## DESCRIPTION

The AM40T120 is available in TO-247 Package

| VCES | IC | VCE | PD |
|---|---|---|---|
| 1200V | 40A | 2.0V | 357W |

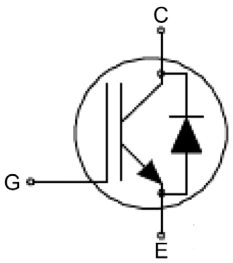
## FEATURES

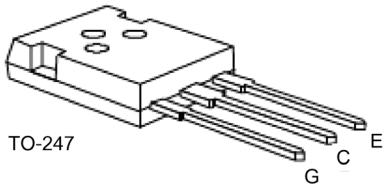
- Fast Switching
- Low $V_{CE(sat)}$: 2.0V
- Positive Temperature Coefficient
- Very Soft, Fast Recovery Anti-Parallel Diode
- Irrm: 12.3A

## APPLICATION

- UPS
- Welding Converters
- Converters With High Switching Frequency

## PIN DESCRIPTION




| Pin# | Symbol | Function |
|---|---|---|
| 1 | G | Gate |
| 2 | C | Collector |
| 3 | E | Emitter |

## ORDERING INFORMATION

| Package Type | Part Number | |
|---|---|---|
| TO-247<br>SPQ:30pcs/Tube | TL3F | AM40T120ATL3FU |
| | | AM40T120ATL3FVU |
| Note | V: Halogen free Package<br>U: Tube | |
| AiT provides all RoHS products | | |

## ABSOLUTE MAXIMUM RATINGS

| Parameter | Symbol | Value | Units |
|---|---|---|---|
| Collector-Emitter Voltage | $V_{CES}$ | 1200 | V |
| Collector Current @ $T_C$ = 25 °C | $I_C$ | 80 | A |
| Collector Current @ $T_C$ = 100 °C | | 40 | A |
| Pulsed Collector Current (1) @ $T_C$ = 25 °C | $I_{CM}$ | 160 | A |
| Diode Continuous Forward Current @ $T_C$ = 25 °C | $I_F$ | 40 | A |
| Diode Continuous Forward Current @ $T_C$ = 100 °C | | 20 | A |
| Diode Maximum Forward Current @ $T_C$ = 25 °C | $I_{FM}$ | 160 | A |
| Gate-Emitter Voltage | $V_{GES}$ | ±20 | V |
| Power Dissipation @ $T_C$ = 25 °C | $P_D$ | 357 | W |
| Storage Temperature Range | $T_{stg}$ | -55 to 150 | ℃ |
| Junction Temperature | $T_J$ | 150 | ℃ |
| Maximum Temperature for Soldering | $T_L$ | 260 | ℃ |
| **THERMAL CHARACTERISTICS** | | | |
| Junction-to-Case (IGBT) | $R_{\theta JC}$ | 0.34 | ℃/W |
| Junction-to-Case (Diode) | $R_{\theta JC}$ | 0.8 | ℃/W |
| Junction-to-Ambient | $R_{\theta JA}$ | 40 | ℃/W |

Stresses above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

(1) Pulse width limited by maximum junction temperature

## ELECTRICAL CHARACTERISTICS

$T_A$=25℃, unless otherwise specified.

