

## 1. Description

The DMN10H170SK3-13(ES) is N-Channel enhancement MOS Field Effect Transistor. Uses advanced shielded gate trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. Device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product DMN10H170SK3-13(ES) is Pb-free.

## 2. Features

- 100V,  $R_{DS(ON)}=90m\Omega(Typ.) @V_{GS}=10V$   
 $R_{DS(ON)}=120m\Omega(Typ.) @V_{GS}=4.5V$
- Use trench MOSFET technology
- High density cell design for low  $R_{DS(on)}$
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

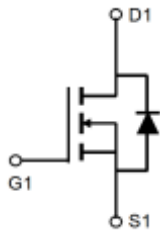
## 3. Applications

- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

## 4. Ordering Information

| Part Number         | Package | Marking     | Material     | Packing     | Quantity per reel | Flammability Rating | Reel Size |
|---------------------|---------|-------------|--------------|-------------|-------------------|---------------------|-----------|
| DMN10H170SK3-13(ES) | TO-252  | ES15N10/lot | Halogen free | Tape & Reel | 2,500 PCS         | UL 94V-0            | 13 inches |

## 5. Pin Configuration and Functions

| Pin | Function | Outline                                                                                           | Circuit Diagram                                                                       |
|-----|----------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1   | Gate     | <p>Note b</p>  |  |
| 3   | Source   |                                                                                                   |                                                                                       |
| 2   | Drain    |                                                                                                   |                                                                                       |

## 6. Specification

### Absolute Maximum Rating & Thermal Characteristics

Ratings at 25 °C ambient temperature unless otherwise specified.

| Parameter                                   |                   | Symbol     | Limit      | Unit |
|---------------------------------------------|-------------------|------------|------------|------|
| Drain-Source Voltage                        |                   | $BV_{DSS}$ | 100        | V    |
| Gate-Source Voltage                         |                   | $V_{GS}$   | ±20        | V    |
| Continuous Drain Current                    | $T_C=25^{\circ}C$ | $I_D$      | 13         | A    |
|                                             | $T_C=75^{\circ}C$ |            | 10         |      |
| Maximum Power Dissipation                   |                   | $P_D$      | 36         | W    |
| Pulsed Drain Current                        |                   | $I_{DM}$   | 52         | A    |
| Avalanche current single pulse <sup>a</sup> |                   | $I_{AS}$   | 4          | A    |
| Avalanche energy single pulse <sup>a</sup>  |                   | $E_{AS}$   | 4          | mJ   |
| Operating Junction Temperature              |                   | $T_J$      | 150        | °C   |
| Lead Temperature                            |                   | $T_L$      | 260        | °C   |
| Storage Temperature Range                   |                   | $T_{stg}$  | -55 to 150 | °C   |

### Thermal resistance ratings

| Single Operation                    |                 |         |         |      |
|-------------------------------------|-----------------|---------|---------|------|
| Parameter                           | Symbol          | Typical | Maximum | Unit |
| Junction-to-Case Thermal Resistance | $R_{\theta JC}$ |         | 3.5     | °C/W |

#### Note

a:  $R_G=25\Omega$ ,  $V_{DD}=50V$ ,  $V_{GS}=10V$ ,  $L=0.5mH$ ,  $T_J=25^{\circ}C$

b: This diagram is only an electrical schematic, and the actual pin size is based on POD.

