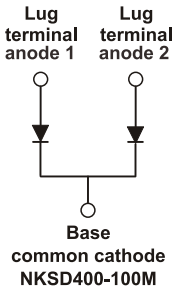
# Schottky Rectifier, 400A/100V

## FEATURES

- 175°C $T_J$ operation
- Molded package
- Center tap module
- Low forward voltage drop
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability
- Lead (Pb)-free
- Designed and qualified for industrial level

TO-244M (non-insulated)




## DESCRIPTION

The NKSD400... Schottky rectifier common cathode module series has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to 175°C junction temperature.

## TYPICAL APPLICATIONS

- High current switching power supplies
- Plating power supplies
- UPS system
- Converters
- Freewheeling
- Welder
- Reverse battery protection.

| PRODUCT SUMMARY | |
|---|---|
| $I_{F(AV)}$ | 400 A |
| $V_R$ | 100 V |

| MAJOR RATINGS AND CHARACTERISTICS | | | |
|---|---|---|---|
| SYMBOL | CHARACTERISTICS | VALUES | UNIT |
| $I_{F(AV)}$ | Rectangular waveform | 400 | A |
| $V_{RRM}$ | | 100 | V |
| $I_{FSM}$ | $t_p$ = 5 µs sine | 25500 | A |
| $V_F$ | 200 Apk, $T_j$ = 125°C (per leg) | 0.69 | V |
| $T_J$ | Range | -55 to 175 | °C |

| VOLTAGE RATINGS | | | |
|---|---|---|---|
| PARAMETER | SYMBOL | NKSD400-100M | UNIT |
| Maximum DC reverse voltage | $V_R$ | 100 | V |
| Maximum working peak reverse voltage | $V_{RWM}$ | | |

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNIT |
|---|---|---|---|---|---|
| Maximum average forward current per leg / per device See fig.5 | $I_{F(AV)}$ | 50% duty cycle at $T_C$ = 141°C, rectangular waveform | | 200 | A |
| | | | | 400 | |
| Maximum peak one cycle non-repetitive surge current per leg See fig.7 | $I_{FSM}$ | 5 µs sine or 3 µs rect. pulse | Following any rated load condition and with rated $V_{RRM}$ applied | 25500 | |
| | | 10 ms sine or 6 ms rect. pulse | | 3300 | |
| Non- repetitive avalanche energy per leg | $E_{AS}$ | $T_J$=25°C, $I_{AS}$=13A, L=0.2mH | | 15 | mJ |
| Repetitive avalanche current per leg | $I_{AR}$ | Current decaying linearly to zero in 1 µs Frequency limited by $T_J$ maximum $V_A$=1.5x$V_R$ typical | | 1 | A |

## ELECTRICAL SPECIFICATIONS

| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNIT |
|---|---|---|---|---|---|
| Maximum forward voltage drop per leg See fig.1 | $V_{FM}$(1) | 200A | $T_J$ = 25°C | 0.84 | V |
| | | 400A | | 1.05 | |
| | | 200A | $T_J$ = 125°C | 0.69 | |
| | | 400A | | 0.80 | |
| Maximum reverse leakage current per leg See fig.2 | $I_{RM}$(1) | $T_J$ = 25°C | $V_R$ = Rated $V_R$ | 100 | µA |
| | | $T_J$ = 125°C | | 50 | mA |
| Maximum junction capacitance per leg | $C_T$ | $V_R$ = 5 $V_{DC}$ (test signal range 100 kHz to 1 MHz) 25°C | | 5500 | pF |
| Typical series inductance per leg | $L_S$ | From top of terminal hole to mounting plane | | 5 | nH |
| Maximum voltage rate of change | dV/dt | Rated $V_R$ | | 10000 | V/µs |

**Note**

(1) Pulse width < 300 µs, duty cycle < 2%

## THERMAL-MECHANICAL SPECIFICATIONS

| PARAMETER | | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Maximum junction and storage temperature range | | $T_J$,$T_{Stg}$ | -55 | - | 175 | °C |
| Thermal resistance, junction to case per leg | TO-244M (non-insulated) | $R_{thJC}$ | - | - | 0.18 | °C/W |
| Thermal resistance, junction to case per module | TO-244M (non-insulated) | $R_{thJC}$ | - | - | 0.09 | |
| Thermal resistance, case to heatsink | | $R_{thCS}$ | - | 0.10 | - | |
| Weight | TO-244M (non-insulated) | | - | 85 (3) | - | g(oz.) |
| Mounting torque(1) | | | 30 (3.4) | - | 40 (4.6) | lbf • in (N•m) |
| Mounting torque center hole | | | 12 (1.4) | - | 18 (2.1) | |
| Terminal torque | | | 30 (3.4) | - | 40 (4.6) | |
| vertical pull | | | - | - | 80 | lbf • in |
| 2" lever pull | | | - | - | 35 | |

**Note**

(1) Mounting sarface must be smooth,flat,free of burrs or other protrusions.
Apply a thin even film or thermal grease to mounting surface.

