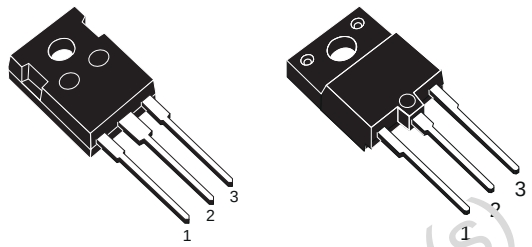
# STW15NB50
# STH15NB50FI

## N-CHANNEL 500V - 0.33Ω - 14.6A - T0-247/ISOWATT218 PowerMESH™ MOSFET

| TYPE | $V_{DSS}$ | $R_{DS(on)}$ | $I_D$ |
|---|---|---|---|
| STW15NB50 | 500 V | < 0.36 Ω | 14.6 A |
| STH15NB50FI | 500 V | < 0.36 Ω | 10.5 A |

- TYPICAL $R_{DS(on)}$ = 0.33 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- VERY LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED

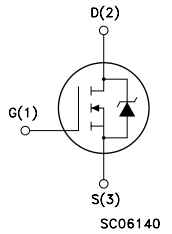



**TO-247** **ISOWATT218**

### DESCRIPTION

Using the latest high voltage MESH OVERLAY™ process, SGS-Thomson has designed an advanced family of power MOSFETs with outstanding performances. The new patent pending strip layout coupled with the Company's proprietary edge termination structure, gives the lowest RDS(on) per area, exceptional avalanche and dv/dt capabilities and unrivalled gate charge and switching characteristics.

### INTERNAL SCHEMATIC DIAGRAM




### APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLIES AND MOTOR DRIVE



### ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | | Unit |
|---|---|---|---|---|
| | | STW15NB50 | STH15NB50FI | |
| $V_{DS}$ | Drain-source Voltage ($V_{GS}$ = 0) | 500 | | V |
| $V_{DGR}$ | Drain- gate Voltage ($R_{GS}$ = 20 kΩ) | 500 | | V |
| $V_{GS}$ | Gate-source Voltage | ± 30 | | V |
| $I_D$ | Drain Current (continuous) at $T_c$ = 25 °C | 14.6 | 10.5 | A |
| $I_D$ | Drain Current (continuous) at $T_c$ = 100 °C | 9.2 | 6.6 | A |
| $I_{DM}$(•) | Drain Current (pulsed) | 58.4 | 58.4 | A |
| $P_{tot}$ | Total Dissipation at $T_c$ = 25 °C | 190 | 80 | W |
| | Derating Factor | 0.64 | 1.52 | W/°C |
| dv/dt(1) | Peak Diode Recovery voltage slope | 4 | | V/ns |
| $V_{ISO}$ | Insulation Withstand Voltage (DC) | 4000 | | V |
| $T_{stg}$ | Storage Temperature | -65 to 150 | | °C |
| $T_j$ | Max. Operating Junction Temperature | 150 | | °C |

## THERMAL DATA

| | | | TO-247 | ISOWATT218 | |
|---|---|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal Resistance Junction-case | Max | 0.66 | 1.56 | °C/W |
| $R_{thj\text{-}amb}$ | Thermal Resistance Junction-ambient | Max | 30 | | °C/W |
| $R_{thc\text{-}sink}$ | Thermal Resistance Case-sink | Typ | 0.1 | | °C/W |
| $T_l$ | Maximum Lead Temperature For Soldering Purpose | | 300 | | °C |

## AVALANCHE CHARACTERISTICS

| Symbol | Parameter | Max Value | Unit |
|---|---|---|---|
| $I_{AR}$ | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by $T_j$ max) | 14.6 | A |
| $E_{AS}$ | Single Pulse Avalanche Energy (starting $T_j$ = 25 °C, $I_D = I_{AR}$, $V_{DD}$ = 50 V) | 850 | mJ |

