## General Description

OST40N120K7E2F 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

RoHS compliant

## Applications

- Induction converters
- On-board charger
- DC/DC converter

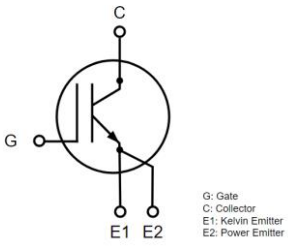
## Key Performance Parameters

| Parameter | Value | Unit |
|---|---|---|
| $V_{CES, min}$ @ 25 °C | 1200 | V |
| Maximum junction temperature | 175 | °C |
| $I_{C, pulse}$ | 160 | A |
| $V_{CE(sat), typ}$ @ $V_{GE}$=15 V | 1.6 | V |
| $Q_g$ | 124 | nC |

## Marking Information

| Product Name | Package | Marking |
|---|---|---|
| OST40N120K7E2F | TO263-7L | OST40N120K7E2 |

## Package & Pin Information

## Absolute Maximum Ratings at $T_{vj}$=25 °C unless otherwise noted

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Collector emitter voltage | $V_{CES}$ | 1200 | V |
| Gate emitter voltage | $V_{GES}$ | ±20 | V |
| Transient gate emitter voltage, $T_P$≤10 µs, D<0.01 | | ±30 | V |
| Continuous collector current[1], $T_C$=25 °C | $I_C$ | 80 | A |
| Continuous collector current[1], $T_C$=100 °C | | 40 | A |
| Pulsed collector current[2], $T_C$=25 °C | $I_{C,\ pulse}$ | 160 | A |
| Power dissipation[3], $T_C$=25 °C | $P_D$ | 395 | W |
| Power dissipation[3], $T_C$=100 °C | | 197 | W |
| Operation and storage temperature | $T_{stg}$, $T_{vj}$ | -55 to 175 | °C |

## Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| IGBT thermal resistance, junction-case | $R_{\theta JC}$ | 0.5 | °C/W |
| Thermal resistance, junction-ambient[4] | $R_{\theta JA}$ | 40 | °C/W |

## Electrical Characteristics at $T_{vj}$=25 °C unless otherwise specified

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|---|---|---|---|---|---|---|
| Collector-emitter breakdown voltage | $V_{(BR)CES}$ | 1200 | | | V | $V_{GE}$=0 V, $I_C$=0.5 mA |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | | 1.6 | 2.1 | V | $V_{GE}$=15 V, $I_C$=40 A $T_{vj}$=25 °C |
| | | | 1.97 | | V | $V_{GE}$=15 V, $I_C$=40 A, $T_{vj}$=125 °C |
| | | | 2.08 | | V | $V_{GE}$=15 V, $I_C$=40 A, $T_{vj}$=175 °C |
| Gate-emitter threshold voltage | $V_{GE(th)}$ | 4.5 | 5.5 | 6.5 | V | $V_{CE}$=$V_{GE}$, $I_C$=0.5 mA |
| Gate-emitter leakage current | $I_{GES}$ | | | 100 | nA | $V_{CE}$=0 V, $V_{GE}$=20 V |
| Zero gate voltage collector current | $I_{CES}$ | | | 10 | µA | $V_{CE}$=1200 V, $V_{GE}$=0 V |

## Dynamic Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|---|---|---|---|---|---|---|
| Input capacitance | $C_{ies}$ | | 7379 | | pF | $V_{GE}$=0 V, $V_{CE}$=25 V, $f$=100 kHz |
| Output capacitance | $C_{oes}$ | | 75 | | pF | |
| Reverse transfer capacitance | $C_{res}$ | | 4 | | pF | |
| Turn-on delay time | $t_{d(on)}$ | | 50 | | ns | $V_{GE}$=15 V, $V_{CC}$=600 V, $R_G$=10 Ω, $I_C$=40 A |
| Rise time | $t_r$ | | 13 | | ns | |
| Turn-off delay time | $t_{d(off)}$ | | 152 | | ns | |
| Fall time | $t_f$ | | 58 | | ns | |
| Turn-on energy | $E_{on}$ | | 0.50 | | mJ | |
| Turn-off energy | $E_{off}$ | | 1.01 | | mJ | |
| Turn-on delay time | $t_{d(on)}$ | | 48 | | ns | $V_{GE}$=15 V, $V_{CC}$=600 V, $R_G$=10 Ω, $I_C$=20 A |
| Rise time | $t_r$ | | 8 | | ns | |
| Turn-off delay time | $t_{d(off)}$ | | 184 | | ns | |
| Fall time | $t_f$ | | 41 | | ns | |
| Turn-on energy | $E_{on}$ | | 0.24 | | mJ | |
| Turn-off energy | $E_{off}$ | | 0.56 | | mJ | |

