

## 1200V 17mΩ SiC MOSFET

## Features:

- High blocking voltage with low  $R_{ds(on)}$
- High frequency operation with low Capacitance
- Simple to drive with -4V/+18V gate
- Robust body diode with low  $Q_{rr}$
- 100% Avalanche Tested

## Benefits

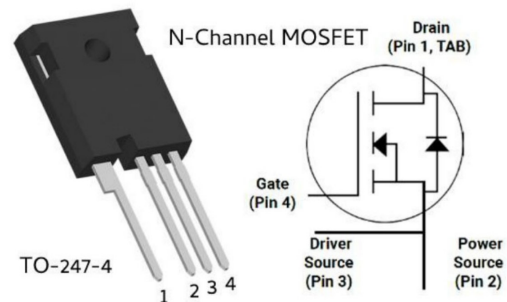
- Superior robustness and system reliability
- Higher system efficiency
- Easier paralleling without thermal runaway
- Capable of high temperature application
- Faster and more efficient switching

## Applications:

- EV/HEV charging station
- Energy storage and Battery charging
- High voltage DC-DC converters
- Solar / Wind Inverters
- UPS and PFC

## Key Performance and Package Parameters

| Type         | V <sub>DS</sub> | R <sub>DS(ON)</sub> | I <sub>D</sub> @25°C | I <sub>D</sub> @100°C | Marking      | Package |
|--------------|-----------------|---------------------|----------------------|-----------------------|--------------|---------|
| PD017S120ANC | 1200V           | 17mΩ                | 133A                 | 94A                   | PD017S120ANC | TO247-4 |

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

| Parameter                                             | Symbols        | Conditions                                                                      | Value      | Unit             |
|-------------------------------------------------------|----------------|---------------------------------------------------------------------------------|------------|------------------|
| Drain - source voltage                                | $V_{DS(max)}$  | $V_{GS}=0V$ , $I_D=100\mu A$                                                    | 1200       | V                |
| Gate - source voltage                                 | $V_{GS(max)}$  | AC ( $f>1\text{Hz}$ , duty cycle $<1\%$ , pulse width $<200\text{ns}$ )         | -9 / +22   | V                |
| Gate – source voltage                                 | $V_{GS(op)}$   | Recommend operation                                                             | -4 / +18   | V                |
| Continuous drain current<br>(limited by $T_{J,max}$ ) | $I_D$          | $V_{GS}=18V$ , $T_C=25^\circ\text{C}$<br>$V_{GS}=18V$ , $T_C=100^\circ\text{C}$ | 133<br>94  | A                |
| Pulsed drain current                                  | $I_{D(pulse)}$ | $T_C=25^\circ\text{C}$                                                          | 267        | A                |
| Total power dissipation                               | $P_D$          | $T_C=25^\circ\text{C}$                                                          | 625        | W                |
| Operating junction temperature                        | $T_J$          |                                                                                 | -55 to 175 | $^\circ\text{C}$ |
| Storage temperature                                   | $T_{STG}$      |                                                                                 | -55 to 175 | $^\circ\text{C}$ |
| Soldering temperature                                 | $T_L$          |                                                                                 | 260        | $^\circ\text{C}$ |
| Avalanche capability, single pulse*                   | $I_{AV}$       | $V_{DD}=100V$ , $V_{GS}=10V$ , $L=1\text{mH}$                                   | 70         | A                |
| Avalanche capability, single pulse**                  | $E_{AV}$       | $V_{DD}=100V$ , $V_{GS}=10V$ , $L=1\text{mH}$                                   | 2450       | mJ               |

