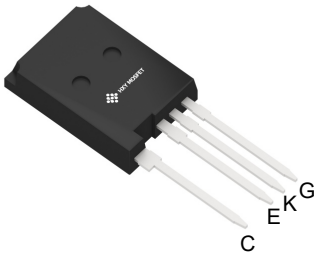
# IKY75N120CH3XKSA1

Insulated Gate Bipolar Transistor

## Features

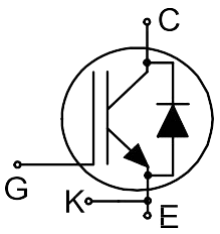
- High Current Capability
- Low Saturation Voltage $V_{CEsat}$
- Low Switching Losses
- Copacked with Fast Recovery Diode




TO-247P-4L

## Benefits

- Low Conduction Loss for a High Efficiency
- Rugged Transient Reliability
- Low EMI




## Applications

- UPS
- EV-Charging
- String Solar Inverter
- Energy Storage Inverter

**Table 1 Key Performance and Package Parameters**

| Type | $V_{CE}$ | $I_C$ | $V_{CEsat}$ $T_{vj}$ = 25°C $I_C$ = 75A | $V_F$ $T_{vj}$ = 25°C $I_F$ = 75A | Package | Packing |
|---|---|---|---|---|---|---|
| IGBT | 1200V | 75A | 1.91V | 1.80V | TO-247P-4L | 30PCS |

## Table 2 Absolute Maximum Ratings

($T_{vj}$ = 25°C unless otherwise noted)

| Parameters | Symbol | Conditions | Values | Unit |
|---|---|---|---|---|
| Collector emitter voltage | $V_{CE}$ | $T_{vj}$ = 25 °C | 1200 | V |
| DC collector current*1 | $I_C$ | $T_C$ = 25 °C | 100 | A |
| | | $T_C$ = 100 °C | 75 | A |
| Pulsed collector current*2 | $I_{CM}$ | $T_C$ = 25 °C | 300 | A |
| Maximum Diode forward current*1 | $I_F$ | $T_C$ = 25 °C | 100 | A |
| | | $T_C$ = 100 °C | 75 | A |
| Diode pulsed current*2 | $I_{FM}$ | $T_C$ = 25 °C | 300 | A |
| Gate source voltage | $V_{GE}$ | $T_{vj}$ = 25 °C | ±20 | V |
| Transient gate-emitter Voltage (tp ≤ 10µs, D < 0.010) | $V_{GE}$ | | ±25 | V |
| Power dissipation | $P_{tot}$ | $T_C$ = 25 °C | 930 | W |
| | | $T_C$ = 100 °C | 460 | |
| Operating junction temperature range | $T_{vj}$ | -40 to +175 | | ℃ |
| Storage temperature range | $T_{stg}$ | -55 to +150 | | |

Notes:

1. The max Collector current rating is limited by maximum junction temperature
2. Pulse width limited by maximum junction temperature

## Table 3 Thermal Resistance

| Parameters | Symbol | Conditions | Values | Unit |
|---|---|---|---|---|
| IGBT thermal resistance junction - case | $R_{thJC}$ | IGBT | 0.16 | K/W |
| Diode thermal resistance junction - case | $R_{thJC}$ | Diode | 0.33 | K/W |
| Thermal resistance junction - ambient | $R_{thJA}$ | | 40 | K/W |

