

**Product Summary**

|                              |                             |
|------------------------------|-----------------------------|
| $V_{DS}$                     | 1700 V                      |
| $I_D (T_c=25^\circ\text{C})$ | 7 A                         |
| $R_{DS(on).typ}$             | 600 mΩ@ $V_{GS}=18\text{V}$ |

**Features**

- Low On-Resistance with High Blocking Voltage
- Low Capacitance
- Avalanche Ruggedness
- Halogen Free, Rohs Compliant

**Benefits**

- High Frequency Operation
- Enabling Higher Switching Frequency
- Increased Power Density
- Reduction of Heat Sink Requirements

**Applications**

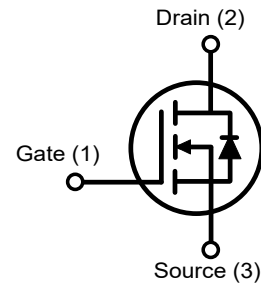
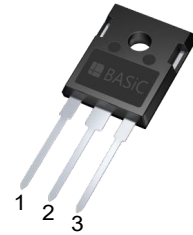
- Switch Mode Power Supplies (SMPS)
- Power Inverter & Solar Inverter
- Motor Drivers & EV Charging Station
- DC/DC Converter

**Package Pin Definitions**

- Pin1 - Gate
- Pin2 - Drain
- Pin3 - Source

**Package Parameters**

| Part Number | Marking    | Package  |
|-------------|------------|----------|
| B2M600170H  | B2M600170H | TO-247-3 |

**Package: TO-247-3**


**Maximum Ratings**

| Symbol           | Parameter                      | Test conditions                                     | Value   | Unit       |
|------------------|--------------------------------|-----------------------------------------------------|---------|------------|
| $V_{DSmax}$      | Drain-Source Voltage           | $V_{GS}=0V, I_D=100\mu A$                           | 1700    | V          |
| $V_{GSmax}^{1)}$ | Gate-Source Voltage            |                                                     | -10/22  | V          |
| $V_{GSop}$       | Recommend Gate-Source Voltage  |                                                     | -4/18   | V          |
| $I_D$            | Continuous Drain Current       | $V_{GS}=18V, T_C=25^\circ C$                        | 7       | A          |
|                  |                                | $V_{GS}=18V, T_C=100^\circ C$                       | 5       | A          |
| $I_{D,pulse}$    | Pulsed Drain Current           | Pulse with $t_p$ limited by $T_{jmax}$              | 10      | A          |
| $P_{tot}$        | Power Dissipation              | $T_C=25^\circ C, T_J=175^\circ C$                   | 75      | W          |
| $E_{AS}$         | Single pulse avalanche energy  | $T_C=25^\circ C, L=0.5mH, I_{AS}=8.5A, V_{DD}=140V$ | 18      | mJ         |
| $T_J$            | Operating Junction Temperature |                                                     | -55~175 | $^\circ C$ |
| $T_{stg}$        | Storage Temperature            |                                                     | -55~175 | $^\circ C$ |
| $M_d$            | TO-247 mounting torque         | M3 Screw                                            | 0.7     | N·m        |

1) Note: When using MOSFET Body Diode  $V_{GSmax}=-4/22V$

**Electrical Characteristics (Defined at  $T_J=25^\circ C$  unless otherwise specified)**  
**Static Characteristics**

| Symbol        | Parameter                        | Test conditions                             | Value |      |      | Unit       |
|---------------|----------------------------------|---------------------------------------------|-------|------|------|------------|
|               |                                  |                                             | Min.  | Typ. | Max. |            |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage   | $V_{GS}=0V, I_D=100\mu A$                   | 1700  |      |      | V          |
| $V_{GS(th)}$  | Gate Threshold Voltage           | $V_{GS}=V_{DS}, I_D=0.5mA$                  | 2.3   | 2.7  | 3.5  | V          |
|               |                                  | $V_{GS}=V_{DS}, I_D=0.5mA, T_J=175^\circ C$ |       | 1.9  |      |            |
| $I_{GSS}$     | Gate-Source Leakage Current      | $V_{GS}=18V, V_{DS}=0V$                     |       |      | 100  | nA         |
| $I_{DSS}$     | Zero Gate Voltage Drain Current  | $V_{DS}=1700V, V_{GS}=0V$                   |       | 1    | 50   | $\mu A$    |
|               |                                  | $V_{DS}=1700V, V_{GS}=0V, T_J=175^\circ C$  |       | 10   | 200  |            |
| $R_{DS(on)}$  | Drain-Source On-State Resistance | $V_{GS}=18V, I_D=2A$                        |       | 600  | 750  | m $\Omega$ |
|               |                                  | $V_{GS}=18V, I_D=2A, T_J=175^\circ C$       |       | 1230 |      |            |
|               |                                  | $V_{GS}=15V, I_D=2A$                        |       | 750  |      |            |
| $g_{fs}$      | Transconductance                 | $V_{DS}=10V, I_D=2A$                        |       | 1    |      | S          |

**Thermal Characteristics**

| Symbol       | Parameter                                | Value |      |      | Unit |
|--------------|------------------------------------------|-------|------|------|------|
|              |                                          | Min.  | Typ. | Max. |      |
| $R_{th(jc)}$ | Thermal Resistance from Junction to Case |       | 2.00 |      | K/W  |

