

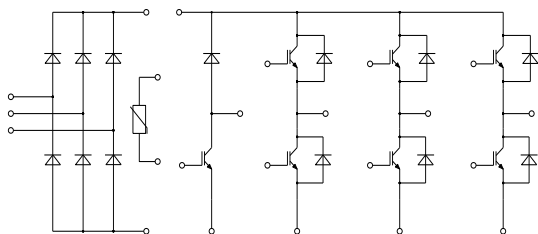
Features

- Low Switching Losses
- Low $V_{ce(sat)}$ with Positive Temperature Coefficient
- Including Fast & Soft Recovery Anti-parallel FWD
- Low Inductance Case
- High Short Circuit Capability(10 μ s)
- Maximum Junction Temperature 175°C
- Isolated Heatsink Using DBC Technology
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

Applications

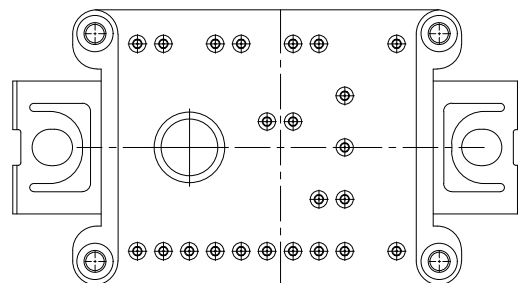
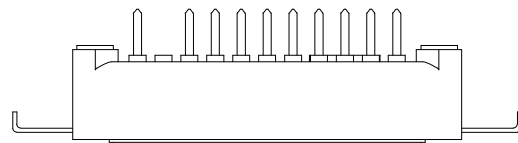
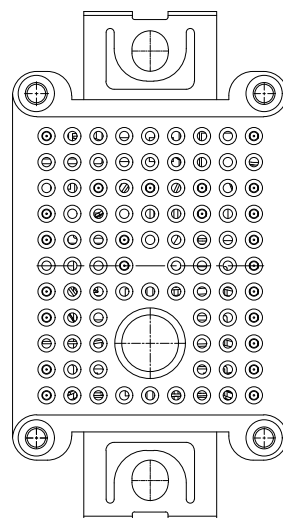
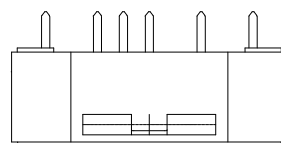
- Motor Drivers
- AC and DC Servo Drive Amplifier
- UPS (Uninterruptible Power Supplies)

Circuit Diagram



IGBT Modules 1200V 10A

P2



● IGBT- Inverter

Maximum Ratings

| Parameter | Symbol | Test Conditions | Rating | Unit |
|-----------------------------------|-----------|--|----------|------|
| Collector-Emitter Voltage | V_{CES} | $V_{GE}=0V, I_C=1mA, T_{vj}=25^{\circ}C$ | 1200 | V |
| Continuous Collector Current | I_C | $T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$ | 10 | A |
| Repetitive Peak Collector Current | I_{CRM} | $t_p=1ms$ | 20 | A |
| Gate-Emitter Voltage | V_{GES} | $T_{vj}=25^{\circ}C$ | ± 20 | V |
| Total Power Dissipation | P_{tot} | $T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$ | 140 | W |

Electrical Characteristics

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|--------------------------------------|---------------|--|------|------|------|---------|
| Gate-Emitter Threshold Voltage | $V_{GE(th)}$ | $V_{GE}=V_{CE}, I_C=0.5mA, T_{vj}=25^{\circ}C$ | 5.2 | 6.0 | 6.6 | V |
| Collector-Emitter Cut-off Current | I_{CES} | $V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$ | | | 1.0 | mA |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C=10A, V_{GE}=15V, T_{vj}=25^{\circ}C$ | | 1.85 | 2.20 | V |
| | | $I_C=10A, V_{GE}=15V, T_{vj}=125^{\circ}C$ | | 2.15 | | V |
| | | $I_C=10A, V_{GE}=15V, T_{vj}=150^{\circ}C$ | | 2.25 | | V |
| Gate Charge | Q_g | | | 0.13 | | μC |
| Input Capacitance | C_{ies} | $V_{CE}=25V, V_{GE}=0V, f=1MHz, T_{vj}=25^{\circ}C$ | | 1.0 | | nF |
| Reverse Transfer Capacitance | C_{res} | | | 0.03 | | |
| Gate-Emitter leakage current | I_{GES} | $V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$ | | | 400 | nA |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{CE}=600V, I_C=10A, V_{GE}=\pm 15V, R_G=47\Omega, T_{vj}=25^{\circ}C$ | | 85 | | ns |
| Rise Time | t_r | | | 50 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 262 | | |
| Fall Time | t_f | | | 140 | | |
| Turn-On Energy | E_{on} | | | 0.98 | | |
| Turn-Off Energy | E_{off} | | 0.48 | | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{CE}=600V, I_C=10A, V_{GE}=\pm 15V, R_G=47\Omega, T_{vj}=125^{\circ}C$ | | 90 | | ns |
| Rise Time | t_r | | | 60 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 285 | | |
| Fall Time | t_f | | | 150 | | |
| Turn-On Energy | E_{on} | | | 1.33 | | |
| Turn-Off Energy | E_{off} | | 0.9 | | | |
| SC Data | I_{SC} | $T_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C, V_{CC}=900V, V_{CEM} \leq 1200V$ | | 70 | | A |

● Diode- Inverter

Maximum Ratings

| Parameter | Symbol | Test Conditions | Rating | Unit |
|---------------------------------|-----------|--|--------|--------|
| Repetitive Peak Reverse Voltage | V_{RRM} | $T_{vj}=25^{\circ}C$ | 1200 | V |
| Continuous DC Forward Current | I_F | | 10 | A |
| Repetitive Peak Forward Current | I_{FRM} | $t_p=1ms$ | 20 | A |
| I^2t -value | I^2t | $V_R=0, t_p=10ms, T_{vj}=125^{\circ}C$ | 16 | A^2s |
| | | $V_R=0, t_p=10ms, T_{vj}=150^{\circ}C$ | 14 | |