## Electrical Characteristics

At TA = 25°C unless otherwise specified

| Parameter                                 | Symbol              | Test Conditions                                                                       | Min. | Typ.  | Max. | Unit |
|-------------------------------------------|---------------------|---------------------------------------------------------------------------------------|------|-------|------|------|
| OFF CHARACTERISTICS                       |                     |                                                                                       |      |       |      |      |
| Drain-to-Source Breakdown Voltage         | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA                                            | 100  |       |      | V    |
| Zero Gate Voltage Drain Current           | I <sub>DSS</sub>    | V <sub>DS</sub> =100V, V <sub>GS</sub> =0V                                            |      |       | 1    | uA   |
| Gate-to-source Leakage Current            | I <sub>GSS</sub>    | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V                                            |      |       | ±100 | nA   |
| ON CHARACTERISTICS                        |                     |                                                                                       |      |       |      |      |
| Gate Threshold Voltage                    | V <sub>GS(TH)</sub> | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA                              | 1.0  | 1.65  | 2.5  | V    |
| Drain-to-source On-resistance             | R <sub>DS(on)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =3.5A                                            |      | 90    | 135  | mΩ   |
|                                           |                     | V <sub>GS</sub> =4.5V, I <sub>D</sub> =2A                                             |      | 120   | 180  |      |
| CHARGES, CAPACITANCES AND GATE RESISTANCE |                     |                                                                                       |      |       |      |      |
| Input Capacitance                         | C <sub>ISS</sub>    | V <sub>GS</sub> =0V, f=1MHz,<br>V <sub>DS</sub> =25V                                  |      | 140.0 |      | pF   |
| Output Capacitance                        | C <sub>OSS</sub>    |                                                                                       |      | 69.6  |      |      |
| Reverse Transfer Capacitance              | C <sub>RSS</sub>    |                                                                                       |      | 5.5   |      |      |
| Total Gate Charge                         | Q <sub>G(TOT)</sub> | V <sub>GS</sub> =10V, V <sub>DS</sub> =25V,<br>I <sub>D</sub> =3A                     |      | 4.2   |      | nC   |
| Gate-to-Source Charge                     | Q <sub>GS</sub>     |                                                                                       |      | 1.5   |      |      |
| Gate-to-Drain Charge                      | Q <sub>GD</sub>     |                                                                                       |      | 1.1   |      |      |
| SWITCHING CHARACTERISTICS                 |                     |                                                                                       |      |       |      |      |
| Turn-On Delay Time                        | t <sub>d(ON)</sub>  | V <sub>GS</sub> =10V, V <sub>DS</sub> =25V,<br>I <sub>D</sub> =3A, R <sub>G</sub> =2Ω |      | 14.7  |      | ns   |
| Rise Time                                 | t <sub>r</sub>      |                                                                                       |      | 3.5   |      |      |
| Turn-Off Delay Time                       | t <sub>d(OFF)</sub> |                                                                                       |      | 20.9  |      |      |
| Fall Time                                 | t <sub>f</sub>      |                                                                                       |      | 2.7   |      |      |
| BODY DIODE CHARACTERISTICS                |                     |                                                                                       |      |       |      |      |
| Forward Voltage                           | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =1.0A                                             |      | 0.8   | 1.5  | V    |

