



## General Description

OST60N65KEWF uses advanced Oriental-Semi's patented Trident-Gate Bipolar Transistor (TGBT™) technology to provide extremely low  $V_{CE(sat)}$ , low gate charge, and excellent switching performance. This device is suitable for mid to high range switching frequency converters.

## Features

- Advanced TGBT™ technology
- Excellent conduction and switching loss
- Excellent stability and uniformity
- Fast and soft antiparallel SiC diode



## Applications

- PV inverters
- Induction converters
- Uninterruptible power supplies

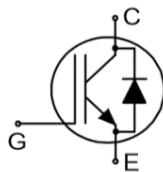
## Key Performance Parameters

| Parameter                       | Value | Unit        |
|---------------------------------|-------|-------------|
| $V_{CES, min} @ 25^{\circ}C$    | 650   | V           |
| Maximum junction temperature    | 175   | $^{\circ}C$ |
| $I_C, pulse$                    | 240   | A           |
| $V_{CE(sat), typ} @ V_{GE}=15V$ | 1.55  | V           |
| $Q_g$                           | 107   | nC          |

## Marking Information

| Product Name | Package | Marking     |
|--------------|---------|-------------|
| OST60N65KEWF | TO263   | OST60N65KEW |

## Package & Pin Information



**Absolute Maximum Ratings** at  $T_{vj}=25^{\circ}\text{C}$  unless otherwise noted

| Parameter                                                              | Symbol                 | Value      | Unit               |
|------------------------------------------------------------------------|------------------------|------------|--------------------|
| Collector emitter voltage                                              | $V_{CES}$              | 650        | V                  |
| Gate emitter voltage                                                   | $V_{GES}$              | $\pm 20$   | V                  |
| Transient gate emitter voltage, $T_P \leq 10\mu\text{s}$ , $D < 0.01$  |                        | $\pm 30$   | V                  |
| Continuous collector current <sup>1)</sup> , $T_C=25^{\circ}\text{C}$  | $I_C$                  | 80         | A                  |
| Continuous collector current <sup>1)</sup> , $T_C=100^{\circ}\text{C}$ |                        | 60         | A                  |
| Pulsed collector current <sup>2)</sup> , $T_C=25^{\circ}\text{C}$      | $I_{C, \text{ pulse}}$ | 240        | A                  |
| Diode forward current <sup>1)</sup> , $T_C=25^{\circ}\text{C}$         | $I_F$                  | 80         | A                  |
| Diode forward current <sup>1)</sup> , $T_C=100^{\circ}\text{C}$        |                        | 60         | A                  |
| Diode pulsed current <sup>2)</sup> , $T_C=25^{\circ}\text{C}$          | $I_{F, \text{ pulse}}$ | 240        | A                  |
| Power dissipation <sup>3)</sup> , $T_C=25^{\circ}\text{C}$             | $P_D$                  | 250        | W                  |
| Power dissipation <sup>3)</sup> , $T_C=100^{\circ}\text{C}$            |                        | 125        | W                  |
| Operation and storage temperature                                      | $T_{stg}, T_{vj}$      | -55 to 175 | $^{\circ}\text{C}$ |

**Thermal Characteristics**

| Parameter                                          | Symbol          | Value | Unit                 |
|----------------------------------------------------|-----------------|-------|----------------------|
| IGBT thermal resistance, junction-case             | $R_{\theta JC}$ | 0.6   | $^{\circ}\text{C/W}$ |
| Diode thermal resistance, junction-case            | $R_{\theta JC}$ | 1.0   | $^{\circ}\text{C/W}$ |
| Thermal resistance, junction-ambient <sup>4)</sup> | $R_{\theta JA}$ | 40    | $^{\circ}\text{C/W}$ |