## Gate Charge Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|---|---|---|---|---|---|---|
| Total gate charge | $Q_g$ | | 124 | | nC | $V_{GE}$=15 V, $V_{CC}$=960 V, $I_C$=40 A |
| Gate-emitter charge | $Q_{ge}$ | | 59 | | nC | |
| Gate-collector charge | $Q_{gc}$ | | 28 | | nC | |

**Note**

1) Calculated continuous current based on maximum allowable junction temperature.
2) Repetitive rating; pulse width limited by max. junction temperature.
3) Pd 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 1inch2 FR-4 board with 2oz. Copper, in a still air environment with $T_a$=25 °C.

## Electrical Characteristics Diagrams

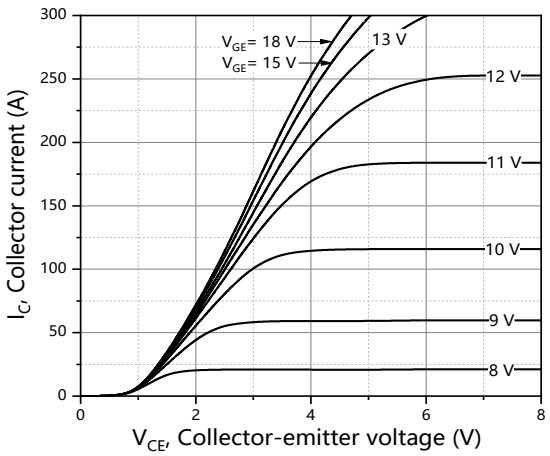



**Figure 1. Typical output characteristics**
($T_{vj}$=25 °C)

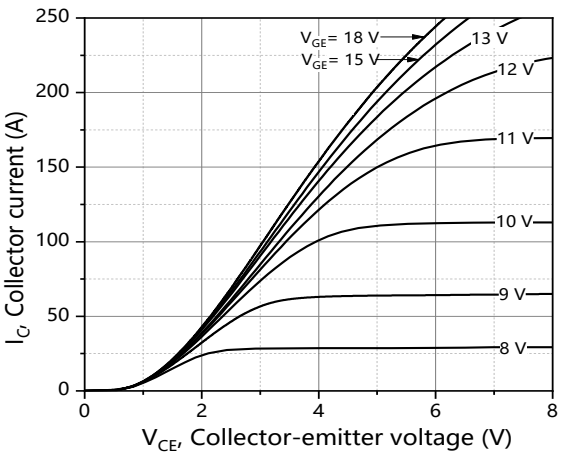



**Figure 2. Typical output characteristics**
($T_{vj}$=150 °C)

