

## Features

- Effectively lower down  $T_j$  and  $R_{th}$ , high anti-EMI ability
- High speed switching with low capacitances
- High blocking voltage with low  $R_{DS(on)}$
- Easy to drive and parallel
- RoHS compliant

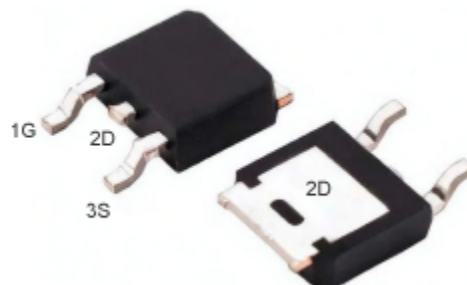
## Benefits

- Increased power density
- Higher operating frequency
- Reduced heat sink requirements
- Higher efficiency
- EMI reduction

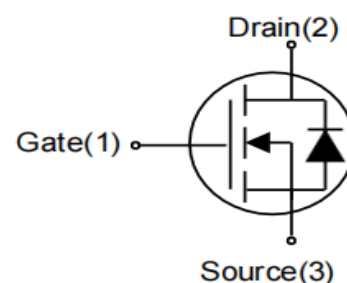
## Applications

- Power factor correction modules
- Switch mode power supplies
- Power inverters
- High voltage converters

| Parameter                | Rating | Units |
|--------------------------|--------|-------|
| $V_{DS}$                 | 800    | V     |
| $I_D @ 25^\circ\text{C}$ | 20     | A     |
| $R_{DS(on)}$             | 160    | mΩ    |



TO-252 (DPAK) Package



| Part Number | Package       | Marking    |
|-------------|---------------|------------|
| GC3M018065E | TO-252 (DPAK) | GC3M018065 |

## Maximum Ratings ( $T_j = 25^\circ\text{C}$ unless otherwise specified)

| Symbol        | Parameter                      | Test conditions                                | Value   | Unit             |
|---------------|--------------------------------|------------------------------------------------|---------|------------------|
| $V_{DS}$      | Drain-Source Voltage           |                                                | 800     | V                |
| $I_D$         | Continuous Drain Current       | $T_c=25^\circ\text{C}$ $T_c=100^\circ\text{C}$ | 20 17.5 | A                |
| $I_{DM}$      | Peak Drain Current             | Pulse width tp limited by $T_{jmax}$           | 30      | A                |
| $V_{GS\ max}$ | Gate-Source Voltage            |                                                | -5/ 26  | V                |
| $V_{GS\ op}$  | Recommend Gate-Source Voltage  |                                                | 0/ 15   | V                |
| $P_{tot}$     | Power Dissipation              | $T_c=25^\circ\text{C}$ $T_c=100^\circ\text{C}$ | 52 25   | W                |
| $T_j$         | Operating Junction Temperature |                                                | -55~175 | $^\circ\text{C}$ |
| $T_{stg}$     | Storage Temperature            |                                                | -55~175 | $^\circ\text{C}$ |

