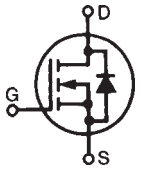
# IXYS

# PolarHV™ HiPerFET Power MOSFET

N-Channel Enhancement Mode
Avalanche Rated
Fast Intrinsic Diode

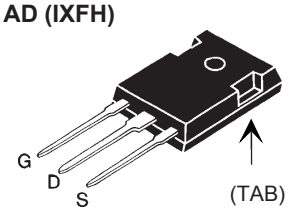
**IXFH 44N50P**
**IXFK 44N50P**
**IXFT 44N50P**

$V_{DSS}$ = 500 V
$I_{D25}$ = 44 A
$R_{DS(on)}$ ≤ 140 mΩ
$t_{rr}$ ≤ 200 ns

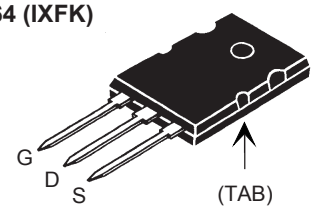



| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{DSS}$ | $T_J$ = 25° C to 175° C | 500 | V |
| $V_{DGR}$ | $T_J$ = 25° C to 175° C; $R_{GS}$ = 1 MΩ | 500 | V |
| $V_{GSM}$ | Transient | ±40 | V |
| $V_{GSM}$ | Continuous | ±30 | V |
| $I_{D25}$ | $T_C$ = 25° C | 44 | A |
| $I_{DM}$ | $T_C$ = 25° C, pulse width limited by $T_{JM}$ | 110 | A |
| $I_{AR}$ | $T_C$ = 25° C | 44 | A |
| $E_{AR}$ | $T_C$ = 25° C | 55 | mJ |
| $E_{AS}$ | $T_C$ = 25° C | 1.7 | J |
| dv/dt | $I_S \le I_{DM}$, di/dt ≤100 A/μs, $V_{DD} \le V_{DSS}$, $T_J$ ≤150° C, $R_G$ = 10 Ω | 10 | V/ns |
| $P_D$ | $T_C$ = 25° C | 650 | W |
| $T_J$ | | -55 ... +150 | °C |
| $T_{JM}$ | | 150 | °C |
| $T_{stg}$ | | -55 ... +150 | °C |
| $T_L$ | 1.6 mm (0.062 in.) from case for 10 s | 300 | °C |
| $T_{SOLD}$ | Plastic case for 10 s | 260 | °C |
| $M_d$ | Mounting torque (TO-247) | 1.13/10 | Nm/lb.in. |
| Weight | TO-247 | 6 | g |
| | TO-268 | 5 | g |
| | TO-264 | 10 | g |

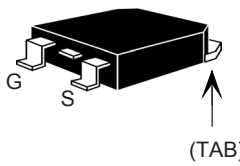
**TO-247 AD (IXFH)**




**TO-264 (IXFK)**




**TO-268 (IXFT)**




G = Gate D = Drain
S = Source TAB = Drain

| Symbol ($T_J$ = 25° C, unless otherwise specified) | Test Conditions | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 250 μA | 500 | | | V |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D$ = 4 mA | 3.0 | | 5.0 | V |
| $I_{GSS}$ | $V_{GS}$ = ±30 $V_{DC}$, $V_{DS}$ = 0 | | | ±10 | nA |
| $I_{DSS}$ | $V_{DS} = V_{DSS}$, $V_{GS}$ = 0 V | | | 25 | μA |
| | $T_J$ = 125° C | | | 500 | μA |
| $R_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D = 0.5\ I_{D25}$ Pulse test, t ≤300 μs, duty cycle d ≤ 2 % | | | 140 | mΩ |

**Features**

- International standard packages
- Unclamped Inductive Switching (UIS) rated
- Low package inductance
  - easy to drive and to protect

