 4.9  | -    |      |
| Body Diode Reverse Recovery Time   | $t_{rr}$  | $I_F=20A,$<br>$di/dt=100A/\mu s$         |      | 33   |      | nS   |
| Body Diode Reverse Recovery Charge | $Q_{rr}$  | $I_F=20A,$<br>$di/dt=100A/\mu s$         |      | 170  |      | nC   |

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

Fig.1 Gate-Charge Characteristics

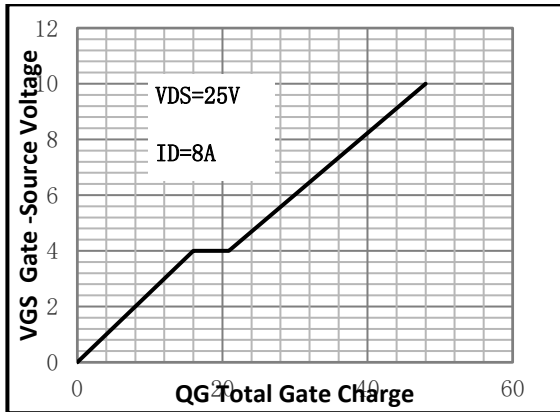


Fig.2 Capacitance Characteristics

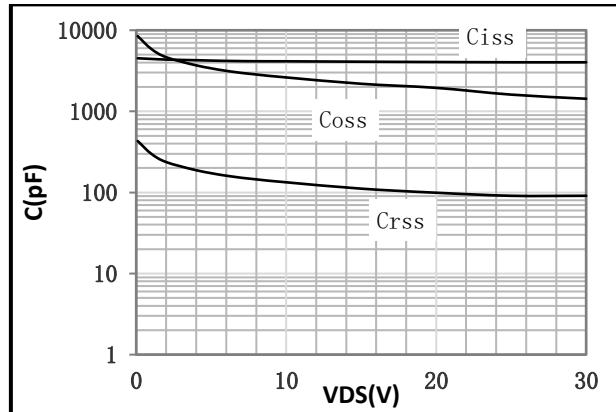


Fig.3 Power Dissipation

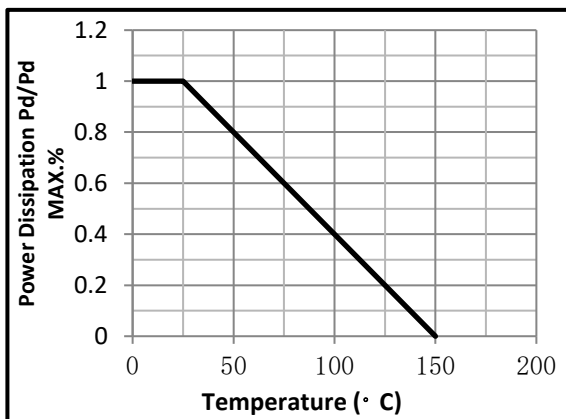


Fig.4 Typical output Characteristics

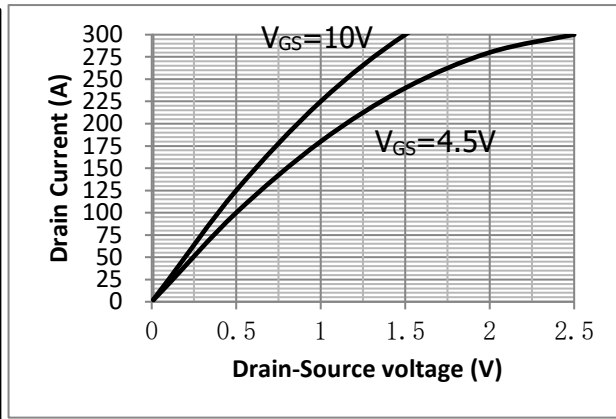


Fig.5 Threshold Voltage V.S Junction Temperature      Fig.6 Resistance V.S Drain Current