## 7. Typical Characteristic

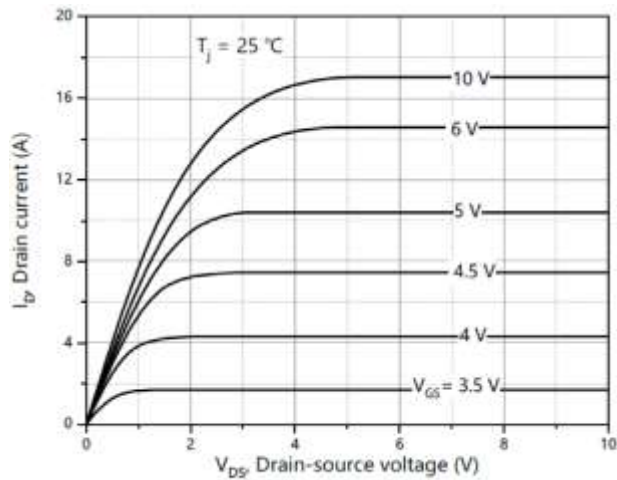


Figure1. Output Characteristics

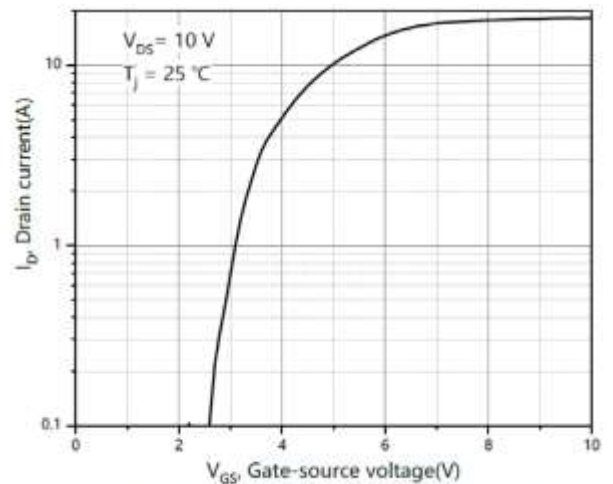


Figure2. Transfer Characteristics

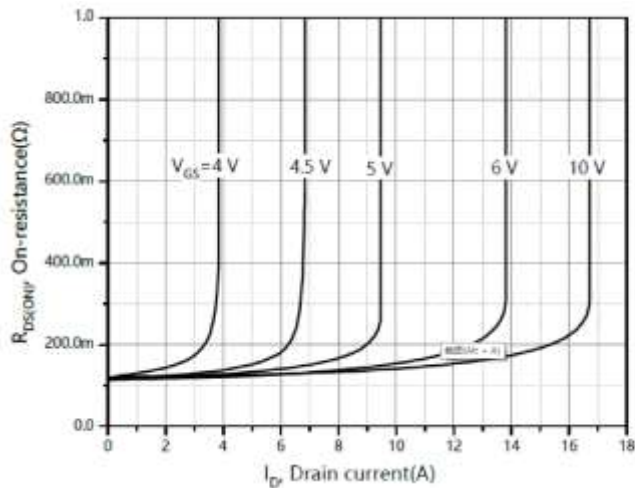


Figure3. On-Resistance vs. Drain Current and Gate Voltage