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector-Emitter Breakdown Voltage | $V_{CES}$ | $V_{GE}$=0V, $I_C$=250μA | 1200 | - | - | V |
| Collector-Emitter Leakage Current | $I_{CES}$ | $V_{CE}$ = 1200V, $V_{GE}$ = 0V | - | - | 250 | μA |
| Gate-Emitter Leakage Current | $I_{GES(F)}$ | $V_{GE}$ = +20V | - | - | 600 | nA |
| Gate-Emitter Reverse Leakage | $I_{GES(R)}$ | $V_{GE}$ = -20V | - | - | -600 | nA |
| **ON CHARACTERISTICS** | | | | | | |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE}$ = 15V, $I_C$=40A | - | 2.0 | 2.4 | V |
| Gate Threshold Voltage | $V_{GE(TH)}$ | $V_{CE}$ = $V_{GE}$, $I_C$ = 1mA | 5.5 | 5.8 | 6.5 | V |
| Pulse width tp≤300μs, δ≤2% | | | | | | |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GE}$ = 0V | - | 3633 | - | pF |
| Output Capacitance | $C_{oss}$ | $V_{CE}$ = 25V | - | 150 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | f = 1.0MHz | - | 90 | - | |
| Total Gate Charge | $Q_g$ | $I_C$ = 40A<br>$V_{CE}$ = 960V<br>$V_{GE}$ = 15V | - | 270 | - | nC |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| Turn-on Delay Time | $t_{d(ON)}$ | $I_C$ =40A | - | 48 | - | ns |
| Rise Time | $t_r$ | $V_{CE}$ = 600V | - | 90 | - | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | $V_{GE}$ = 15V | - | 275 | - | |
| Fall Time | $t_f$ | $R_G$ =10Ω | - | 55 | - | |
| Turn-On Switching Loss | $E_{on}$ | Inductive Load | - | 4.694 | - | mJ |
| Turn-Off Switching Loss | $E_{off}$ | | - | 1.627 | - | |
| Total Switching Loss | $E_{ts}$ | | - | 6.321 | - | |
| **DIODE CHARACTERISTICS** | | | | | | |
| Diode Forward Voltage | $V_F$ | $I_F$=20A | - | 2 | 2.6 | V |
| Reverse Recovery Time | $T_{rr}$ | $I_F$=20A,<br>di/dt=200A/us | - | 60 | - | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | - | 413 | - | nC |
| Reverse Recovery Current | $I_{rrm}$ | | - | 12.3 | - | A |

