

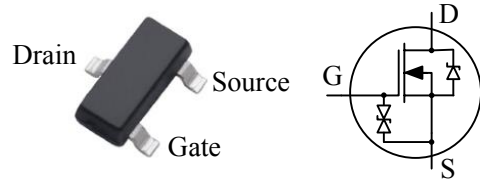
## Depletion-Mode Power MOSFET

### General Features

- ESD Improved Capability
- Depletion Mode (Normally On)
- Proprietary Advanced Planar Technology
- Rugged Polysilicon Gate Cell Structure
- Fast Switching Speed
- RoHS Compliant
- Halogen-free Available

|                         |                                  |                              |
|-------------------------|----------------------------------|------------------------------|
| <b>BV<sub>DSX</sub></b> | <b>R<sub>DS(ON)</sub> (Max.)</b> | <b>I<sub>DSS</sub> (min)</b> |
| <b>150V</b>             | <b>15 Ω</b>                      | <b>200mA</b>                 |

SOT-23



### Applications

- New Energy Vehicles
- Industrial Automation
- Surge Protection
- Non-isolated Linear Power Supply
- Normally-on Switches
- Linear Amplifier
- Constant Current Source
- Telecom

### Ordering Information

| Part Number | Package | Marking | Remark       |
|-------------|---------|---------|--------------|
| DMZ1520E    | SOT-23  | 1520    | Halogen Free |

### Absolute Maximum Ratings

T<sub>A</sub>=25°C unless otherwise specified

| Symbol                              | Parameter                                  | DMZ1520E   | Unit |
|-------------------------------------|--|------------|------|
| V <sub>DSX</sub>                    | Drain-to-Source Voltage <sup>[1]</sup>     | 150        | V    |
| V <sub>DGX</sub>                    | Drain-to-Gate Voltage <sup>[1]</sup>       | 150        | V    |
| I <sub>D</sub>                      | Continuous Drain Current                   | 0.2        | A    |
| I <sub>DM</sub>                     | Pulsed Drain Current <sup>[2]</sup>        | 0.6        |      |
| P <sub>D</sub>                      | Power Dissipation                          | 0.50       | W    |
| V <sub>GS</sub>                     | Gate-to-Source Voltage                     | ±20        | V    |
| V <sub>ESD</sub>                    | Gate to Source ESD <sup>[3]</sup>          | 1500       | V    |
|                                     | Source to Gate ESD <sup>[3]</sup>          | 1500       | V    |
| T <sub>L</sub>                      | Soldering Temperature                      | 300        | °C   |
|                                     | Distance of 1.6mm from case for 10 seconds |            |      |
| T <sub>J</sub> and T <sub>STG</sub> | Operating and Storage Temperature Range    | -55 to 150 |      |

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

### Thermal Characteristics

| Symbol           | Parameter                               | DMZ1520E | Unit |
|------------------|---|----------|------|
| R <sub>θJA</sub> | Thermal Resistance, Junction-to-Ambient | 250      | K/W  |

## Electrical Characteristics

### OFF Characteristics

 $T_A = 25^\circ\text{C}$  unless otherwise specified

| Symbol       | Parameter                         | Min. | Typ. | Max.     | Unit          | Test Conditions  |
|--------------|-----------------------------------|------|------|----------|---------------|--|
| $BV_{DSX}$   | Drain-to-Source Breakdown Voltage | 150  | --   | --       | V             | $V_{GS} = -10\text{V}$ , $I_D = 250\mu\text{A}$                              |
| $I_{D(OFF)}$ | Drain-to-Source Leakage Current   | --   | --   | 10       | $\mu\text{A}$ | $V_{DS} = 150\text{V}$ , $V_{GS} = -10\text{V}$                              |
|              |                                   | --   | --   | 1.0      | mA            | $V_{DS} = 150\text{V}$ , $V_{GS} = -10\text{V}$<br>$T_J = 125^\circ\text{C}$ |
| $I_{GSS}$    | Gate-to-Source Leakage Current    | --   | --   | $\pm 20$ | $\mu\text{A}$ | $V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$                             |