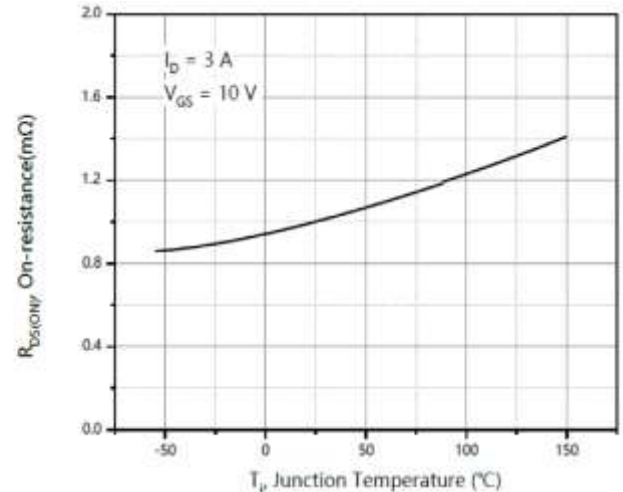


Figure4. Normalized On-Resistance

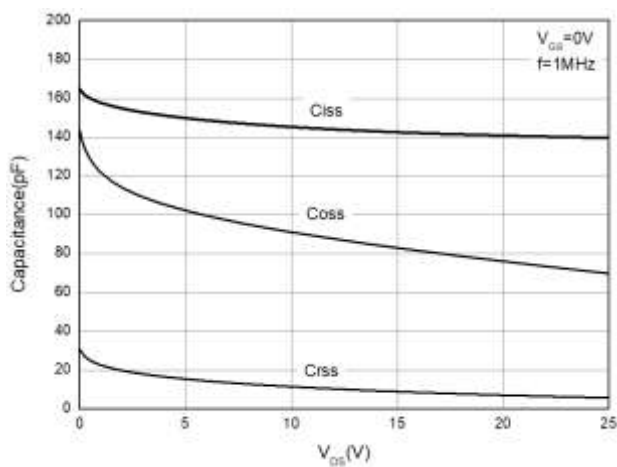


Figure5. Capacitance Characteristics

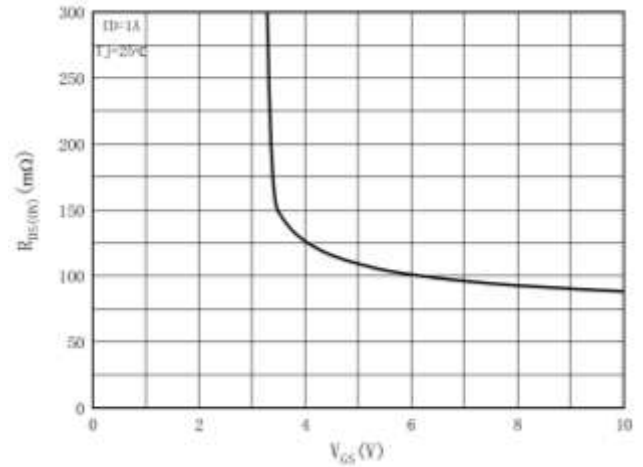
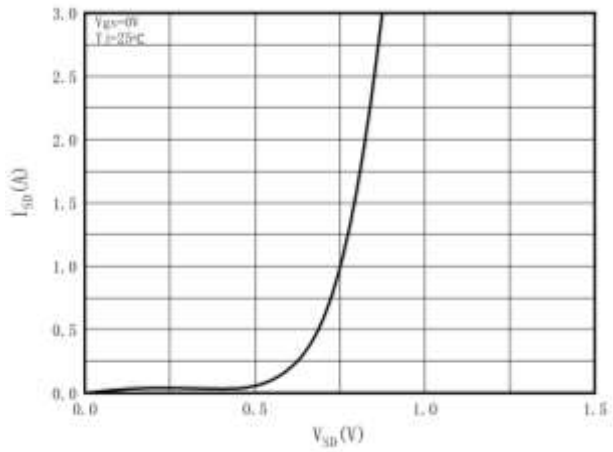


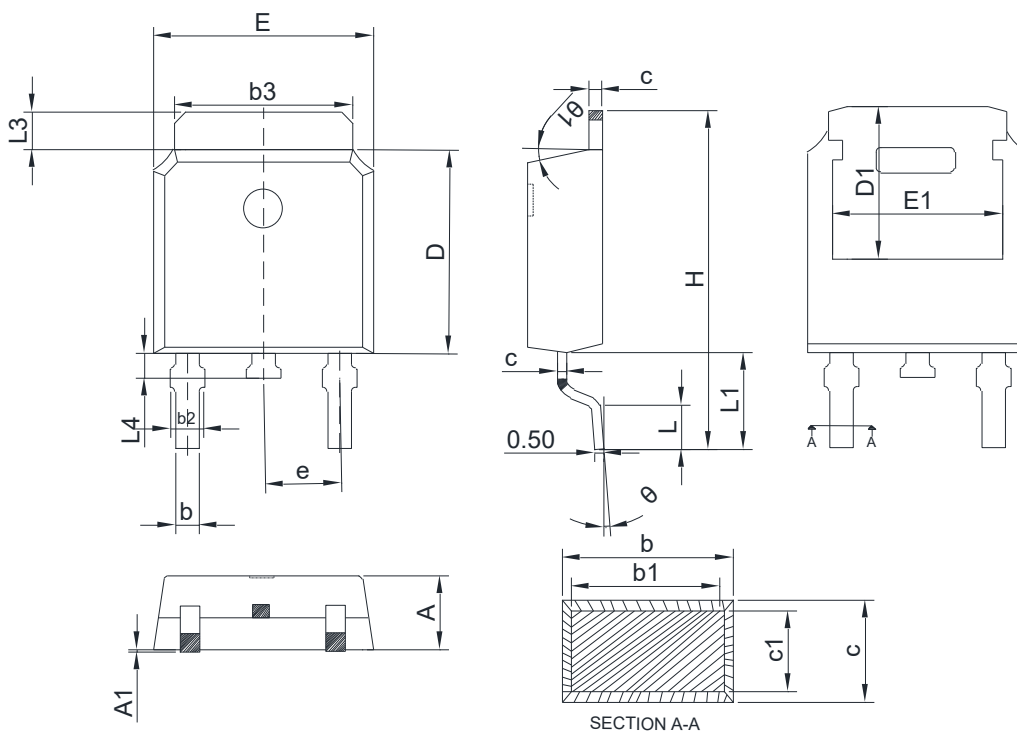
Figure6. on-Resistance vs. Gate to Source