## TYPICAL PERFORMANCE CHARACTERISTICS

Fig.1 Forward Bias Safe Operating Area

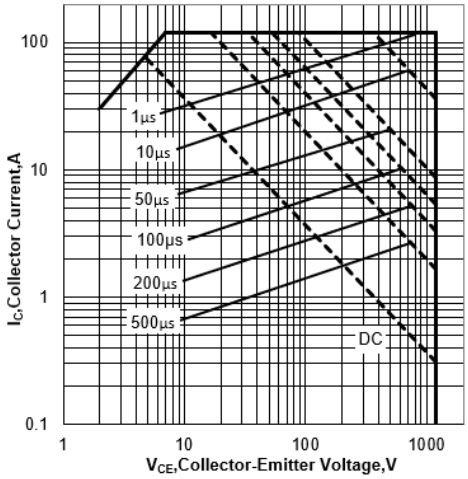



Fig.2 Power Dissipation vs Case Temperature

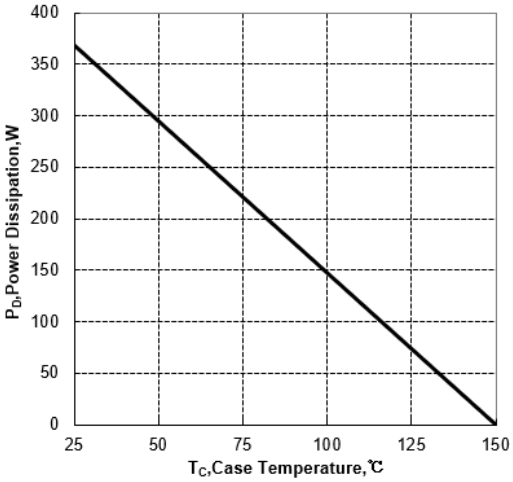



Fig.3 Collector Current vs Case Temperature

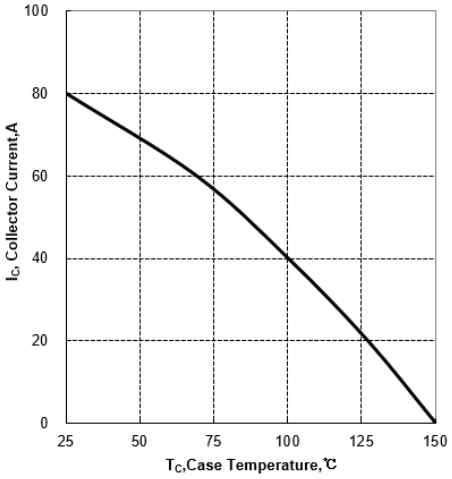



Fig.4 Typical Transfer Characteristics

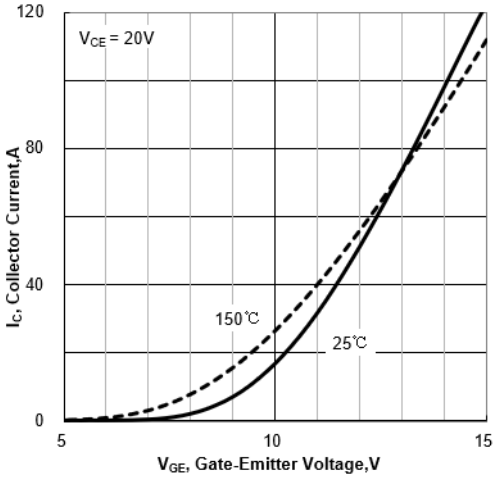



Fig.5 Typical Output Characteristics($T_C$=25℃)

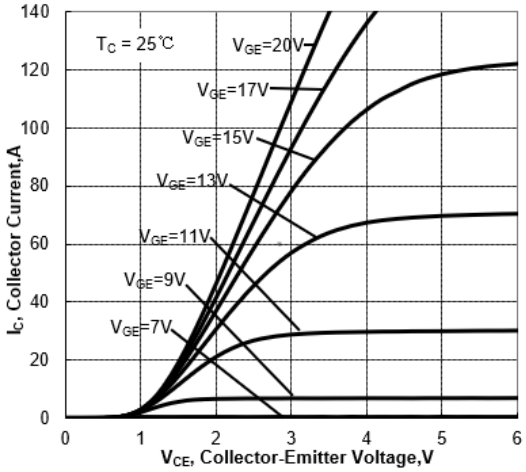



Fig.6 Typical Output haracteristics($T_C$=150℃)