**Advantages**

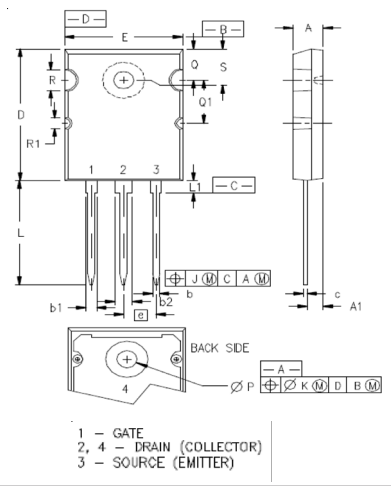
- Easy to mount
- Space savings
- High power density

| Symbol | Test Conditions ($T_J$ = 25° C, unless otherwise specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $g_{fs}$ | $V_{DS}$= 20 V; $I_D$ = 0.5 $I_{D25}$, pulse test | 20 | 32 | | S |
| $C_{iss}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 25 V, f = 1 MHz | | 5440 | | pF |
| $C_{oss}$ | | | 639 | | pF |
| $C_{rss}$ | | | 40 | | pF |
| $t_{d(on)}$ | $V_{GS}$ = 10 V, $V_{DS}$ = 0.5 $V_{DSS}$, $I_D$ = $I_{D25}$ $R_G$ = 3 Ω (External) | | 28 | | ns |
| $t_r$ | | | 29 | | ns |
| $t_{d(off)}$ | | | 85 | | ns |
| $t_f$ | | | 27 | | ns |
| $Q_{g(on)}$ | $V_{GS}$= 10 V, $V_{DS}$ = 0.5 $V_{DSS}$, $I_D$ = 0.5 $I_{D25}$ | | 98 | | nC |
| $Q_{gs}$ | | | 35 | | nC |
| $Q_{gd}$ | | | 30 | | nC |
| $R_{thJC}$ | | | | 0.19 | ° C/W |
| $R_{thCS}$ | (TO-247) | | 0.21 | | ° C/W |
| | (TO-264) | | 0.15 | | ° C/W |

**Source-Drain Diode**

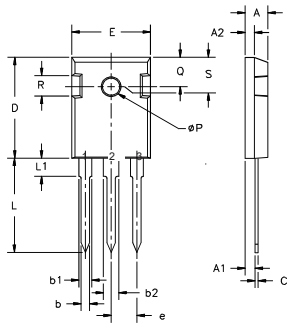
| Symbol | Test Conditions ($T_J$ = 25° C, unless otherwise specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $I_S$ | $V_{GS}$ = 0 V | | | 44 | A |
| $I_{SM}$ | Repetitive | | | 110 | A |
| $V_{SD}$ | $I_F$ = $I_S$, $V_{GS}$ = 0 V, Pulse test, t ≤300 μs, duty cycle d≤ 2 % | | | 1.5 | V |
| $t_{rr}$ | $I_F$ = 25 A, -di/dt = 100 A/μs | | | 200 | ns |
| $Q_{RM}$ | $V_R$ = 100V, $V_{GS}$ = 0 V | | 0.6 | | μC |
| $I_{RM}$ | | | 6.0 | | A |

**TO-264 (IXFK) Outline**




| SYM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS MAX |
|---|---|---|---|---|
| A | .185 | .209 | 4.70 | 5.31 |
| A1 | .102 | .118 | 2.59 | 3.00 |
| b | .037 | .055 | 0.94 | 1.40 |
| b1 | .087 | .102 | 2.21 | 2.59 |
| b2 | .110 | .126 | 2.79 | 3.20 |
| c | .017 | .029 | 0.43 | 0.74 |
| D | 1.007 | 1.047 | 25.58 | 26.59 |
| E | .760 | .799 | 19.30 | 20.29 |
| e | .215BSC | | 5.46 BSC | |
| J | .000 | .010 | 0.00 | 0.25 |
| K | .000 | .010 | 0.00 | 0.25 |
| L | .779 | .842 | 19.79 | 21.39 |
| L1 | .087 | .102 | 2.21 | 2.59 |
| ØP | .122 | .138 | 3.10 | 3.51 |
| Q | .240 | .256 | 6.10 | 6.50 |
| Q1 | .330 | .346 | 8.38 | 8.79 |
| ØR | .155 | .187 | 3.94 | 4.75 |
| ØR1 | .085 | .093 | 2.16 | 2.36 |
| S | .243 | .253 | 6.17 | 6.43 |