Electrical Characteristics

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|-------------------------------|-----------|--|-----|------|-----|---------|
| Forward Voltage | V_F | $I_F=10A, T_{vj}=25^{\circ}C$ | | 2.0 | 2.5 | V |
| | | $I_F=10A, T_{vj}=125^{\circ}C$ | | 2.1 | | V |
| | | $I_F=10A, T_{vj}=150^{\circ}C$ | | 2.1 | | V |
| Recovered Charge | Q_{rr} | $I_F=10A,$ $V_R=600V,$ $-di_F/dt=500A/\mu s,$ $T_{vj}=25^{\circ}C$ | | 0.90 | | μC |
| Peak Reverse Recovery Current | I_{rr} | | | 12.5 | | A |
| Reverse Recovery Energy | E_{rec} | | | 0.25 | | mJ |
| Recovered Charge | Q_{rr} | $I_F=10A,$ $V_R=600V,$ $-di_F/dt=500A/\mu s,$ $T_{vj}=125^{\circ}C$ | | 1.70 | | μC |
| Peak Reverse Recovery Current | I_{rr} | | | 10.4 | | A |
| Reverse Recovery Energy | E_{rec} | | | 0.50 | | mJ |

● IGBT- Brake-chopper

Maximum Ratings

| Parameter | Symbol | Test Conditions | Rating | Unit |
|-----------------------------------|-----------|--|----------|------|
| Collector-Emitter Voltage | V_{CES} | $V_{GE}=0V, I_C=1mA, T_{vj}=25^{\circ}C$ | 1200 | V |
| Continuous Collector Current | I_C | $T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$ | 10 | A |
| Repetitive Peak Collector Current | I_{CRM} | $t_p=1ms$ | 20 | A |
| Gate-Emitter Voltage | V_{GES} | $T_{vj}=25^{\circ}C$ | ± 20 | V |
| Total Power Dissipation | P_{tot} | $T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$ | 105 | W |

Electrical Characteristics

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit | |
|--------------------------------------|---------------|--|------|------|------|---------|----|
| Gate-Emitter Threshold Voltage | $V_{GE(th)}$ | $V_{GE}=V_{CE}, I_C=0.3mA, T_{vj}=25^{\circ}C$ | 5.2 | 6.0 | 6.6 | V | |
| Collector-Emitter Cut-off Current | I_{CES} | $V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$ | | | 1.0 | mA | |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C=10A, V_{GE}=15V, T_{vj}=25^{\circ}C$ | | 1.85 | 2.25 | V | |
| | | $I_C=10A, V_{GE}=15V, T_{vj}=125^{\circ}C$ | | 2.15 | | V | |
| | | $I_C=10A, V_{GE}=15V, T_{vj}=150^{\circ}C$ | | 2.25 | | V | |
| Gate Charge | Q_g | | | 0.13 | | μC | |
| Input Capacitance | C_{ies} | $V_{CE}=25V, V_{GE}=0V, f=1MHz, T_{vj}=25^{\circ}C$ | | 1.0 | | nF | |
| Reverse Transfer Capacitance | C_{res} | | | 0.03 | | | |
| Gate-Emitter leakage current | I_{GES} | $V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$ | | | 400 | nA | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{CE}=600V, I_C=10A, V_{GE}=\pm 15V, R_G=47\Omega, T_{vj}=25^{\circ}C$ | | 85 | | ns | |
| Rise Time | t_r | | | 50 | | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 262 | | | |
| Fall Time | t_f | | | 140 | | | |
| Turn-On Energy | E_{on} | | | 0.98 | | | mJ |
| Turn-Off Energy | E_{off} | | 0.48 | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{CE}=600V, I_C=10A, V_{GE}=\pm 15V, R_G=47\Omega, T_{vj}=125^{\circ}C$ | | 90 | | ns | |
| Rise Time | t_r | | | 60 | | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 285 | | | |
| Fall Time | t_f | | | 150 | | | |
| Turn-On Energy | E_{on} | | | 1.33 | | | mJ |
| Turn-Off Energy | E_{off} | | | 0.90 | | | |
| SC Data | I_{SC} | $T_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C, V_{CC}=800V, V_{CEM} \leq 1200V$ | | 70 | | A | |

● Diode- Brake-chopper

Maximum Ratings

| Parameter | Symbol | Test Conditions | Rating | Unit |
|---------------------------------|-----------|--|--------|--------|
| Repetitive Peak Reverse Voltage | V_{RRM} | $T_{vj}=25^{\circ}C$ | 1200 | V |
| Continuous DC Forward Current | I_F | | 10 | A |
| Repetitive Peak Forward Current | I_{FRM} | $t_p=1ms$ | 20 | A |
| I^2t -value | I^2t | $V_R=0, t_p=10ms, T_{vj}=125^{\circ}C$ | 16 | A^2s |
| | | $V_R=0, t_p=10ms, T_{vj}=150^{\circ}C$ | 14 | |

Electrical Characteristics

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|-------------------------------|-----------|--|-----|------|-----|---------|
| Forward Voltage | V_F | $I_F=10A, T_{vj}=25^{\circ}C$ | | 2.0 | 2.5 | V |
| | | $I_F=10A, T_{vj}=125^{\circ}C$ | | 2.1 | | V |
| | | $I_F=10A, T_{vj}=150^{\circ}C$ | | 2.1 | | V |
| Recovered Charge | Q_{rr} | $I_F=10A,$ $V_R=600V,$ $-di_F/dt=500A/\mu s,$ $T_{vj}=25^{\circ}C$ | | 0.90 | | μC |
| Peak Reverse Recovery Current | I_{rr} | | | 12.5 | | A |
| Reverse Recovery Energy | E_{rec} | | | 0.25 | | mJ |
| Recovered Charge | Q_{rr} | $I_F=10A,$ $V_R=600V,$ $-di_F/dt=500A/\mu s,$ $T_{vj}=125^{\circ}C$ | | 1.70 | | μC |
| Peak Reverse Recovery Current | I_{rr} | | | 10.4 | | A |
| Reverse Recovery Energy | E_{rec} | | | 0.50 | | mJ |