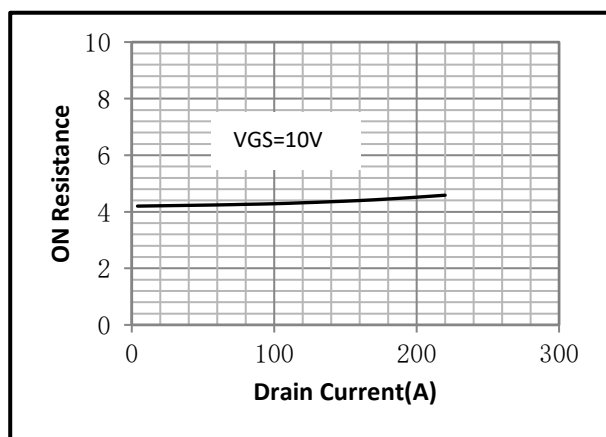
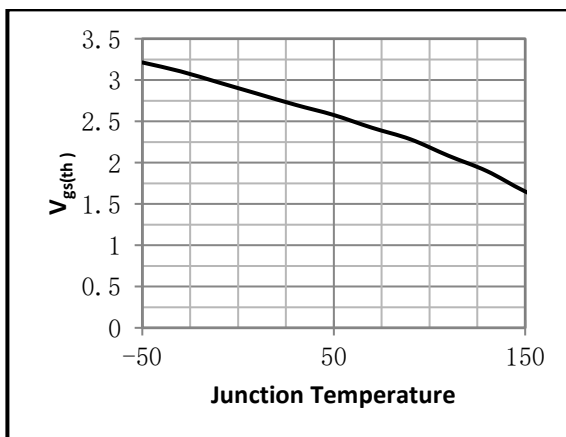