**Electrical Characteristics** at  $T_{vj}=25^{\circ}\text{C}$  unless otherwise specified

| Parameter                            | Symbol        | Min. | Typ. | Max. | Unit          | Test condition                                                             |
|--------------------------------------|---------------|------|------|------|---------------|----------------------------------------------------------------------------|
| Collector-emitter breakdown voltage  | $V_{(BR)CES}$ | 650  |      |      | V             | $V_{GE}=0\text{ V}$ , $I_C=0.5\text{ mA}$                                  |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ |      | 1.55 | 1.85 | V             | $V_{GE}=15\text{ V}$ , $I_C=60\text{ A}$<br>$T_{vj}=25^{\circ}\text{C}$    |
|                                      |               |      | 1.81 |      | V             | $V_{GE}=15\text{ V}$ , $I_C=60\text{ A}$ ,<br>$T_{vj}=125^{\circ}\text{C}$ |
|                                      |               |      | 1.96 |      | V             | $V_{GE}=15\text{ V}$ , $I_C=60\text{ A}$ ,<br>$T_{vj}=175^{\circ}\text{C}$ |
| Gate-emitter threshold voltage       | $V_{GE(th)}$  | 3.0  | 4.0  | 5.0  | V             | $V_{CE}=V_{GE}$ , $I_D=0.5\text{ mA}$                                      |
| Diode forward voltage                | $V_F$         |      | 2.2  | 2.5  | V             | $V_{GE}=0\text{ V}$ , $I_F=50\text{ A}$<br>$T_{vj}=25^{\circ}\text{C}$     |
|                                      |               |      | 2.8  |      | V             | $V_{GE}=0\text{ V}$ , $I_F=50\text{ A}$ ,<br>$T_{vj}=125^{\circ}\text{C}$  |
|                                      |               |      | 3.25 |      | V             | $V_{GE}=0\text{ V}$ , $I_F=50\text{ A}$ ,<br>$T_{vj}=175^{\circ}\text{C}$  |
| Gate-emitter leakage current         | $I_{GES}$     |      |      | 100  | nA            | $V_{CE}=0\text{ V}$ , $V_{GE}=20\text{ V}$                                 |
| Zero gate voltage collector current  | $I_{CES}$     |      |      | 100  | $\mu\text{A}$ | $V_{CE}=650\text{ V}$ , $V_{GE}=0\text{ V}$                                |



### Dynamic Characteristics

| Parameter                    | Symbol       | Min. | Typ. | Max. | Unit | Test condition                                                                               |
|------------------------------|--------------|------|------|------|------|----------------------------------------------------------------------------------------------|
| Input capacitance            | $C_{ies}$    |      | 5695 |      | pF   | $V_{GE}=0\text{ V}$ ,<br>$V_{CE}=25\text{ V}$ ,<br>$f=100\text{ kHz}$                        |
| Output capacitance           | $C_{oes}$    |      | 301  |      | pF   |                                                                                              |
| Reverse transfer capacitance | $C_{res}$    |      | 4.2  |      | pF   |                                                                                              |
| Turn-on delay time           | $t_{d(on)}$  |      | 43   |      | ns   | $V_{GE}=15\text{ V}$ ,<br>$V_{CC}=400\text{ V}$ ,<br>$R_G=10\ \Omega$ ,<br>$I_C=60\text{ A}$ |
| Rise time                    | $t_r$        |      | 61   |      | ns   |                                                                                              |
| Turn-off delay time          | $t_{d(off)}$ |      | 137  |      | ns   |                                                                                              |
| Fall time                    | $t_f$        |      | 49   |      | ns   |                                                                                              |
| Turn-on energy               | $E_{on}$     |      | 1.3  |      | mJ   |                                                                                              |
| Turn-off energy              | $E_{off}$    |      | 0.92 |      | mJ   | $V_{GE}=15\text{ V}$ ,<br>$V_{CC}=400\text{ V}$ ,<br>$R_G=10\ \Omega$ ,<br>$I_C=30\text{ A}$ |
| Turn-on delay time           | $t_{d(on)}$  |      | 37   |      | ns   |                                                                                              |
| Rise time                    | $t_r$        |      | 32   |      | ns   |                                                                                              |
| Turn-off delay time          | $t_{d(off)}$ |      | 164  |      | ns   |                                                                                              |
| Fall time                    | $t_f$        |      | 14   |      | ns   |                                                                                              |
| Turn-on energy               | $E_{on}$     |      | 0.42 |      | mJ   |                                                                                              |
| Turn-off energy              | $E_{off}$    |      | 0.45 |      | mJ   |                                                                                              |

