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## ZXMNS3BM832

### MPPS™ Miniature Package Power Solutions 30V N Channel MOSFET & 40V, 1A SCHOTTKY DIODE COMBINATION DUAL

#### SUMMARY

N Channel MOSFET ---  $V_{(BR)DSS} = 30V$ ;  $R_{SAT(on)} = 0.18\Omega$ ;  $I_D = 2.7A$   
 Schottky Diode ---  $V_R = 40V$ ;  $V_F = 500mV (@1A)$ ;  $I_C = 1A$

#### DESCRIPTION

Packaged in the new innovation 3mm x 2mm MLP this combination dual product comprises a low gate drive, low on-resistance N-Channel MOSFET plus a fast-switching 1A Schottky barrier diode. This combination provides for highly efficient performance in a range of applications, including DC-DC conversion and low voltage power-management circuits.

Users will also gain several other **key benefits**:

- Performance capability equivalent to much larger packages**
- Improved circuit efficiency & power levels**
- PCB area and device placement savings**
- Lower package height (0.9mm nom)**
- Reduced component count**

#### FEATURES

- Low on-resistance
- Fast switching speed
- Low threshold
- Low gate drive
- Extremely Low  $V_F$ , fast switching Schottky
- 3mm x 2mm MLP

#### APPLICATIONS

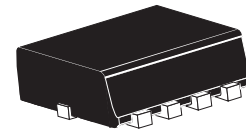
- DC - DC Converters
- Low voltage power-management

#### ORDERING INFORMATION

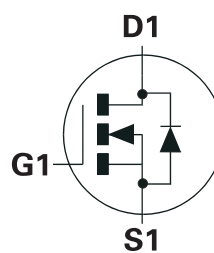
| DEVICE        | REEL | TAPE WIDTH | QUANTITY PER REEL |
|---------------|------|------------|-------------------|
| ZXMNS3BM832TA | 7''  | 8mm        | 3000              |
| ZXMNS3BM832TC | 13'' | 8mm        | 10000             |

#### DEVICE MARKING

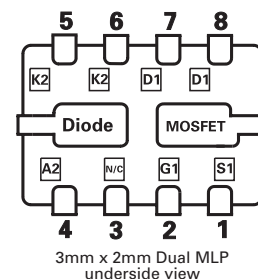
MSA



3mm x 2mm Dual Die MLP



#### PINOUT



3mm x 2mm Dual MLP underside view

## ZXMNS3BM832

### ABSOLUTE MAXIMUM RATINGS.

| PARAMETER  | SYMBOL    | VALUE       | UNIT       |
|--|-----------|-------------|------------|
| <b>MOSFET</b>  |           |             |            |
| Drain-Source Voltage   | $V_{DSS}$ | 30          | V          |
| Gate-Charge Voltage  | $V_{GS}$  | $\pm 12$    | V          |
| Continuous Drain Current @ $V_{GS}=4.5V$ ; $T_A=25^\circ C$ (b)(d)<br>@ $V_{GS}=4.5V$ ; $T_A=70^\circ C$ (b)(d)<br>@ $V_{GS}=2.5V$ ; $T_A=25^\circ C$ (a)(d) | $I_D$     | 2.72        | A          |
|  |           | 2.18        | A          |
|  |           | 2.00        | A          |
| Pulsed Drain Current (c)   | $I_{DM}$  | t.b.a       | A          |
| Source Current (Body Diode) @ $T_A=25^\circ C$ (b)(d)  | $I_S$     | 2.7         | A          |
| Pulsed Source Current (Body Diode)(c)  | $I_{SM}$  | t.b.a       | A          |
| Storage Temperature Range  | $T_{stg}$ | -55 to +150 | $^\circ C$ |
| Junction Temperature   | $T_j$     | 150         | $^\circ C$ |
| <b>Schottky Diode</b>  |           |             |            |
| Continuous Reverse Voltage   | $V_R$     | 40          | V          |
| Forward Current  | $I_F$     | 1           | A          |
| Non Repetitive Forward Current $t \leq 100\mu s$<br>$t \leq 10ms$  | $I_{FSM}$ | 12          | A          |
|  |           | 5.2         | A          |
| Forward Voltage @ 1A   | $V_F$     | 500         | mV         |
| Storage Temperature Range  | $T_{stg}$ | -55 to +150 | $^\circ C$ |
| Junction Temperature   | $T_j$     | 125         | $^\circ C$ |