### ON Characteristics

 $T_A = 25^\circ\text{C}$  unless otherwise specified

| Symbol        | Parameter                            | Min. | Typ. | Max. | Unit     | Test Conditions  |
|---------------|--------------------------------------|------|------|------|----------|--|
| $I_{DSS}$     | Saturated Drain-to-Source Current    | 200  | --   | --   | mA       | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$               |
| $R_{DS(ON)}$  | Static Drain-to-Source On-Resistance | --   | 10   | 15   | $\Omega$ | $V_{GS} = 0\text{V}$ , $I_D = 100\text{mA}$ <sup>[4]</sup> |
| $V_{GS(OFF)}$ | Gate-to-Source Cut-off Voltage       | -3.5 | --   | -5.5 | V        | $V_{DS} = 3\text{V}$ , $I_D = 8\mu\text{A}$                |
| gfs           | Forward Transconductance             | --   | 0.24 | --   | S        | $V_{DS} = 10\text{V}$ , $I_D = 100\text{mA}$               |

### Dynamic Characteristics

Essentially independent of operating temperature

| Symbol    | Parameter                     | Min. | Typ. | Max. | Unit | Test Conditions   |
|-----------|-------------------------------|------|------|------|------|---|
| $C_{ISS}$ | Input Capacitance             | --   | 12.8 | --   | pF   | $V_{GS} = -10\text{V}$<br>$V_{DS} = 25\text{V}$<br>$f = 1.0\text{MHz}$                |
| $C_{OSS}$ | Output Capacitance            | --   | 5.4  | --   |      |   |
| $C_{RSS}$ | Reverse Transfer Capacitance  | --   | 3.3  | --   |      |   |
| $Q_G$     | Total Gate Charge             | --   | 3    | --   | nC   | $V_{GS} = -10\text{V} \sim 0\text{V}$<br>$V_{DS} = 75\text{V}$ , $I_D = 200\text{mA}$ |
| $Q_{GS}$  | Gate-to-Source Charge         | --   | 0.23 | --   |      |   |
| $Q_{GD}$  | Gate-to-Drain (Miller) Charge | --   | 1.1  | --   |      |   |

### Resistive Switching Characteristics

Essentially independent of operating temperature

| Symbol       | Parameter           | Min. | Typ. | Max. | Unit | Test Conditions   |
|--------------|---------------------|------|------|------|------|---|
| $t_{d(on)}$  | Turn-on Delay Time  | --   | 7    | --   | ns   | $V_{GS} = -10\text{V} \sim 0\text{V}$<br>$V_{DD} = 75\text{V}$ , $I_D = 200\text{mA}$<br>$R_G = 20\Omega$ |
| $t_{rise}$   | Rise Time           | --   | 16   | --   |      |   |
| $t_{d(off)}$ | Turn-off Delay Time | --   | 25   | --   |      |   |
| $t_{fall}$   | Fall Time           | --   | 120  | --   |      |   |

### Source-Drain Diode Characteristics

 $T_A = 25^\circ\text{C}$  unless otherwise specified

| Symbol   | Parameter             | Min. | Typ. | Max. | Units | Test Conditions                                  |
|----------|-----------------------|------|------|------|-------|--|
| $V_{SD}$ | Diode Forward Voltage | --   | --   | 1.2  | V     | $I_{SD} = 200\text{mA}$ , $V_{GS} = -10\text{V}$ |

NOTE:

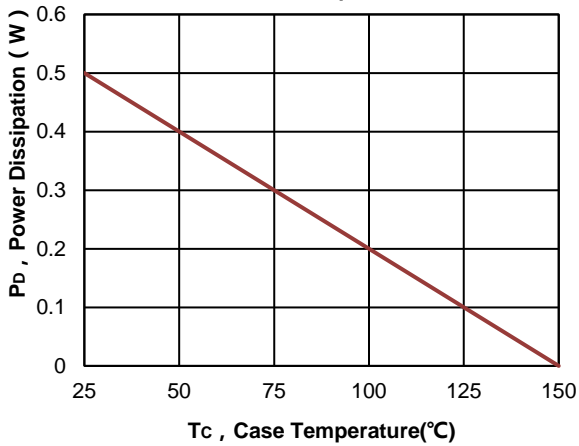
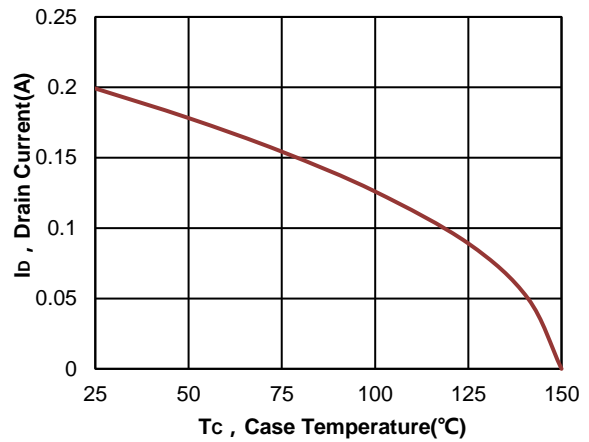
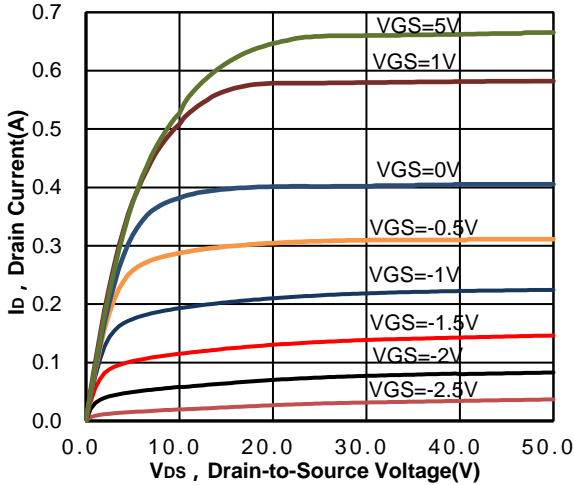
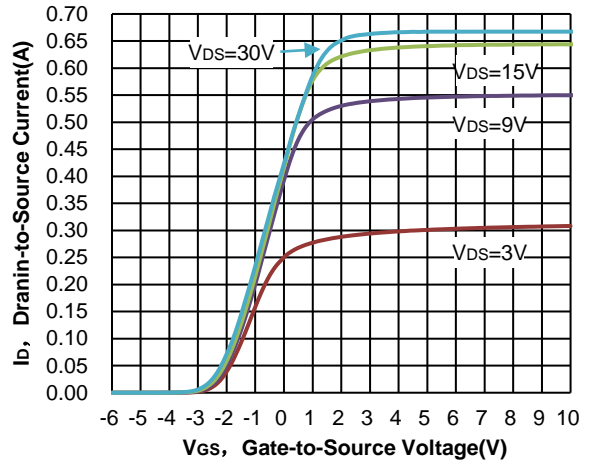
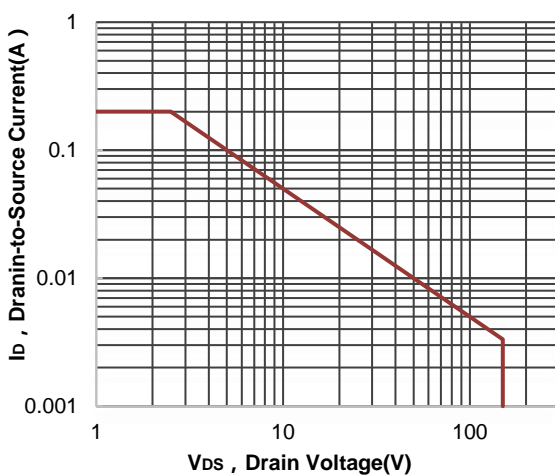
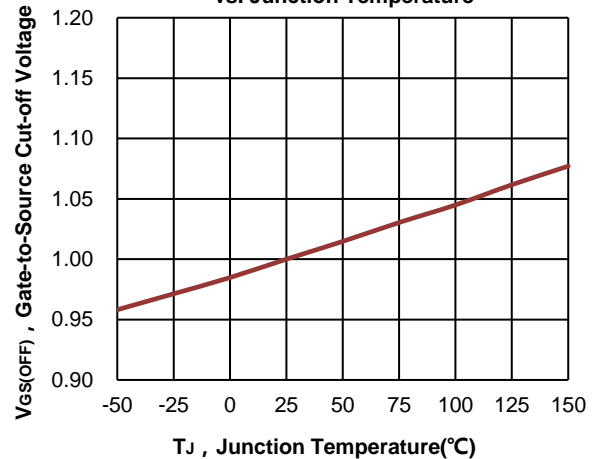
[1]  $T_J = +25^\circ\text{C}$  to  $+150^\circ\text{C}$ 

[2] Repetitive rating, pulse width limited by maximum junction temperature.