\*100% tested in 60% rating

\*\*100% tested in 36% rating

**Electrical Characteristics at Tc = 25°C (unless otherwise specified)**

| Parameter                        | Symbols       | Conditions                                                                 | Value |      |     | Unit      |
|----------------------------------|---------------|----------------------------------------------------------------------------|-------|------|-----|-----------|
|                                  |               |                                                                            | Min   | Typ  | Max |           |
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=100\mu A$                                                  | 1200  | -    | -   | V         |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=20mA$                                                  | 2.2   | 3.0  | 4.2 | V         |
|                                  |               | $V_{DS}=V_{GS}, I_D=20mA, T_J=150^\circ C$                                 | -     | 2.3  | -   | V         |
|                                  |               | $V_{DS}=V_{GS}, I_D=20mA, T_J=175^\circ C$                                 | -     | 2.2  | -   | V         |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=1200V, V_{GS}=0V$                                                  | 0     | 0.5  | 100 | $\mu A$   |
|                                  |               | $V_{DS}=1200V, V_{GS}=0V, T_J=175^\circ C$                                 | 0     | 5    | 200 | $\mu A$   |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=18V, V_{DS}=0V$                                                    | 0     | 5    | 100 | nA        |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=-4V, V_{DS}=0V$                                                    | -100  | -5   | 0   | nA        |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=18V, I_D=50A$                                                      | -     | 17   | 24  | $m\Omega$ |
|                                  |               | $V_{GS}=18V, I_D=50A, T_J=175^\circ C$                                     | -     | 33   | -   | $m\Omega$ |
| Transconductance                 | gfs           | $V_{DS}=20V, I_D=50A$                                                      | -     | 41   | -   | S         |
|                                  |               | $V_{DS}=20V, I_D=50A, T_J=175^\circ C$                                     | -     | 39   | -   | S         |
| Input capacitance                | $C_{iss}$     | $V_{DS}=1000V, V_{GS}=0V$<br>$f=100KHZ, V_{AC}=25mV$                       | -     | 4350 | -   | pF        |
| Output capacitance               | $C_{oss}$     |                                                                            | -     | 168  | -   | pF        |
| Reverse transfer capacitance     | $C_{rss}$     |                                                                            | -     | 14   | -   | pF        |
| Coss stored energy               | $E_{oss}$     |                                                                            | -     | 98   | -   | $\mu J$   |
| Turn-on switching energy         | $E_{ON}$      | $V_{DS}=800V, V_{GS}=-4V/18V$<br>$I_D=50A, R_{G(ext)}=2\Omega, L=200\mu H$ | -     | 402  | -   | $\mu J$   |
| Turn-off switching energy        | $E_{OFF}$     |                                                                            | -     | 110  | -   | $\mu J$   |
| Turn-on delay time               | $t_{d(on)}$   | $V_{DS}=800V, V_{GS}=-4V/18V$<br>$I_D=50A, R_{G(ext)}=2\Omega, L=200\mu H$ | -     | 18   | -   | ns        |
| Rise time                        | $t_r$         |                                                                            | -     | 22   | -   | ns        |
| Turn-off delaytime               | $t_{d(off)}$  |                                                                            | -     | 39   | -   | ns        |
| Fall time                        | $t_f$         |                                                                            | -     | 9    | -   | ns        |
| Total gate charge                | $Q_g$         | $V_{DS}=800V, V_{GS}=-4V/18V$<br>$I_D=50A$                                 | -     | 205  | -   | nC        |
| Gate-source charge               | $Q_{gs}$      |                                                                            | -     | 53   | -   | nC        |
| Gate-drain charge                | $Q_{gd}$      |                                                                            | -     | 76   | -   | nC        |
| Internal gate input resistance   | $R_{g(int)}$  | $f=1MHz, I_D=0A$                                                           | -     | 1.2  | -   | $\Omega$  |

\*\*\*Turn-off with -4V gate bias is highly recommended

**Reverse Diode Characteristics at Tc= 25°C (unless otherwise specified)**

| Parameter                        | Symbols   | Conditions                                                               | Value |     |     | Unit |
|----------------------------------|-----------|--------------------------------------------------------------------------|-------|-----|-----|------|
|                                  |           |                                                                          | Min   | Typ | Max |      |
| Diode Forward Voltage            | $V_{SD}$  | $V_{GS}=-4V, I_{SD}=40A, T_J=25^\circ C$                                 | -     | 4.5 | -   | V    |
| Diode Forward Voltage            | $V_{SD}$  | $V_{GS}=-4V, I_{SD}=40A, T_J=175^\circ C$                                | -     | 4.0 | -   | V    |
| Continuous diode forward current | $I_S$     | $V_{GS}=-4V, T_J=25^\circ C$                                             | -     | 100 | -   | A    |
| Reverse recovery time            | $t_{rr}$  | $V_{GS}=-4V, I_{SD}=50A, V_R=800V,$<br>$R_{G(ext)}=10\Omega, L=200\mu H$ | -     | 22  | -   | ns   |
| Reverse recovery charge          | $Q_{rr}$  |                                                                          | -     | 515 | -   | nC   |
| Peak reverse recovery current    | $I_{rrm}$ |                                                                          | -     | 40  | -   | A    |

**Thermal Characteristics**

| Parameter          | Symbols       | Conditions       | Value |      |      | Unit         |
|--------------------|---------------|------------------|-------|------|------|--------------|
|                    |               |                  | Min   | Typ  | Max  |              |
| Thermal resistance | $R_{th(j-c)}$ | Junction to case | -     | 0.20 | 0.24 | $^\circ C/W$ |