Fig.7 On-Resistance VS Gate Source Voltage

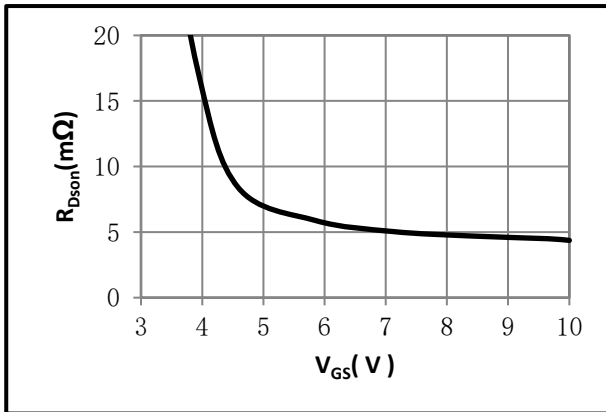


Fig.8 On-Resistance V.S Junction Temperature

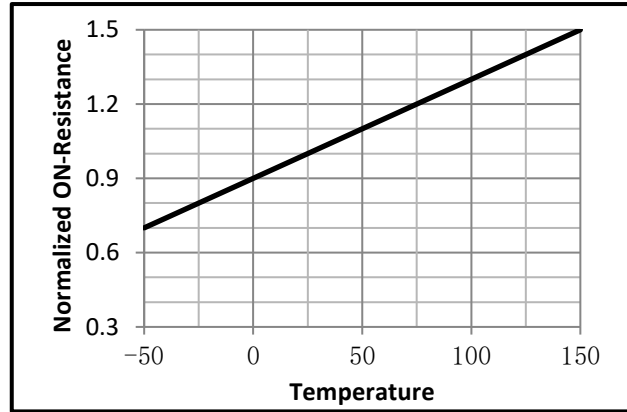


Fig.9 SOA Maximum Safe Operating Area

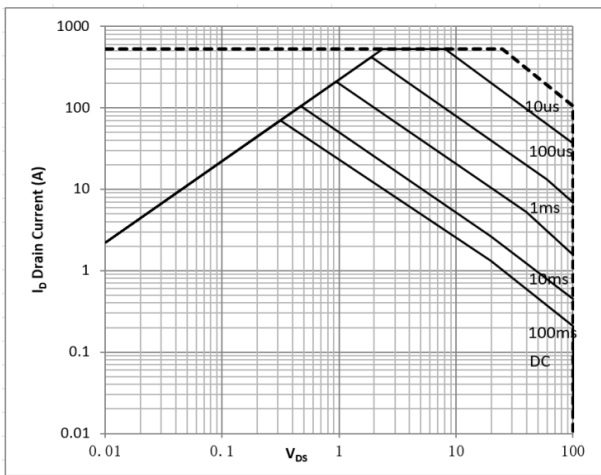


Fig.10  $I_D$ -Junction Temperature

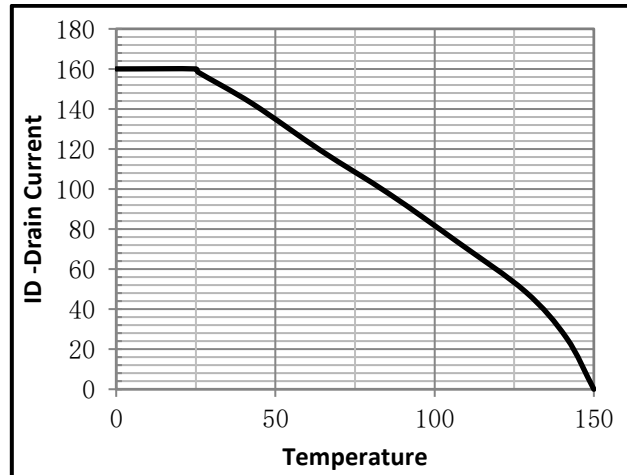


Fig.11 Gate Charge Measurement Circuit

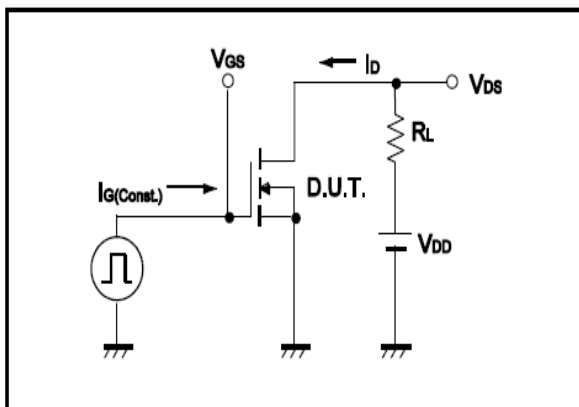


Fig.12 Gate Charge Waveform

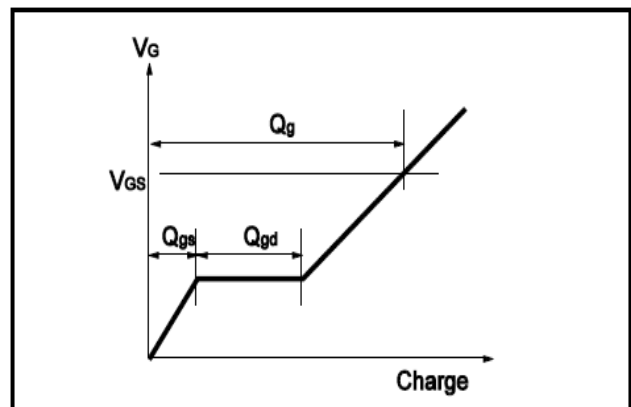


Fig.13 Switching Time Measurement Circuit

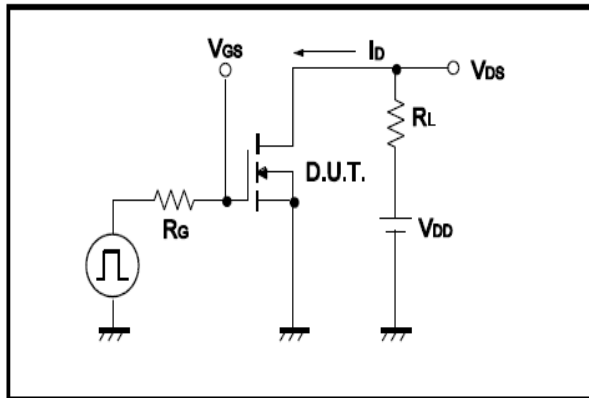


Fig.14 Switching Time Waveform

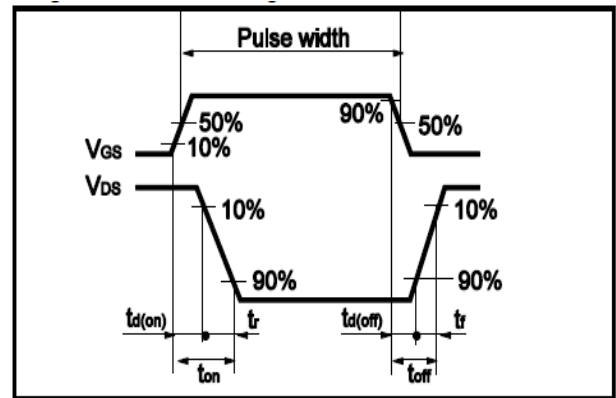


Fig.15 Avalanche Measurement Circuit

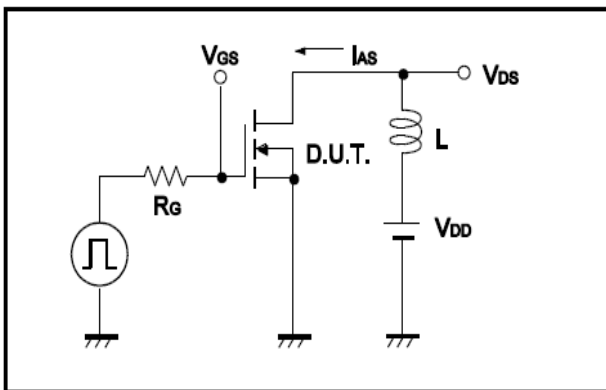