## Table 4 Static Characteristics

| Parameters | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Collector-emitter voltage | $V_{(BR)CES}$ | $T_{vj}$ = 25 °C | 1200 | - | - | V |
| Collector-emitter saturation voltage | $V_{CEsat}$ | $V_{GE}$ = 15 V, $I_C$ =75 A<br>$T_{vj}$ = 25 °C | - | 1.91 | 2.35 | V |
| | | $V_{GE}$ = 15 V, $I_C$ =75 A<br>$T_{vj}$ = 175 °C | - | 2.79 | - | |
| Diode forward voltage | $V_F$ | $V_{GE}$ = 0 V, $I_C$ =75 A<br>$T_{vj}$ = 25 °C | - | 1.80 | 2.35 | V |
| | | $V_{GE}$ = 0 V, $I_C$ =75 A<br>$T_{vj}$ = 175 °C | - | 1.62 | - | |
| Gate-emitter threshold voltage | $V_{GEth}$ | $V_{CE}$ = $V_{GE}$, $I_C$ = 2.6 mA<br>$T_{vj}$ = 25 °C | 5.1 | 5.9 | 6.6 | V |
| Zero gate voltage collector current | $I_{CES}$ | $V_{CE}$ = 1200 V, $V_{GE}$ = 0 V<br>$T_{vj}$ = 25 °C | - | - | 40 | μA |
| Gate-emitter leakage current | $I_{GES}$ | $V_{GE}$ = ±20 V, $V_{CE}$ = 0 V | - | - | ±100 | nA |

## Table 5 Dynamic Characteristics

| Parameters | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Input capacitance | $C_{ies}$ | $V_{CE}$ = 25 V<br>$V_{GE}$ = 0 V<br>f = 1MHz | - | 9883 | - | pF |
| Output capacitance | $C_{oes}$ | | - | 274 | - | |
| Reverse transfer capacitance | $C_{res}$ | | - | 65 | - | |
| Gate input resistance | $R_G$ | f = 1MHz | - | 0.4 | - | Ω |
| Gate charge | $Q_g$ | $V_{CE}$ = 600 V<br>$I_C$ = 75A<br>$V_{GE}$ = 0 V to 15 V | - | 307 | - | nC |
| Gate to emitter charge | $Q_{ge}$ | | - | 103 | - | |
| Gate to collector charge | $Q_{gc}$ | | - | 113 | - | |

## Table 6 Switching Characteristics

| Parameters | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Turn-on delay time | $t_{d(on)}$ | $T_{vj}$ = 25 ℃ ; $V_{CC}$ = 600 V, $I_C$ = 75 A; $V_{GE}$ = 0 / 15 V; $R_g$(on) = 5.1 Ω; $R_g$(off) = 5.1 Ω; | - | 63 | - | ns |
| Rise time | $t_r$ | | - | 29 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 188 | - | |
| Fall time | $t_f$ | | - | 96 | - | |
| Turn-on energy | $E_{on}$ | | - | 3.9 | - | mJ |
| Turn-off energy | $E_{off}$ | | - | 3.0 | - | |
| Total switching energy | $E_{ts}$ | | - | 6.9 | - | |
| Turn-on delay time | $t_{d(on)}$ | $T_{vj}$ = 175 ℃ ; $V_{CC}$ = 600 V, $I_C$ = 75 A; $V_{GE}$ = 0 / 15 V; $R_g$(on) = 5.1 Ω; $R_g$(off) = 5.1 Ω; | - | 48 | - | ns |
| Rise time | $t_r$ | | - | 27 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 262 | - | |
| Fall time | $t_f$ | | - | 170 | - | |
| Turn-on energy | $E_{on}$ | | - | 5.38 | - | mJ |
| Turn-off energy | $E_{off}$ | | - | 4.72 | - | |
| Total switching energy | $E_{ts}$ | | - | 10.1 | - | |

## Table 7 Diode Recovery Characteristics

| Parameters | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Reverse recovery time | $t_{rr}$ | $T_{vj}$ = 25 ℃ ; $V_R$ = 600 V, $I_F$ = 75 A; $R_g$(on) = 5.1 Ω; $R_g$(off) = 5.1 Ω; di/dt = 2600 A/us; | - | 366 | - | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 7.15 | - | μC |
| Peak reverse recovery current | $I_{rrm}$ | | - | 57 | - | A |
| Reverse recovery energy | $E_{rec}$ | | - | 3.10 | - | mJ |
| Reverse recovery time | $t_{rr}$ | $T_{vj}$ = 175 ℃ ; $V_R$ = 600 V, $I_F$ = 75 A; $R_g$(on) = 5.1 Ω; $R_g$(off) = 5.1 Ω; di/dt = 2600 A/us; | - | 511 | - | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 18.88 | - | μC |
| Peak reverse recovery current | $I_{rrm}$ | | - | 122 | - | A |
| Reverse recovery energy | $E_{rec}$ | | - | 8.44 | - | mJ |