## Typical Characteristics

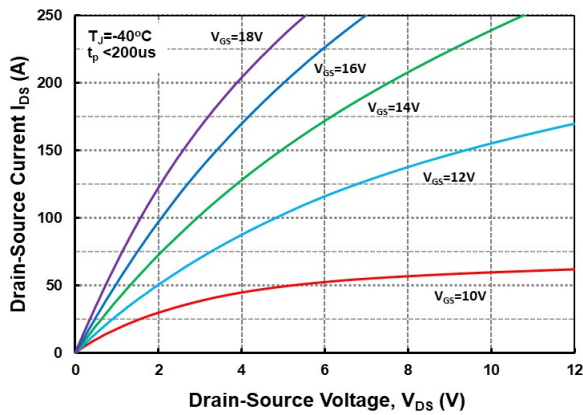


Figure 1: Output Characteristics,  $T_J = -40^\circ\text{C}$

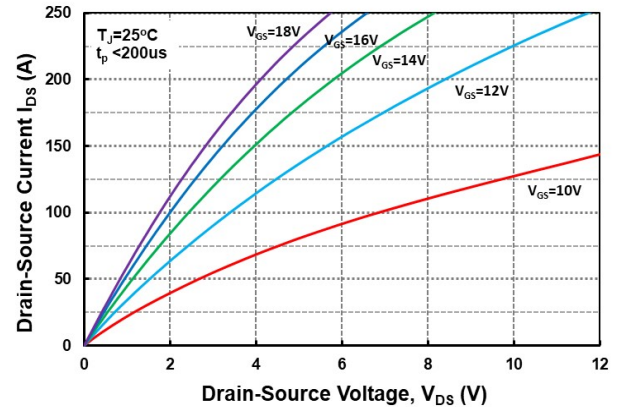


Figure 2: Output Characteristics,  $T_J = 25^\circ\text{C}$

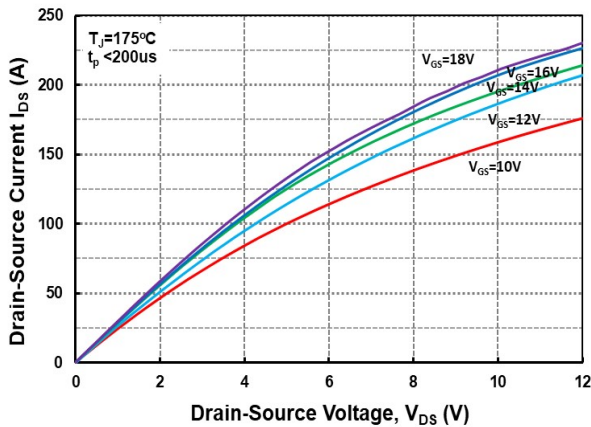


Figure 3: Output Characteristics,  $T_J = 175^\circ\text{C}$

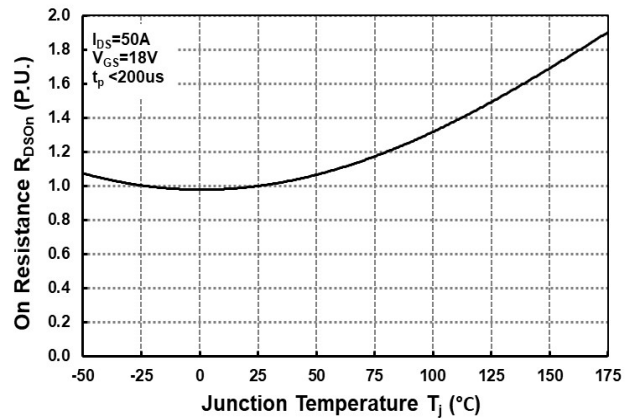


Figure 4: Normalized On-Resistance vs. Temperature

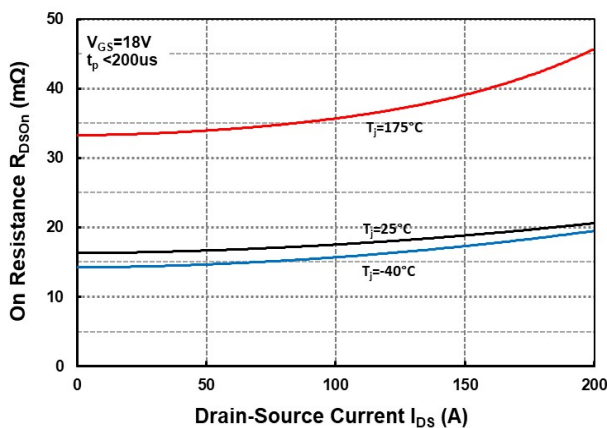


Figure 5: On-Resistance vs. Drain Current for Various Temperatures

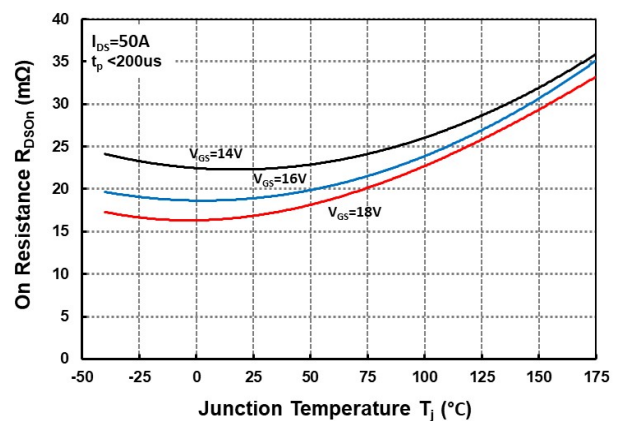