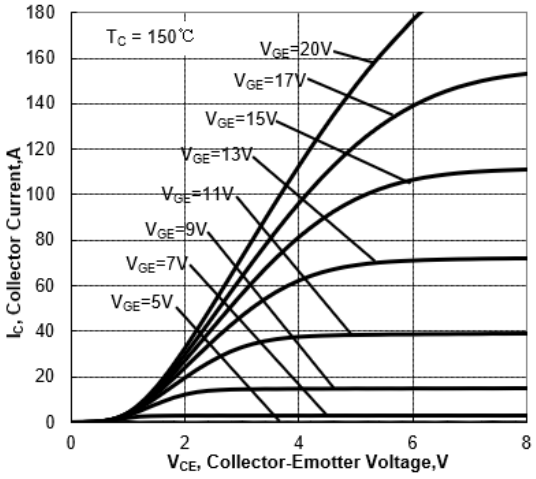


Fig.7 Typical Collector-Emitter Saturation Voltage vs Junction Temperature

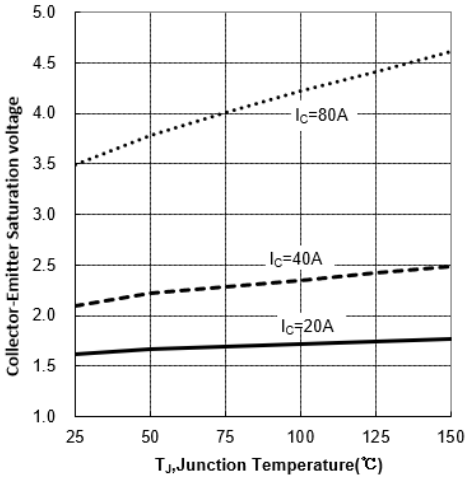



Fig.8 Typical Transfer Characteristics

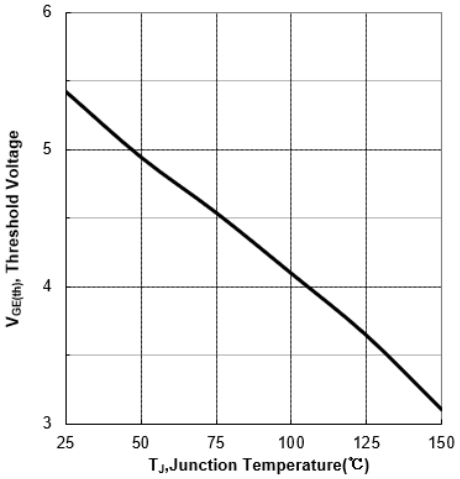



Fig.9 Typical Gate Charge

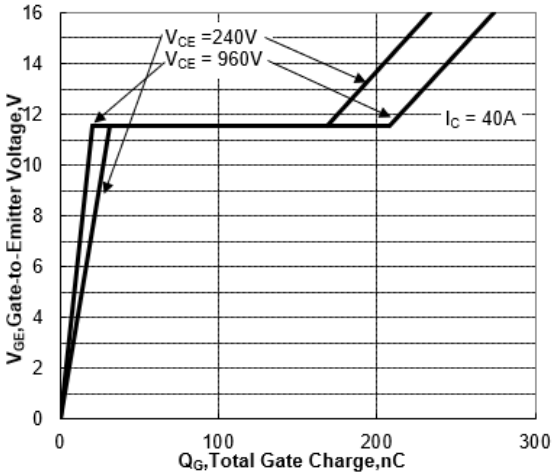



Fig.10 Typical Capacitance vs Collector- Emitter Voltage

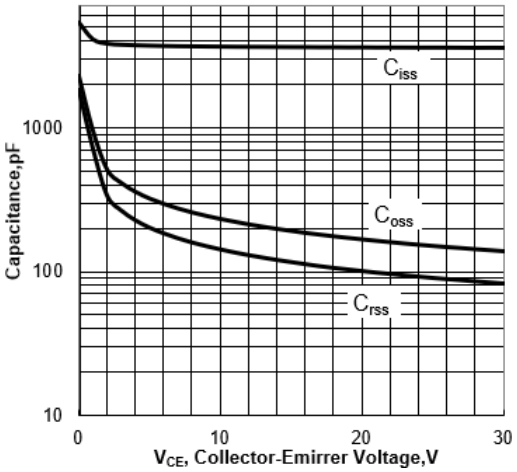



Fig.11 IGBT Transient Thermal Impedance vs Pulse Width

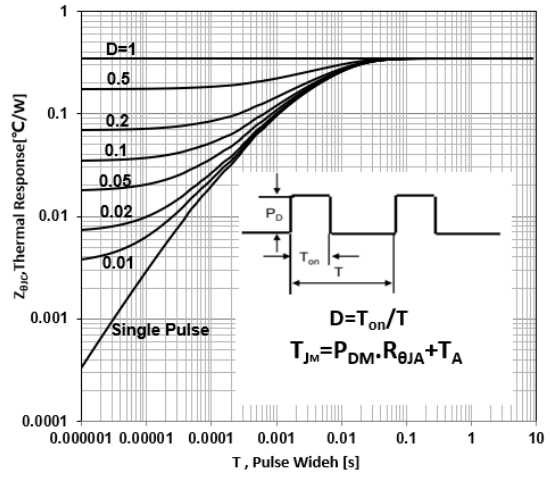



Fig.12 Diode Transient Thermal Impedance vs Pulse Width

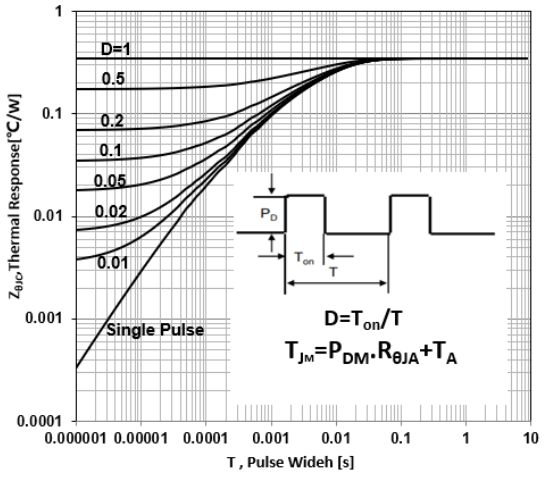


Fig.13 Typical Diode Forward Current vs Forward Voltage

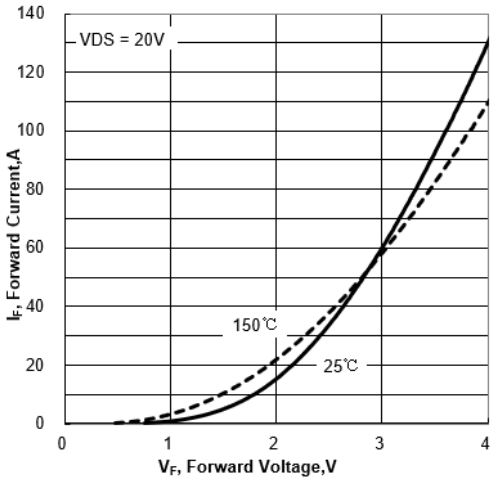



Fig.14 Inductive Switching Test Circuit

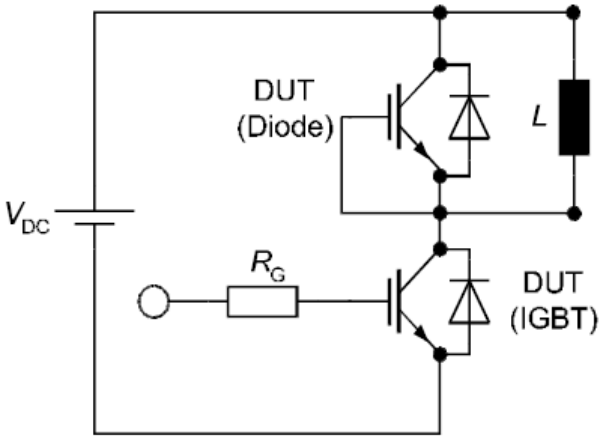



Fig.15 Inductive Switching Waveforms

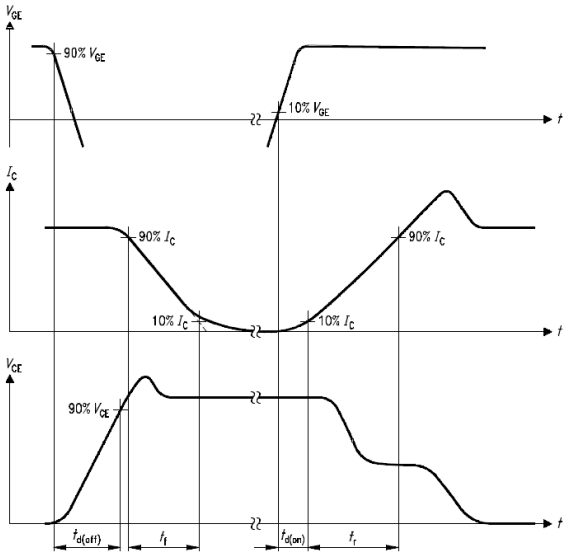



