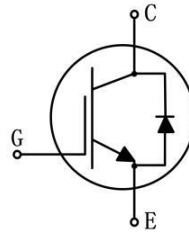


Trench Field-stop IGBT Discrete

| Parameter | Value | Unit |
|---------------|-------|------|
| V_{CE} | 1200 | V |
| I_C | 120 | A |
| $V_{CE(sat)}$ | 1.68 | V |



TO-247PLUS-3L

Features

- 1200V trench gate/field termination process
- Low switching losses
- V_{cesat} has a positive temperature coefficient

Applications

- Frequency converter
- Servo motor
- Inverter

IGBT

Maximum Ratings

| Parameter | Symbol | Test condition | Value | Unit |
|--|--------------|--|-------------|-------------|
| Collector-Emitter voltage | V_{CES} | $T_{vj}=25^{\circ}C$ | 1200 | V |
| Continuous DC collector current | $I_{C\ nom}$ | $T_C=100^{\circ}C, T_{vj\ max}=175^{\circ}C$ | 120 | A |
| Repetitive peak collector current | I_{CRM} | $t_p=1ms$ | 360 | A |
| Gate-emitter voltage | V_{GE} | | ± 20 | V |
| Transient gate-emitter voltage | V_{GE} | $t_p \leq 0.5\mu s, D < 0.001$ | ± 25 | V |
| Short-circuit withstand time | t_{SC} | $V_{CC}=800V, V_{GE}=15V,$ Allowed number of short circuits < 1000A, Time between short circuits $\geq 1.0s,$ $T_{vj}=150^{\circ}C$ | 8 | μs |
| Power dissipation | P_{tot} | $T_C=25^{\circ}C, T_C=100^{\circ}C$ | 1250 625 | W |
| Temperature under switching conditions | $T_{vj\ op}$ | | -40...+175 | $^{\circ}C$ |
| Storage temperature | T_{stg} | | -40...+150 | $^{\circ}C$ |

Thermal Characteristics

| Parameter | Symbol | Test condition | Value | Unit |
|---|---------------|----------------|-------|---------------|
| IGBT thermal resistance, junction - case | $R_{th(j-c)}$ | | 0.12 | $^{\circ}C/W$ |
| Diode thermal resistance, junction - case | $R_{th(j-c)}$ | | 0.20 | $^{\circ}C/W$ |

Characteristic Values

| Parameter | Symbol | Test condition | Value | | | Unit |
|--------------------------------------|--------------|---|-------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Collector-Emitter saturation voltage | V_{CEsat} | $V_{GE}=15V, I_C=120A$ $T_{vj}=25^{\circ}C$ | | 1.68 | 2.08 | V |
| | | $V_{GE}=15V, I_C=120A$ $T_{vj}=150^{\circ}C$ | | 2.21 | | |
| | | $V_{GE}=15V, I_C=120A$ $T_{vj}=175^{\circ}C$ | | 2.30 | | |
| Gate-Emitter threshold voltage | $V_{GE(th)}$ | $I_C=2.34mA, V_{GE}=V_{CE}$ $T_{vj}=25^{\circ}C$ | 5.4 | 6.0 | 6.6 | V |