**AC Characteristics**

| Symbol       | Parameter                                    | Test conditions                                    | Value |      |      | Unit |
|--------------|----------------------------------------------|----------------------------------------------------|-------|------|------|------|
|              |                                              |                                                    | Min.  | Typ. | Max. |      |
| $C_{iss}$    | Input Capacitance                            | $V_{GS}=0V, V_{DS}=1000V$<br>$f=1MHz, V_{AC}=25mV$ |       | 170  |      | pF   |
| $C_{oss}$    | Output Capacitance                           |                                                    |       | 11   |      | pF   |
| $C_{rss}$    | Reverse Transfer Capacitance                 |                                                    |       | 2    |      | pF   |
| $E_{oss}$    | $C_{oss}$ Stored Energy                      |                                                    |       | 6.3  |      | μJ   |
| $C_{O(ER)}$  | Effective Output Capacitance, Energy Related | $V_{GS}=0V, 0V < V_{DS} < 1000V$                   |       | 12.7 |      | pF   |
| $C_{O(TR)}$  | Effective Output Capacitance, Time Related   | $V_{GS}=0V, 0V < V_{DS} < 1000V$                   |       | 18   |      | pF   |
| $R_{G(int)}$ | Internal Gate Resistance                     | $f=1MHz, V_{AC}=25mV$                              |       | 30   |      | Ω    |

**Gate Charge Characteristics**

| Symbol   | Parameter             | Test conditions                                | Value |      |      | Unit |
|----------|-----------------------|------------------------------------------------|-------|------|------|------|
|          |                       |                                                | Min.  | Typ. | Max. |      |
| $Q_{GS}$ | Gate to Source Charge | $V_{DS}=1000V$<br>$I_D=2A$<br>$V_{GS}=-4/+18V$ |       | 2    |      | nC   |
| $Q_{GD}$ | Gate to Drain Charge  |                                                |       | 11   |      | nC   |
| $Q_G$    | Total Gate Charge     |                                                |       | 14   |      | nC   |

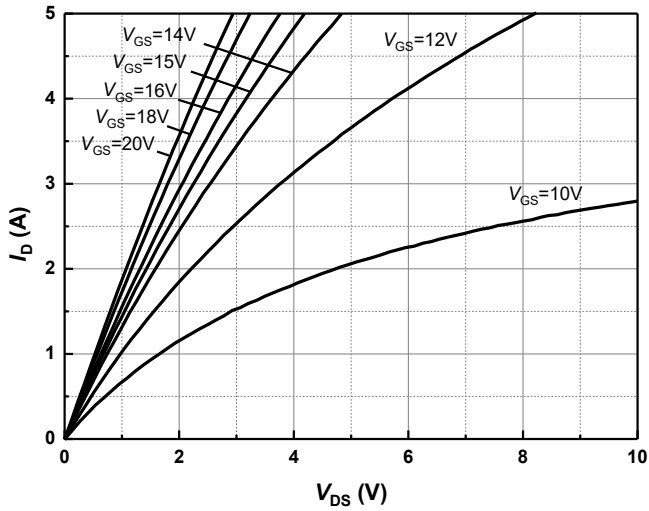
**Switching Characteristics**

| Symbol       | Parameter           | Test conditions                                                                                                                                                                              | Value |      |      | Unit |
|--------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|------|------|
|              |                     |                                                                                                                                                                                              | Min.  | Typ. | Max. |      |
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DC}=1000V, V_{GS}=-4/18V$<br>$I_D=2A, R_{G(ext)}=2.2\Omega$<br>$L_g=70nH, T_j=25^\circ C$<br>diode: body diode at $V_{GS}=-4V$<br>Inductive Load<br>Eon includes diode reverse recovery  |       | 12   |      | ns   |
| $t_r$        | Rise Time           |                                                                                                                                                                                              |       | 24   |      | ns   |
| $t_{d(off)}$ | Turn-Off Delay Time |                                                                                                                                                                                              |       | 20   |      | ns   |
| $t_f$        | Fall Time           |                                                                                                                                                                                              |       | 66   |      | ns   |
| $E_{on}$     | Turn-On Energy      |                                                                                                                                                                                              |       | 80   |      | uJ   |
| $E_{off}$    | Turn-Off Energy     |                                                                                                                                                                                              |       | 13   |      | uJ   |
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DC}=1000V, V_{GS}=-4/18V$<br>$I_D=2A, R_{G(ext)}=2.2\Omega$<br>$L_g=70nH, T_j=175^\circ C$<br>diode: body diode at $V_{GS}=-4V$<br>Inductive Load<br>Eon includes diode reverse recovery |       | 14   |      | ns   |
| $t_r$        | Rise Time           |                                                                                                                                                                                              |       | 22   |      | ns   |
| $t_{d(off)}$ | Turn-Off Delay Time |                                                                                                                                                                                              |       | 24   |      | ns   |
| $t_f$        | Fall Time           |                                                                                                                                                                                              |       | 67   |      | ns   |
| $E_{on}$     | Turn-On Energy      |                                                                                                                                                                                              |       | 110  |      | uJ   |
| $E_{off}$    | Turn-Off Energy     |                                                                                                                                                                                              |       | 13   |      | uJ   |