● Diode- Rectifier

Maximum Ratings

| Parameter | Symbol | Test Conditions | Rating | Unit |
|--|-------------|------------------------------------|--------|--------|
| Repetitive Peak Reverse Voltage | V_{RRM} | $T_j=25^{\circ}C$ | 1600 | V |
| Average On-state Current 50/60Hz, sine wave | $I_{F(AV)}$ | $T_C=100^{\circ}C$ | 10 | A |
| Maximum RMS Current at Rectifier Output | I_{RMSM} | $T_C=100^{\circ}C$ | 10 | A |
| Surge Forward Current | I_{FSM} | $V_R=0, t_p=10ms, T_j=45^{\circ}C$ | 150 | A |
| I^2t -value | I^2t | $V_R=0, t_p=10ms, T_j=45^{\circ}C$ | 110 | A^2s |

Electrical Characteristics

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|-----------------------|--------|-------------------------------|-----|------|-----|------|
| Diode Forward Voltage | V_F | $I_F=10A, T_j=150^{\circ}C$ | | 1.00 | | V |
| Reverse Current | I_r | $T_j=150^{\circ}C, V_R=1600V$ | | | 1.0 | mA |

● NTC-Thermistor

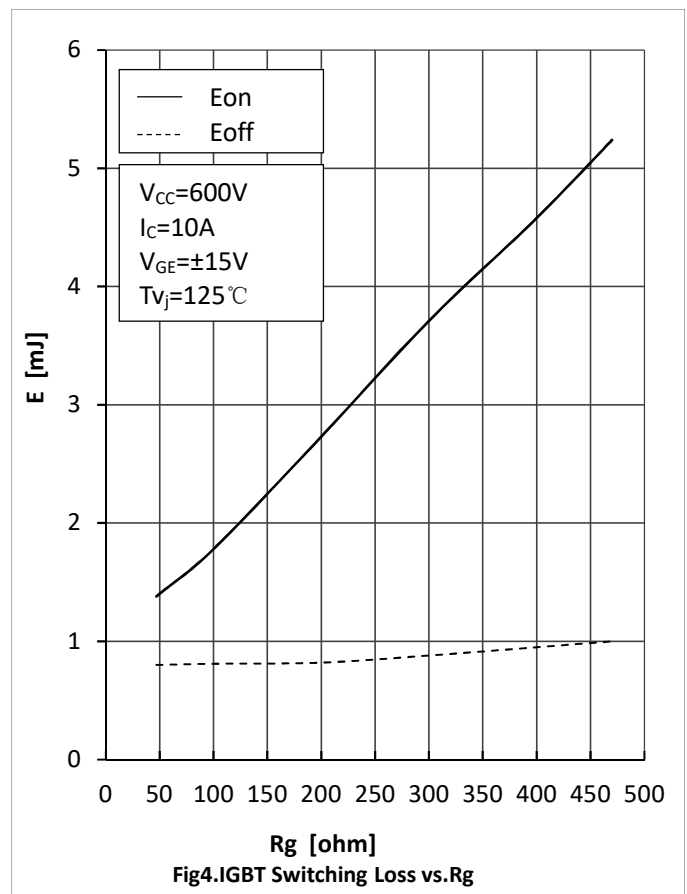
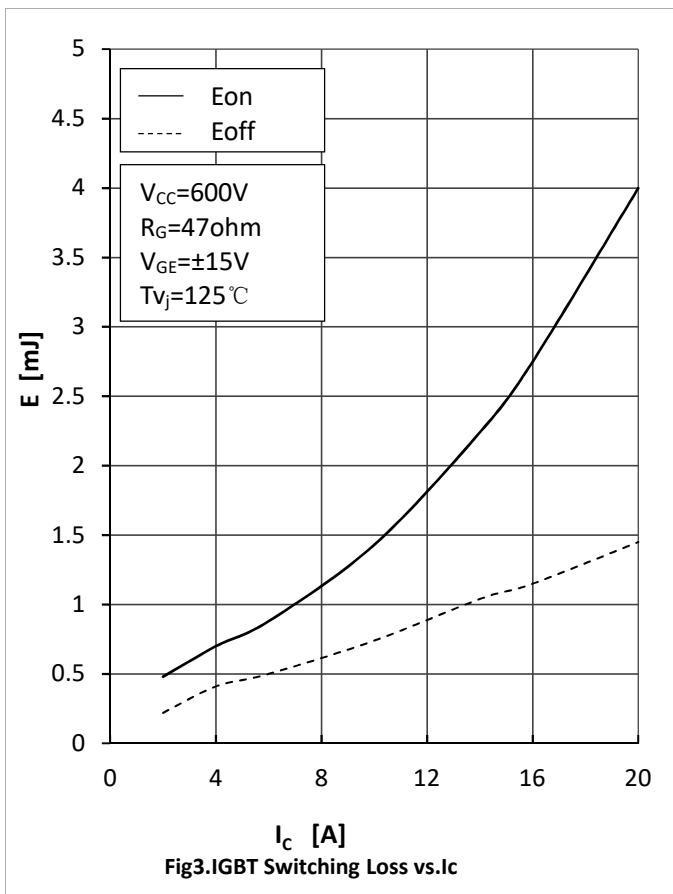
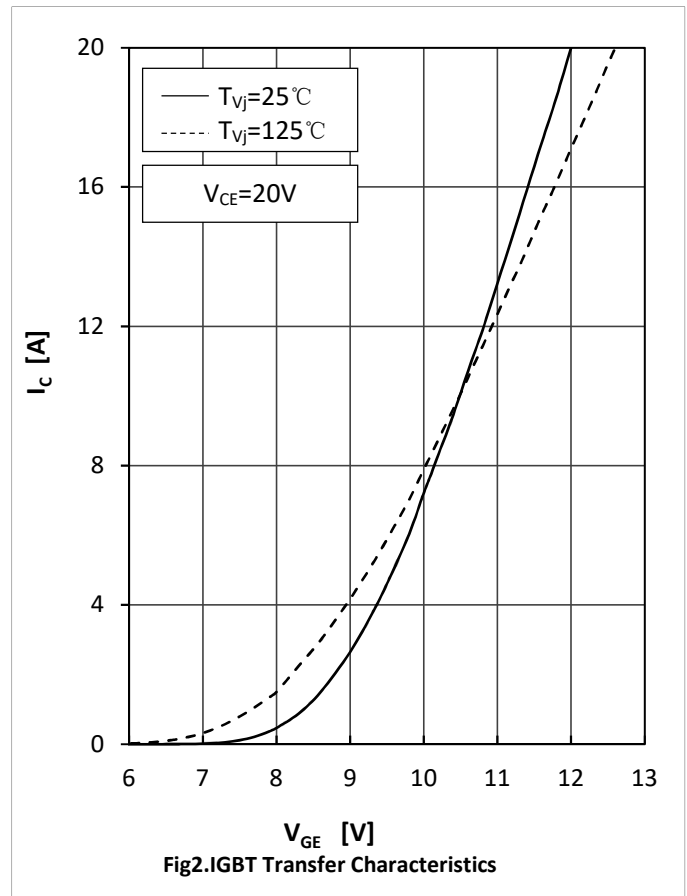
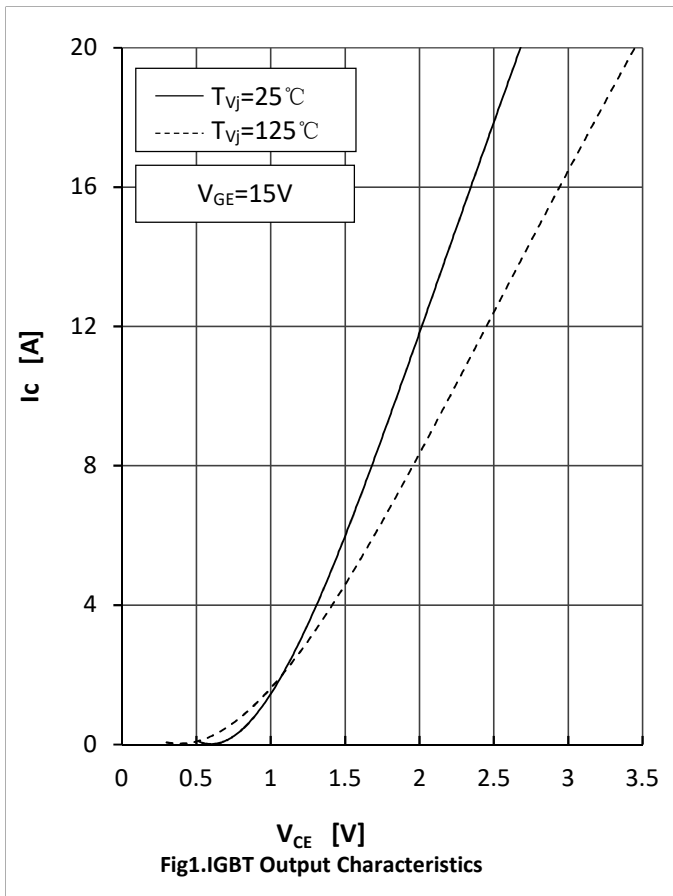
Electrical Characteristics