### Gate Charge Characteristics

| Parameter             | Symbol   | Min. | Typ. | Max. | Unit | Test condition                                                         |
|-----------------------|----------|------|------|------|------|------------------------------------------------------------------------|
| Total gate charge     | $Q_g$    |      | 107  |      | nC   | $V_{GE}=15\text{ V}$ ,<br>$V_{CC}=520\text{ V}$ ,<br>$I_C=60\text{ A}$ |
| Gate-emitter charge   | $Q_{ge}$ |      | 43   |      | nC   |                                                                        |
| Gate-collector charge | $Q_{gc}$ |      | 21   |      | nC   |                                                                        |

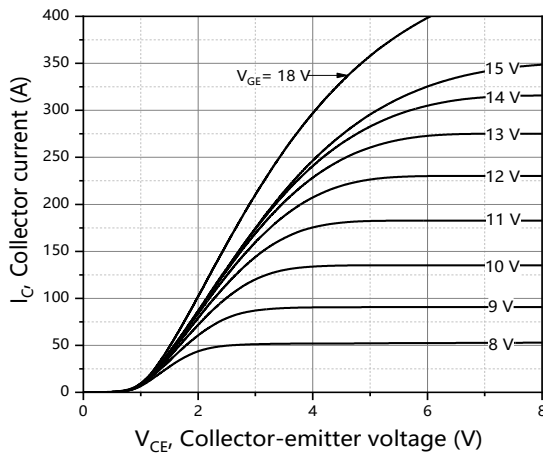
### Body Diode Characteristics

| Parameter                           | Symbol    | Min. | Typ. | Max. | Unit | Test condition                                                                                                 |
|-------------------------------------|-----------|------|------|------|------|----------------------------------------------------------------------------------------------------------------|
| Diode reverse recovery time         | $t_{rr}$  |      | 24   |      | ns   | $V_R=400\text{ V}$ ,<br>$I_F=60\text{ A}$ ,<br>$di_F/dt=500\text{ A}/\mu\text{s}$<br>$T_{vj}=25^\circ\text{C}$ |
| Diode reverse recovery charge       | $Q_{rr}$  |      | 80   |      | nC   |                                                                                                                |
| Diode peak reverse recovery current | $I_{rrm}$ |      | 4.2  |      | A    |                                                                                                                |

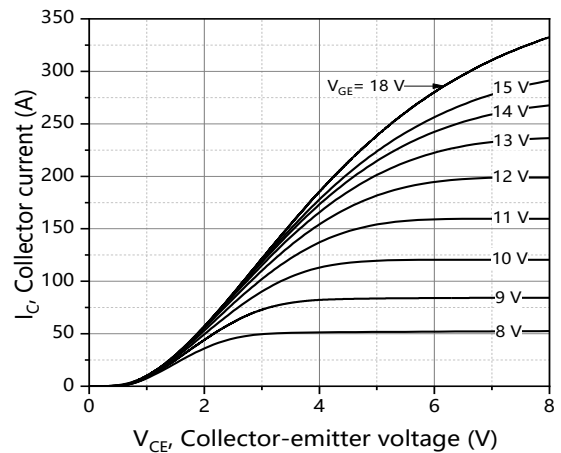
### Note

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating; pulse width limited by max. junction temperature.
- 3)  $P_d$  is based on max. junction temperature, using junction-case thermal resistance.
- 4) The value of  $R_{\theta JA}$  is measured with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_a=25^\circ\text{C}$ .