## ELECTRICAL CHARACTERISTICS ($T_{case}$ = 25 °C unless otherwise specified)

OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage | $I_D$ = 250 µA $V_{GS}$ = 0 | 500 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current ($V_{GS}$ = 0) | $V_{DS}$ = Max Rating<br>$V_{DS}$ = Max Rating $T_c$ = 125 °C | | | 1<br>50 | µA<br>µA |
| $I_{GSS}$ | Gate-body Leakage Current ($V_{DS}$ = 0) | $V_{GS}$ = ± 30 V | | | ± 100 | nA |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$ $I_D$ = 250 µA | 3 | 4 | 5 | V |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS}$ = 10 V $I_D$ = 7.5 A | | 0.33 | 0.36 | Ω<br>Ω |
| $I_{D(on)}$ | On State Drain Current | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$<br>$V_{GS}$ = 10 V | 14.6 | | | A |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $g_{fs}$ (*) | Forward Transconductance | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D$ = 7.5 A | 8 | 12 | | S |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$ | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | $V_{DS}$ = 25 V f = 1 MHz $V_{GS}$ = 0 | | 2600<br>330<br>40 | 3400<br>430<br>55 | pF<br>pF<br>pF |

**ELECTRICAL CHARACTERISTICS** (continued)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(on)}$<br>$t_r$ | Turn-on Time<br>Rise Time | $V_{DD}$ = 250 V $I_D$ = 7.5 A<br>$R_G$ = 4.7 Ω $V_{GS}$ = 10 V<br>(see test circuit, figure 3) | | 24<br>14 | 34<br>20 | ns<br>ns |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD}$ = 400 V $I_D$ = 15 A $V_{GS}$ = 10 V | | 60<br>15<br>27 | 80 | nC<br>nC<br>nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{r(Voff)}$<br>$t_f$<br>$t_c$ | Off-voltage Rise Time<br>Fall Time<br>Cross-over Time | $V_{DD}$ = 400 V $I_D$ = 15 A<br>$R_G$ = 4.7 Ω $V_{GS}$ = 10 V<br>(see test circuit, figure 5) | | 15<br>25<br>35 | 20<br>33<br>47 | ns<br>ns<br>ns |

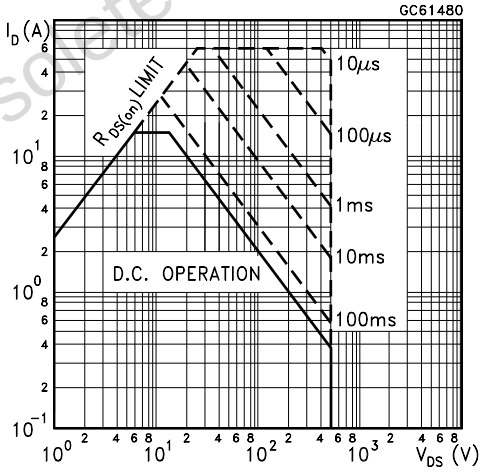
SOURCE DRAIN DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{SD}$<br>$I_{SDM}$(•) | Source-drain Current<br>Source-drain Current (pulsed) | | | | 14.6<br>58.4 | A<br>A |
| $V_{SD}$ (*) | Forward On Voltage | $I_{SD}$ = 15 A $V_{GS}$ = 0 | | | 1.6 | V |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery Time<br>Reverse Recovery Charge<br>Reverse Recovery Current | $I_{SD}$ = 15 A di/dt = 100 A/µs<br>$V_{DD}$ = 100 V $T_j$ = 150 °C<br>(see test circuit, figure 5) | | 680<br>9<br>26 | | ns<br>µC<br>A |

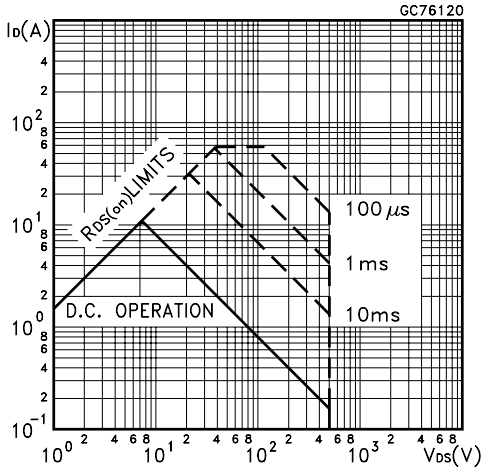
(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area