Figure 6: On-Resistance vs. Temperature for Various Gate Voltage

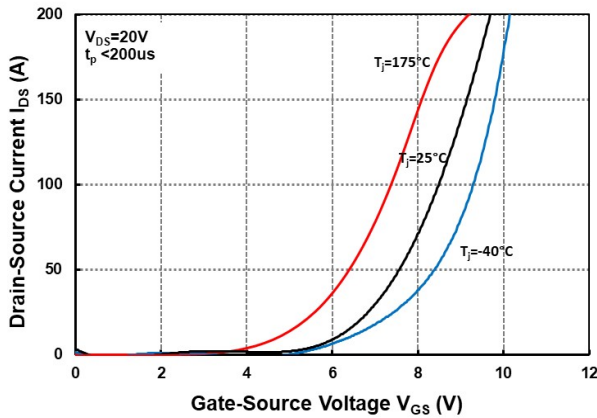


Figure 7: Transfer Characteristic for Various Junction Temperatures

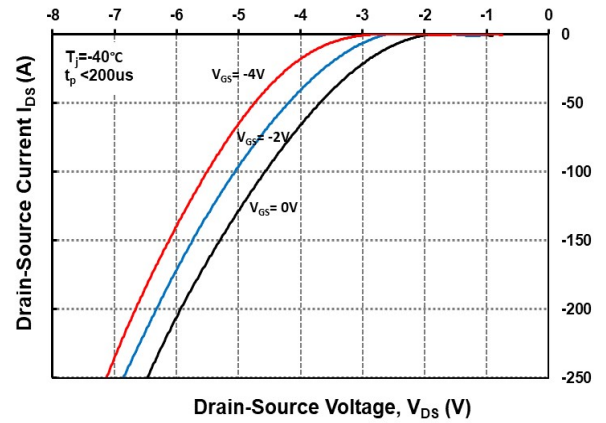


Figure 8: Body Diode Characteristics @ -40°C

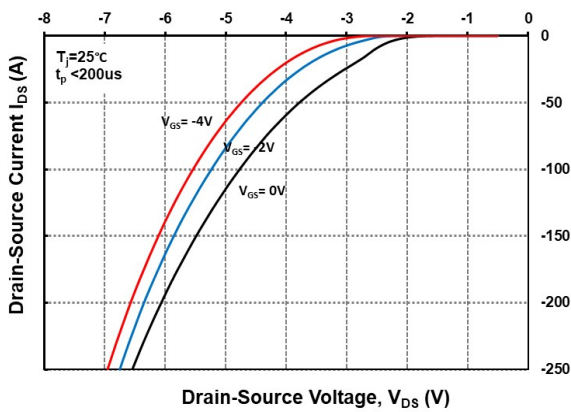


Figure 9: Body Diode Characteristics @ 25°C

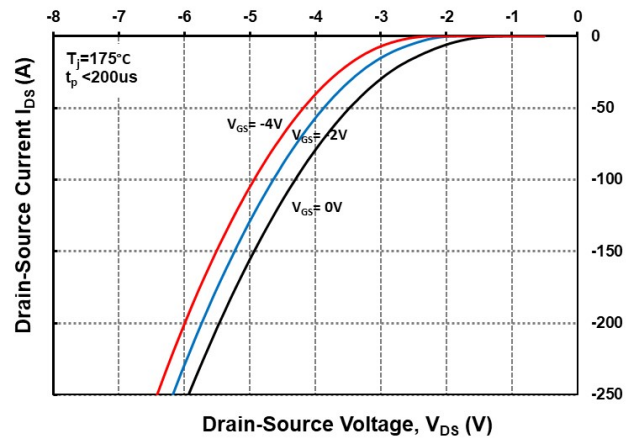


Figure 10: Body Diode Characteristics @ 175°C

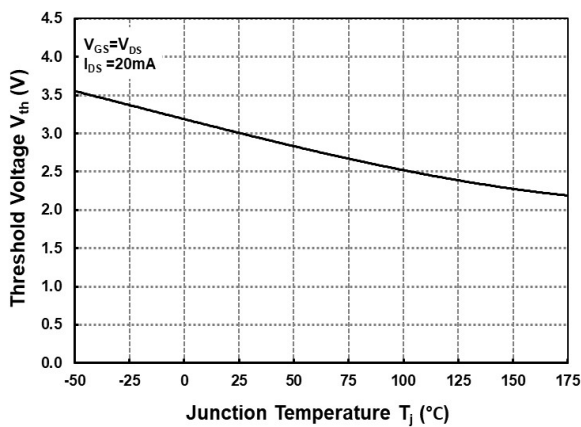


Figure 11: Threshold Voltage vs. Temperature

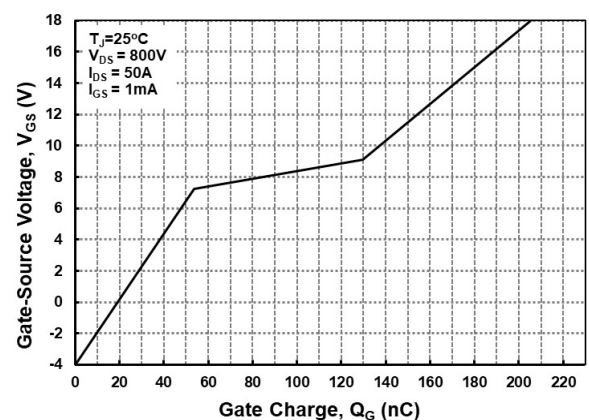


Figure 12: Gate Charge Characteristics