[3] The test is based on JEDEC EIA/JESD22-A114(HBM).

[4] Pulse width  $\leq 380\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

## Typical Characteristics

**Figure 1. Maximum Power Dissipation vs. Case Temperature**

**Figure 2. Maximum Continuous Drain Current vs. Case Temperature**

**Figure 3. Typical Output Characteristics**

**Figure 4. Typical Transfer Characteristics**

**Figure 5. Maximum Rated Safe Operating Area**

**Figure 6. Typical Gate-to-Source Cut-off Voltage vs. Junction Temperature**


## Typical Application

In the application circuits of industrial automation, automotive electronics, and new energy, DMZ1520E can be used to power LDO. As shown in Figure 7, only one DMZ1520E is used in the circuit, which can convert the high input voltage into a stable low voltage to supply power to the LDO, and at the same time provide transient surge suppression for the LDO. The input voltage and output voltage of the LDO satisfy the relationship:  $V_S = V_{out} + |V_{GS(OFF)}|$ . The circuit has a fast response speed, a simple structure, and can effectively save costs.

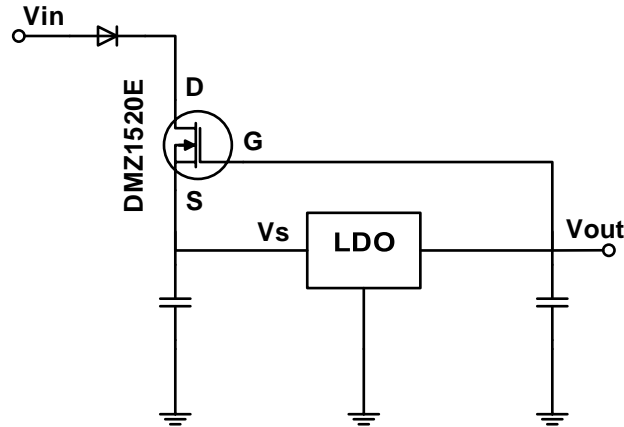


Figure 7. The Circuit of DMZ1520E to power supply for LDO

Using the sub-threshold characteristics of the DMZ1520E, it can form a stable current source with the resistor R. Its basic application is shown in Figure 8:

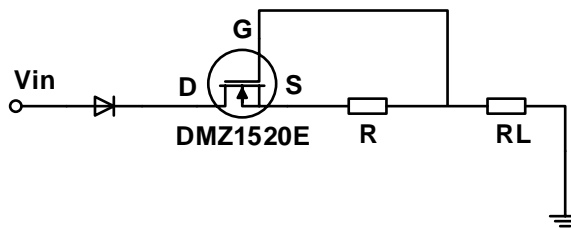
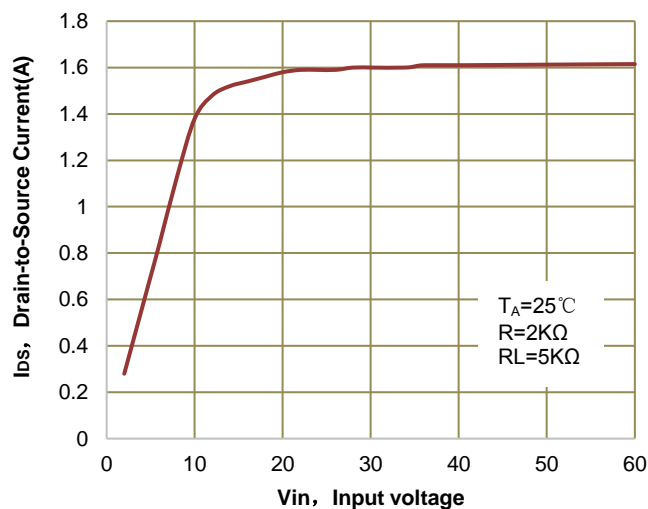