## Electrical Characteristics ( $T_c = 25^\circ\text{C}$ unless otherwise specified)

| Symbol        | Parameter                         | Min. | Typ. | Max. | Unit          | Test Conditions                                                                            | Note    |
|---------------|-----------------------------------|------|------|------|---------------|--------------------------------------------------------------------------------------------|---------|
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage    | 800  |      |      | V             | $V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$                                                   |         |
| $I_{DSS}$     | Zero Gate Voltage Drain Current   |      | 2    | 100  | $\mu\text{A}$ | $V_{GS} = 0\text{ V}, V_{DS} = 750\text{ V}$                                               |         |
| $I_{GSS+}$    | Gate-Source Leakage Current       |      |      | 200  | nA            | $V_{DS} = 0\text{ V}, V_{GS} = +22\text{ V}$                                               |         |
| $I_{GSS-}$    | Gate-Source Leakage Current       |      |      | 200  | nA            | $V_{DS} = 0\text{ V}, V_{GS} = -10\text{ V}$                                               |         |
| $V_{GS(th)}$  | Gate Threshold Voltage            |      | 3.5  | 4.2  | V             | $V_{GS} = V_{DS}, I_{DS} = 1\text{ mA}, T_J = 25^\circ\text{C}$                            | Fig. 14 |
|               |                                   |      | 2.8  |      |               | $V_{GS} = V_{DS}, I_{DS} = 1\text{ mA}, T_J = 175^\circ\text{C}$                           |         |
| $R_{DS(on)}$  | Static Drain-Source On-Resistance |      | 160  | 180  | m $\Omega$    | $V_{GS} = 15\text{ V}, I_D = 6\text{ A}, T_J = 25^\circ\text{C}$                           | Fig. 15 |
|               |                                   |      | 195  |      |               | $V_{GS} = 15\text{ V}, I_D = 6\text{ A}, T_J = 175^\circ\text{C}$                          |         |
| $C_{iss}$     | Input Capacitance                 |      | 208  |      | pF            | $V_{DS} = 400\text{ V}, f = 1\text{ MHz}, V_{GS} = 0\text{ V}$                             | Fig. 8  |
| $C_{oss}$     | Output Capacitance                |      | 18   |      |               |                                                                                            |         |
| $C_{rss}$     | Reverse Transfer Capacitance      |      | 1.8  |      |               |                                                                                            |         |
| $Q_g$         | Total Gate Charge                 |      | 10.6 |      | nC            | $V_{DD} = 400\text{ V}, V_{GS} = -5/18\text{ V}, I_D = 5\text{ A}$                         | Fig. 7  |
| $Q_{gs}$      | Gate-Source Charge                |      | 5.1  |      |               |                                                                                            |         |
| $Q_{gd}$      | Gate-Drain Charge                 |      | 2.2  |      |               |                                                                                            |         |
| $R_{G(int)}$  | Gate Input Resistance             |      | 1.2  |      | $\Omega$      | $f = 1\text{ MHz}, I_D = 0\text{ A}$                                                       |         |
| $E_{on}$      | Turn-On Switching Energy          |      | 25   |      | $\mu\text{J}$ | $V_{DD} = 400\text{ V}, I_D = 5\text{ A}, R_G = 10\text{ }\Omega, V_{GS} = -5/18\text{ V}$ | Fig. 12 |
| $E_{off}$     | Turn-Off Switching Energy         |      | 10   |      |               |                                                                                            |         |
| $t_{d(on)}$   | Turn-On Delay Time                |      | 5    |      | ns            | $V_{DD} = 400\text{ V}, I_D = 5\text{ A}, R_G = 10\text{ }\Omega, V_{GS} = -5/18\text{ V}$ |         |
| $t_r$         | Rise Time                         |      | 17   |      |               |                                                                                            |         |
| $t_{d(off)}$  | Turn-Off Delay Time               |      | 8    |      |               |                                                                                            |         |
| $t_f$         | Fall Time                         |      | 10   |      |               |                                                                                            |         |

## Reverse SiC Diode Characteristics

| Symbol    | Parameter                        | Typ. | Max. | Unit | Test Conditions                                                                                       | Note    |
|-----------|----------------------------------|------|------|------|-------------------------------------------------------------------------------------------------------|---------|
| $V_{SD}$  | Diode Forward Voltage            | 4.0  |      | V    | $V_{GS} = -4\text{ V}, I_{SD} = 5\text{ A}, T_J = 25^\circ\text{C}$                                   | Fig. 16 |
|           |                                  | 3.6  |      |      | $V_{GS} = -4\text{ V}, I_{SD} = 5\text{ A}, T_J = 175^\circ\text{C}$                                  | Fig. 17 |
| $*I_{SD}$ | Continuous Diode Forward Current |      | 18   | A    | $TC = 25^\circ\text{C}$                                                                               |         |
|           |                                  |      | 10   |      | $TC = 175^\circ\text{C}$                                                                              |         |
| $t_{rr}$  | Reverse Recovery Time            | 50   |      | ns   | $I_{SD} = 5\text{ A}, di/dt = 1000\text{ A}/\mu\text{s}, V_{DD} = 400\text{ V}, V_{GS} = -5\text{ V}$ |         |
| $Q_{rr}$  | Reverse Recovery Charge          | 38   |      | nC   |                                                                                                       |         |
| $I_{RRM}$ | Peak Reverse Recovery Current    | 2.4  |      | A    |                                                                                                       |         |