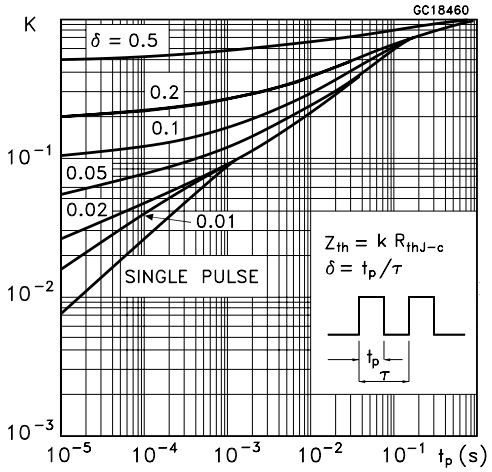
Safe Operating Area for TO-247



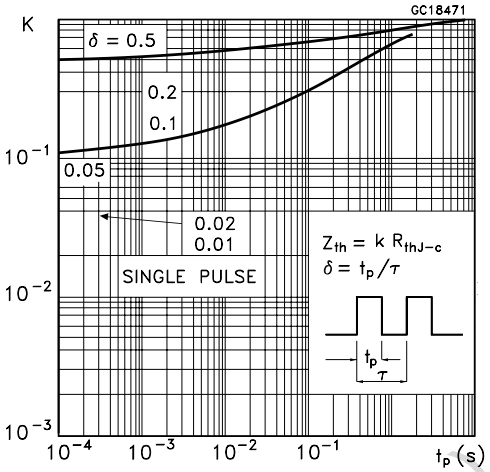

Safe Operating Area for ISOWATT218



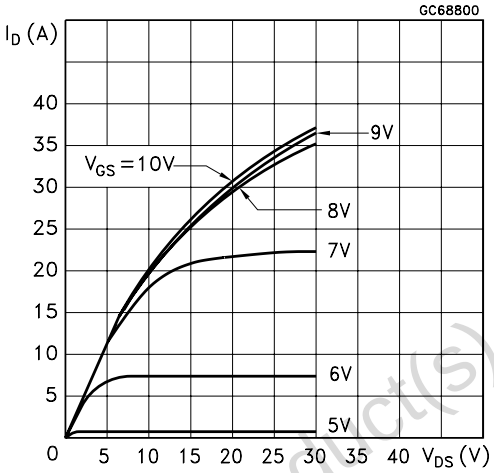
Thermal Impedance for TO-247



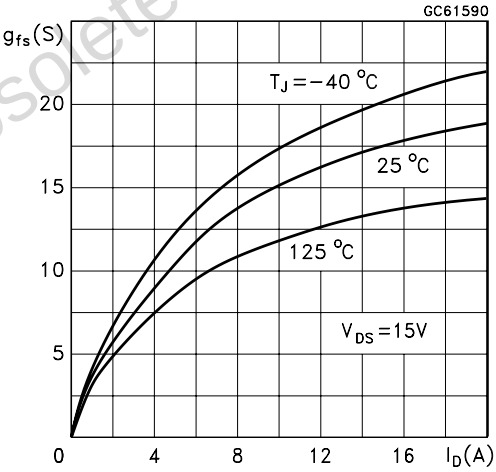

Thermal Impedance for ISOWATT218



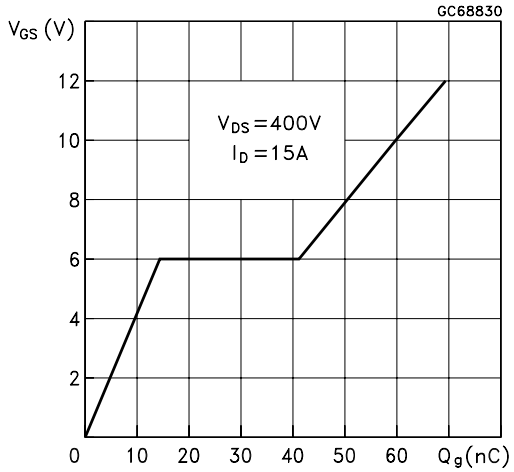

Output Characteristics



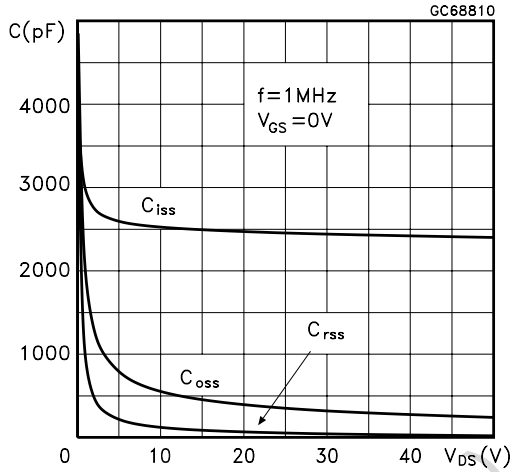

Transconductance



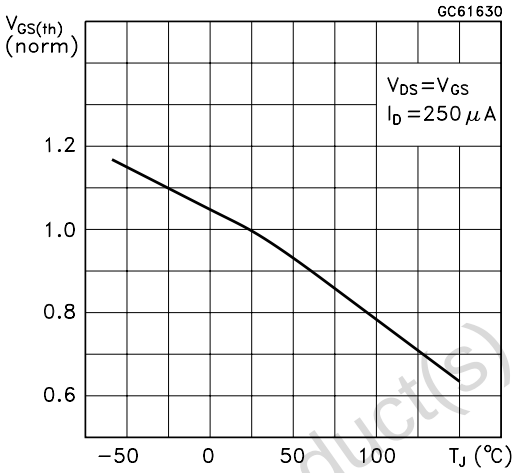