| | | | | | | |
|-----------------------------------|--------------|---|-----------------------|-------|-----|---------|
| Transconductance | G_{fs} | $V_{CE}=20V, I_C=120A$ | $T_{vj}=25^{\circ}C$ | 74 | | S |
| Input capacitance | C_{ies} | | | 18.1 | | nF |
| Output capacitance | C_{oes} | $f=100kHz, V_{CE}=25V, V_{GE}=0V$ | $T_{vj}=25^{\circ}C$ | 0.44 | | |
| Reverse transfer capacitance | C_{res} | | | 0.12 | | |
| Gate charge | Q_G | $I_C=120A, V_{GE}=15V, V_{CE}=960V$ | $T_{vj}=25^{\circ}C$ | 1.08 | | μC |
| Collector-emitter cut-off current | I_{CES} | $V_{CE}=1200V, V_{GE}=0V$ | $T_{vj}=25^{\circ}C$ | | 40 | μA |
| Gate-emitter leakage current | I_{GES} | $V_{CE}=0V, V_{GE}=20V$ | $T_{vj}=25^{\circ}C$ | | 100 | nA |
| Turn-on delay time | $t_{d(on)}$ | $I_C=120A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=10\Omega$ (inductive load) | $T_{vj}=25^{\circ}C$ | 130 | | ns |
| | | | $T_{vj}=175^{\circ}C$ | 108 | | |
| Rise time | t_r | $I_C=120A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=10\Omega$ (inductive load) | $T_{vj}=25^{\circ}C$ | 270 | | ns |
| | | | $T_{vj}=175^{\circ}C$ | 260 | | |
| Turn-off delay time | $t_{d(off)}$ | $I_C=120A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=10\Omega$ (inductive load) | $T_{vj}=25^{\circ}C$ | 254 | | ns |
| | | | $T_{vj}=175^{\circ}C$ | 287 | | |
| Fall time | t_f | $I_C=120A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=10\Omega$ (inductive load) | $T_{vj}=25^{\circ}C$ | 105 | | ns |
| | | | $T_{vj}=175^{\circ}C$ | 182 | | |
| Turn-on energy loss per pulse | E_{on} | $I_C=120A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=10\Omega$ $di/dt=370A/\mu s(T_{vj}=175^{\circ}C)$ (inductive load) | $T_{vj}=25^{\circ}C$ | 22.40 | | mJ |
| | | | $T_{vj}=175^{\circ}C$ | 29.16 | | |
| Turn-off energy loss per pulse | E_{off} | $I_C=120A, V_{CE}=600V$ $V_{GE}=\pm 15V, R_G=10\Omega$ $dv/dt=8000V/\mu s(T_{vj}=175^{\circ}C)$ (inductive load) | $T_{vj}=25^{\circ}C$ | 5.88 | | mJ |
| | | | $T_{vj}=175^{\circ}C$ | 8.57 | | |

Diode

Maximum Ratings

| Parameter | Symbol | Test condition | Value | Unit |
|---------------------------------|-----------|---|-------|------|
| Repetitive peak reverse voltage | V_{RRM} | $T_{vj}=25^{\circ}C$ | 1200 | V |
| Continuous DC forward current | I_F | $T_C=100^{\circ}C, T_{vj\max}=175^{\circ}C$ | 120 | A |
| Repetitive peak forward current | I_{FRM} | $t_p=1ms$ | 360 | A |

Characteristic Values

| Parameter | Symbol | Test condition | Value | | | Unit |
|-------------------------------|-----------|--|-------|-------|------|---------|
| | | | Min. | Typ. | Max. | |
| Forward voltage | V_F | $I_F=120A, V_{GE}=0V$ | | 1.77 | 2.30 | V |
| | | $I_F=120A, V_{GE}=0V$ | | 2.00 | | |
| | | $I_F=120A, V_{GE}=0V$ | | 1.97 | | |
| Peak reverse recovery current | I_{RM} | $I_F=120A,$ $-diF/dt=300A/\mu s(T_{vj}=175^{\circ}C)$ | | 24 | | A |
| | | $V_R=600V, V_{GE}=-15V$ | | 42 | | |
| Reverse Recovered charge | Q_{rr} | $I_F=120A,$ $-diF/dt=300A/\mu s(T_{vj}=175^{\circ}C)$ | | 6.62 | | μC |
| | | $V_R=600V, V_{GE}=-15V$ | | 18.00 | | |
| Reverse Recovery Time | t_{rr} | $I_F=120A,$ $-diF/dt=300A/\mu s(T_{vj}=175^{\circ}C)$ | | 482 | | ns |
| | | $V_R=600V, V_{GE}=-15V$ | | 790 | | |
| Reverse recovered energy | E_{rec} | $I_F=120A,$ $-diF/dt=300A/\mu s(T_{vj}=175^{\circ}C)$ | | 2.04 | | mJ |
| | | $V_R=600V, V_{GE}=-15V$ | | 6.48 | | |