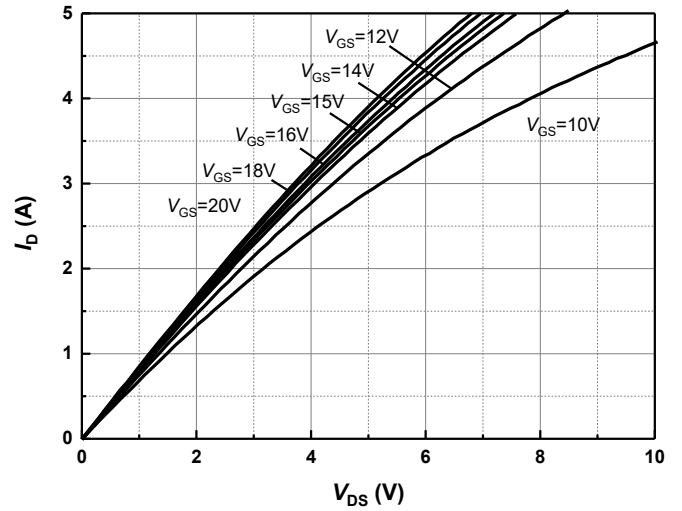
**Reverse Diode Characteristics**

| Symbol         | Parameter                        | Test conditions                                                                     | Value |      |      | Unit |
|----------------|----------------------------------|-------------------------------------------------------------------------------------|-------|------|------|------|
|                |                                  |                                                                                     | Min.  | Typ. | Max. |      |
| $V_{SD}$       | Diode Forward Voltage            | $V_{GS}=-4V, I_{SD}=1A, T_j=25^\circ C$                                             |       | 5.2  |      | V    |
|                |                                  | $V_{GS}=-4V, I_{SD}=1A, T_j=175^\circ C$                                            |       | 4.5  |      |      |
| $I_{SD}$       | Continuous Diode Forward Current | $V_{GS}=-4V, T_c=25^\circ C$                                                        |       | 6    |      | A    |
| $I_{SD,pulse}$ | Pulse Diode Current              | $V_{GS}=-4V$ , pulse width $t_p$ limited by $T_{jmax}$                              |       | 9    |      | A    |
| $t_{rr}$       | Reverse Recovery Time            | $V_{GS}=-4V, V_{DC}=1000V, I_{SD}=2A$<br>$-di_F/dt=500A/\mu s$<br>$T_j=25^\circ C$  |       | 39   |      | ns   |
| $Q_{rr}$       | Reverse Recovery Charge          |                                                                                     |       | 42   |      | nC   |
| $I_{rrm}$      | Peak Reverse Recovery Current    |                                                                                     |       | 2    |      | A    |
| $t_{rr}$       | Reverse Recovery Time            | $V_{GS}=-4V, V_{DC}=1000V, I_{SD}=2A$<br>$-di_F/dt=500A/\mu s$<br>$T_j=175^\circ C$ |       | 38   |      | ns   |
| $Q_{rr}$       | Reverse Recovery Charge          |                                                                                     |       | 98   |      | nC   |
| $I_{rrm}$      | Peak Reverse Recovery Current    |                                                                                     |       | 3.5  |      | A    |

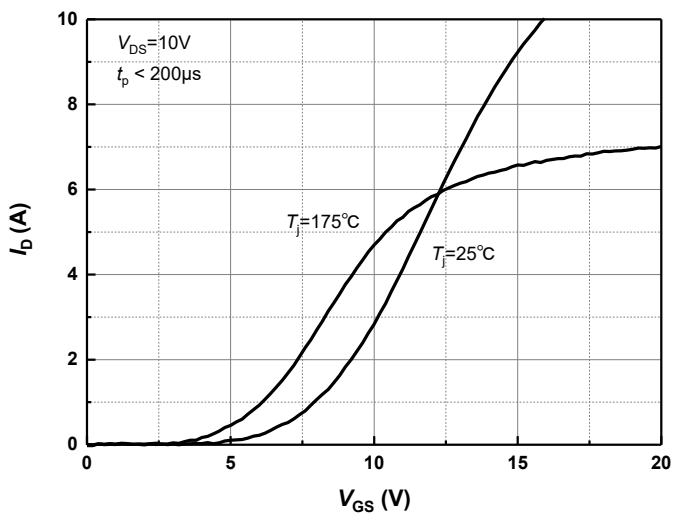
## Typical Performance



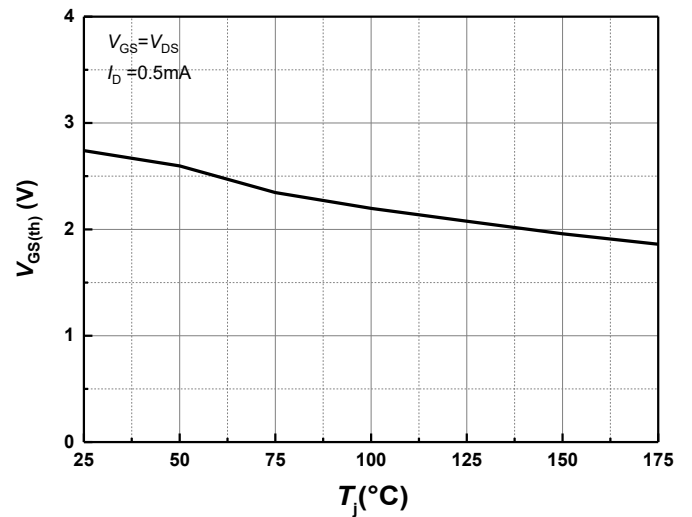
**Figure 1** Typical Forward Output Characteristics at  $T_j = 25^\circ\text{C}$