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|-------------------|--------------|--|-----|------|------|------------|
| Rated Resistance | R_{25} | | | 5.0 | | k Ω |
| Deviation of R100 | $\Delta R/R$ | $T_C=100, R_{100}=493.3\Omega$ | -5 | | 5 | % |
| Power Dissipation | P_{25} | | | | 20.0 | mW |
| B-value | $B_{25/50}$ | $R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$ | | 3375 | | K |

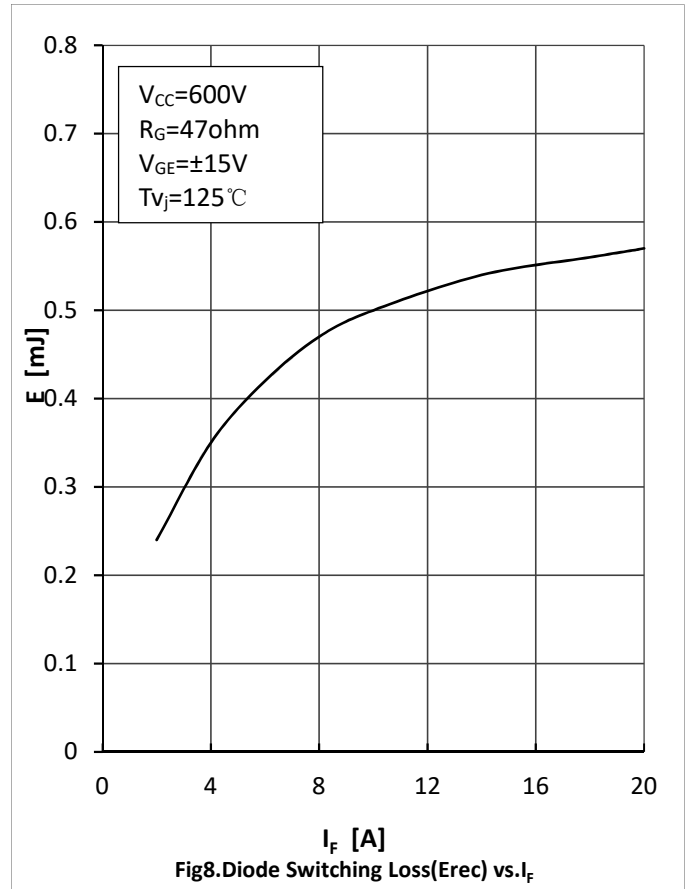
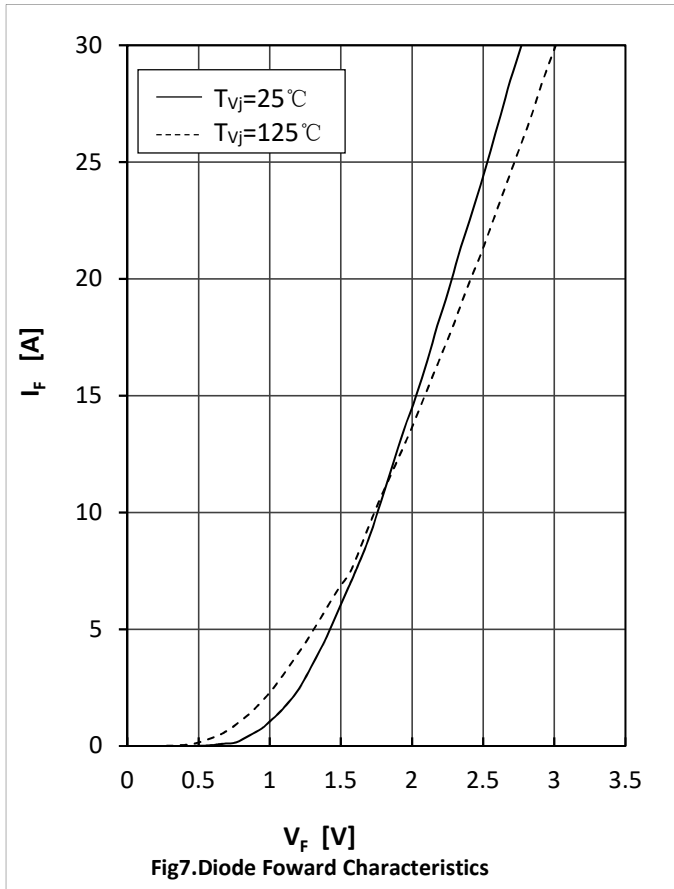
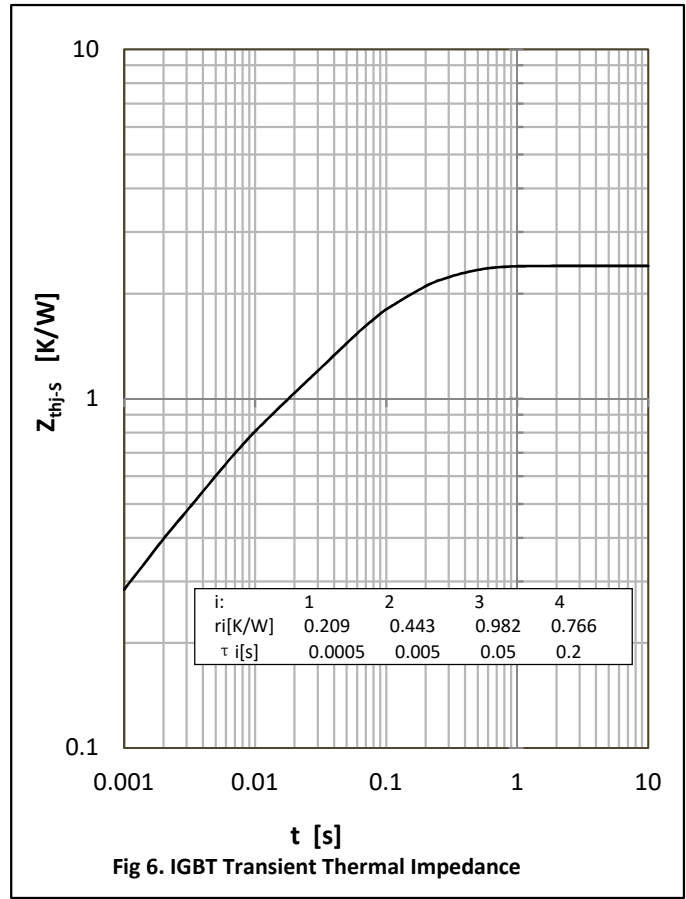
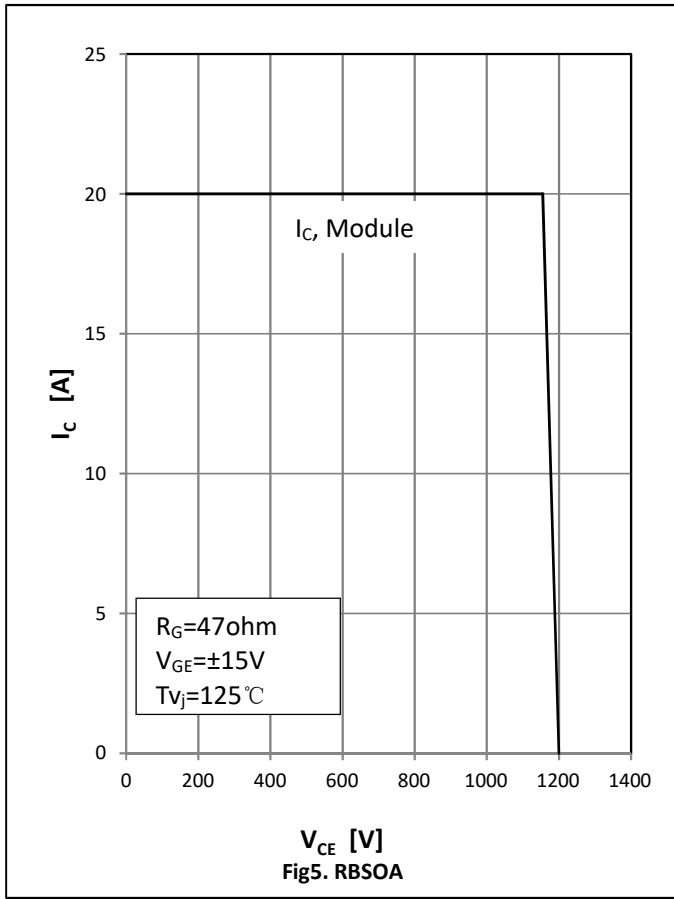
● Module Characteristics($T_C=25^{\circ}\text{C}$ unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|--|-----------------|---------------------------------------|------|-------|------|--------------------|
| Isolation voltage | V_{isol} | $t=1\text{min}, f=50\text{Hz}$ | 2500 | | | V |
| Maximum Junction Temperature | T_{jmax} | | | | 175 | $^{\circ}\text{C}$ |
| Operating Junction Temperature | $T_{vj\ op}$ | | -40 | | 150 | $^{\circ}\text{C}$ |