## Electrical Characteristics Diagrams

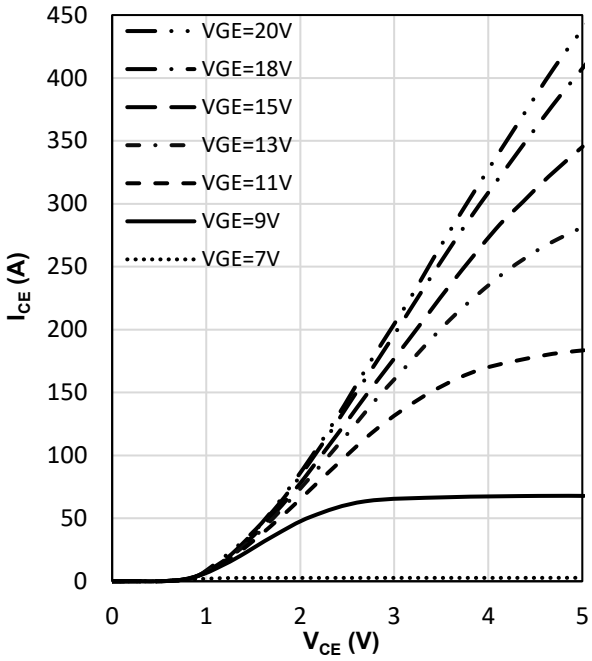



Fig.1 Typical Output Characteristics (25°C)

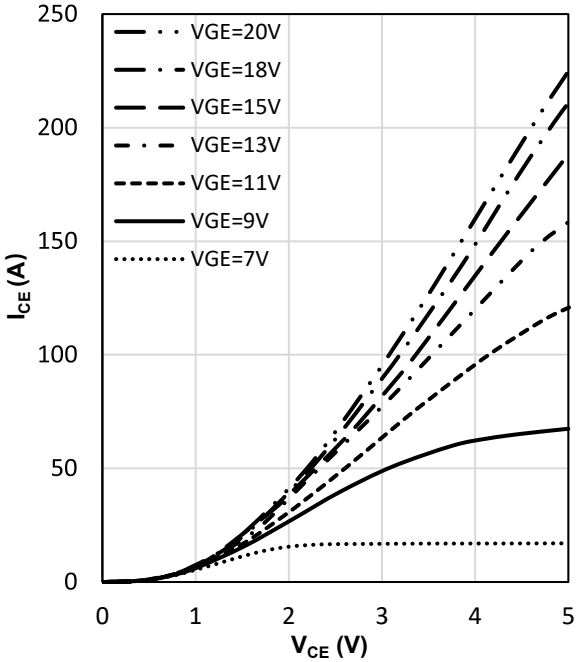



Fig.2 Typical Output Characteristics (175°C)