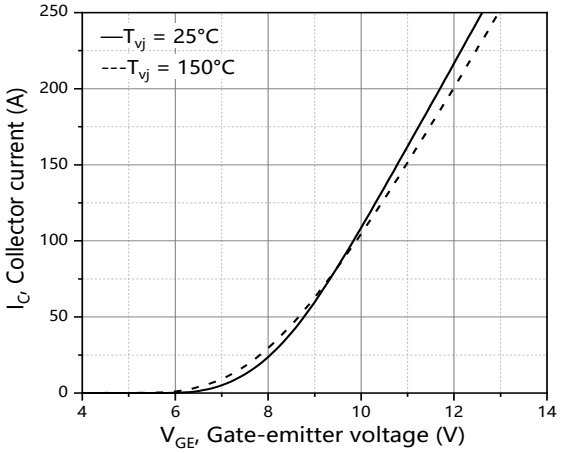



**Figure 3. Typical transfer characteristics**
($V_{CE}$=20 V)

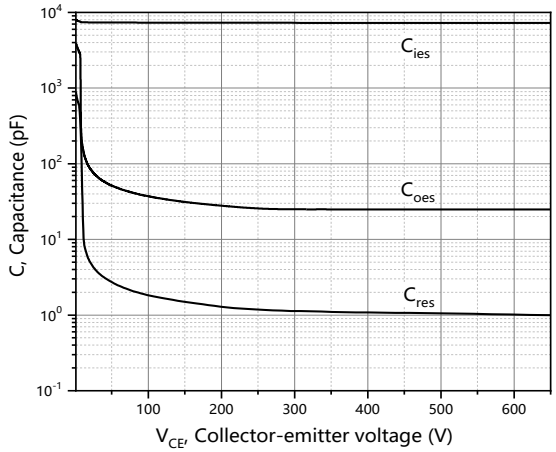



**Figure 4. Typical capacitance**
($V_{GE}$=0V, $f$=100 kHz)

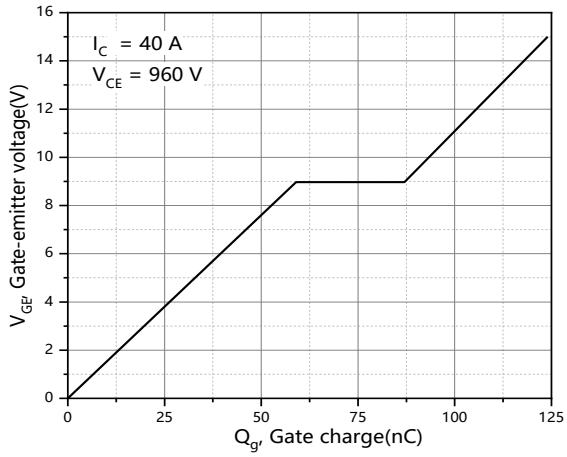



**Figure 5. Typical gate charge**

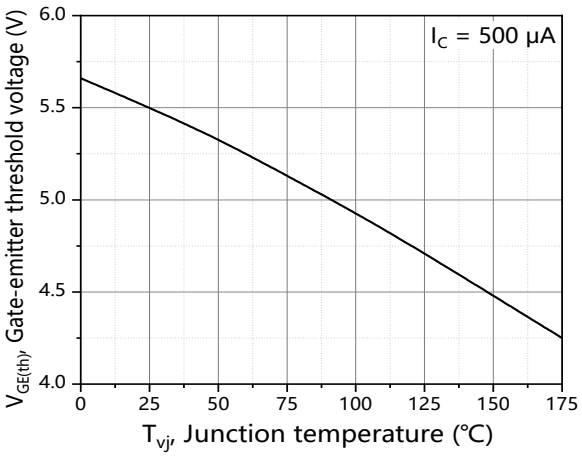



**Figure 6. Gate-emitter threshold voltage**

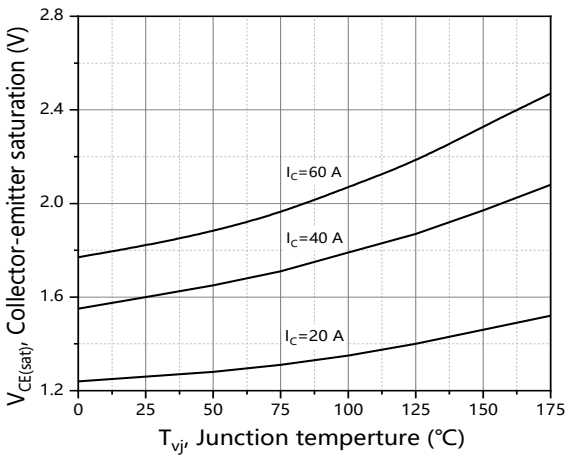



**Figure 7. Typical collector-emitter voltage**

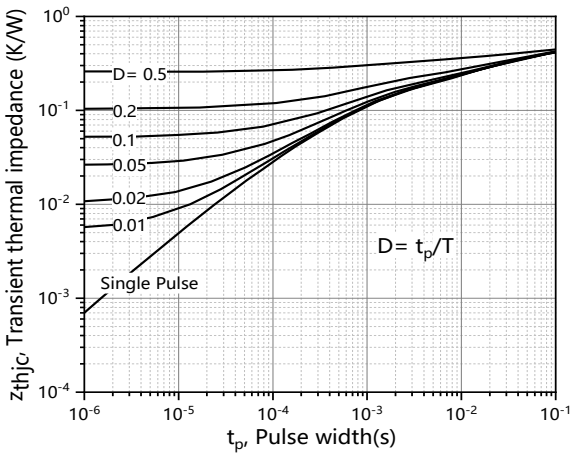



**Figure 9. IGBT transient thermal impedance**

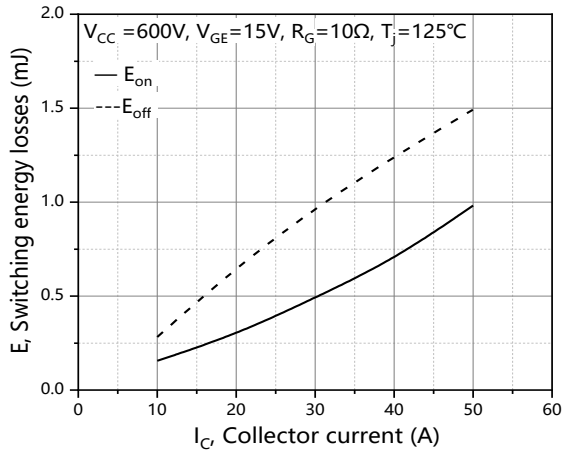
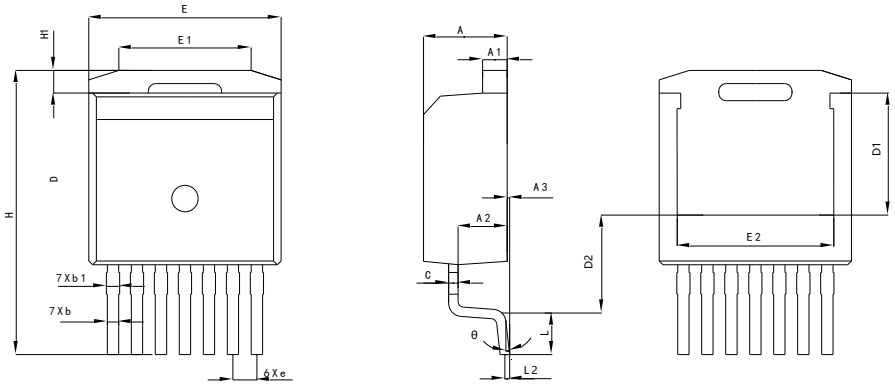



**Figure 11. Switching energy vs. collector current**

## Package Information




| Symbol | mm | | |
|---|---|---|---|
| | Min | Nom | Max |
| A | 4.30 | 4.43 | 4.56 |
| A1 | 1.20 | 1.30 | 1.40 |
| A2 | 2.45 | 2.60 | 2.75 |