**Figure7. Body Diode Characteristics**

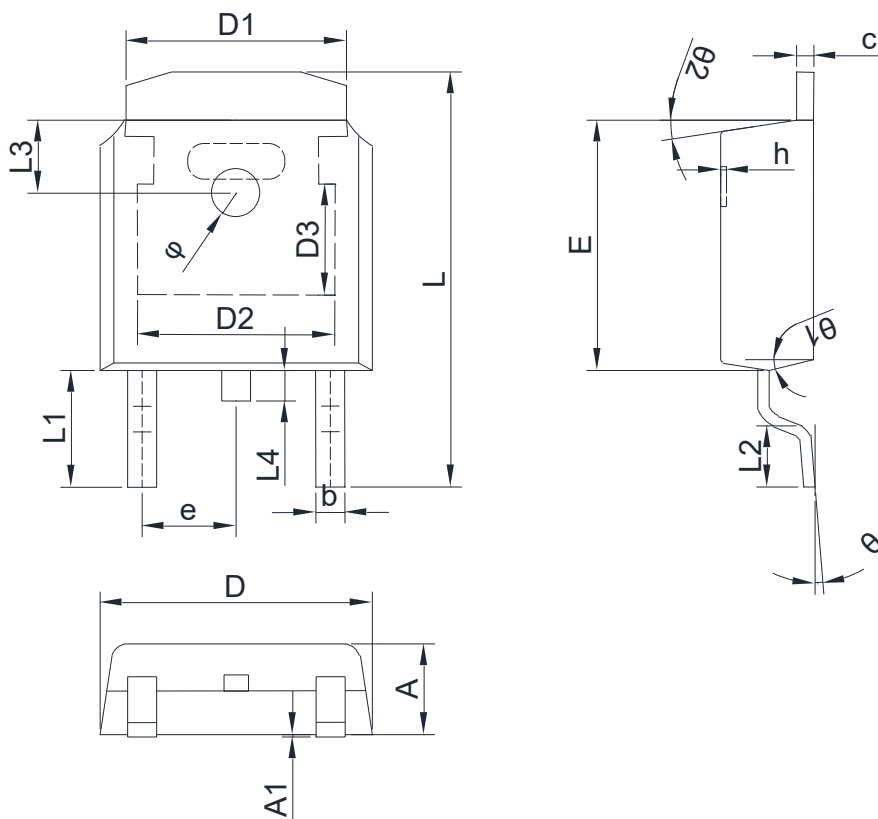
## 8. Dimension (TO-252)