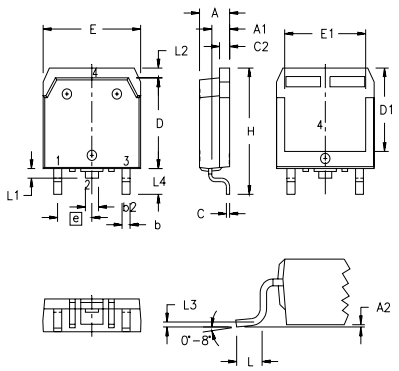
**TO-247 (IXFH) Outline**



Terminals: 1 - Gate 2 - Drain
3 - Source Tab - Drain

| Dim. | Millimeter Min. | Millimeter Max. | Inches Min. | Inches Max. |
|---|---|---|---|---|
| A | 4.7 | 5.3 | .185 | .209 |
| $A_1$ | 2.2 | 2.54 | .087 | .102 |
| $A_2$ | 2.2 | 2.6 | .059 | .098 |
| b | 1.0 | 1.4 | .040 | .055 |
| $b_1$ | 1.65 | 2.13 | .065 | .084 |
| $b_2$ | 2.87 | 3.12 | .113 | .123 |
| C | .4 | .8 | .016 | .031 |
| D | 20.80 | 21.46 | .819 | .845 |
| E | 15.75 | 16.26 | .610 | .640 |
| e | 5.20 | 5.72 | 0.205 | 0.225 |
| L | 19.81 | 20.32 | .780 | .800 |
| L1 | | 4.50 | | .177 |
| ØP | 3.55 | 3.65 | .140 | .144 |
| Q | 5.89 | 6.40 | 0.232 | 0.252 |
| R | 4.32 | 5.49 | .170 | .216 |
| S | 6.15 BSC | | 242 BSC | |

**TO-268 (IXFT) Outline**



| SYM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS MAX |
|---|---|---|---|---|
| A | .193 | .201 | 4.90 | 5.10 |
| A1 | .106 | .114 | 2.70 | 2.90 |
| A2 | .001 | .010 | 0.02 | 0.25 |
| b | .045 | .057 | 1.15 | 1.45 |
| b2 | .075 | .083 | 1.90 | 2.10 |
| C | .016 | .026 | 0.40 | 0.65 |
| C2 | .057 | .063 | 1.45 | 1.60 |
| D | .543 | .551 | 13.80 | 14.00 |
| D1 | .488 | .500 | 12.40 | 12.70 |
| E | .624 | .632 | 15.85 | 16.05 |
| E1 | .524 | .535 | 13.30 | 13.60 |
| e | .215 BSC | | 5.45 BSC | |
| H | .736 | .752 | 18.70 | 19.10 |
| L | .094 | .106 | 2.40 | 2.70 |
| L1 | .047 | .055 | 1.20 | 1.40 |
| L2 | .039 | .045 | 1.00 | 1.15 |
| L3 | .010 BSC | | 0.25 BSC | |
| L4 | .150 | .161 | 3.80 | 4.10 |