Fig.16. Inductive Switching Waveforms

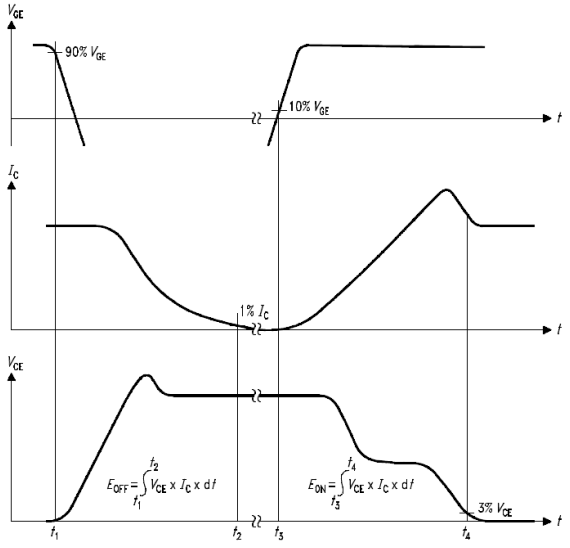
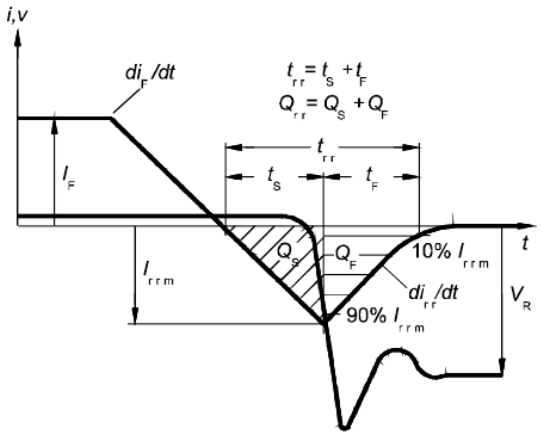
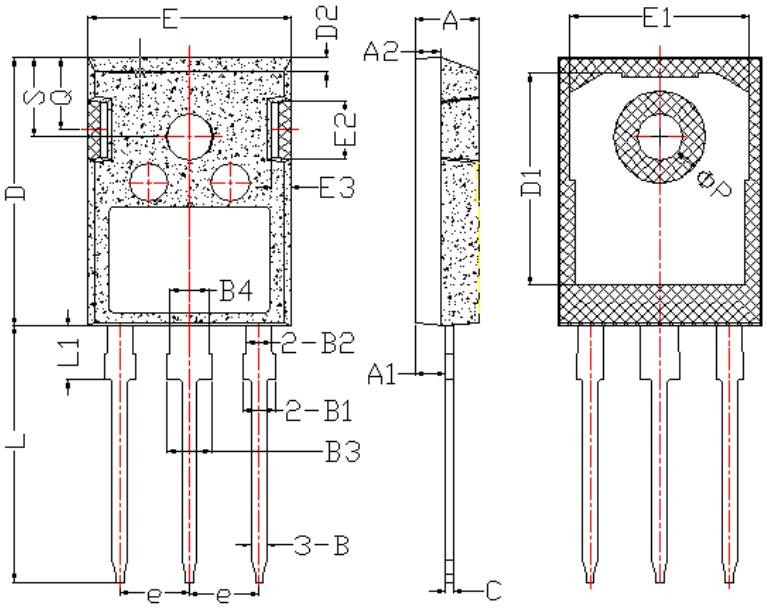



Fig.17. Inductive Switching Waveforms



## PACKAGE INFORMATION

Dimension in TO-247 (Unit: mm)




| Symbol | Min. | Max. | Symbol | Min. | Max. |
|---|---|---|---|---|---|
| A | 4.900 | 5.160 | D2 | 1.050 | 1.350 |
| A1 | 2.270 | 2.530 | E | 15.700 | 16.030 |
| A2 | 1.850 | 2.110 | E1 | 13.100 | 14.150 |
| B | 1.070 | 1.330 | E2 | 3.680 | 5.100 |
| B1 | 1.900 | 2.410 | E3 | 1.680 | 2.600 |
| B2 | 1.750 | 2.150 | e | 5.440 | |
| B3 | 2.870 | 3.380 | L | 19.800 | 20.310 |
| B4 | 2.870 | 3.130 | L1 | 4.170 | 4.470 |
| C | 0.550 | 0.680 | ΦP | 3.500 | 3.700 |
| D | 20.820 | 21.100 | Q | 5.490 | 6.000 |
| D1 | 16.250 | 17.650 | S | 6.040 | 6.300 |

## IMPORTANT NOTICE

AiT Semiconductor Inc. (AiT) reserves the right to make changes to any its product, specifications, to discontinue any integrated circuit product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

AiT Semiconductor Inc. integrated circuit products are not designed, intended, authorized, or warranted to be suitable for use in life support applications, devices or systems or other critical applications. Use of AiT products in such applications is understood to be fully at the risk of the customer. As used herein may involve potential risks of death, personal injury, or server property, or environmental damage. In order to minimize risks associated with the customer's applications, the customer should provide adequate design and operating safeguards.

AiT Semiconductor Inc. assumes to no liability to customer product design or application support. AiT warrants the performance of its products of the specifications applicable at the time of sale.