**Figure 2** Typical Forward Output Characteristics at  $T_j = 175^\circ\text{C}$

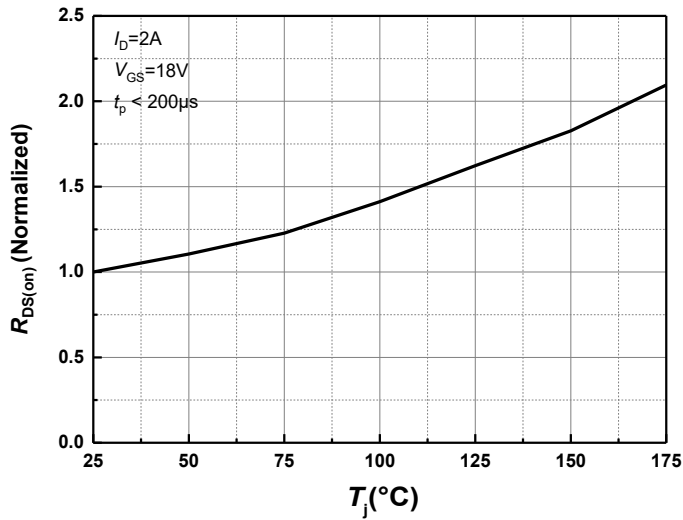


**Figure 3** Transfer Characteristics for Various Temperature

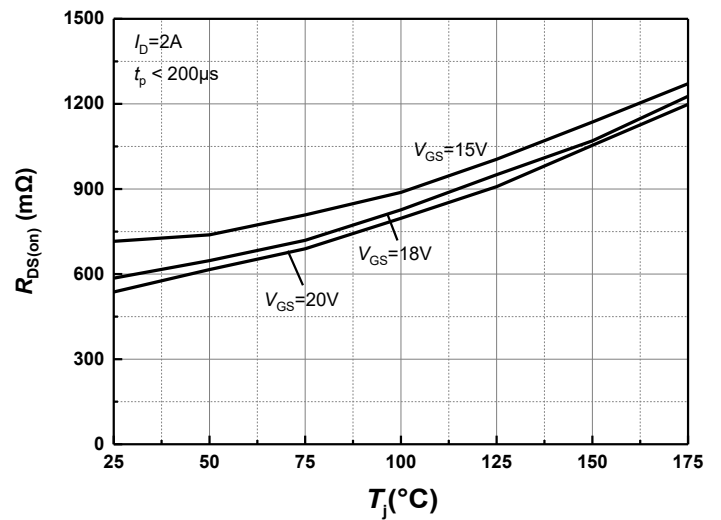


**Figure 4** Threshold Voltage for Various Temperature

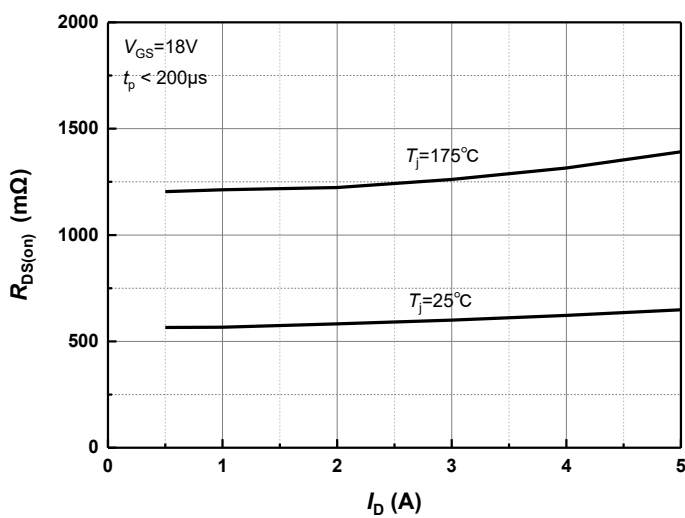
## Typical Performance



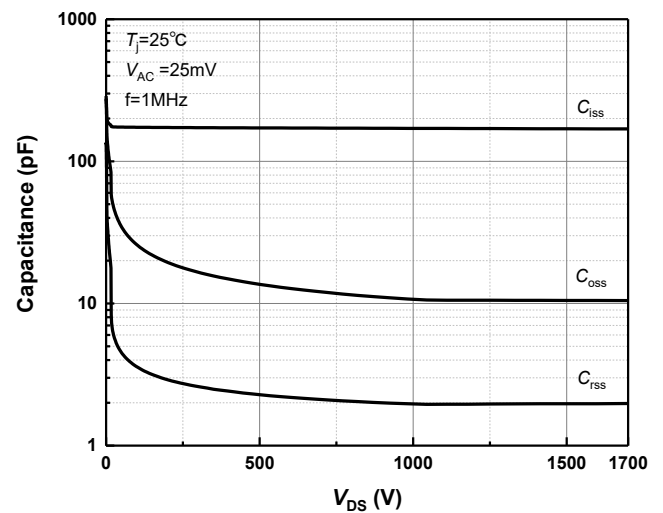
**Figure 5** Normalized On-Resistance for Various Temperature