Typical Characteristics

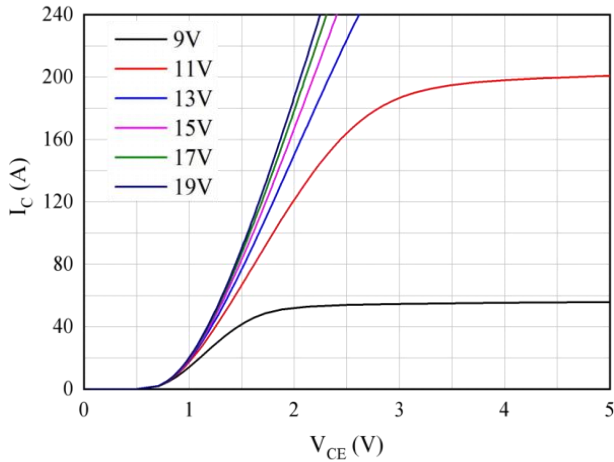


Fig 1. Typical output characteristics ($T_{vj}=25^{\circ}\text{C}$)

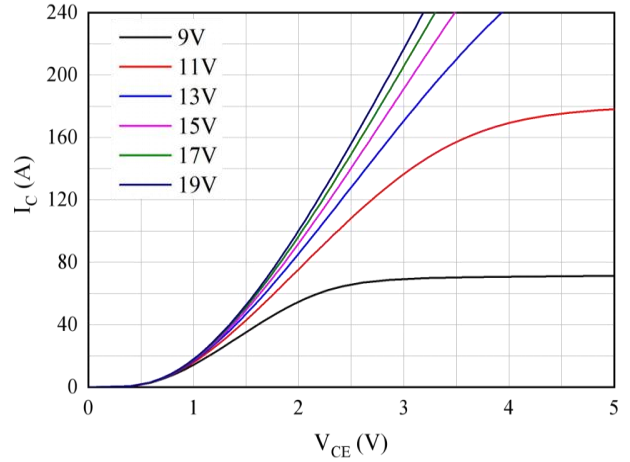


Fig 2. Typical output characteristics ($T_{vj}=175^{\circ}\text{C}$)

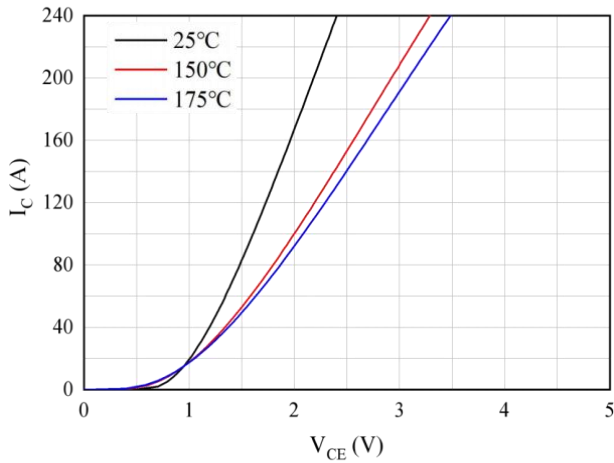


Fig 3. Typical output characteristics ($V_{ge}=15\text{V}$)

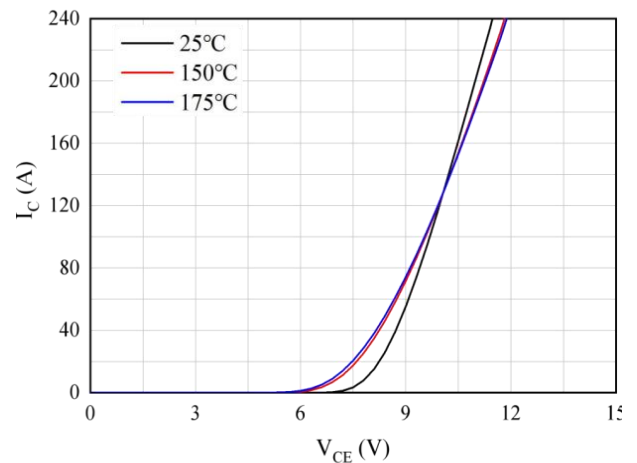


Fig 4. Typical transfer characteristic ($V_{ce}=20\text{V}$)