#### Notes

- (a) For a dual device surface mounted on 8 sq cm single sided 2oz copper on FR4 PCB, in still air conditions **with all exposed pads attached**. The copper are is split down the centre line into two separate areas with one half connected to each half of the dual device.
- (b) Measured at  $t < 5$  secs for a dual device surface mounted on 8 sq cm single sided 2oz copper on FR4 PCB, in still air conditions **with all exposed pads attached**. The copper are is split down the centre line into two separate areas with one half connected to each half of the dual device.
- (c) For a dual device surface mounted on 8 sq cm single sided 2oz copper on FR4 PCB, in still air conditions **with minimal lead connections only**.
- (d) For a dual device surface mounted on 10 sq cm single sided 1oz copper on FR4 PCB, in still air conditions **with all exposed pads attached**. The copper are is split down the centre line into two separate areas with one half connected to each half of the dual device.
- (e) For a dual device surface mounted on 85 sq cm single sided 2oz copper on FR4 PCB, in still air conditions **with all exposed pads attached**. The copper are is split down the centre line into two separate areas with one half connected to each half of the dual device.
- (f) For a dual device with one active die.
- (g) For dual device with 2 active die running at equal power.
- (h) Repetitive rating - pulse width limited by max junction temperature. Refer to Transient Thermal Impedance graph.
- (i) The minimum copper dimensions required for mounting are no smaller than the exposed metal pads on the base if the device as shown in the package dimensions data. The thermal resistance for a dual device mounted on 1.5mm thick FR4 board using minimum copper 1 oz weight, 1mm wide tracks and one half of the device active is  $R_{th} = 250^\circ C/W$  giving a power rating of  $P_{tot} = 500mW$ .

## ZXMNS3BM832

### THERMAL PARAMETERS

| PARAMETER   | SYMBOL | VALUE       | UNIT       |
|---|--------|-------------|------------|
| <b>Schottky</b>   |        |             |            |
| Power Dissipation at TA=25°C (a)(d)<br>Linear Derating Factor | $P_D$  | 1.2<br>12   | W<br>mW/°C |
| <b>Transistor</b>   |        |             |            |
| Power Dissipation at TA=25°C (a)(f)<br>Linear Derating Factor | $P_D$  | 1.5<br>12   | W<br>mW/°C |
| Power Dissipation at TA=25°C (b)(f)<br>Linear Derating Factor | $P_D$  | 2.9<br>23.2 | W<br>mW/°C |
| Power Dissipation at TA=25°C (c)(f)<br>Linear Derating Factor | $P_D$  | 1<br>8      | W<br>mW/°C |
| Power Dissipation at TA=25°C (d)(f)<br>Linear Derating Factor | $P_D$  | 1.13<br>8   | W<br>mW/°C |
| Power Dissipation at TA=25°C (d)(g)<br>Linear Derating Factor | $P_D$  | 1.7<br>13.6 | W<br>mW/°C |
| Power Dissipation at TA=25°C (e)(g)<br>Linear Derating Factor | $P_D$  | 3<br>24     | W<br>mW/°C |

### THERMAL RESISTANCE

| PARAMETER                  | SYMBOL          | VALUE | UNIT |
|----------------------------|-----------------|-------|------|
| Junction to Ambient (a)(f) | $R_{\theta JA}$ | 83.3  | °C/W |
| Junction to Ambient (b)(f) | $R_{\theta JA}$ | 43    | °C/W |
| Junction to Ambient (c)(f) | $R_{\theta JA}$ | 125   | °C/W |
| Junction to Ambient (d)(f) | $R_{\theta JA}$ | 111   | °C/W |
| Junction to Ambient (d)(g) | $R_{\theta JA}$ | 73.5  | °C/W |
| Junction to Ambient (e)(g) | $R_{\theta JA}$ | 41.7  | °C/W |

#### Notes

- (a) For a dual device surface mounted on 8 sq cm single sided 2oz copper on FR4 PCB, in still air conditions **with all exposed pads attached**. The copper are is split down the centre line into two separate areas with one half connected to each half of the dual device.
- (b) Measured at t<5 secs for a dual device surface mounted on 8 sq cm single sided 2oz copper on FR4 PCB, in still air conditions **with all exposed pads attached**. The copper are is split down the centre line into two separate areas with one half connected to each half of the dual device.
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- (e) For a dual device surface mounted on 85 sq cm single sided 2oz copper on FR4 PCB, in still air conditions **with all exposed pads attached attached**. The copper are is split down the centre line into two separate areas with one half connected to each half of the dual device.
- (f) For a dual device with one active die.
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## ZXMNS3BM832