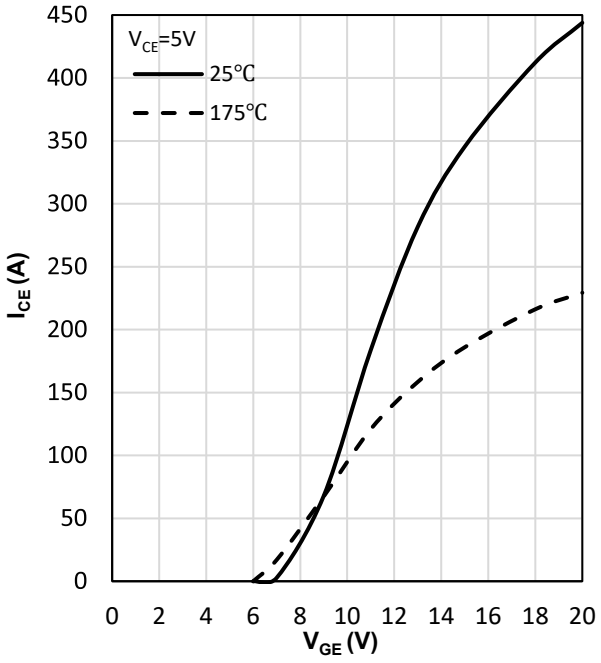



Fig.3 Typical Transfer Characteristics

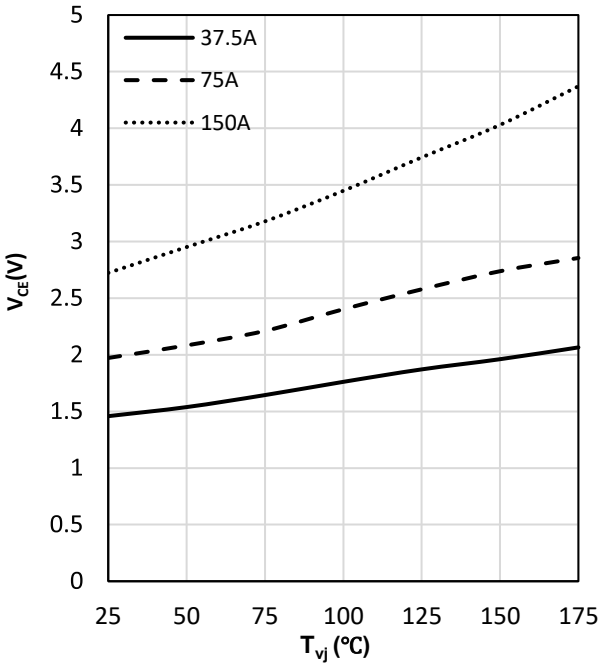



Fig.4 Typical Saturation Voltage

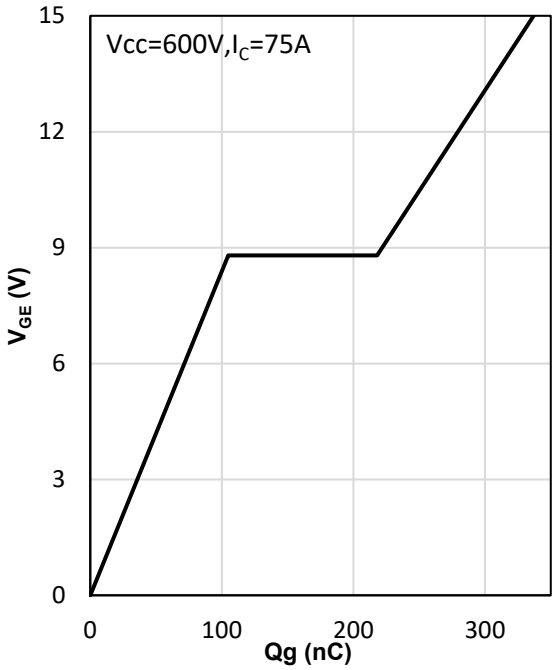