Gate Charge vs Gate-source Voltage



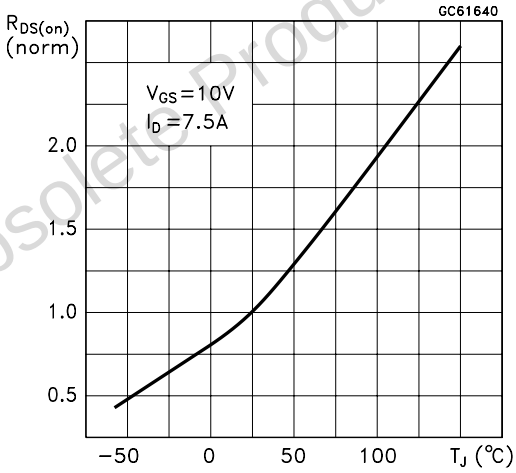

Capacitance Variations




Normalized Gate Threshold Voltage vs Temperature




Normalized On Resistance vs Temperature




Source-drain Diode Forward Characteristics

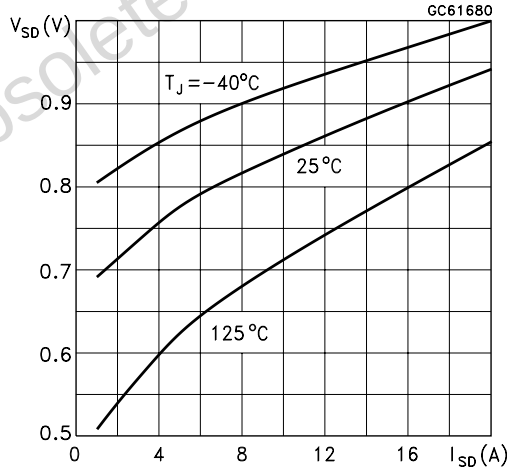


**Fig. 1:** Unclamped Inductive Load Test Circuit

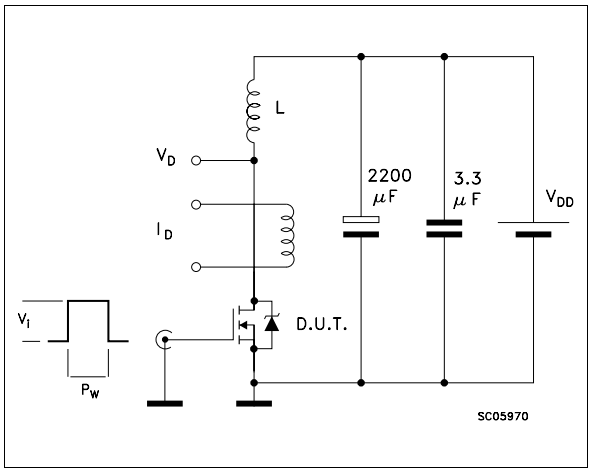



**Fig. 2:** Unclamped Inductive Waveform

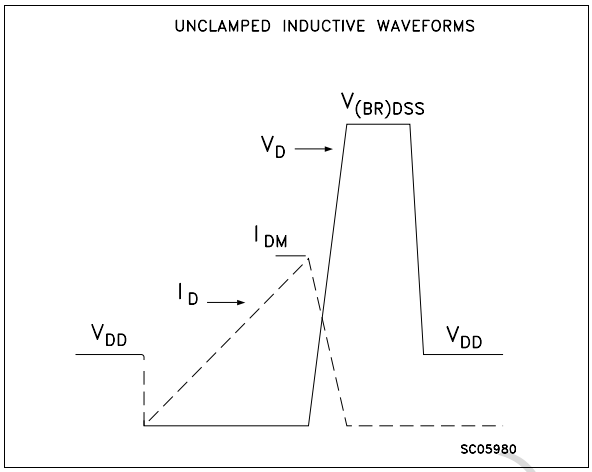
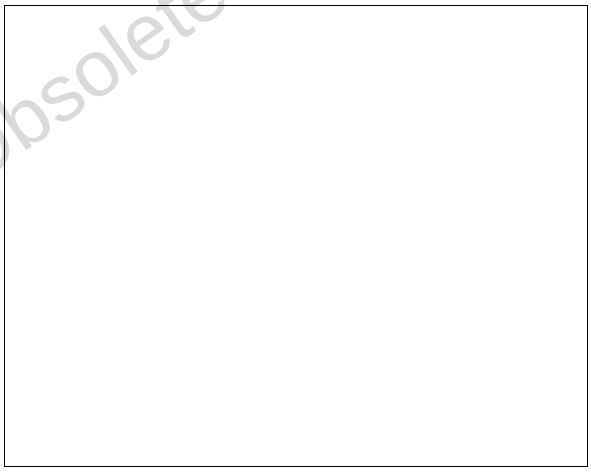