**Fig. 1. Output Characteristics @ 25ºC**

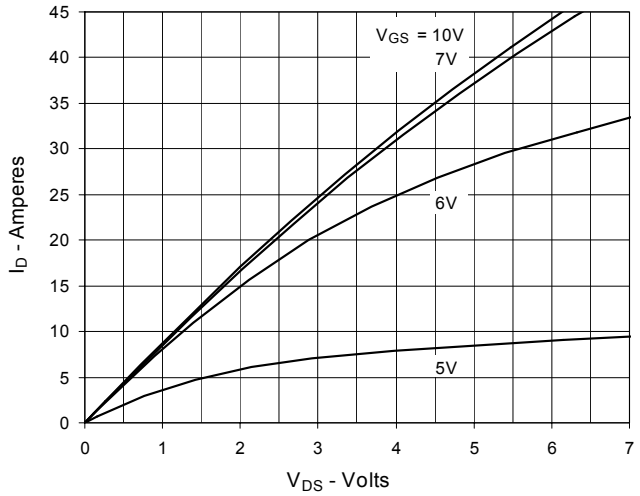



**Fig. 2. Extended Output Characteristics @ 25ºC**

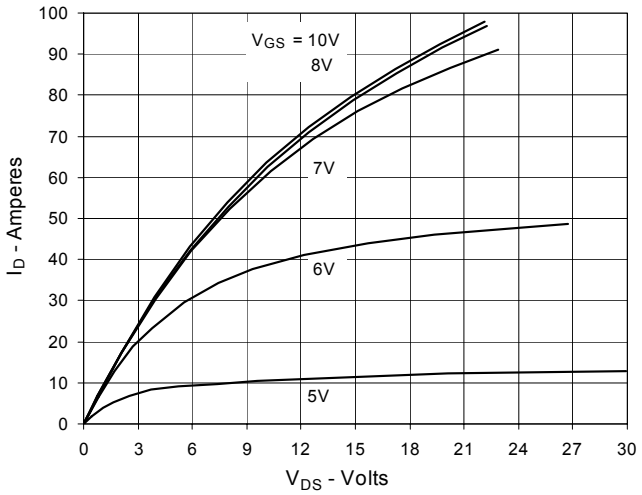



**Fig. 3. Output Characteristics @ 125ºC**

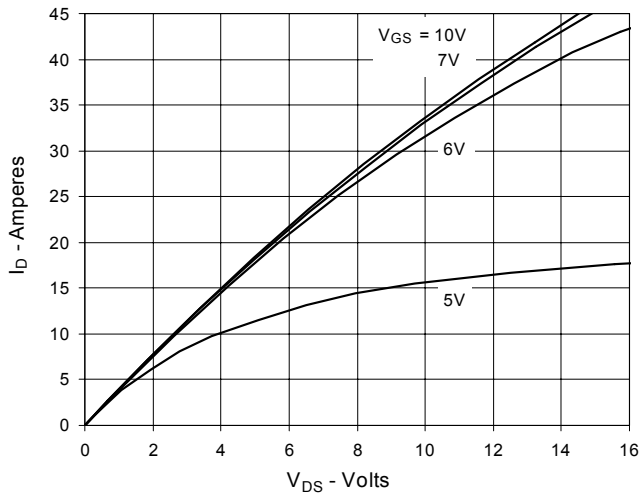



**Fig. 4. $R_{DS(on)}$ Normalized to $I_D$ = 22A Value vs. Junction Temperature**

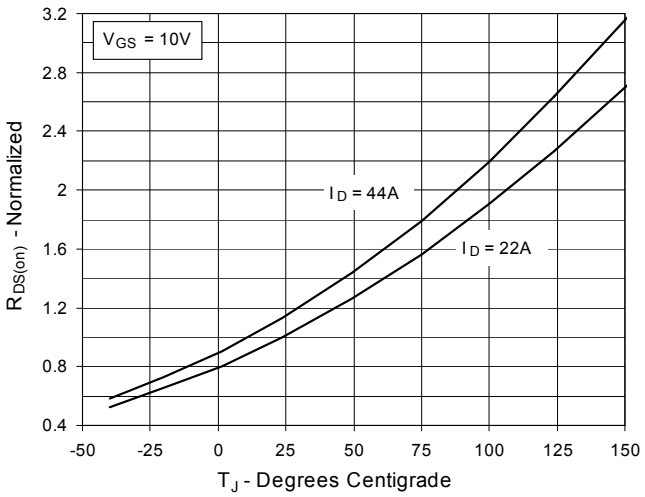