## Ordering Information Table

**Device code**

| NK | S | D | 400 | — | 100 | M |
|---|---|---|---|---|---|---|
| ① | ② | ③ | ④ | | ⑤ | ⑥ |

1 - NPS's power module
2 - S for Schottky Barrier Diode
3 - D for Dual Diodes, TO-244 Package
4 - Maximum average forward current, A
5 - Voltage rating (100 = 100V)
6 - "M" for molding package TO-244M

**Fig.1 Maximum forward voltage drop characteristics (Per Leg)**

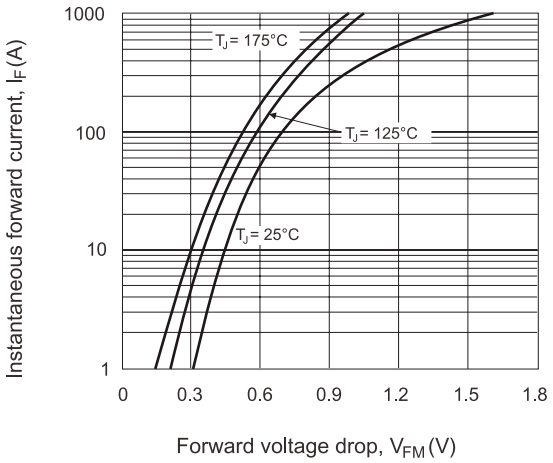



**Fig.2 Typical values of reverse current vs. Reverse voltage (Per Leg)**

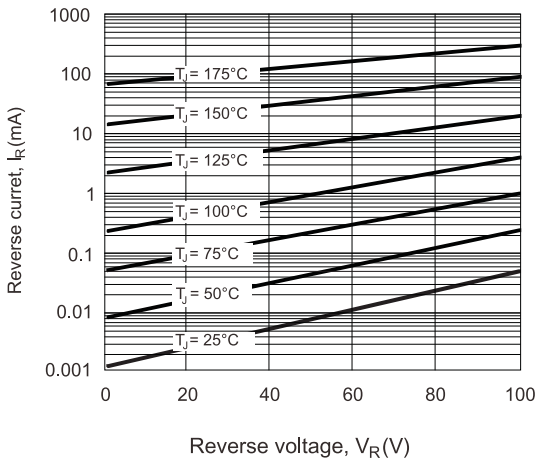