## Thermal Characteristics

| Symbol     | Parameter                                   | Typ. | Unit                      | Test Conditions | Note   |
|------------|---------------------------------------------|------|---------------------------|-----------------|--------|
| $R_{thJC}$ | Thermal Resistance from Junction to Case    | 2.88 | $^\circ\text{C}/\text{W}$ |                 | Fig. 2 |
| $R_{thJA}$ | Thermal Resistance From Junction to Ambient | 40   |                           |                 |        |

## Typical Characteristics

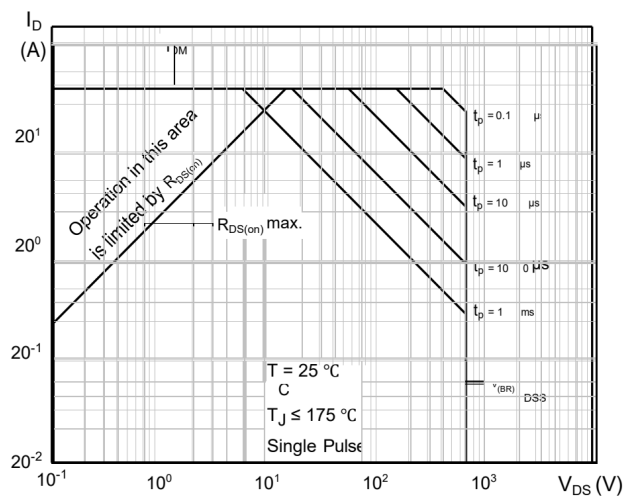


Figure 1. Safe Operating Area

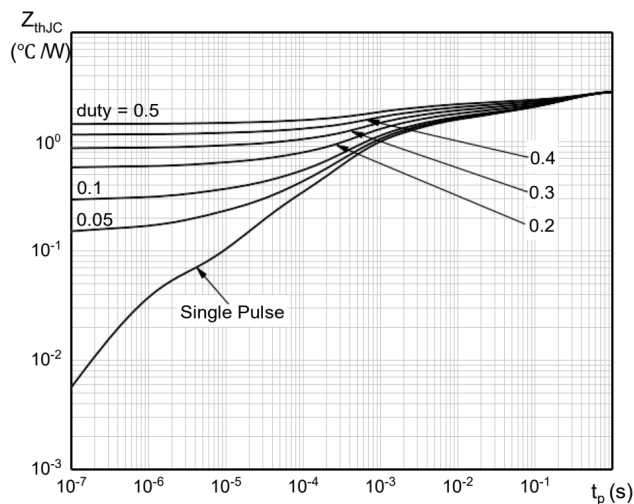


Figure 2. Maximum Transient Thermal Impedance

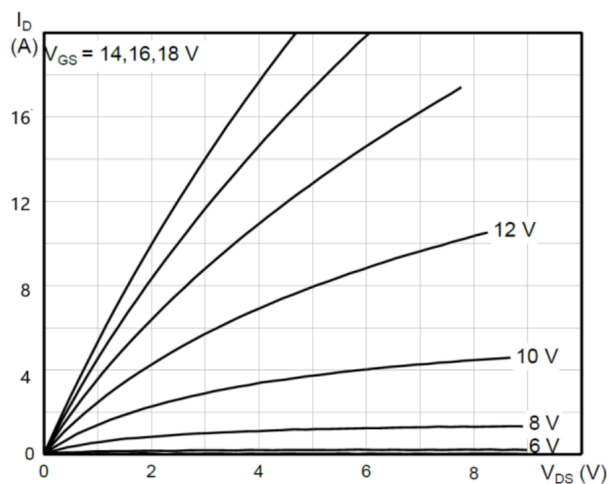