**Fig. 3:** Switching Times Test Circuits For Resistive Load

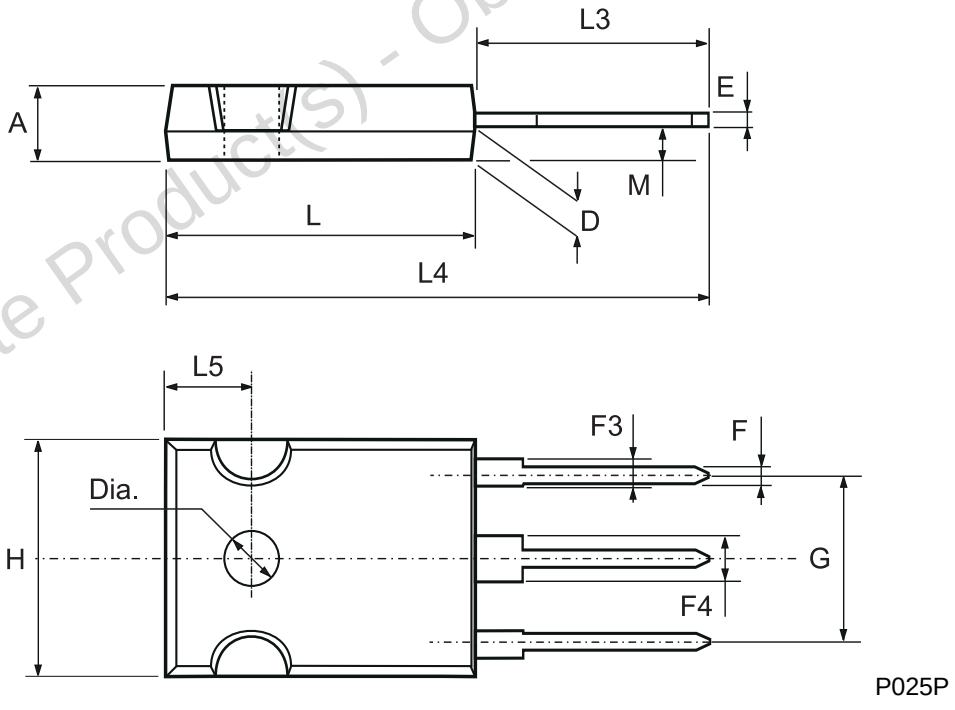
**Fig. 4:** Gate Charge test Circuit

**Fig. 5:** Test Circuit For Inductive Load Switching And Diode Recovery Times



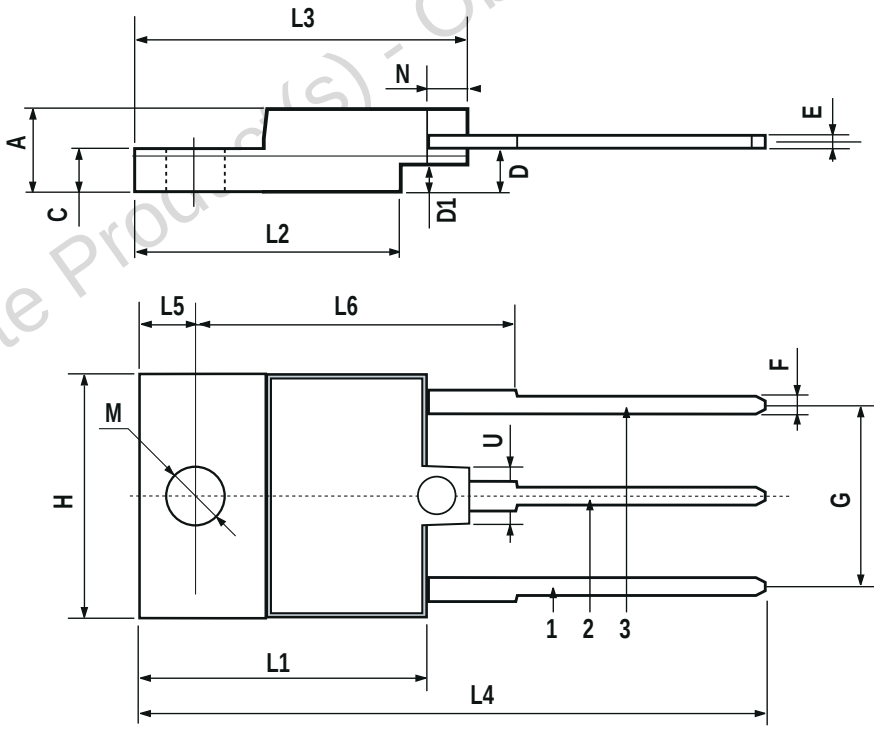
## TO-247 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.7 | | 5.3 | 0.185 | | 0.209 |
| D | 2.2 | | 2.6 | 0.087 | | 0.102 |
| E | 0.4 | | 0.8 | 0.016 | | 0.031 |
| F | 1 | | 1.4 | 0.039 | | 0.055 |
| F3 | 2 | | 2.4 | 0.079 | | 0.094 |
| F4 | 3 | | 3.4 | 0.118 | | 0.134 |
| G | | 10.9 | | | 0.429 | |
| H | 15.3 | | 15.9 | 0.602 | | 0.626 |
| L | 19.7 | | 20.3 | 0.776 | | 0.779 |
| L3 | 14.2 | | 14.8 | 0.559 | 0.413 | 0.582 |
| L4 | | 34.6 | | | 1.362 | |
| L5 | | 5.5 | | | 0.217 | |
| M | 2 | | 3 | 0.079 | | 0.118 |