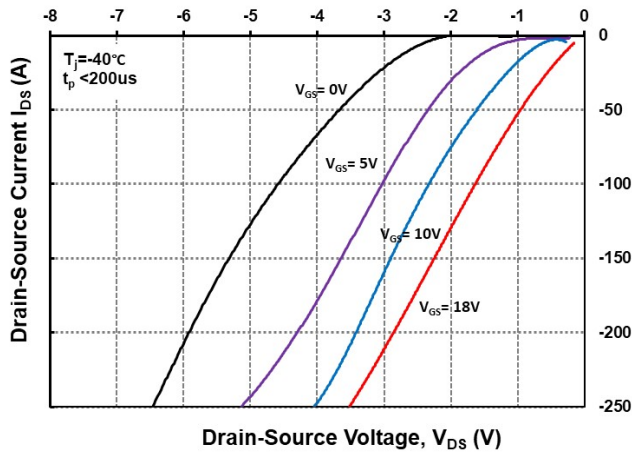


Figure 13: 3<sup>rd</sup> Quadrant Characteristics @ -40°C

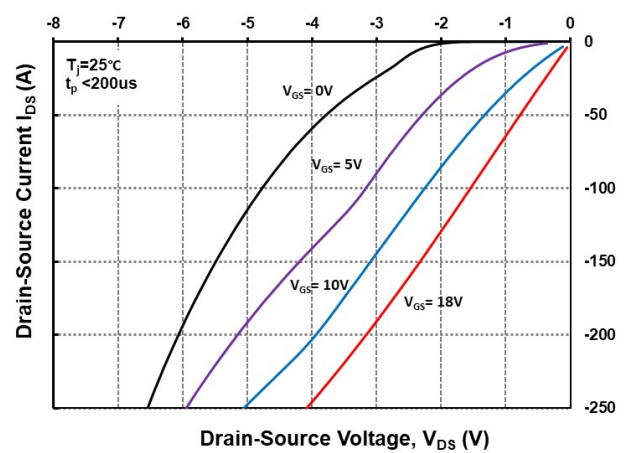


Figure 14: 3<sup>rd</sup> Quadrant Characteristics @ 25°C

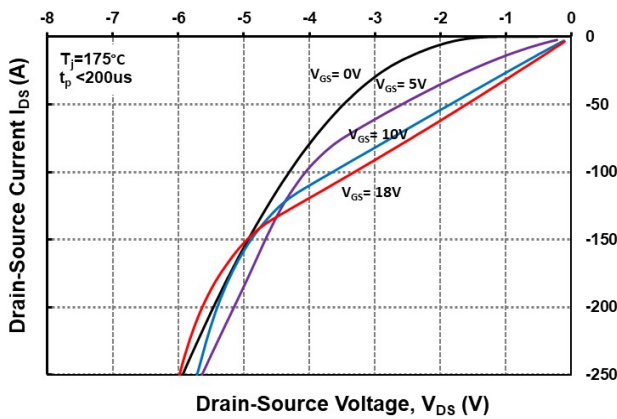


Figure 15: 3<sup>rd</sup> Quadrant Characteristics @ 175°C

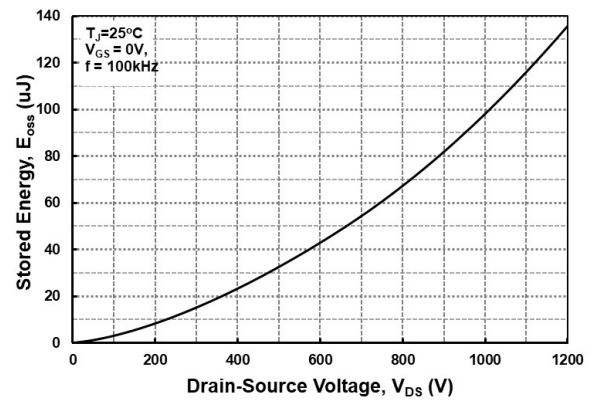


Figure 16: Output Capacitor Stored Energy

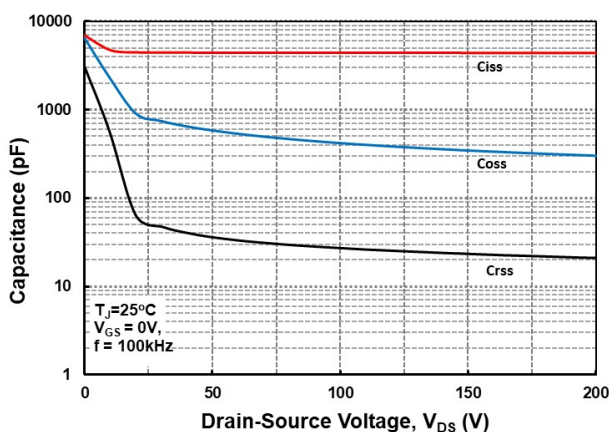


Figure 17: Capacitances vs. Drain-Source Voltage (0-200V)

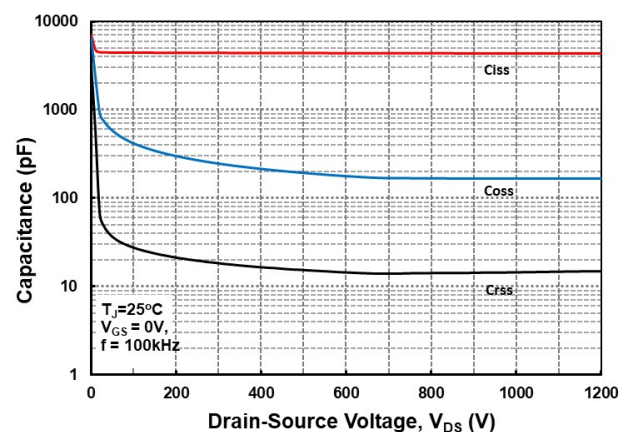


Figure 18: Capacitances vs. Drain-Source Voltage (0-1200V)