Figure 3. Typical Output Characteristics,  $T_J = 25^\circ\text{C}$

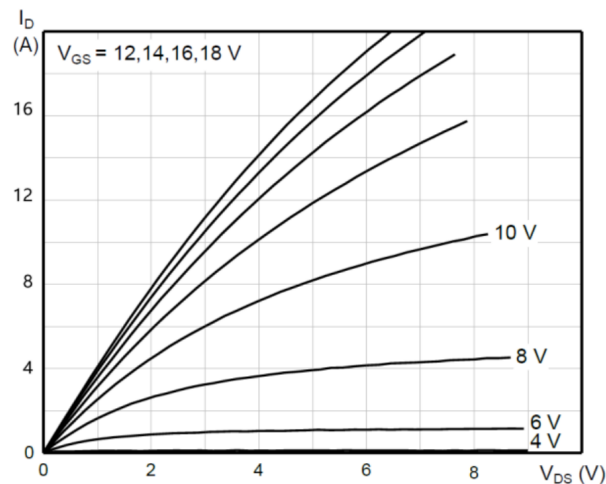


Figure 4. Typical Output Characteristics,  $T_J = 175^\circ\text{C}$

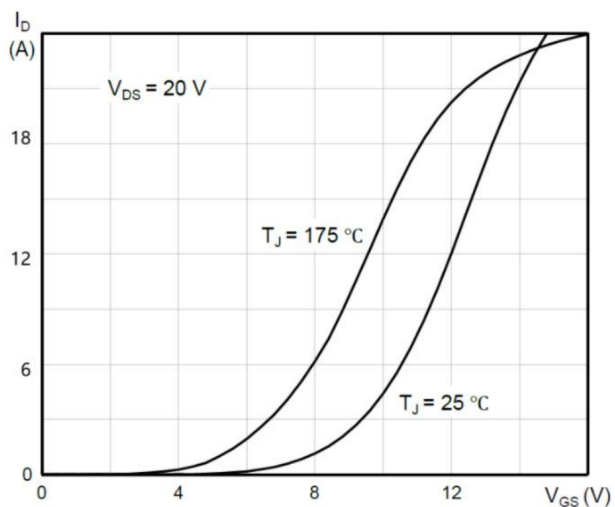


Figure 5. Typical Transfer Characteristics

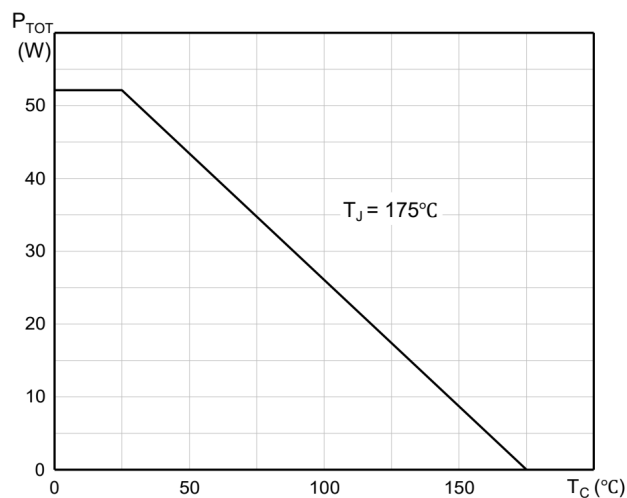


Figure 6. Total Power Dissipation

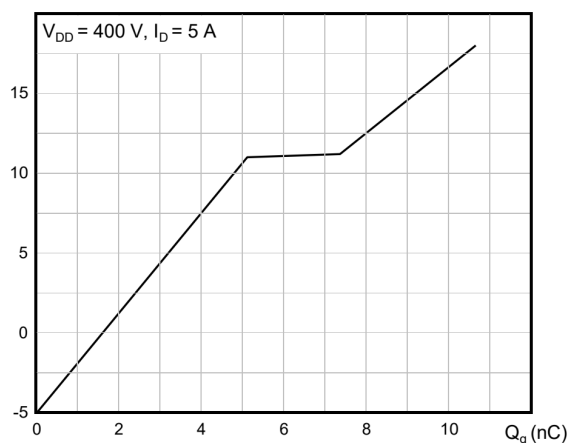


Figure 7. Typical Gate Charge Characteristics

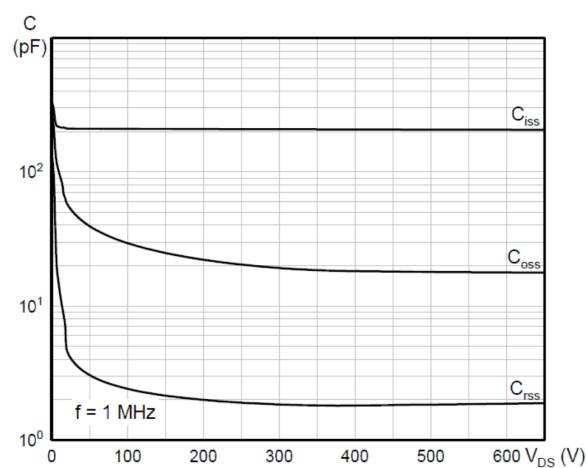


Figure 8. Typical Capacitance Characteristics

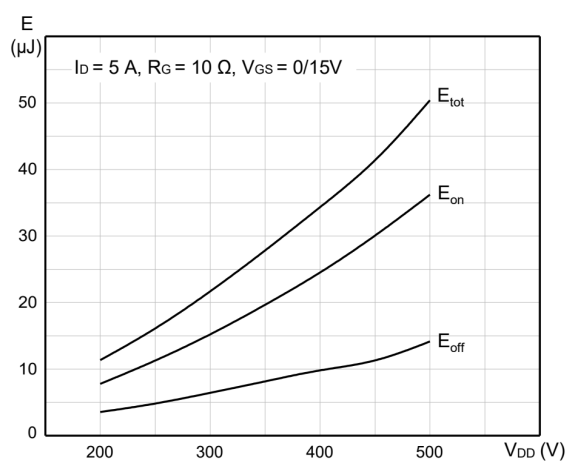


Figure 9. Typical Switching Energy vs. Supply Voltage

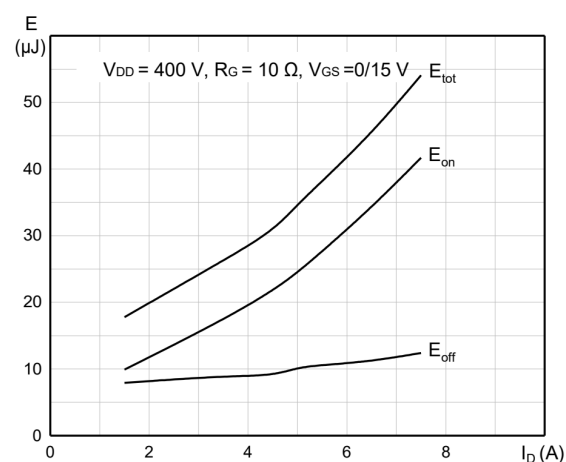


Figure 10. Typical Switching Energy vs. Drain Current

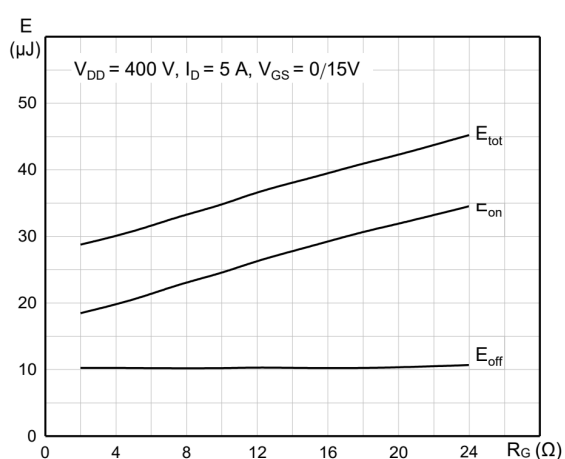