**Figure 6** On-Resistance vs. Temperature for Various Gate-Source Voltage

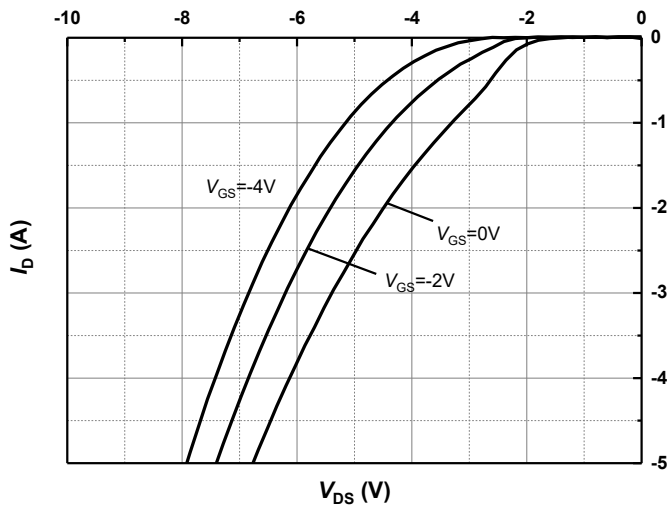


**Figure 7** On-Resistance vs. Drain Current for Various Temperature

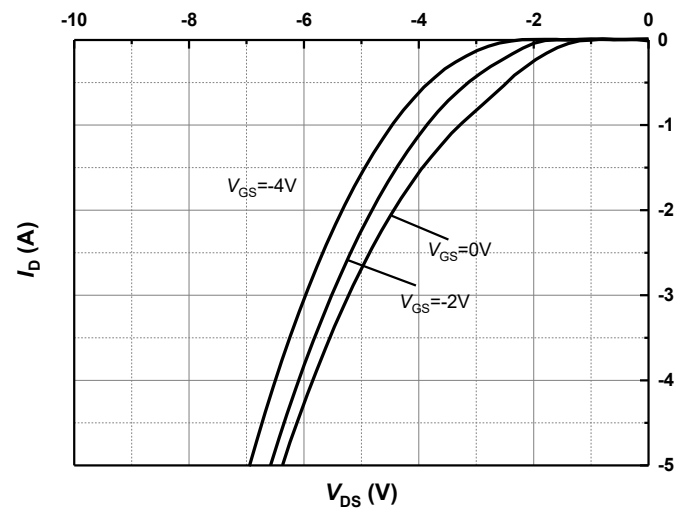


**Figure 8** Capacitance vs. Drain-Source Voltage (0 - 1700V)

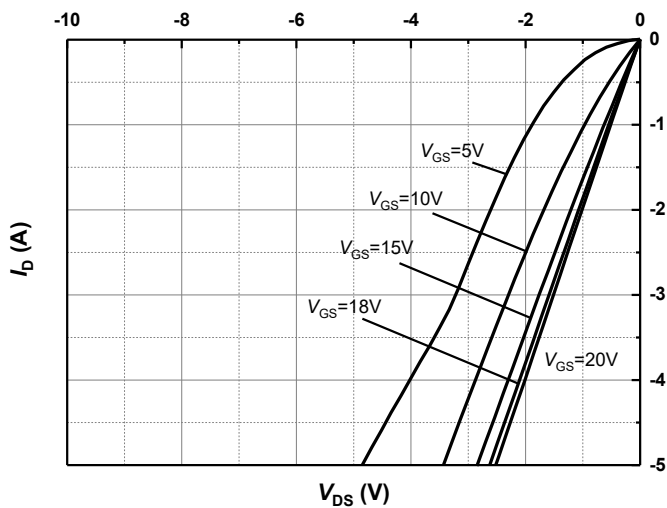
## Typical Performance



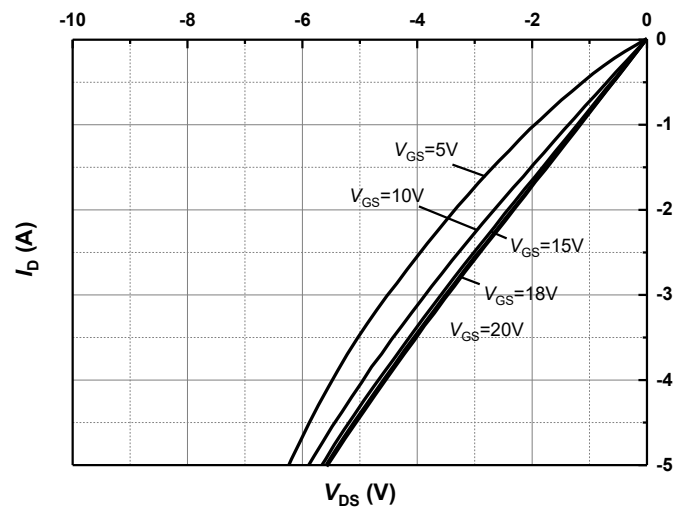
**Figure 9** Body Diode Characteristics at  $T_j=25^{\circ}\text{C}$