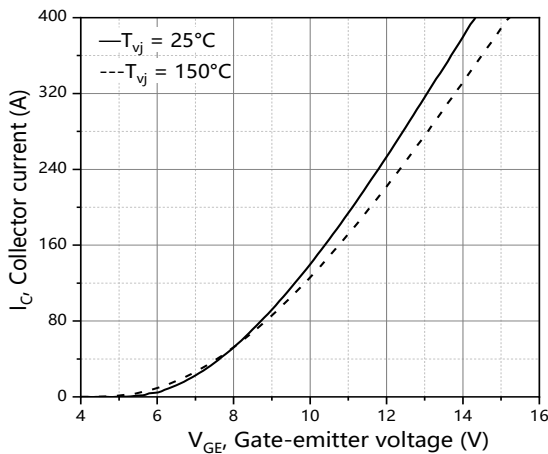
## Electrical Characteristics Diagrams



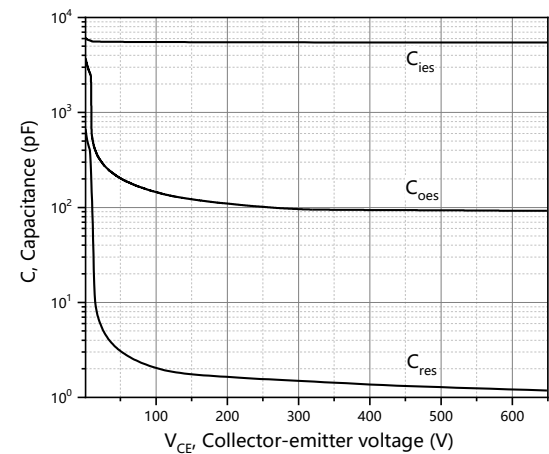
**Figure 1. Typical output characteristics**  
( $T_{vj}=25^{\circ}\text{C}$ )



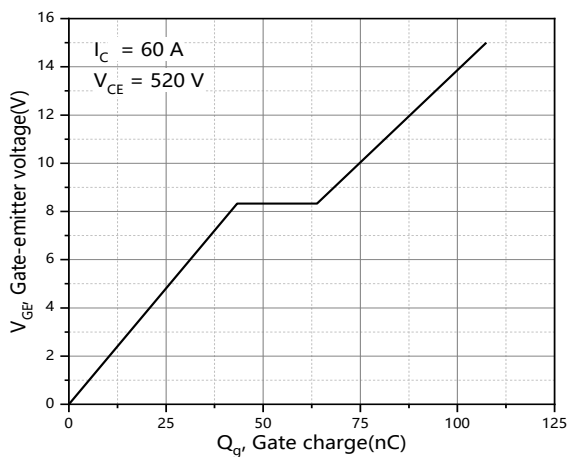
**Figure 2. Typical output characteristics**  
( $T_{vj}=150^{\circ}\text{C}$ )



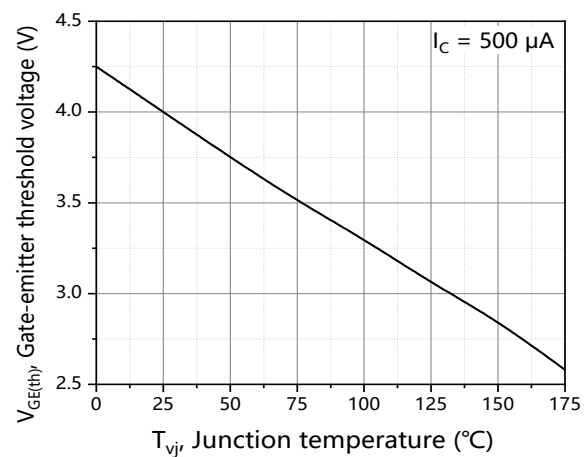
**Figure 3. Typical transfer characteristics**  
( $V_{CE}=20\text{V}$ )