**Fig.5 Gate Charge Characteristics**

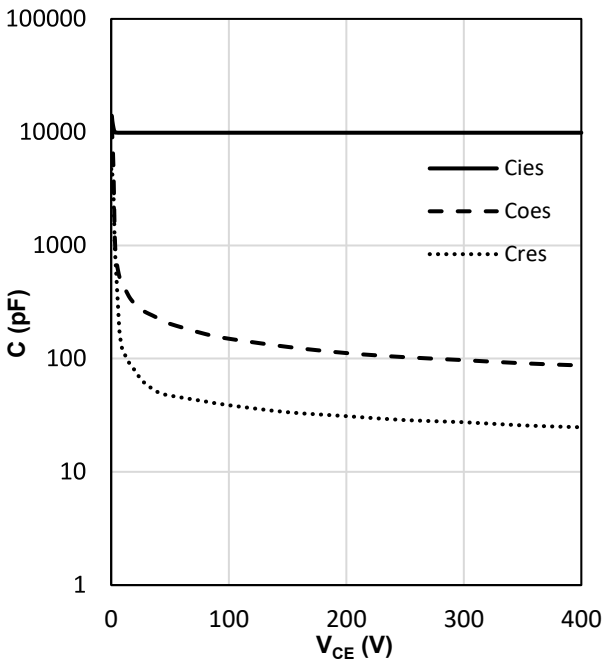



**Fig.6 Typical Capacitance**

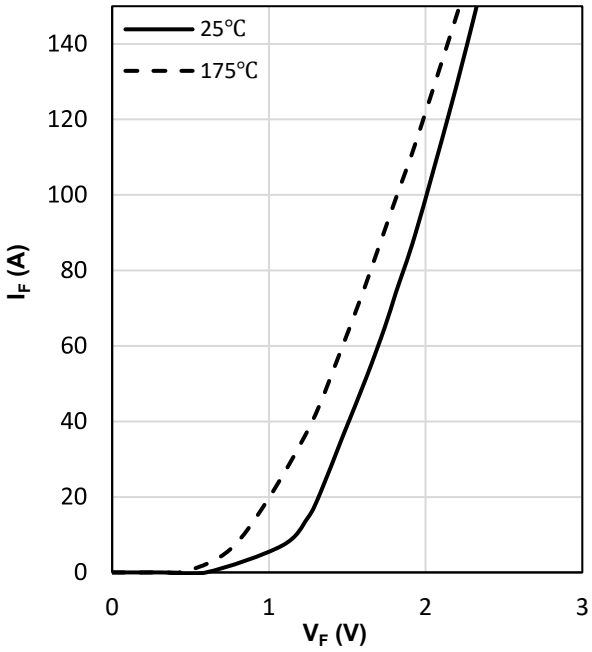



**Fig.7 Typical Diode $V_F$ vs. $I_F$ Characteristic**

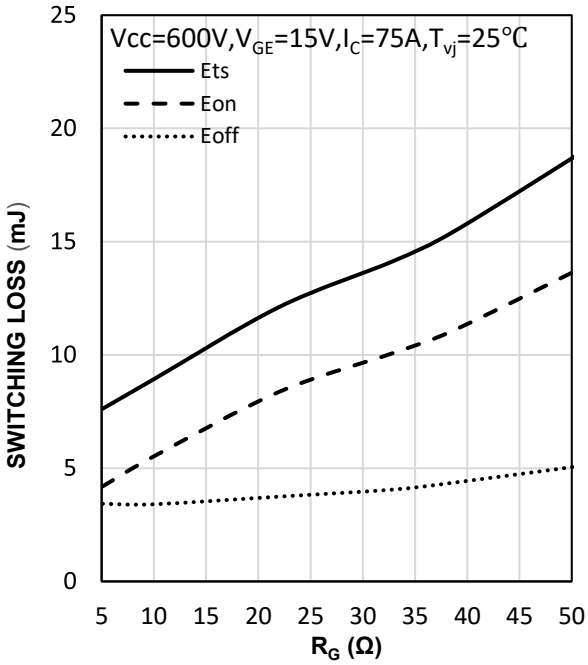