**Figure 10** Body Diode Characteristics at  $T_j=175^{\circ}\text{C}$

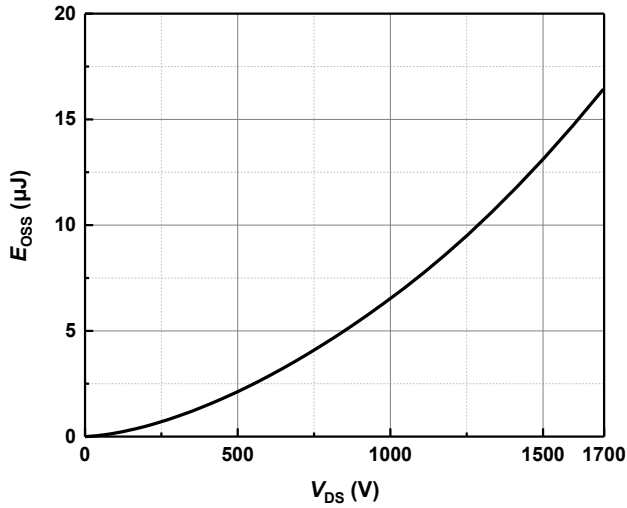


**Figure 11** 3rd Quadrant Characteristics at  $T_j=25^{\circ}\text{C}$

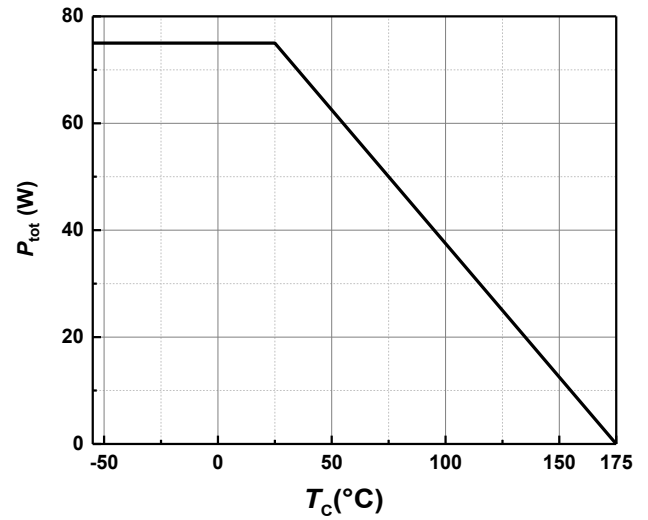


**Figure 12** 3rd Quadrant Characteristics at  $T_j=175^{\circ}\text{C}$

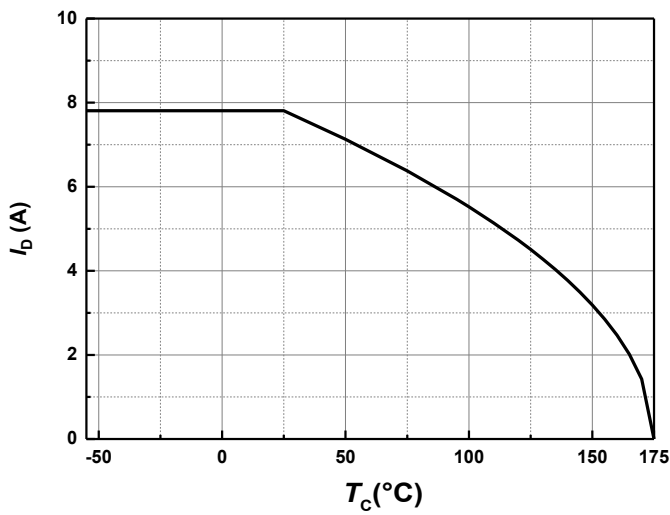
## Typical Performance



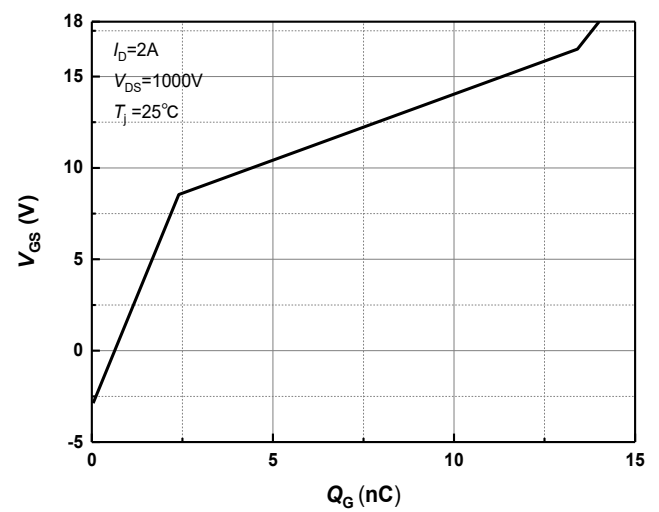
**Figure 13 Output Capacitor stored Energy**



**Figure 14 Maximum Power Dissipation Derating vs. Case Temperature**



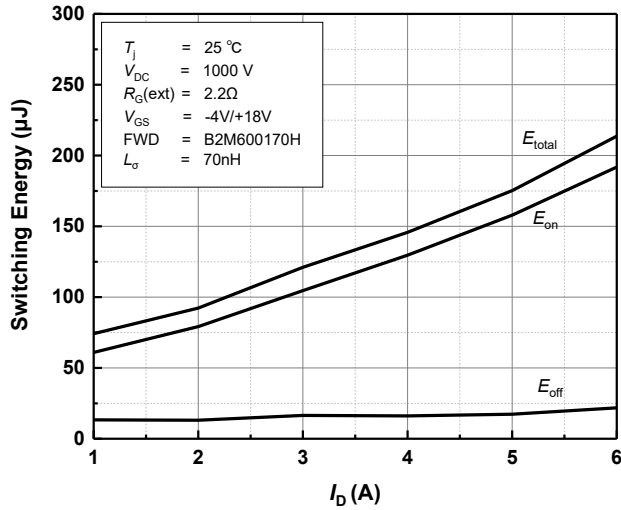
**Figure 15 Continuous Drain Current Derating vs. Case Temperature**



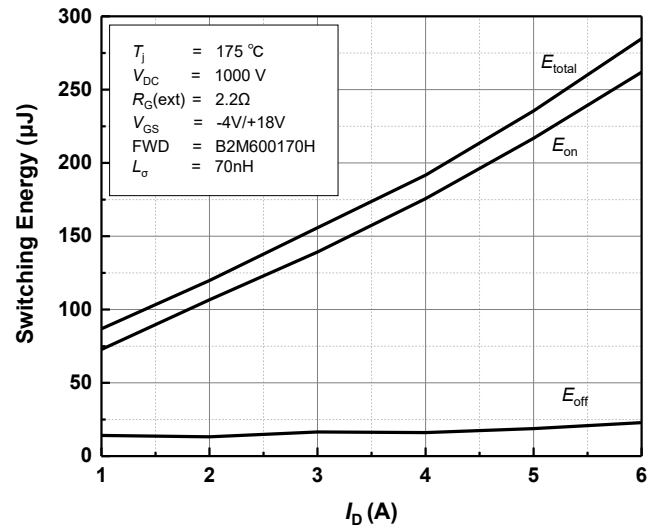
**Figure 16 Gate Charge Characteristics**



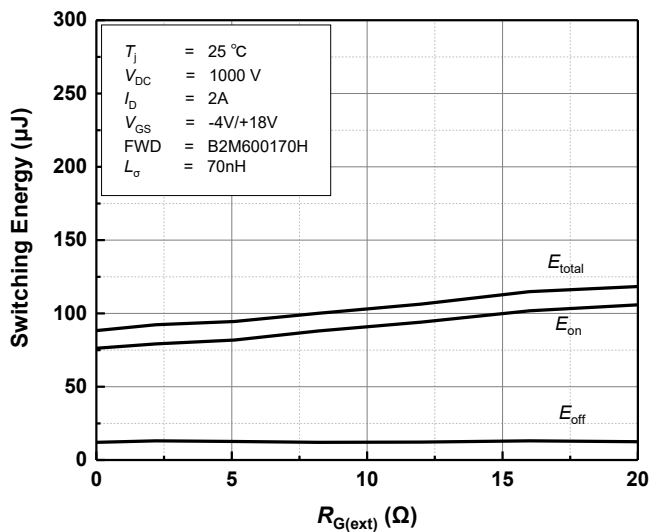
## Typical Performance



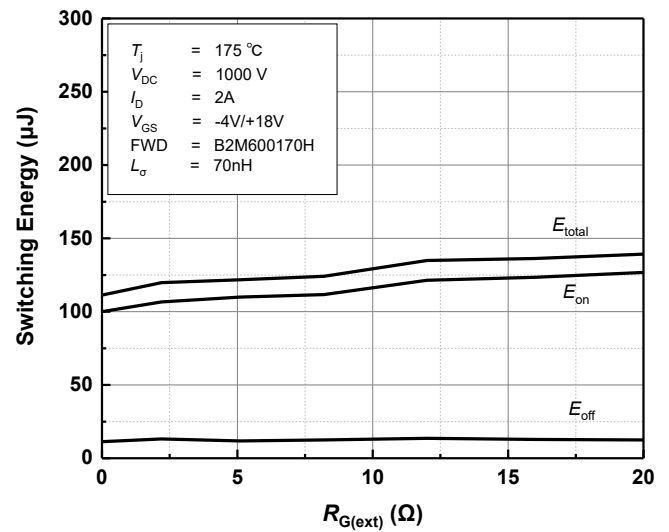
**Figure 17** Clamped Inductive Switching Energy vs. Drain Current ( $V_{\text{DC}} = 1000\text{V}$ ) at  $T_j = 25^\circ\text{C}$