| Operating Junction Temperature | T_{stg} | | -40 | | 125 | $^{\circ}\text{C}$ |
| Stray Inductance | L_{CE} | | | 30 | | nH |
| Module Lead Resistance , Terminal to Chip | $R_{cc'+EE'}$ | TC=25 $^{\circ}\text{C}$, per switch | | 8.00 | | m Ω |
| | $R_{AA'+CC'}$ | | | 6.00 | | |
| Thermal Resistance Junction to Case | $R_{\theta jc}$ | per IGBT-inverter | | 1.25 | 1.40 | K/W |
| | | per Diode-inverter | | 1.75 | 1.90 | |
| | | per IGBT-brake-chopper | | 1.25 | 1.40 | |
| | | per Diode-chopper | | 1.75 | 1.90 | |
| | | per Diode-rectifier | | 2.05 | 2.10 | |
| Thermal Resistance Case to Sink | $R_{\theta cs}$ | per IGBT-inverter | | 1.05 | | K/W |
| | | per Diode-inverter | | 1.30 | | |
| | | per IGBT-brake-chopper | | 1.15 | | |
| | | per Diode-chopper | | 1.30 | | |
| | | per Diode-rectifier | | 1.25 | | |
| | | per Module | | 0.058 | | |
| Mounting Force Per Clamp | F | | 20 | | 50 | N |
| Weight of Module | G | | | 25 | | g |