Figure 8. The Circuit of DMZ1520E and resistor form constant current source

Using the sample with  $V_{GS(OFF)} = -4.3V$  ( $@V_{DS} = 3V, I_{DS} = 8\mu A$ ) to test according to the circuit shown in Figure 8, the result is shown in Figure 9:

Figure 9. Typical Drain-to-Source Current vs. Input voltage



In the Type-C/PD charger circuit, DMZ1520E and resistor R form a constant current source, which supplies stable power to InnoSwitch. The structure of the circuit is simple, and the DMZ1520E can also provide transient surge suppression for InnoSwitch. The circuit is shown in Figure 10:

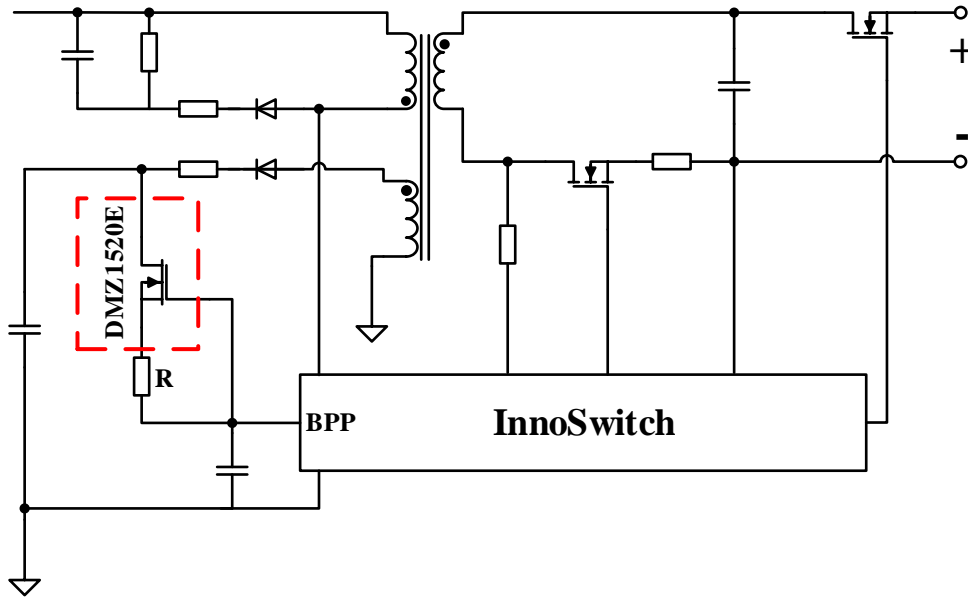
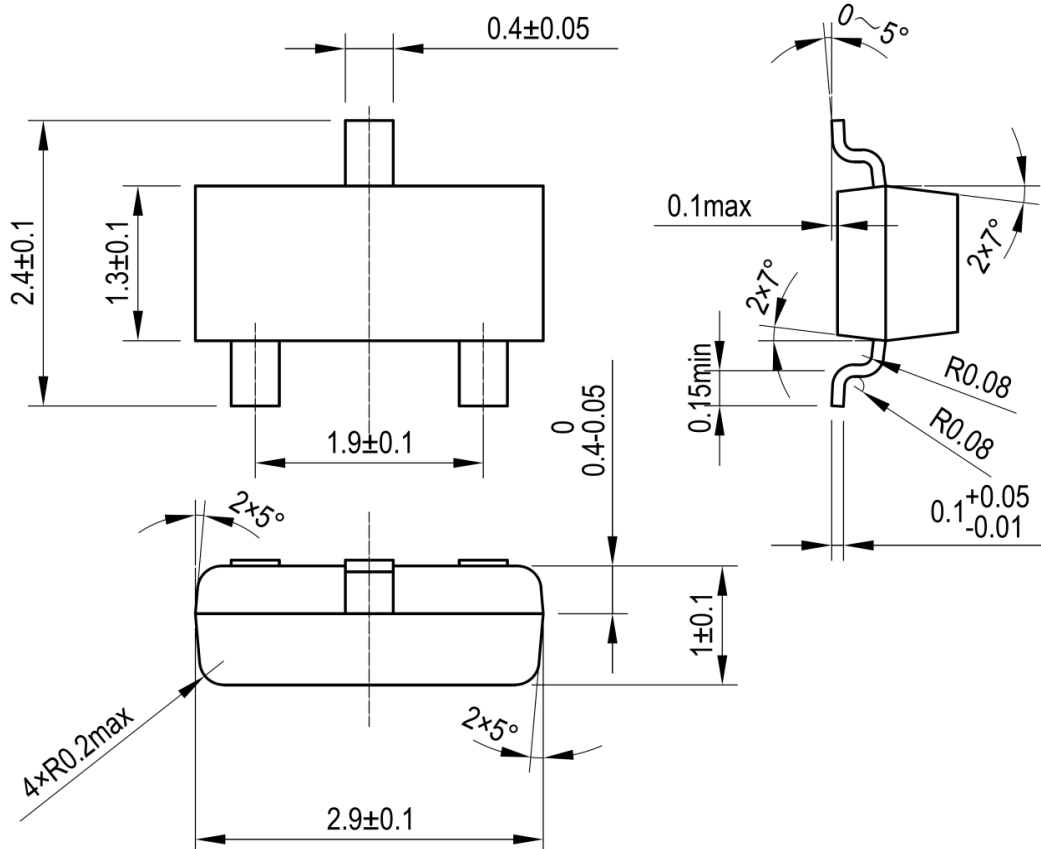