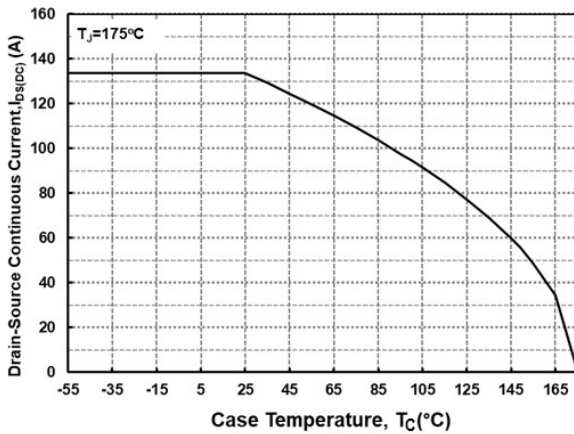


Figure 19: Continuous Drain Current Derating vs. Case

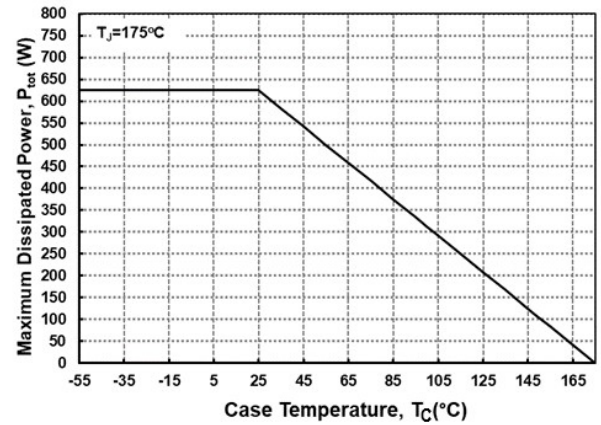


Figure 20: Maximum Power Dissipation Derating vs. Case Temperature

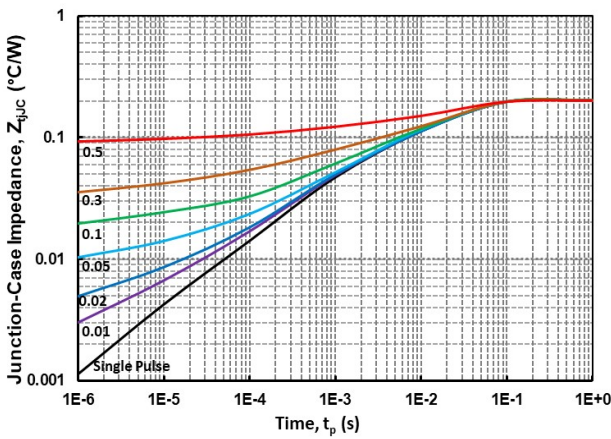


Figure 21: Transient Thermal Impedance (Junction - Case)

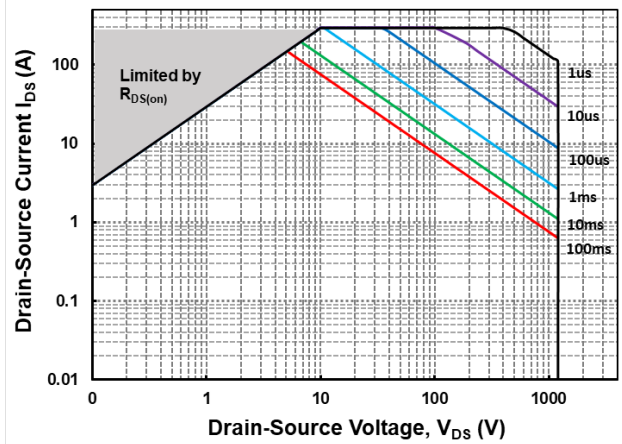


Figure 22: Safe Operating Area

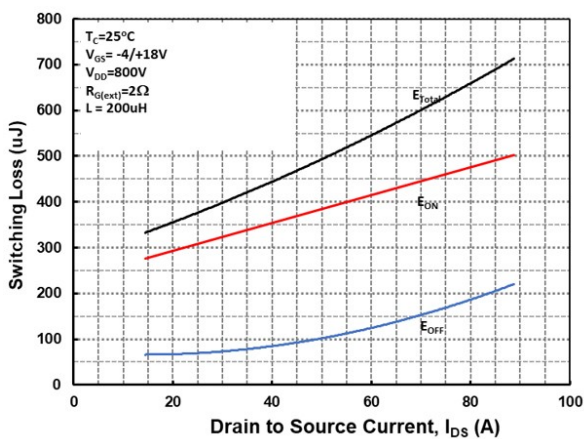


Figure 23: Clamped inductive Switching Energy vs Drain Current (VDD= 800V)