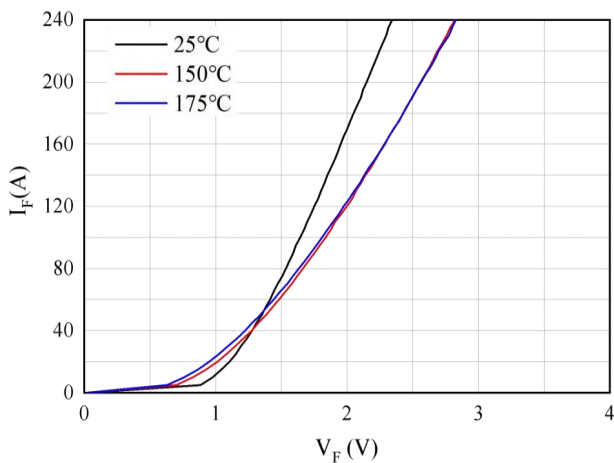


Fig 5. Forward characteristic of Diode

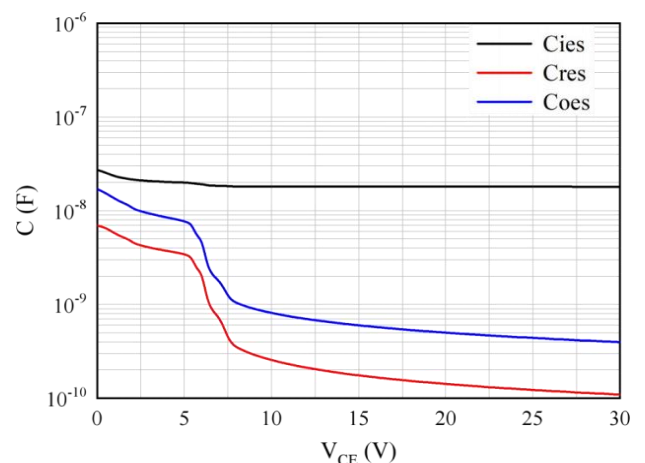


Fig 6. Capacitance characteristic

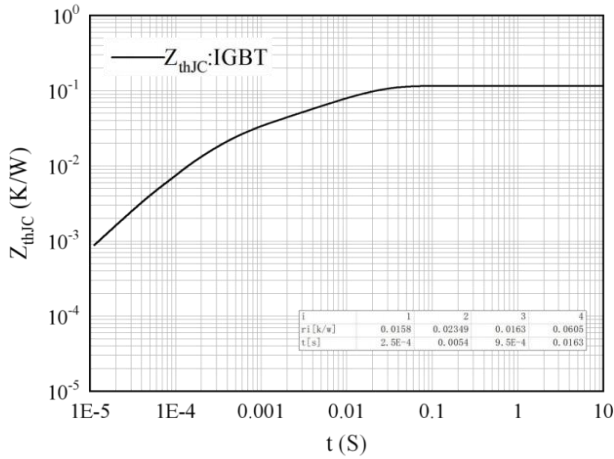


Fig 7. Transient thermal impedance IGBT,
 $Z_{thJC}=f(t)$

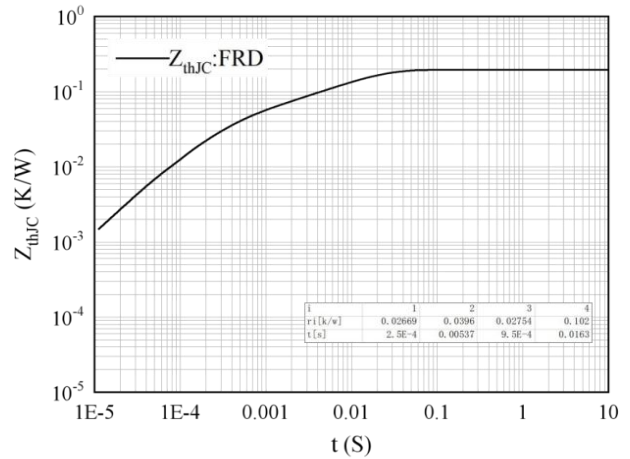


Fig 8. Transient thermal impedance FRD,
 $Z_{thJC}=f(t)$

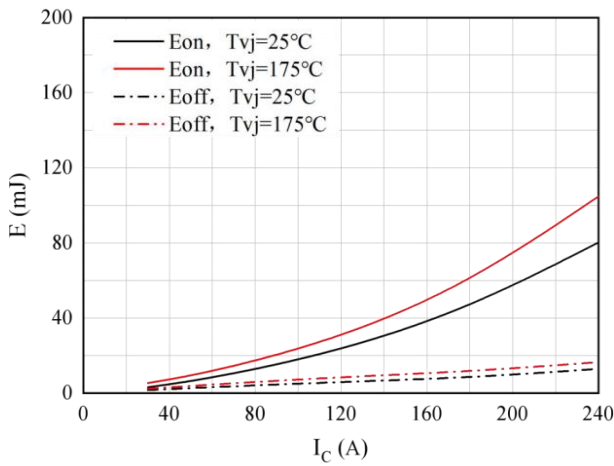


Fig 9. Switching losses of IGBT
 $V_{GE}=\pm 15V, R_{gon}=10\Omega, R_{goff}=10\Omega, V_{CE}=600V$