Figure 11. Switching Energy vs. Gate Resistance

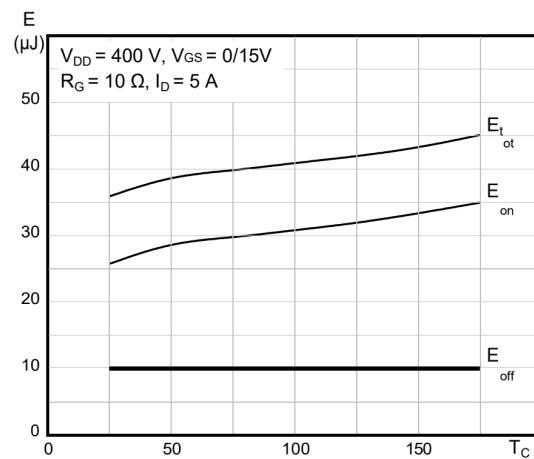


Figure 12. Typical Switching Energy vs. Temperature

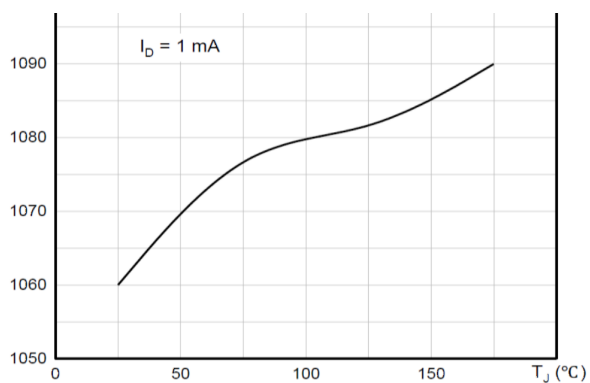


Figure 13. Breakdown Voltage vs. Temperature

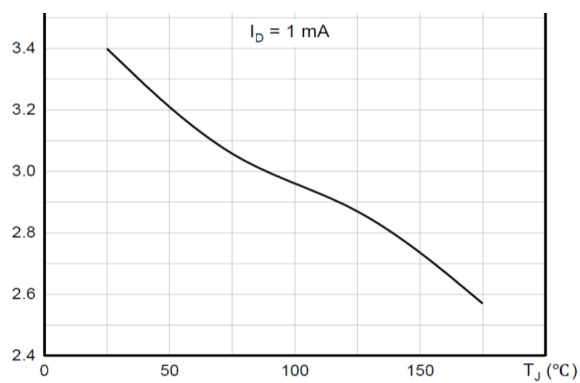


Figure 14. Gate Threshold vs. Temperature

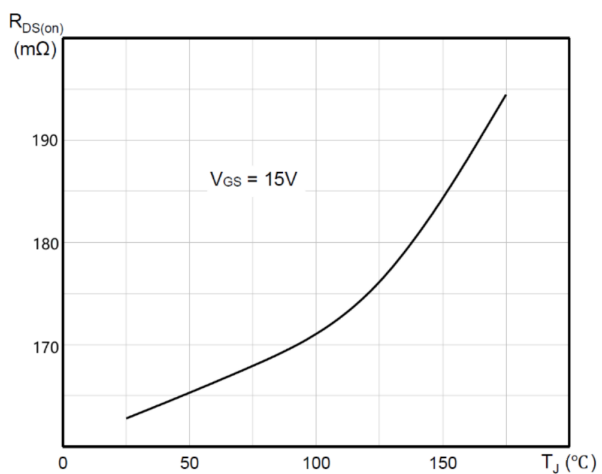


Figure 15. On-Resistance vs. Temperature

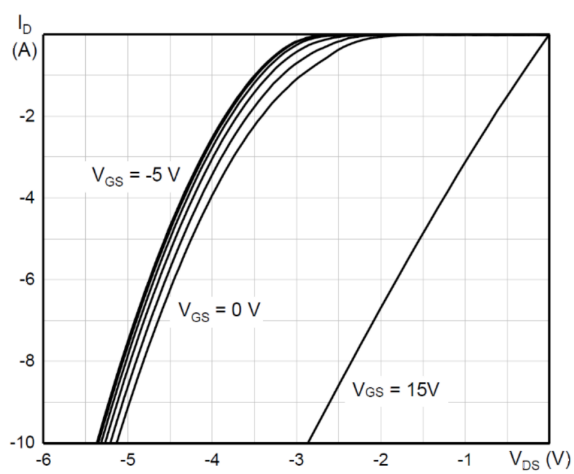
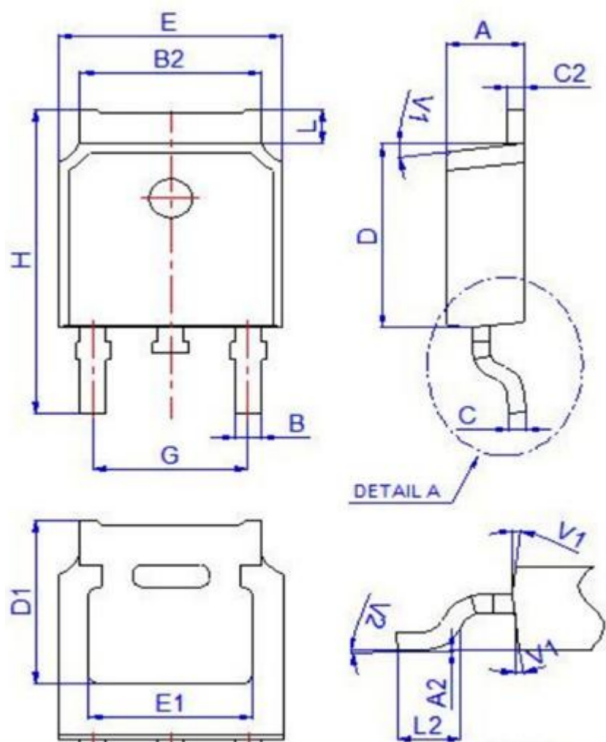


Figure 16. Body Diode Characteristics,  $T_J = 25^\circ\text{C}$

## Package Outline Dimension: TO-252 (DPAK)

### TO-252



| Ref. | Dimensions  |      |       |          |      |       |
|------|-------------|------|-------|----------|------|-------|