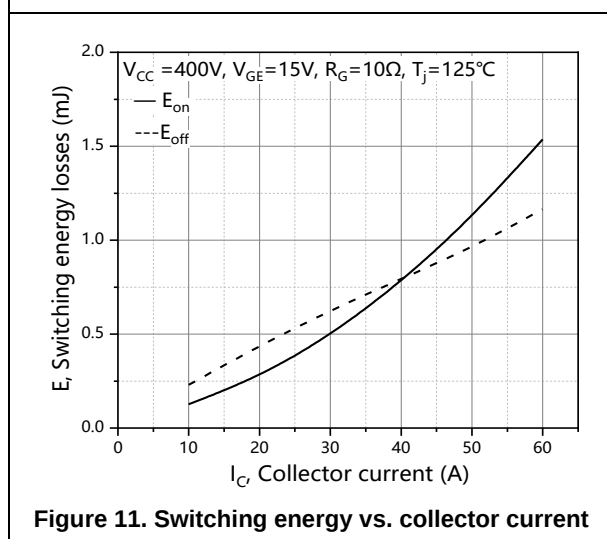
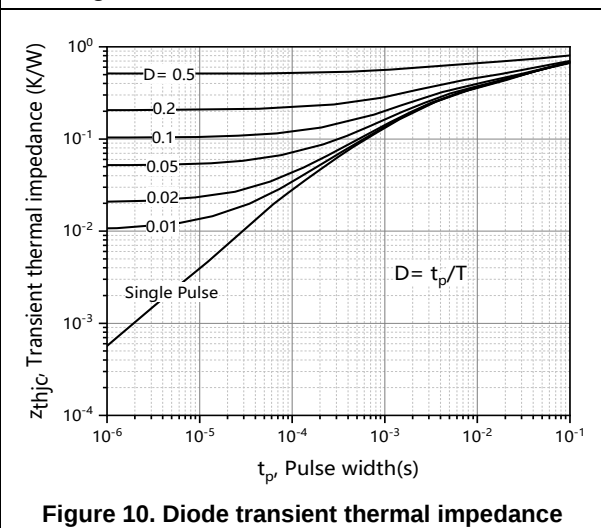
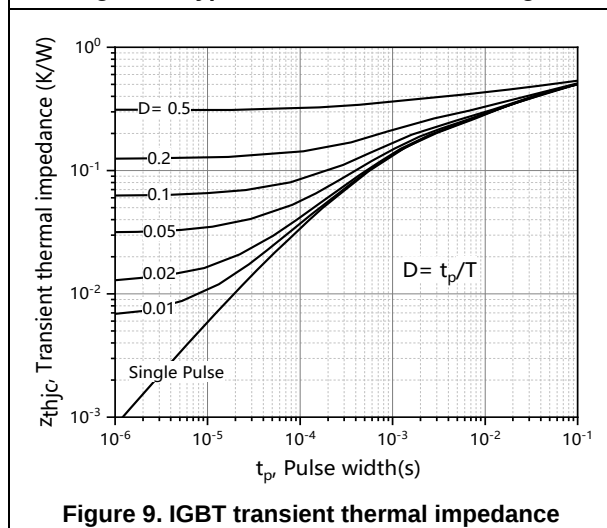
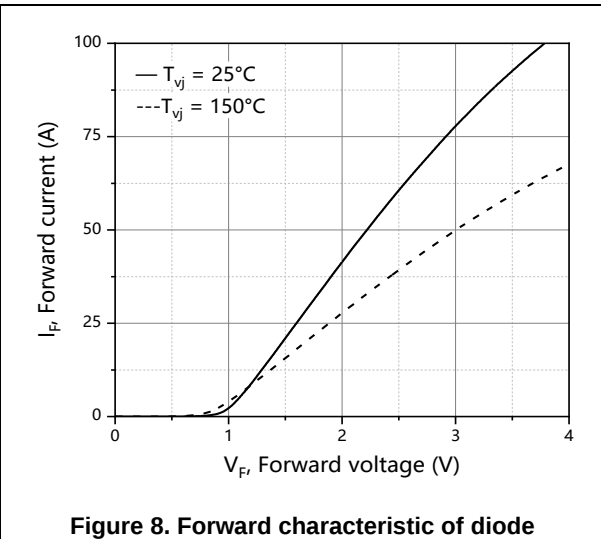
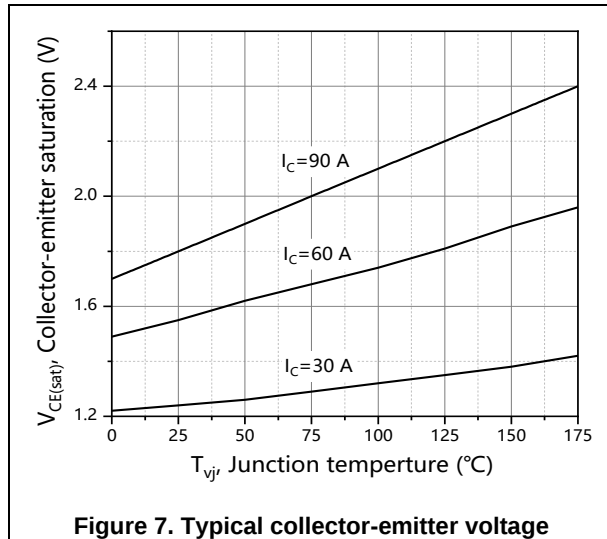
**Figure 4. Typical capacitance**  
( $V_{GE}=0\text{V}$ ,  $f=100\text{ kHz}$ )