**Figure 18** Clamped Inductive Switching Energy vs. Drain Current ( $V_{\text{DC}} = 1000\text{V}$ ) at  $T_j = 175^\circ\text{C}$

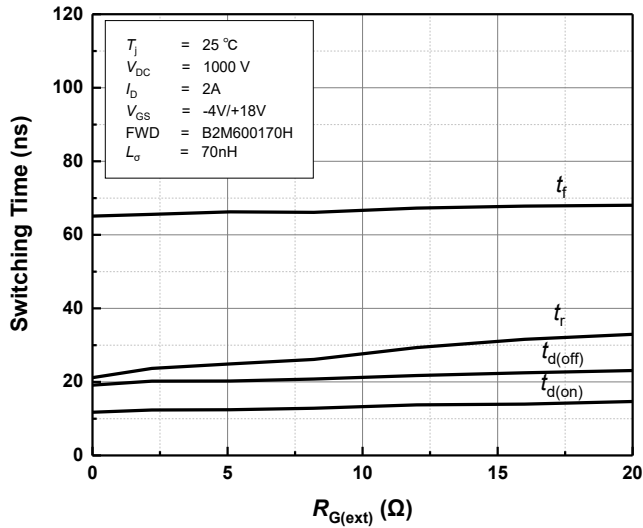


**Figure 19** Clamped Inductive Switching Energy vs. External Gate Resistance at  $T_j = 25^\circ\text{C}$

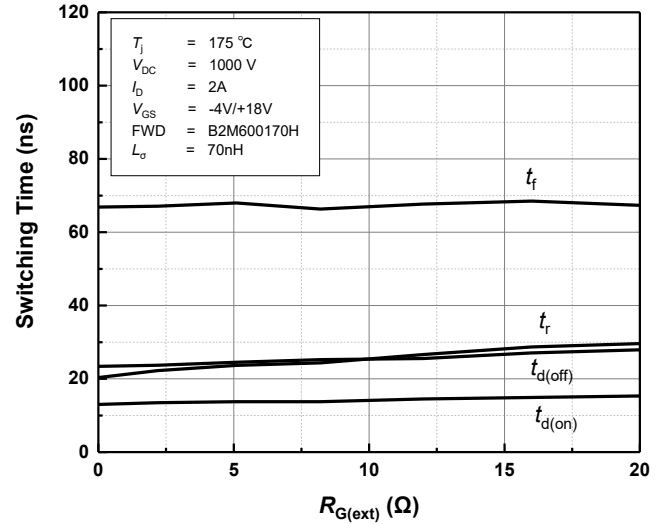


**Figure 20** Clamped Inductive Switching Energy vs. External Gate Resistance at  $T_j = 175^\circ\text{C}$

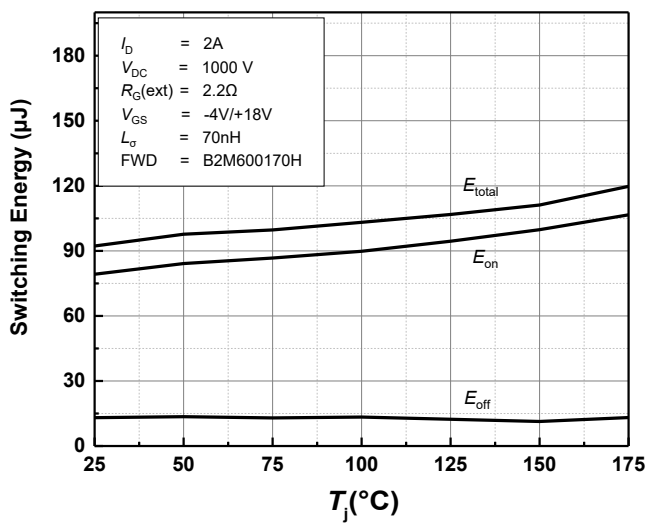
## Typical Performance



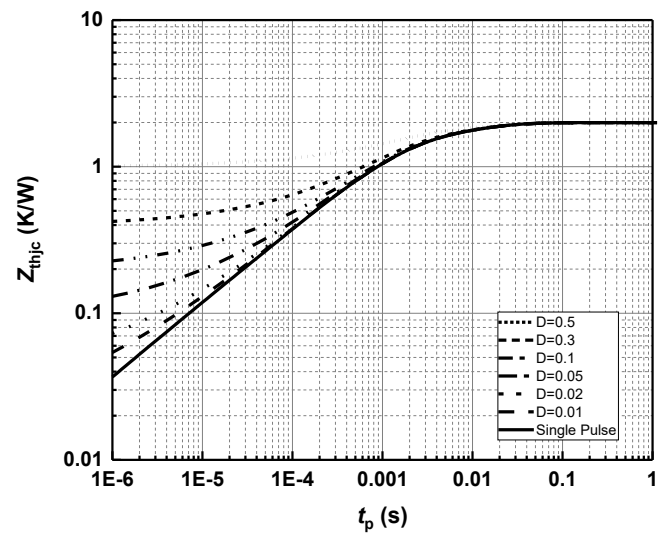
**Figure 21** Clamped Inductive Switching Time vs. External Gate Resistance at  $T_j=25^\circ\text{C}$