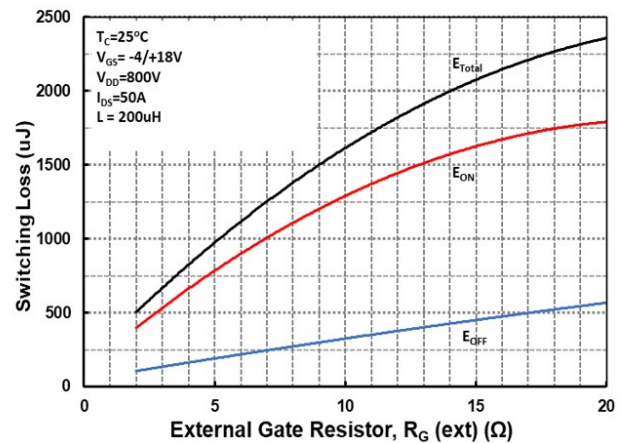
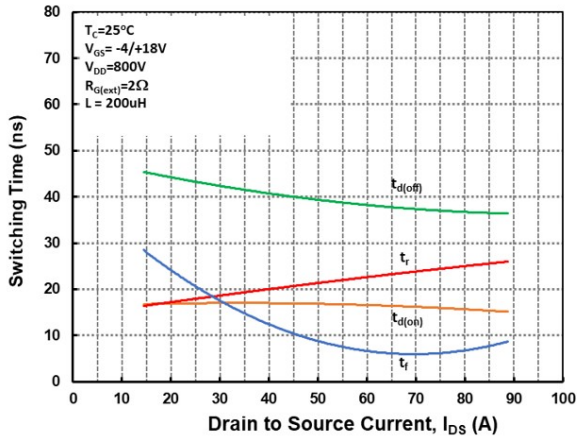
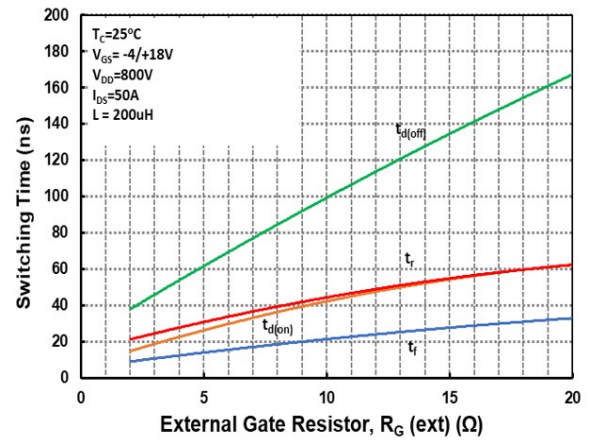


Figure 24: Clamped inductive Switching Energy vs External Gate Resistor R<sub>G(ext)</sub>

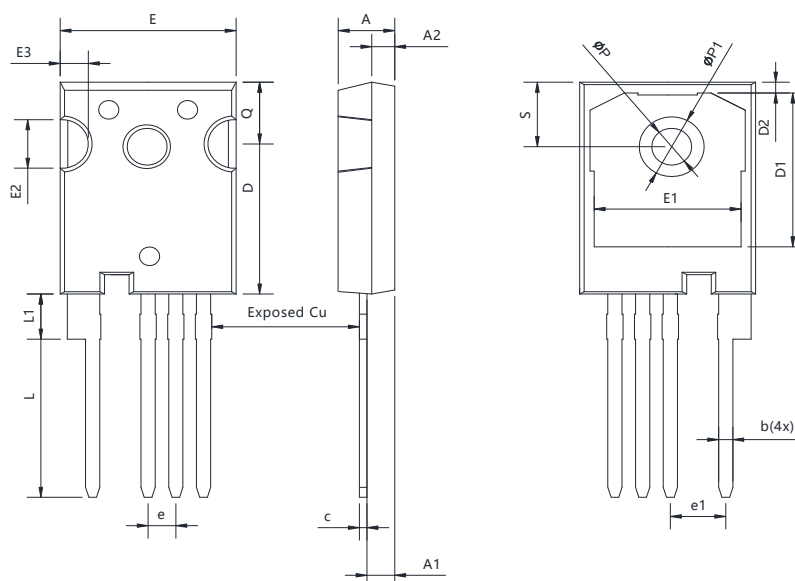


**Figure 25. Switching Times vs Drain Current**  
( $V_{DD} = 800\text{V}$ )



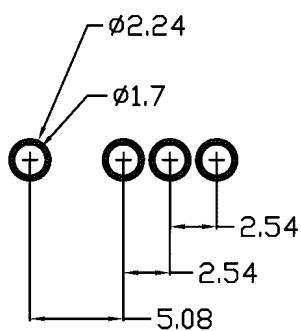
**Figure 26: Switching Times vs External Gate Resistor  $R_{G(ext)}$**