### POD A(Q)



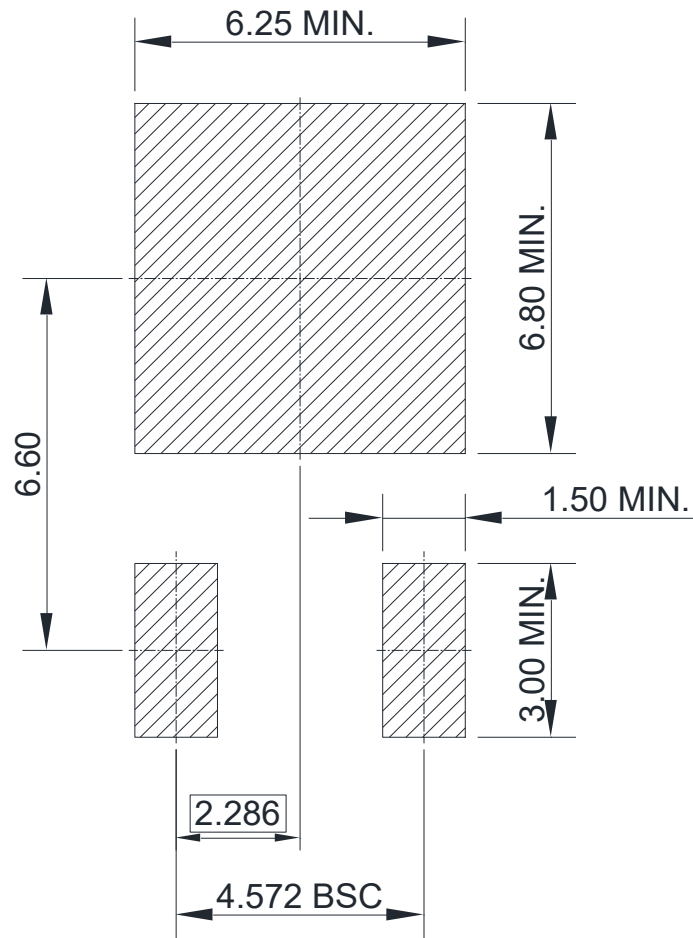
| COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER |      |      |      |        |         |      |       |
|---------------------------------------------|------|------|------|--------|---------|------|-------|
| SYMBOL                                      | MIN  | TYP  | MAX  | SYMBOL | MIN     | TYP  | MAX   |
| A                                           | 2.20 | 2.30 | 2.40 | D1     | 5.21    | -    | -     |
| A1                                          | 0.00 | -    | 0.12 | E      | 6.50    | 6.60 | 6.70  |
| b                                           | 0.65 | -    | 0.89 | E1     | 4.32    | -    | -     |
| b1                                          | 0.64 | 0.76 | 0.79 | H      | 9.70    | 9.95 | 10.20 |
| b2                                          | 0.76 | 0.86 | 1.10 | L      | 1.40    | 1.50 | 1.60  |
| b3                                          | 5.20 | 5.33 | 5.46 | L1     | 2.84REF |      |       |
| c                                           | 0.48 | -    | 0.60 | e      | 2.29BSC |      |       |
| c1                                          | 0.47 | 0.51 | 0.55 | theta  | 0°      | -    | 10°   |
| D                                           | 6.00 | 6.10 | 6.20 | theta1 | 0°      | -    | 15°   |
| L3                                          | 0.90 | -    | 1.27 | L4     | 0.60    | 0.80 | 1.00  |

POD B(X)



| COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER |           |       |       |            |           |        |        |
|---------------------------------------------|-----------|-------|-------|------------|-----------|--------|--------|
| SYMBOL                                      | MIN       | TYP   | MAX   | SYMBOL     | MIN       | TYP    | MAX    |
| A                                           | 2.200     | 2.300 | 2.400 | h          | 0.000     | 0.100  | 0.200  |
| A1                                          | 0.000     |       | 0.127 | L          | 9.900     | 10.100 | 10.300 |
| b                                           | 0.640     | 0.690 | 0.740 | L1         | 2.888 REF |        |        |
| c(电镀后)                                      | 0.460     | 0.520 | 0.580 | L2         | 1.400     | 1.550  | 1.700  |
| D                                           | 6.500     | 6.600 | 6.700 | L3         | 1.600 REF |        |        |
| D1                                          | 5.334 REF |       |       | L4         | 0.600     | 0.800  | 1.000  |
| D2                                          | 4.826 REF |       |       | $\phi$     | 1.100     | 1.200  | 1.300  |
| D3                                          | 3.166 REF |       |       | $\theta$   | 0°        |        | 8°     |
| E                                           | 6.000     | 6.100 | 6.200 | $\theta_1$ | 9° TYP    |        |        |
| e                                           | 2.286 TYP |       |       | $\theta_2$ | 9° TYP    |        |        |

## 9. Recommended Soldering Footprint



DIMENSIONS: MILLIMETERS

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