**Fig.8 Switching Loss vs.Gate Resistance(25°C)**

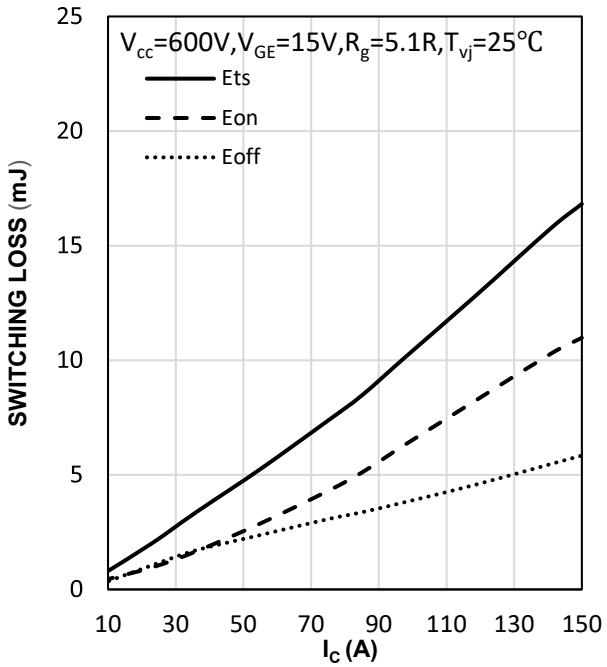



**Fig.9 Switching Loss vs.Collector Current(25°C)**

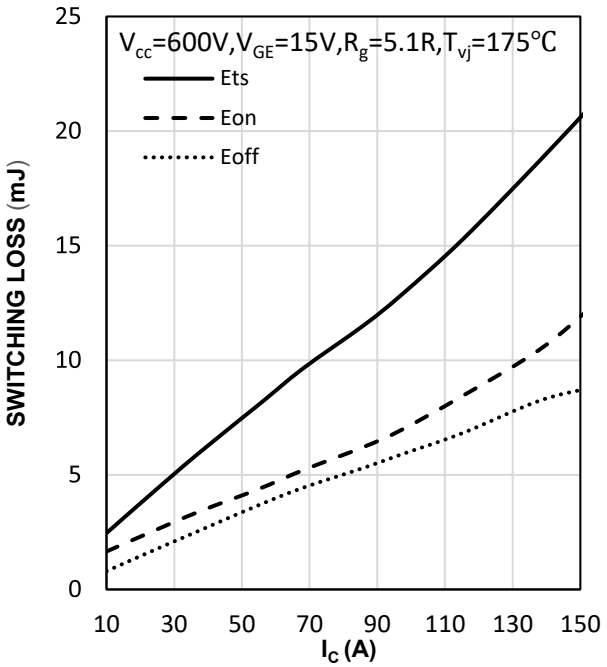



**Fig.10 Switching Loss vs.Collector