**Fig. 5. $R_{DS(on)}$ Normalized to $I_D$ = 22A Value vs. Drain Current**

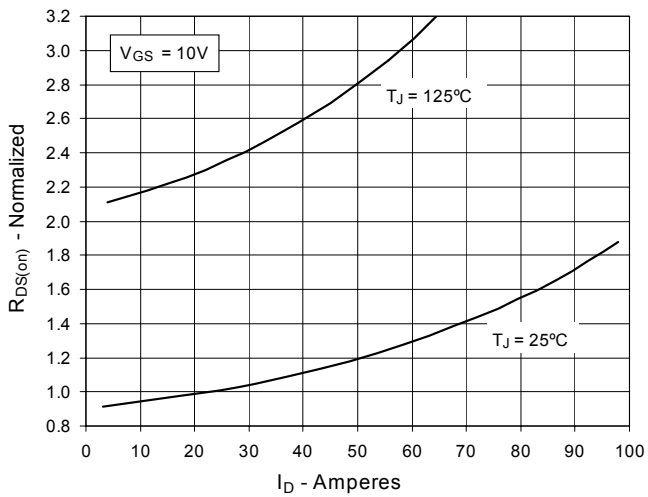



**Fig. 6. Maximum Drain Current vs. Case Temperature**

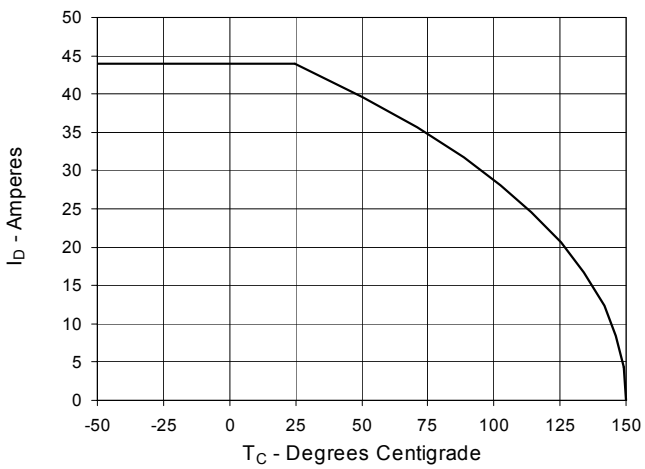


**Fig. 7. Input Admittance**

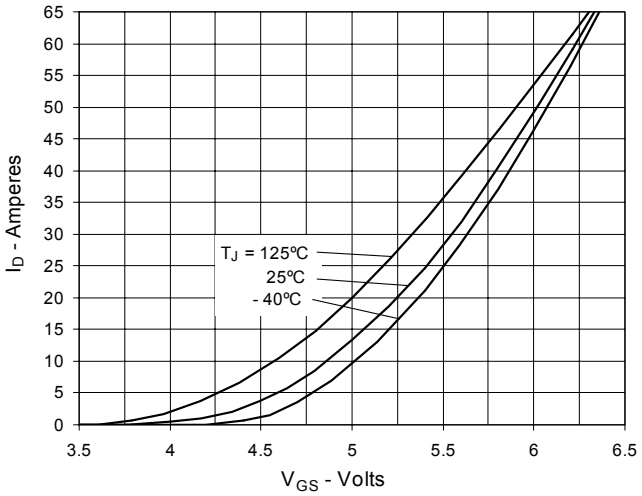



**Fig. 8. Transconductance**

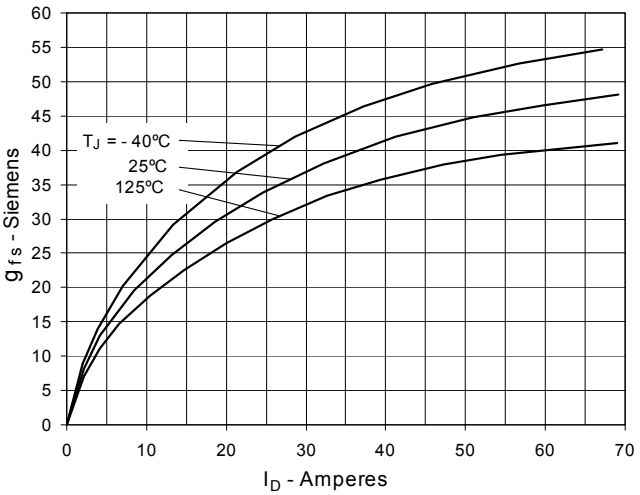