Figure 10. Constant current source circuit with DMZ1520E

**Package Dimensions**
**SOT-23**




**Published by**

**ARK Microelectronics Co., Ltd.**

**ADD: D26,UESTC National Science Park No. 1 Shuangxing Avenue, Chengdu, Sichuan.All  
All Rights Reserved.**

**Disclaimers**

---

ARK Microelectronics Co., Ltd. reserves the right to make change without notice in order to improve reliability, function or design and to discontinue any product or service without notice. Customers should obtain the latest relevant information before orders and should verify that such information is current and complete. All products are sold subject to ARK Microelectronics Co., Ltd's terms and conditions supplied at the time of order acknowledgement.

ARK Microelectronics Co., Ltd. warrants performance of its hardware products to the specifications at the time of sale, Testing, reliability and quality control are used to the extent ARK Microelectronics Co., Ltd deems necessary to support this warrantee. Except where agreed upon by contractual agreement, testing of all parameters of each product is not necessary performed.

ARK Microelectronics Co., Ltd. does not assume any liability arising from the use of any product or circuit designs described herein. Customers are responsible for their products and applications using ARK Microelectronics Co., Ltd's components. To minimize risk, customers must provide adequate design and operating safeguards.

ARK Microelectronics Co., Ltd. does not warrant or convey any license either expressed or implied under its patent rights, nor the rights of others. Reproduction of information in ARK Microelectronics Co., Ltd's data sheets or data books is permissible only if reproduction is without modification or alteration. Reproduction of this information with any alteration is an unfair and deceptive business practice. ARK Microelectronics Co., Ltd is not responsible or liable for such altered documentation.

Resale of ARK Microelectronics Co., Ltd's products with statements different from or beyond the parameters stated by ARK Microelectronics Co., Ltd. for the product or service voids all express or implied warranties for the associated ARK Microelectronics Co., Ltd's product or service and is unfair and deceptive business practice. ARK Microelectronics Co., Ltd is not responsible or liable for any such statements.

---

**Life Support Policy:**

ARK Microelectronics Co., Ltd's products are not authorized for use as critical components in life devices or systems without the expressed written approval of ARK Microelectronics Co., Ltd.

As used herein:

1. Life support devices or systems are devices or systems which:
    - a. are intended for surgical implant into the human body,
    - b. support or sustain life,
    - c. whose failure to perform when properly used in accordance with instructions for used provided in the labeling, can be reasonably expected to result in significant injury to the user.
  2. A critical component is any component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.
-