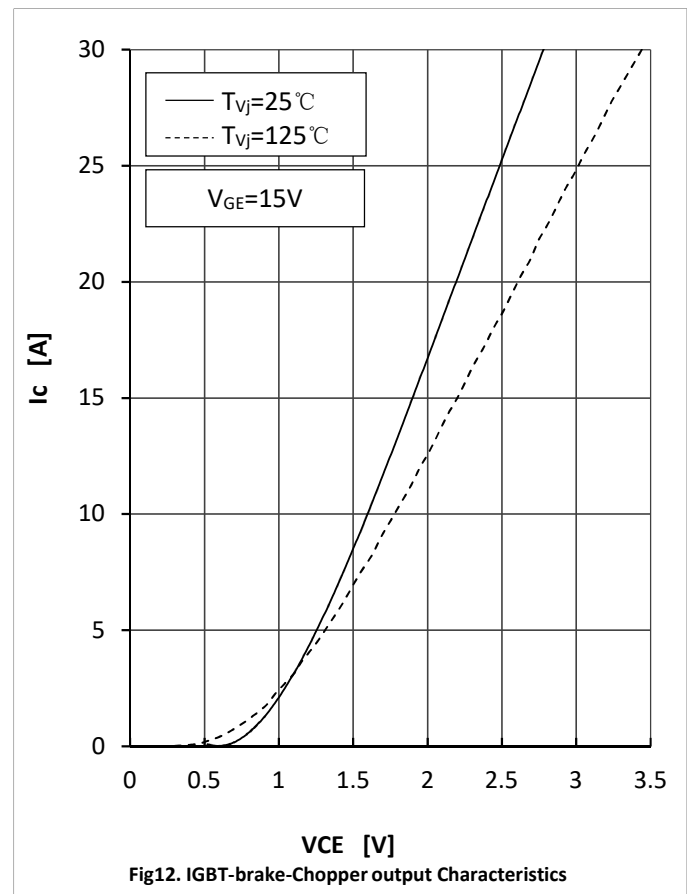
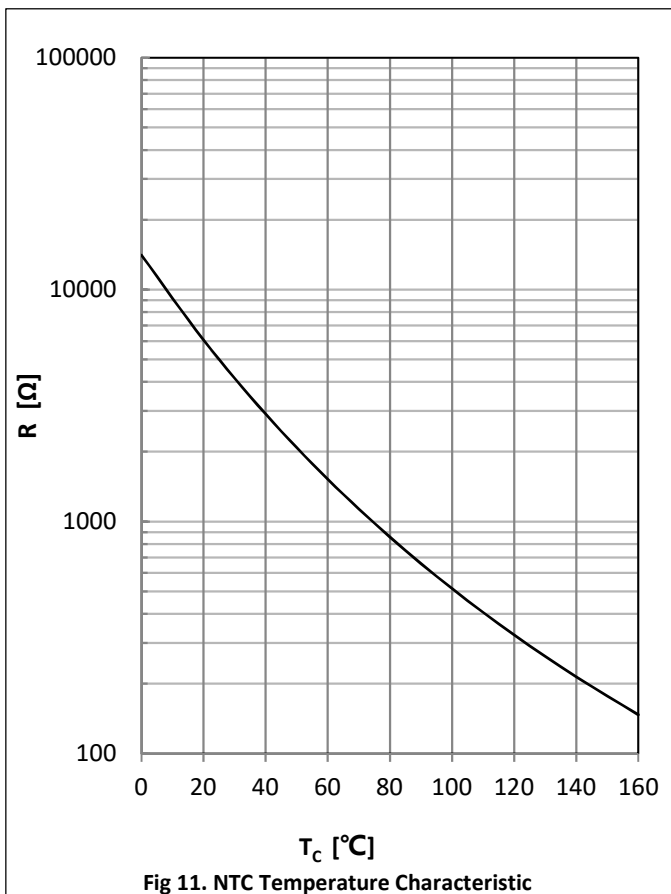
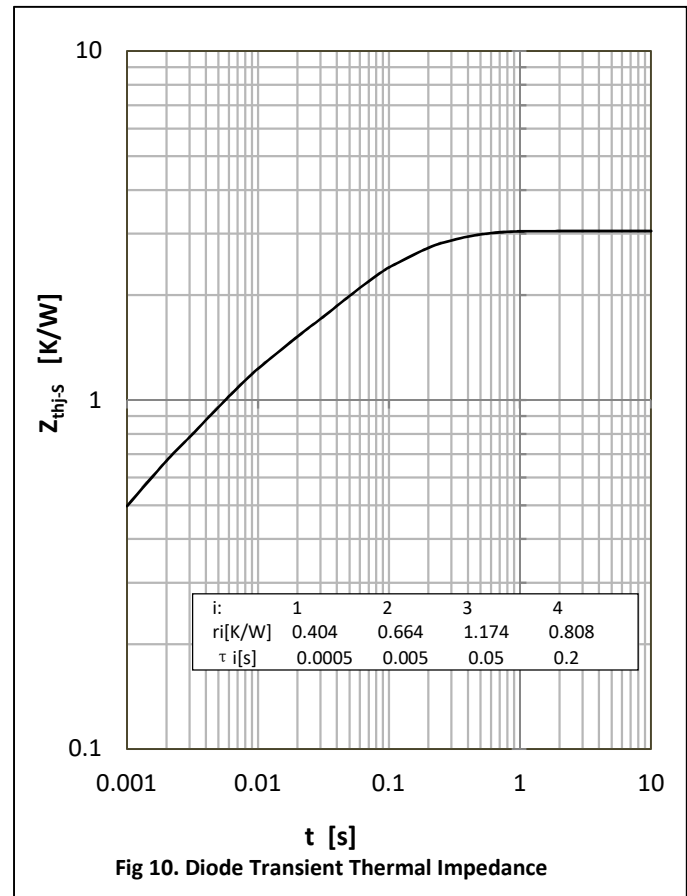
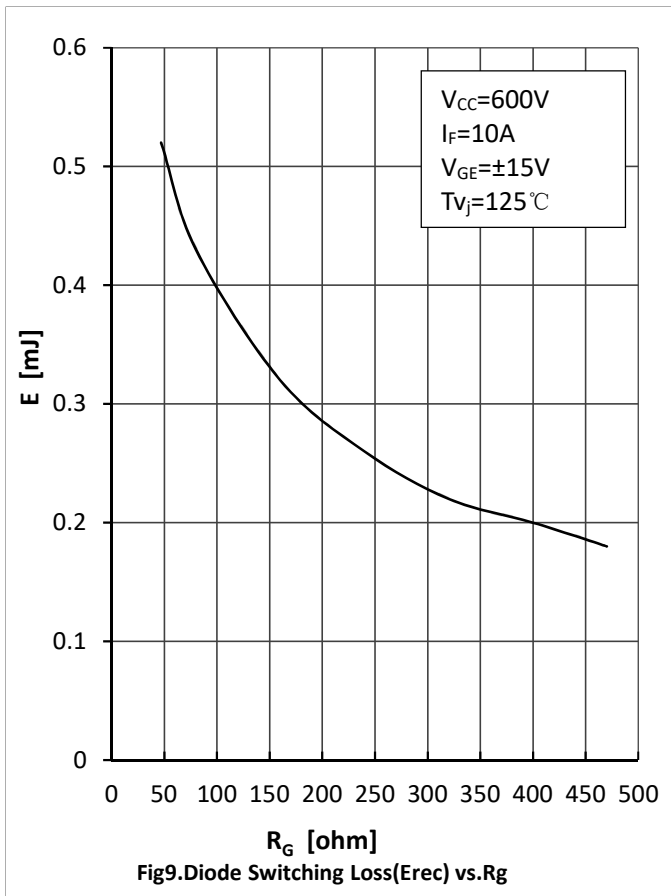
Curve Characteristics