**Figure 22** Clamped Inductive Switching Time vs. External Gate Resistance at  $T_j=175^\circ\text{C}$



**Figure 23** Clamped Inductive Switching Energy vs. Temperature



**Figure 24** Transient Thermal Impedance (Junction - Case)

## Typical Performance

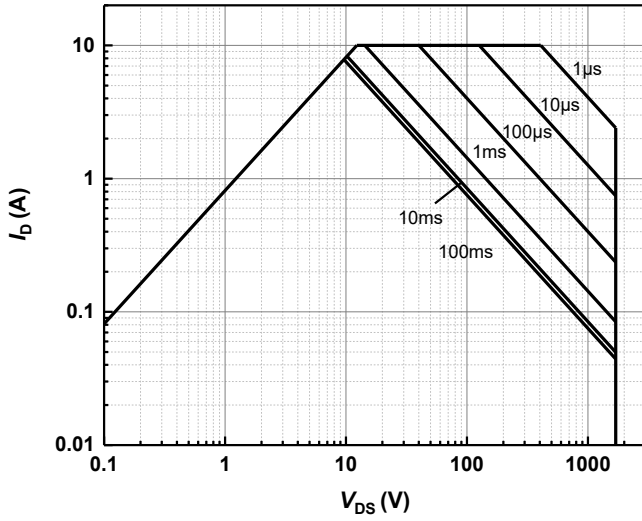
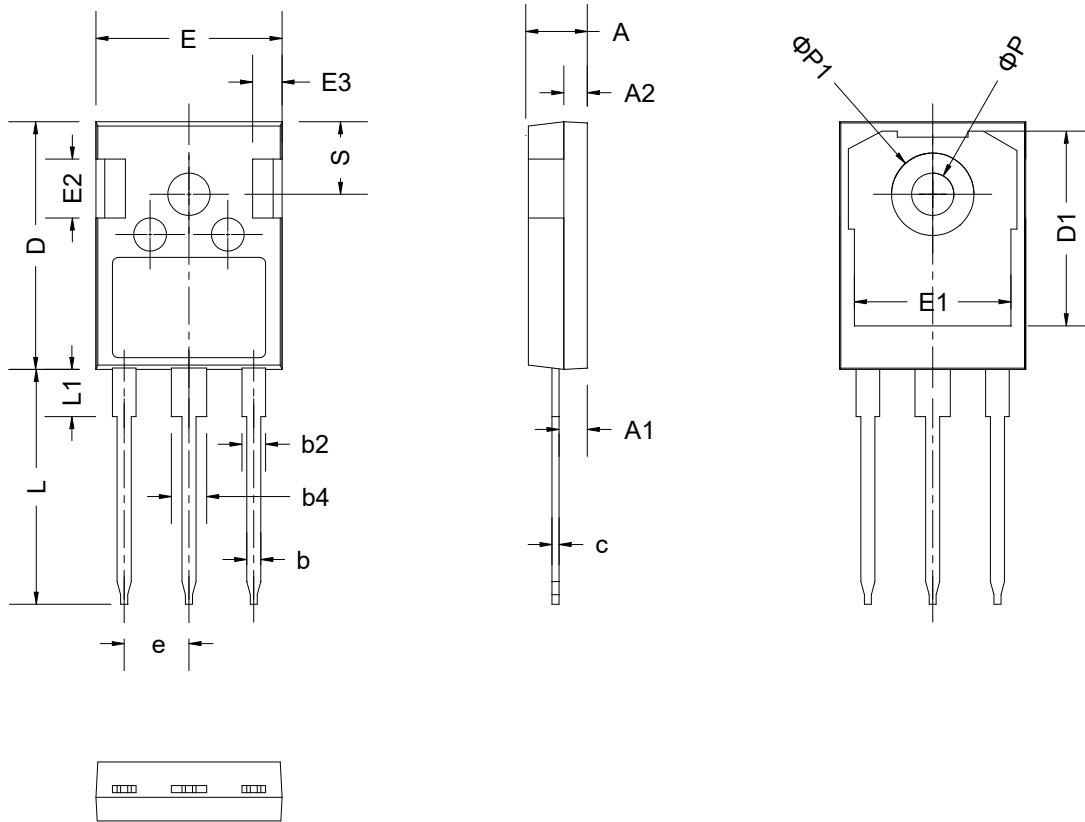


Figure 25 Forward Biased Safe Operating Area

**Package Dimensions**



| SYMBOL | mm       |       |       |
|--------|----------|-------|-------|
|        | MIN      | NOM   | MAX   |
| A      | 4.80     | 5.00  | 5.20  |
| A1     | 2.21     | 2.41  | 2.59  |
| A2     | 1.85     | 2.00  | 2.15  |
| b      | 1.11     | 1.21  | 1.36  |
| b2     | 1.91     | 2.01  | 2.21  |
| b4     | 2.91     | 3.01  | 3.21  |
| c      | 0.51     | 0.61  | 0.75  |
| D      | 20.80    | 21.00 | 21.30 |
| D1     | 16.25    | 16.55 | 16.85 |
| E      | 15.50    | 15.80 | 16.10 |
| E1     | 13.00    | 13.30 | 13.60 |
| E2     | 4.80     | 5.00  | 5.20  |
| E3     | 2.30     | 2.50  | 2.70  |
| e      | 5.44 BSC |       |       |
| L      | 19.62    | 19.92 | 20.22 |
| L1     | -        | -     | 4.30  |
| φ P    | 3.40     | 3.60  | 3.80  |
| φ P1   | -        | -     | 7.30  |
| S      | 6.16 BSC |       |       |

**Revision History**

| Document Version | Date of Release | Description of Changes   |
|------------------|-----------------|--------------------------|
| Rev. 0.0         | 2024-07-08      | Draft datasheet created. |
|                  |                 |                          |
|                  |                 |                          |
|                  |                 |                          |

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