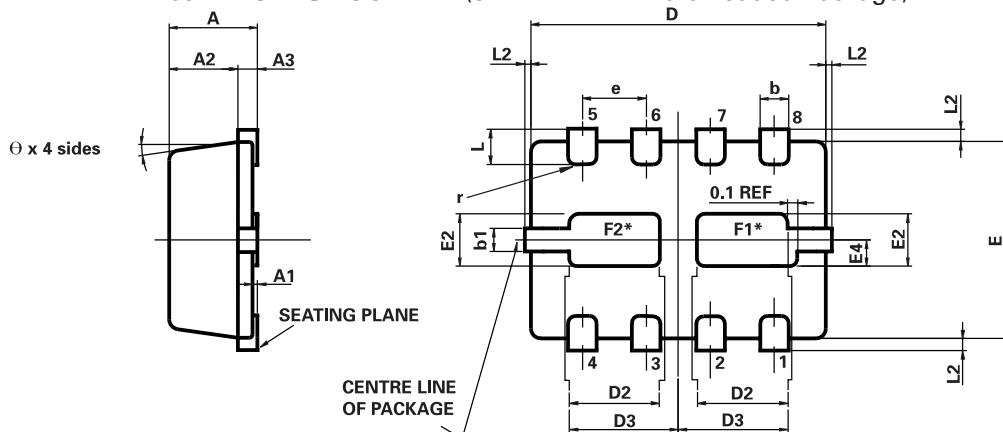
**ELECTRICAL CHARACTERISTICS** (at  $T_{amb} = 25^{\circ}\text{C}$  unless otherwise stated).

| PARAMETER  | SYMBOL        | MIN. | TYP.   | MAX.   | UNIT   | CONDITIONS.   |
|--|---------------|------|--|--|--|---|
| <b>MOSFET</b>                                    |               |      |  |  |  |   |
| <b>STATIC</b>                                    |               |      |  |  |  |   |
| Drain-Source Breakdown Voltage                   | $V_{(BR)DSS}$ | 30   |  |  | V  | $I_D=250\mu\text{A}, V_{GS}=0\text{V}$  |
| Zero Gate Voltage Drain Current                  | $I_{DSS}$     |      |  | 1  | $\mu\text{A}$                                | $V_{DS}=30\text{V}, V_{GS}=0\text{V}$   |
| Gate-Body Leakage                                | $I_{GSS}$     |      |  | 100  | nA   | $V_{GS}=\pm 20\text{V}, V_{DS}=0\text{V}$   |
| Gate-Source Threshold Voltage                    | $V_{GS(th)}$  | 0.7  |  |  | V  | $I_D=250\mu\text{A}, V_{DS}=V_{GS}$   |
| Static Drain-Source On-State Resistance (1)      | $R_{DS(on)}$  |      | 0.13<br>0.17   | 0.18<br>0.25                                       | $\Omega$<br>$\Omega$                         | $V_{GS}=4.5\text{V}, I_D=1.5\text{A}$<br>$V_{GS}=2.5\text{V}, I_D=1.3\text{A}$  |
| Forward Transconductance (1)(3)                  | $g_{fs}$      |      | t.b.a  |  | S  | $V_{DS}=15\text{V}, I_D=1.5\text{A}$  |
| <b>DYNAMIC (3)</b>                               |               |      |  |  |  |   |
| Input Capacitance                                | $C_{iss}$     |      | 314  |  | pF   | $V_{DS}=15\text{V}, V_{GS}=0\text{V}, f=1\text{MHz}$  |
| Output Capacitance                               | $C_{oss}$     |      | 40   |  | pF   |   |
| Reverse Transfer Capacitance                     | $C_{rss}$     |      | 23   |  | pF   |   |
| <b>SWITCHING(2) (3)</b>                          |               |      |  |  |  |   |
| Turn-On Delay Time                               | $t_{d(on)}$   |      | 1.1  |  | ns   | $V_{DD}=15\text{V}, I_D=1\text{A}$<br>$R_G=6.0\Omega, V_{GS}=4.5\text{V}$   |
| Rise Time  | $t_r$         |      | 1.5  |  | ns   |   |
| Turn-Off Delay Time                              | $t_{d(off)}$  |      | 5.1  |  | ns   |   |
| Fall Time  | $t_f$         |      | 2.1  |  | ns   |   |
| Total Gate Charge                                | $Q_g$         |      | 2.9  |  | nC   | $V_{DS}=15\text{V}, V_{GS}=4.5\text{V}, I_D=1.5\text{A}$  |
| Gate-Source Charge                               | $Q_{gs}$      |      | 0.6  |  | nC   |   |
| Gate-Drain Charge                                | $Q_{gd}$      |      | 0.8  |  | nC   |   |
| <b>SOURCE-DRAIN DIODE</b>                        |               |      |  |  |  |   |
| Diode Forward Voltage (1)                        | $V_{SD}$      |      | 0.85   | 0.95   | V  | $T_J=25^{\circ}\text{C}, I_S=1.7\text{A}, V_{GS}=0\text{V}$   |
| Reverse Recovery Time (3)                        | $t_{rr}$      |      | 17.7   |  | ns   | $T_J=25^{\circ}\text{C}, I_F=2.7\text{A}, di/dt=100\text{A}/\mu\text{s}$  |
| Reverse Recovery Charge (3)                      | $Q_{rr}$      |      | 13.0   |  | nC   |   |
| <b>SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS</b> |               |      |  |  |  |   |
| Reverse Breakdown Voltage                        | $V_{(BR)R}$   | 40   | 60   |  | V  | $I_R=300\mu\text{A}$  |
| Forward Voltage                                  | $V_F$         |      | 240<br>265<br>305<br>355<br>390<br>425<br>495<br>420 | 270<br>290<br>340<br>400<br>450<br>500<br>600<br>— | mV<br>mV<br>mV<br>mV<br>mV<br>mV<br>mV<br>mV | $I_F=50\text{mA}^*$<br>$I_F=100\text{mA}^*$<br>$I_F=250\text{mA}^*$<br>$I_F=500\text{mA}^*$<br>$I_F=750\text{mA}^*$<br>$I_F=1000\text{mA}^*$<br>$I_F=1500\text{mA}^*$<br>$I_F=1000\text{mA}, T_a=100^{\circ}\text{C}$ |
| Reverse Current                                  | $I_R$         |      | 50   | 100  | $\mu\text{A}$                                | $V_R=30\text{V}$  |
| Diode Capacitance                                | $C_D$         |      | 25   |  | pF   | $f=1\text{MHz}, V_R=25\text{V}$   |
| Reverse Recovery Time                            | $t_{rr}$      |      | 12   |  | ns   | switched from $I_F=500\text{mA}$ to $I_R=500\text{mA}$<br>Measured at $I_R=50\text{mA}$   |