## Package Dimensions

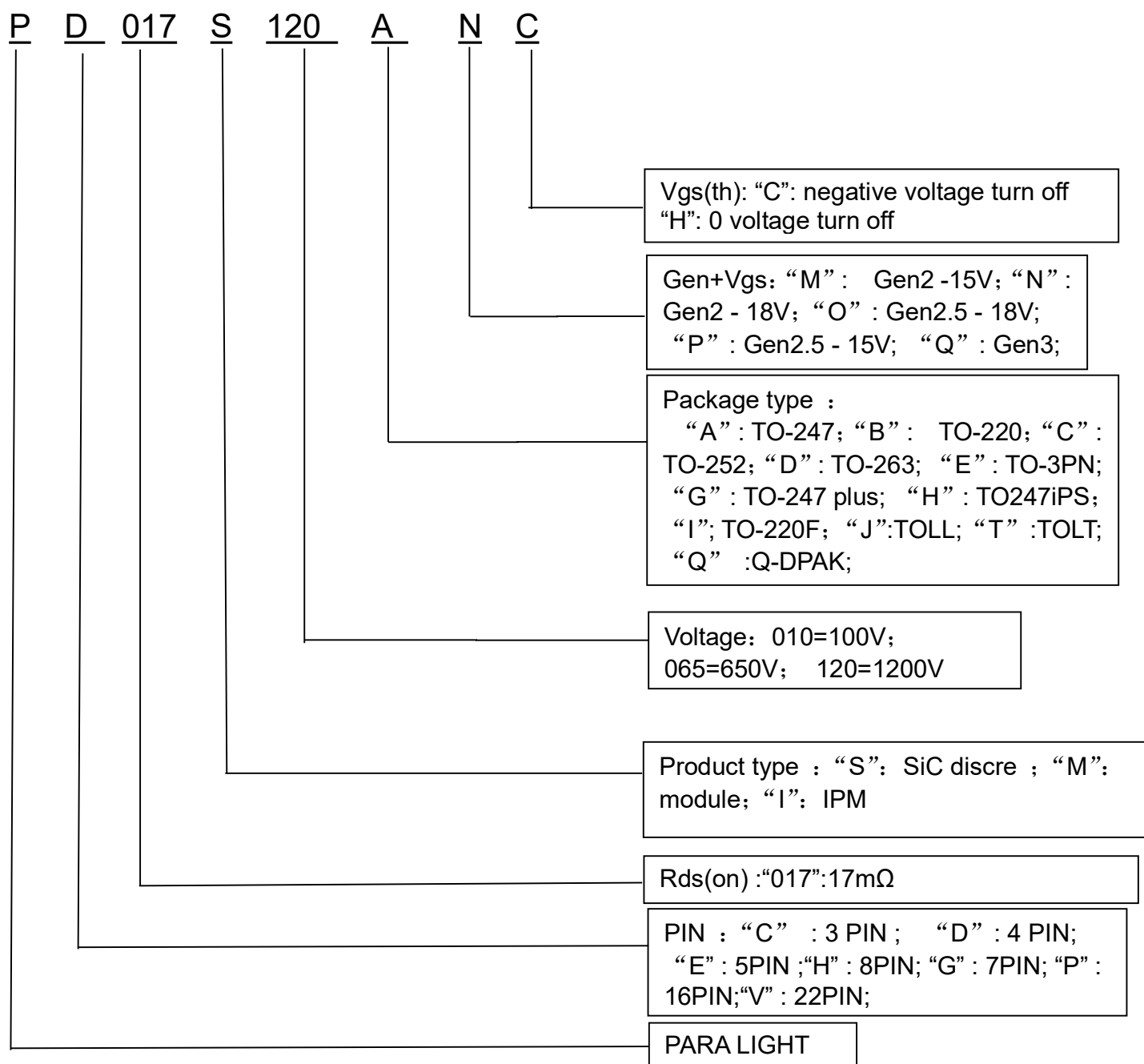


| Common dimensions(mm) |       |       |       |        |         |       |       |
|-----------------------|-------|-------|-------|--------|---------|-------|-------|
| Symbol                | Min   | Typ   | Max   | Symbol | Min     | Typ   | Max   |
| A                     | 4.82  | 5.02  | 5.22  | E1     | 13.01   | 13.26 | 13.51 |
| A1                    | 2.21  | 2.41  | 2.61  | E2     | 4.71    | 4.91  | 5.11  |
| A2                    | 1.8   | 2.0   | 2.2   | E3     | 2.26    | 2.46  | 2.66  |
| b                     | 0.95  | 1.2   | 1.45  | e      | 2.54BSC |       |       |
| b1                    | 1.95  | 2.2   | 2.45  | e1     | 5.08BSC |       |       |
| b2                    | 2.95  | 3.2   | 3.45  | L      | 18.23   | 18.48 | 18.73 |
| c                     | 0.35  | 0.6   | 0.85  | L1     | 2.35    | 2.60  | 2.85  |
| D                     | 22.34 | 22.54 | 22.74 | P      | 3.41    | 3.61  | 3.81  |
| D1                    | 16.3  | 16.55 | 16.8  | P1     | 6.94    | 7.19  | 7.44  |
| D2                    | 0.99  | 1.19  | 1.39  | Q      | 5.59    | 5.79  | 5.99  |
| E                     | 15.74 | 15.94 | 16.14 | S      | 5.97    | 6.17  | 6.37  |

## Recommended Solder Pad Layout



**PART NO. SYSTEM :**



## Revision history

### Document revision history

| Date        | Version | Changes          |
|-------------|---------|------------------|
| 2025.07.08  | A / 0   | First release.   |
| 2025.10.31  | A / 1   | Error correction |
| 2026. 04.02 | A / 2   | Error correction |
|             |         |                  |
|             |         |                  |