**Fig. 9. Forward Voltage Drop of Intrinsic Diode**

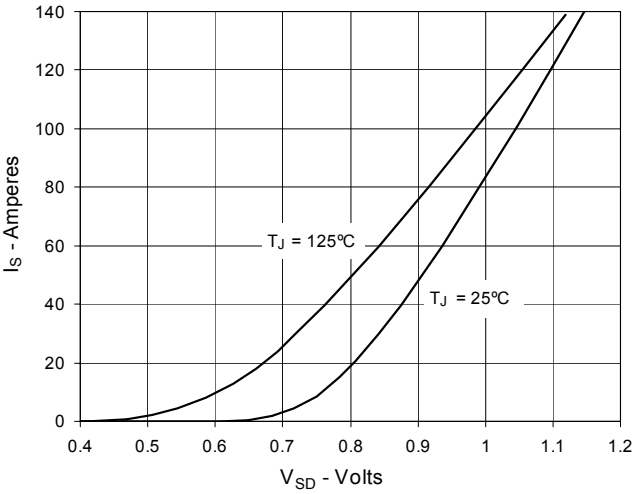



**Fig. 10. Gate Charge**

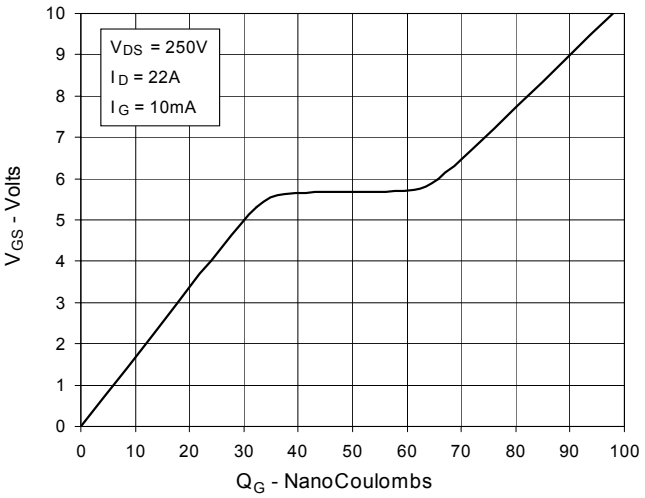



**Fig. 11. Capacitance**

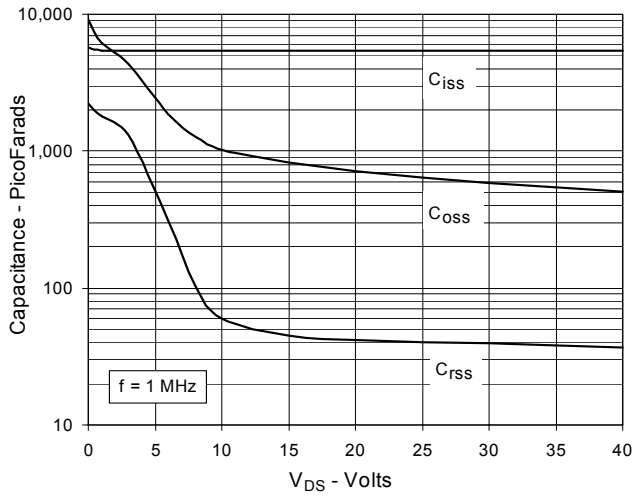



**Fig. 12. Forward-Bias Safe Operating Area**

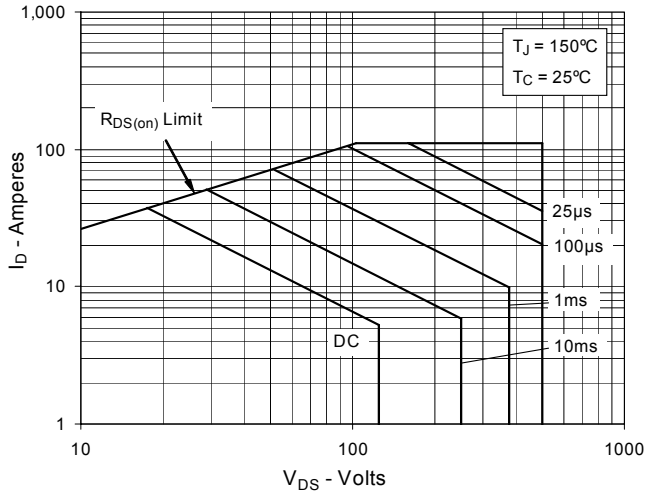


**Fig. 13. Maximum Transient Thermal Resistance**