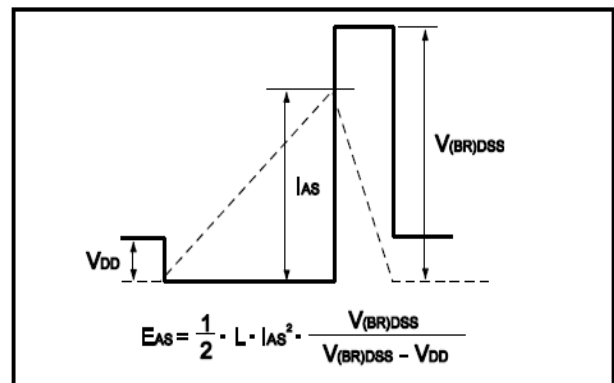


Fig.16 Avalanche Waveform



•Dimensions (TO-220)

Unit: mm

| SYMBOL | min   | nom | max   | SYMBOL | min   | nom  | max   |
|--------|-------|-----|-------|--------|-------|------|-------|
| A      | 4.00  |     | 4.80  | E      | 9.90  |      | 10.70 |
| B      | 1.20  |     | 1.50  | e      |       | 2.54 |       |
| B1     | 1.00  |     | 1.40  | F      | 1.10  |      | 1.45  |
| b1     | 0.65  |     | 1.00  | L      | 12.50 |      | 14.50 |
| c      | 0.35  |     | 0.75  | L1     | 3.00  | 3.50 | 4.00  |
| D      | 15.00 |     | 16.50 | Q      | 2.50  |      | 3.00  |
| D1     | 5.90  |     | 6.90  | Q1     | 2.00  |      | 3.00  |
|        |       |     |       | ΦP     | 3.60  |      | 3.90  |