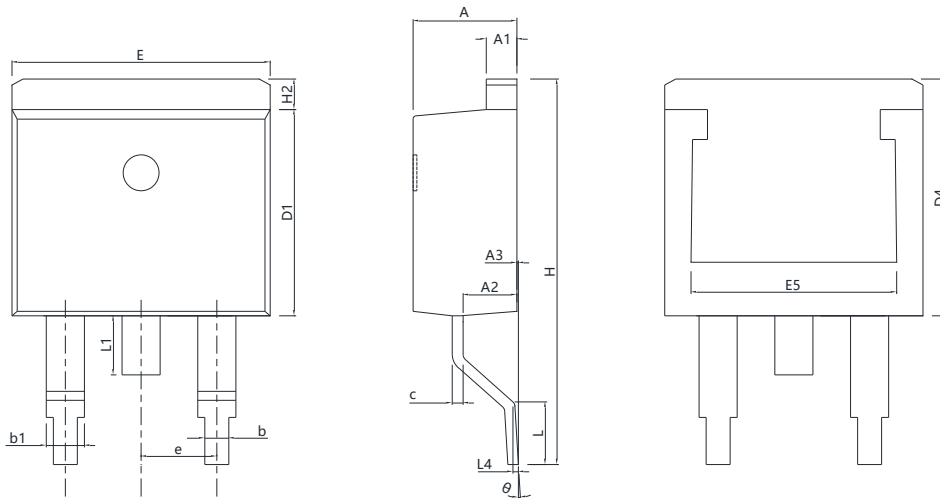
**Figure 5. Typical gate charge**



**Figure 6. Gate-emitter threshold voltage**



## Package Information



| Symbol | mm       |       |       |
|--------|----------|-------|-------|
|        | Min      | Nom   | Max   |
| A      | 4.37     | 4.57  | 4.77  |
| A1     | 1.22     | 1.27  | 1.42  |
| A2     | 2.49     | 2.69  | 2.89  |
| A3     | 0.00     | 0.13  | 0.25  |
| b      | 0.70     | 0.81  | 0.96  |
| b1     | 1.17     | 1.27  | 1.47  |
| c      | 0.30     | 0.38  | 0.53  |
| D1     | 8.50     | 8.70  | 8.90  |
| D4     | 6.60     | -     | -     |
| E      | 9.86     | 10.16 | 10.36 |
| E5     | 7.06     | -     | -     |
| e      | 2.54 BSC |       |       |
| H      | 14.70    | 15.10 | 15.50 |
| H2     | 1.07     | 1.27  | 1.47  |
| L      | 2.00     | 2.30  | 2.60  |
| L1     | 1.40     | 1.55  | 1.70  |
| L4     | 0.25 BSC |       |       |
| θ      | 0°       | 5°    | 9°    |

Version 1: TO263-P package outline dimension

Ordering Information

| Package Type | Units/ Reel | Tubes/ Inner Box | Units/ Inner Box | Inner Boxes/ Carton Box | Units/ Carton Box |
|--------------|-------------|------------------|------------------|-------------------------|-------------------|
| TO263-P      | 800         | 1                | 800              | 5                       | 4000              |

Product Information

| Product      | Package | Pb Free | RoHS | Halogen Free |
|--------------|---------|---------|------|--------------|
| OST60N65KEWF | TO263   | yes     | yes  | yes          |

Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Oriental Semiconductor hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

For further information on technology, delivery terms and conditions and prices, please contact the Oriental Semiconductor sales representatives ([www.orientalsemi.com](http://www.orientalsemi.com)).

© Oriental Semiconductor Co.,Ltd. All Rights Reserved 