| A3 | 0.00 | 0.13 | 0.25 |
| b | 0.50 | 0.60 | 0.70 |
| b1 | 0.60 | 0.70 | 0.90 |
| c | 0.45 | 0.50 | 0.60 |
| D | 8.93 | 9.08 | 9.23 |
| D1 | 6.30 | 6.45 | 6.60 |
| D2 | 5.18 REF | | |
| e | 1.27 BSC | | |
| E | 10.08 | 10.18 | 10.28 |
| E1 | 7.00 REF | | |
| E2 | 7.90 | 8.30 | 8.70 |
| H | 14.53 | 15.03 | 15.53 |
| H1 | 0.98 | 1.20 | 1.42 |
| L | 1.90 | 2.20 | 2.50 |
| L2 | 0.25 BSC | | |
| θ | 0° | 3° | 7° |

Version 1: TO263LV-7L-P package outline dimension

## Ordering Information

| Package Type | Units/ Reel | Reel / Inner Box | Units/ Inner Box | Inner Boxes/ Carton Box | Units/ Carton Box |
|---|---|---|---|---|---|
| TO263-7L-P | 800 | 1 | 800 | 5 | 4000 |

## Product Information

| Product | Package | Pb Free | RoHS | Halogen Free |
|---|---|---|---|---|
| OST40N120K7E2F | TO263-7L | yes | yes | yes |

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