Current(175°C)**

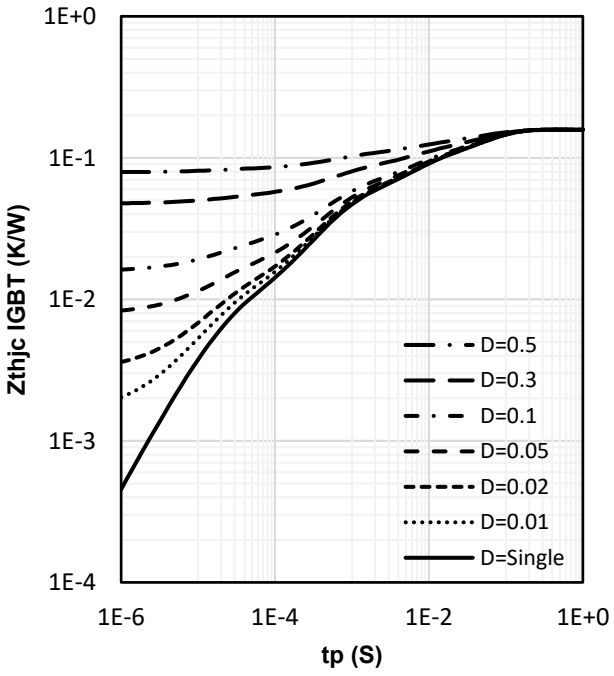



**Fig.11 Thermal Characteristics (IGBT)**

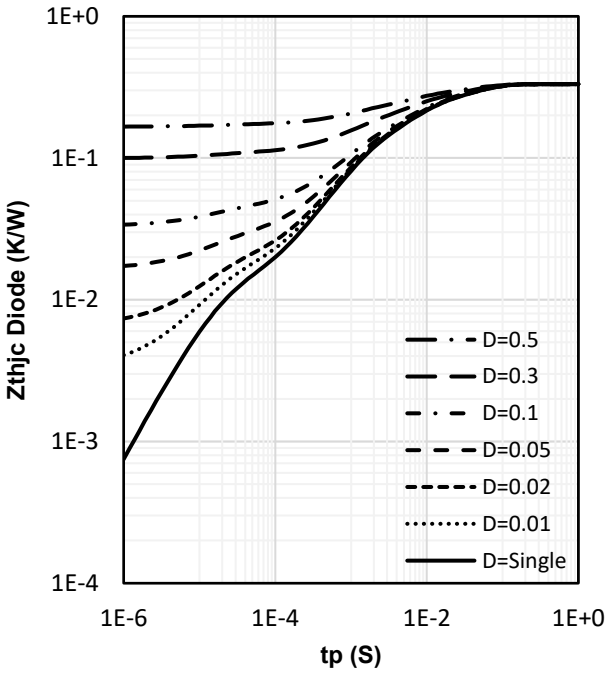
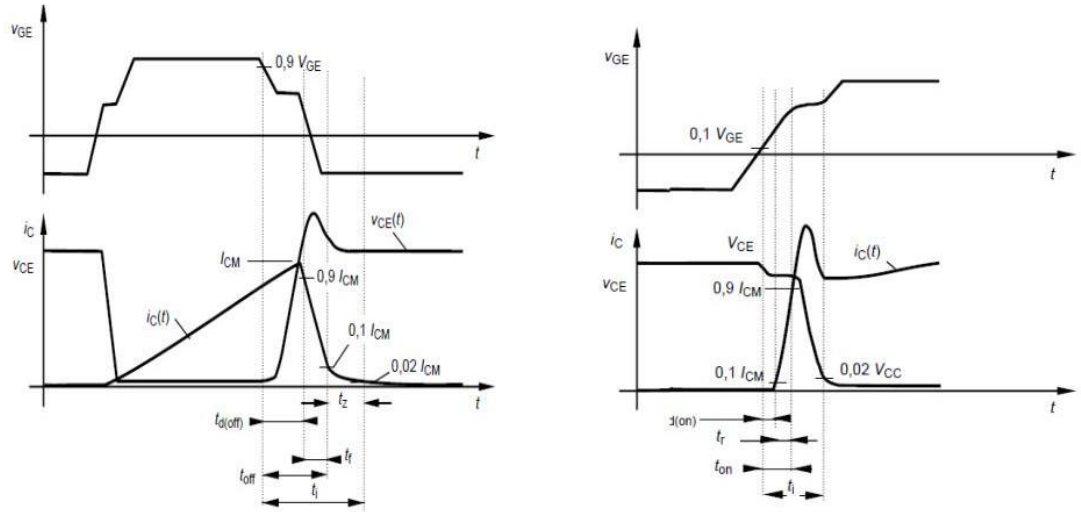
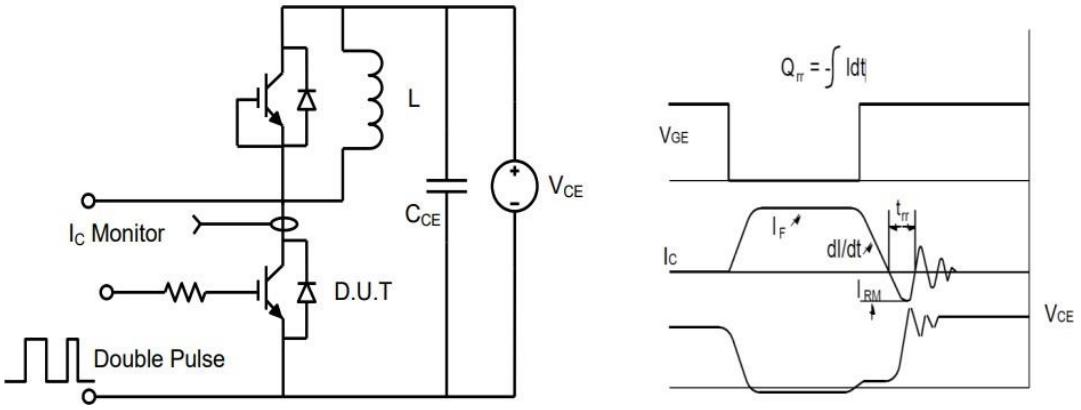