NOTES: (1) Measured under pulsed conditions. Width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .  
 (2) Switching characteristics are independent of operating junction temperature.  
 (3) For design aid only, not subject to production testing.

## ZXMNS3BM832

### MLP832 PACKAGE OUTLINE (3mm x 2mm Micro Leaded Package)



\*Exposed Flags. Solder connection to improve thermal dissipation is optional.  
 F1 at collector 1 potential  
 F2 at collector 2 potential

CONTROLLING DIMENSIONS IN MILLIMETRES  
 APPROX. CONVERTED DIMENSIONS IN INCHES

### MLP832 PACKAGE DIMENSIONS

| DIM | MILLIMETRES |      | INCHES    |        | DIM | MILLIMETRES |      | INCHES     |        |
|-----|-------------|------|-----------|--------|-----|-------------|------|------------|--------|
|     | MIN.        | MAX. | MIN.      | MAX.   |     | MIN.        | MAX. | MIN.       | MAX.   |
| A   | 0.80        | 1.00 | 0.031     | 0.039  | e   | 0.65 REF    |      | 0.0256 BSC |        |
| A1  | 0.00        | 0.05 | 0.00      | 0.002  | E   | 2.00 BSC    |      | 0.0787 BSC |        |
| A2  | 0.65        | 0.75 | 0.0255    | 0.0295 | E2  | 0.43        | 0.63 | 0.017      | 0.0249 |
| A3  | 0.15        | 0.25 | 0.006     | 0.0098 | E4  | 0.16        | 0.36 | 0.006      | 0.014  |
| b   | 0.24        | 0.34 | 0.009     | 0.013  | L   | 0.20        | 0.45 | 0.0078     | 0.0157 |
| b1  | 0.17        | 0.30 | 0.0066    | 0.0118 | L2  | 0.125       |      | 0.00       | 0.005  |
| D   | 3.00 BSC    |      | 0.118 BSC |        | r   | 0.075 BSC   |      | 0.0029 BSC |        |
| D2  | 0.82        | 1.02 | 0.032     | 0.040  | θ   | 0°          | 12°  | 0°         | 12°    |
| D3  | 1.01        | 1.21 | 0.0397    | 0.0476 |     |             |      |            |        |

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