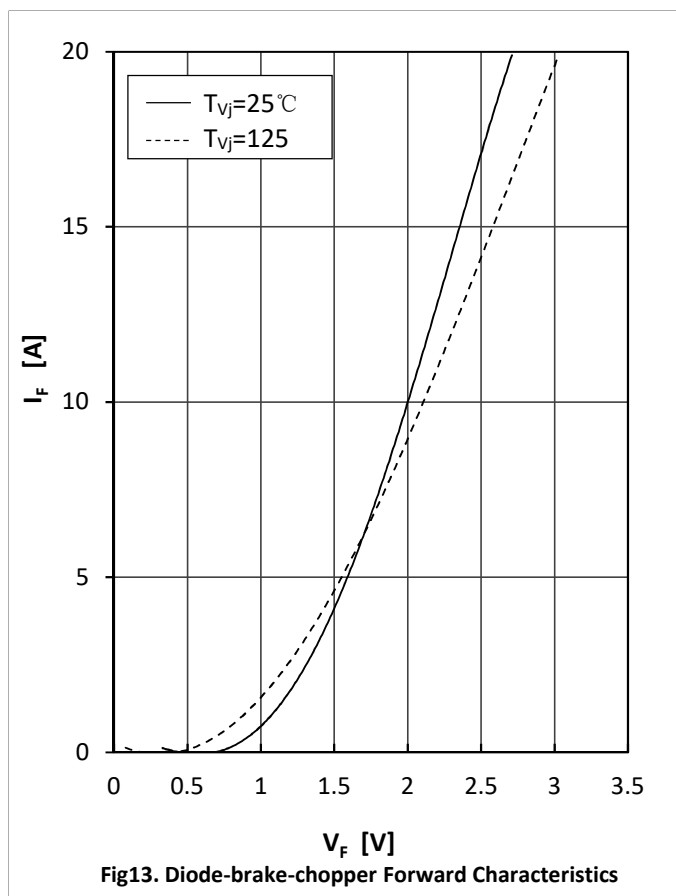
Curve Characteristics



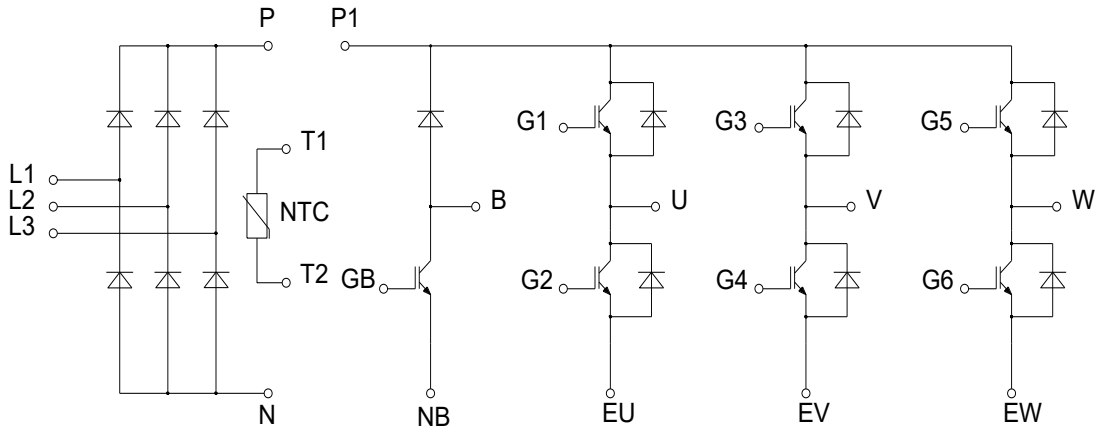
Curve Characteristics



Curve Characteristics



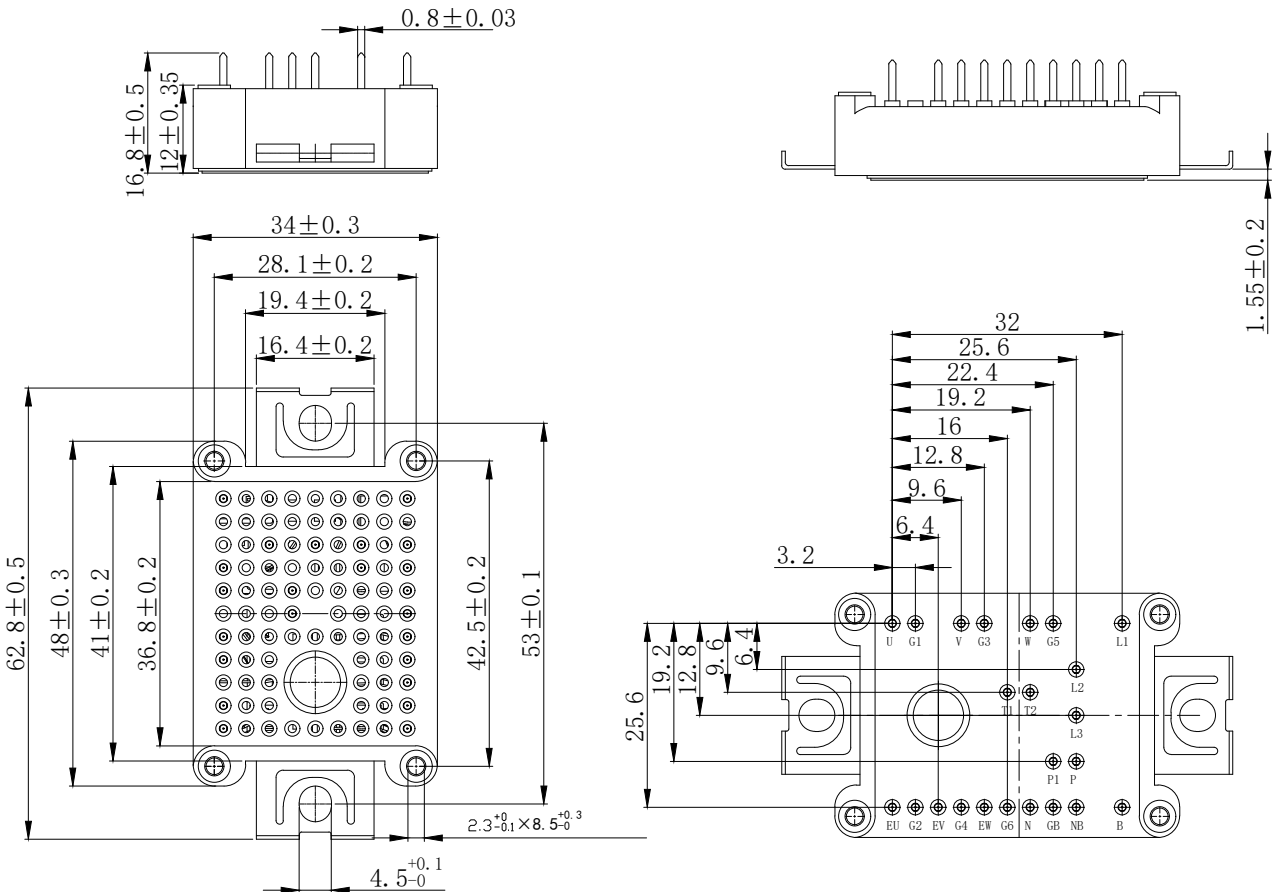
Circuit Diagram



Package Dimensions

Dimensions in mm

P2



Ordering Information

| Device | Packing |
|----------------|------------------------------|
| Part Number-BP | Bulk: 24pcs/Box ; 240pcs/Ctn |

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