|      | Millimeters |      |       | Inches   |      |       |
|      | Min.        | Typ. | Max.  | Min.     | Typ. | Max.  |
| A    | 2.10        |      | 2.50  | 0.083    |      | 0.098 |
| A2   | 0           |      | 0.10  | 0        |      | 0.004 |
| B    | 0.66        |      | 0.86  | 0.026    |      | 0.034 |
| B2   | 5.18        |      | 5.48  | 0.202    |      | 0.216 |
| C    | 0.40        |      | 0.60  | 0.016    |      | 0.024 |
| C2   | 0.44        |      | 0.58  | 0.017    |      | 0.023 |
| D    | 5.90        |      | 6.30  | 0.232    |      | 0.248 |
| D1   | 5.30REF     |      |       | 0.209REF |      |       |
| E    | 6.40        |      | 6.80  | 0.252    |      | 0.268 |
| E1   | 4.63        |      |       | 0.182    |      |       |
| G    | 4.47        |      | 4.67  | 0.176    |      | 0.184 |
| H    | 9.50        |      | 10.70 | 0.374    |      | 0.421 |
| L    | 1.09        |      | 1.21  | 0.043    |      | 0.048 |
| L2   | 1.35        |      | 1.65  | 0.053    |      | 0.065 |
| V1   |             | 7°   |       |          | 7°   |       |
| V2   | 0°          |      | 6°    | 0°       |      | 6°    |

## Revision History

| Revision    | Date of Release | Description of Changes    |
|-------------|-----------------|---------------------------|
| Preliminary | 2025-07-19      | Release of the datasheet. |

## Information

For further information on technology, delivery terms and conditions and prices, please contact SUPSiC.

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