**Fig.12 Thermal Characteristics (Diode)**

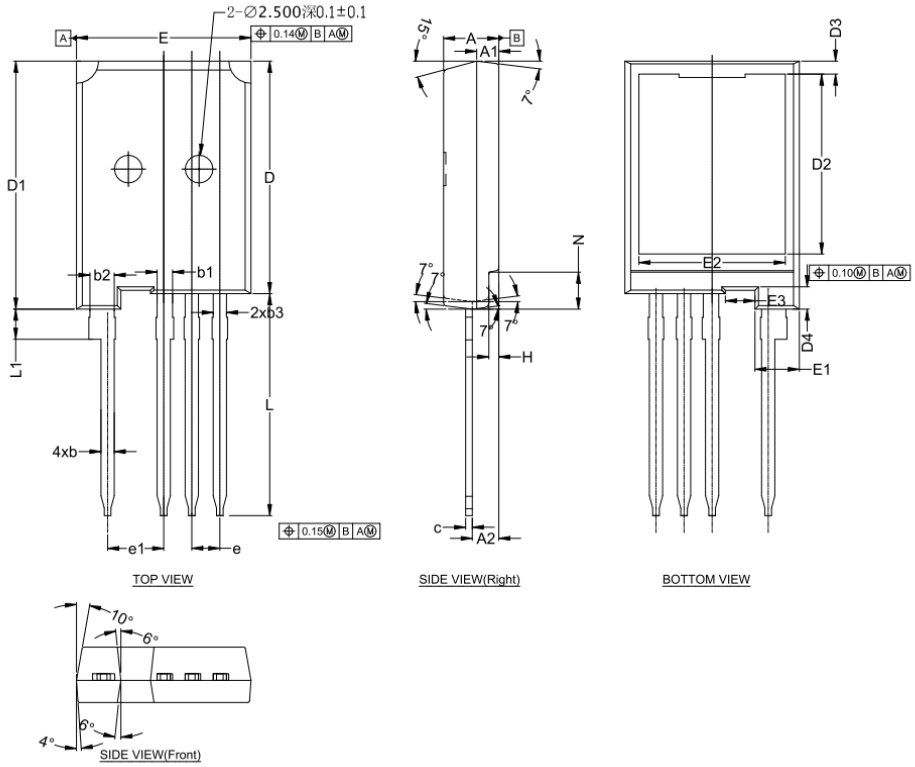
Switching Test Circuit & Waveforms




Diode Recovery Test Circuit & Waveforms



## Package Outline




| DIM / SYMBOL | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | 4.900 | 5.000 | 5.100 |
| A1 | 1.940 | 2.040 | 2.140 |
| A2 | 2.310 | 2.400 | 2.510 |
| b | 1.160 | 1.200 | 1.290 |
| b1 | 1.360 | 1.400 | 1.490 |
| b2 | 2.160 | 2.200 | 2.290 |
| b3 | 1.160 | 1.200 | 1.390 |
| c | 0.590 | 0.600 | 0.700 |
| D | 20.900 | 21.000 | 21.100 |
| D1 | 22.300 | 22.400 | 22.500 |
| D2 | 15.950 | 16.250 | 16.550 |
| D3 | 0.970 | 1.170 | 1.370 |
| D4 | 1.900 | 2.000 | 2.100 |
| E | 15.700 | 15.800 | 15.900 |
| E1 | 3.900 | 4.000 | 4.100 |
| E2 | 13.100 | 13.259 | 13.500 |
| E3 | 2.580 | 2.680 | 2.780 |
| e | 2.540 BSC. | | |
| e1 | 5.080 BSC. | | |
| L | 19.800 | 20.000 | 20.100 |
| L1 | 2.550 | 2.722 | 2.850 |
| H | 0.800 | 0.900 | 1.000 |
| N | 3.240 | 3.340 | 3.440 |

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5-1994
2. ALL DIMENSIONS ARE IN MILLIMETERS, ANGLES ARE IN DEGREE.
3. SURFACE ROUGHNESS:0.8-1.2

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