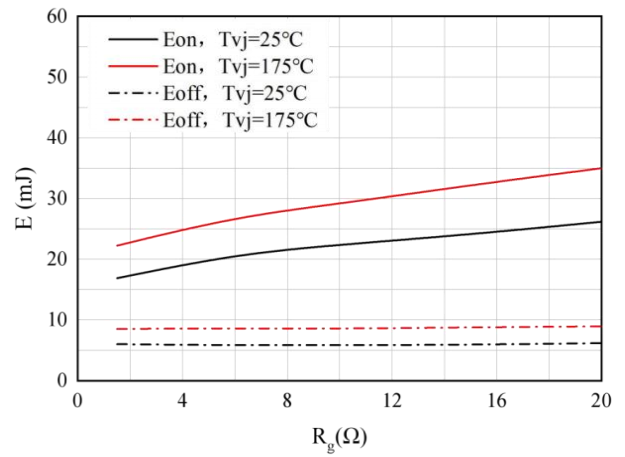


Fig 10. Switching losses of IGBT
 $V_{GE}=\pm 15V, I_C=120A, V_{CE}=600V$

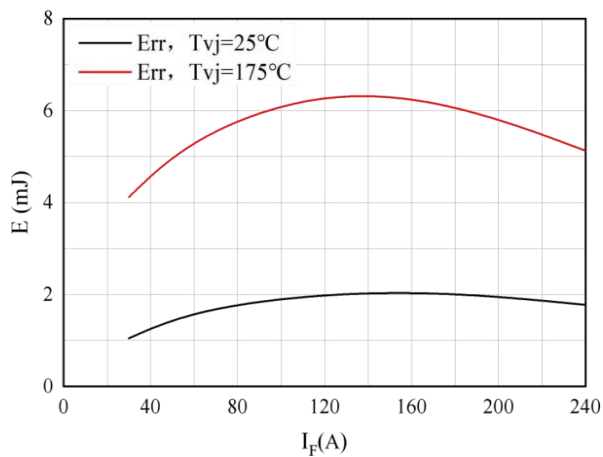


Fig 11. Switching losses of Diode
 $R_{gon}=10\Omega, V_{CE}=600V$

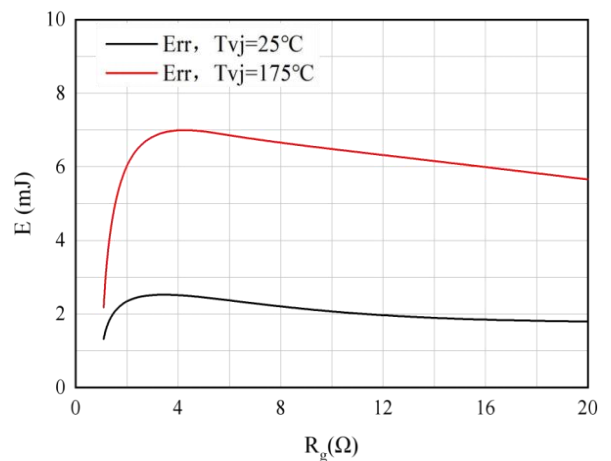
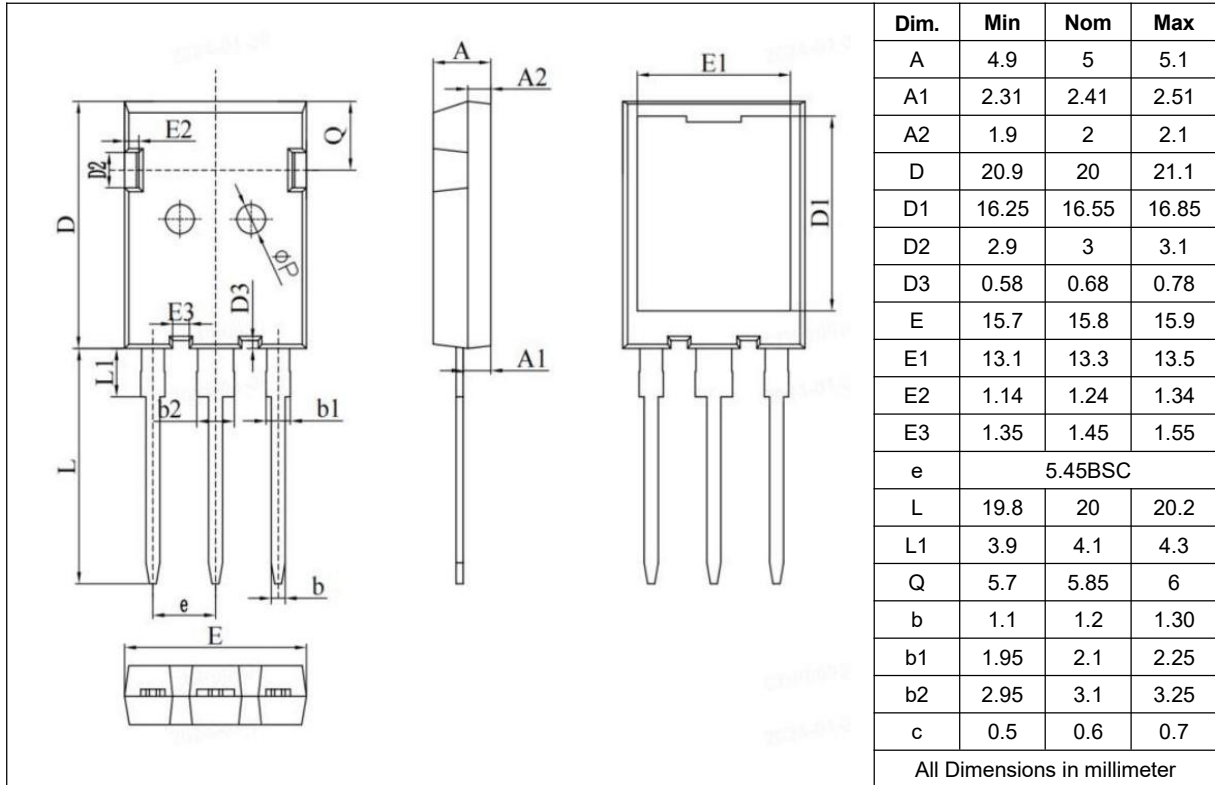


Fig 12. Switching losses of Diode
 $I_F=120A, V_{CE}=600V$

Package Outlines (Unit: mm)

TO-247PLUS-3L



***Important Usage Information and Disclaimer**

The specifications of Zhuhai Hypersemi Co., Ltd. products are not guarantees of product characteristics. They reflect typical performance expected in standard applications, which may vary with specific uses. Users must conduct prior testing for their applications and make necessary adjustments.

Users are responsible for the safety of applications utilizing our products and must implement adequate safety measures to prevent physical injury, fire, or other risks in case of product failure. It is the user's duty to ensure that application designs comply with all applicable laws and standards. Our products must not be used in any applications where a product failure could reasonably result in personal injury, unless specifically authorized in a signed document by Zhuhai Hypersemi Co., Ltd.

No representations or warranties are made regarding the accuracy or completeness of this information, including any claims of non-infringement of third-party intellectual property rights. Zhuhai Hypersemi Co., Ltd. assumes no liability for any applications or uses of its products and does not grant any licenses to its intellectual property rights or those of others. We also make no claims regarding non-infringement of third-party intellectual property rights that may arise from applications.

Due to technical requirements, our products may contain hazardous substances. For details, please contact your nearest sales office. This document replaces all previous information and may be updated. We reserve the right to make changes.