| Dia | 3.55 | | 3.65 | 0.140 | | 0.144 |



## ISOWATT218 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 5.35 | | 5.65 | 0.210 | | 0.222 |
| C | 3.3 | | 3.8 | 0.130 | | 0.149 |
| D | 2.9 | | 3.1 | 0.114 | | 0.122 |
| D1 | 1.88 | | 2.08 | 0.074 | | 0.081 |
| E | 0.75 | | 1 | 0.029 | | 0.039 |
| F | 1.05 | | 1.25 | 0.041 | | 0.049 |
| G | 10.8 | | 11.2 | 0.425 | | 0.441 |
| H | 15.8 | | 16.2 | 0.622 | | 0.637 |
| L1 | 20.8 | | 21.2 | 0.818 | | 0.834 |
| L2 | 19.1 | | 19.9 | 0.752 | | 0.783 |
| L3 | 22.8 | | 23.6 | 0.897 | | 0.929 |
| L4 | 40.5 | | 42.5 | 1.594 | | 1.673 |
| L5 | 4.85 | | 5.25 | 0.190 | | 0.206 |
| L6 | 20.25 | | 20.75 | 0.797 | | 0.817 |
| M | 3.5 | | 3.7 | 0.137 | | 0.145 |
| N | 2.1 | | 2.3 | 0.082 | | 0.090 |
| U | | 4.6 | | | 0.181 | |

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