**Fig.3 Maximum thermal impedance $R_{th(j-c)}$ characteristics (Per Leg, for TO-244M non-insulated)**

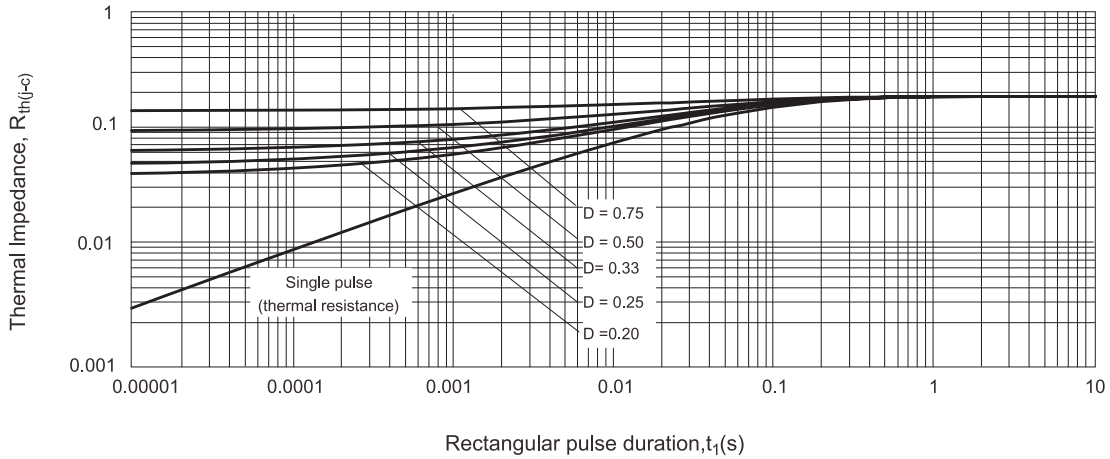


**Fig.4 Typical junction capacitance vs. Reverse voltage (Per Leg )**

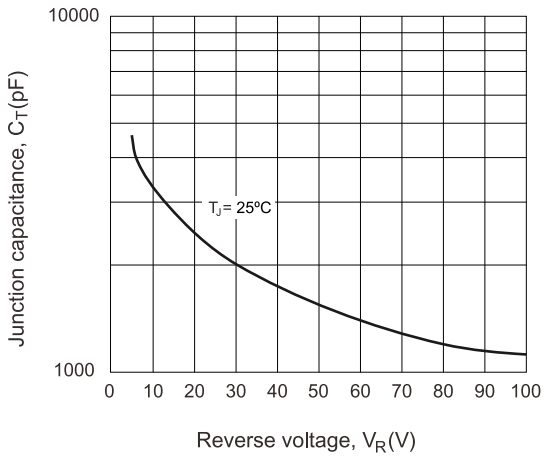



**Fig.5 Maximum allowable case temperature vs. Average forward current (Per Leg)**

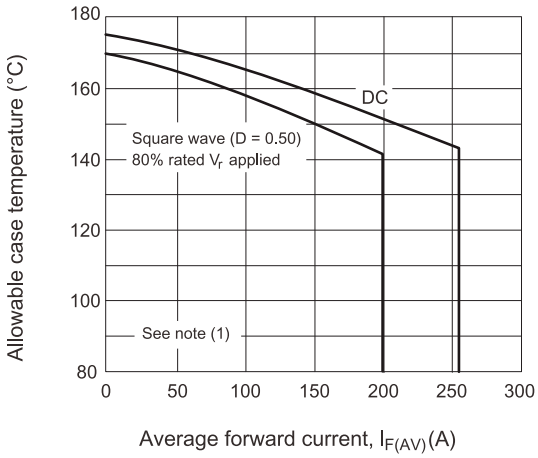



**Fig.6 Forward power loss characteristics (Per Leg)**

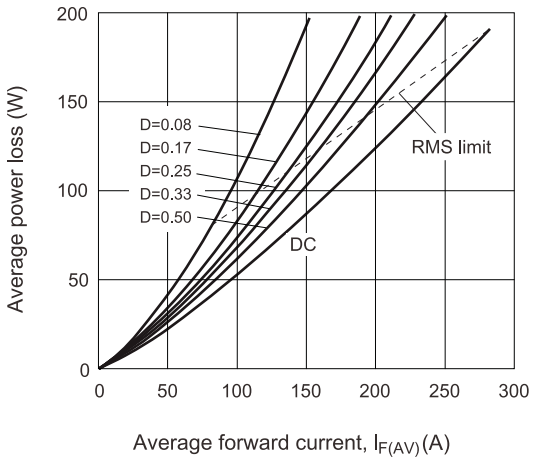



**Fig.7 Maximum non-repetitive surge current (Per Leg)**

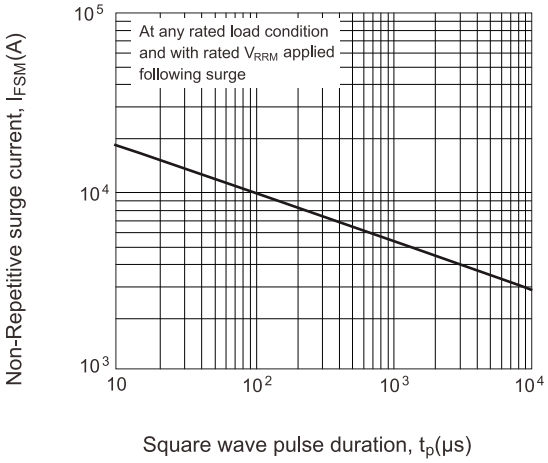
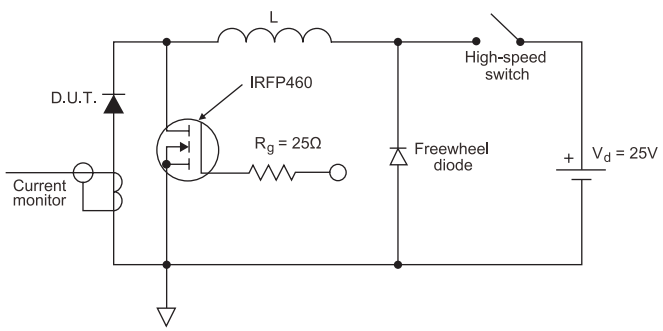



**Fig.8 Unclamped Inductive test circuit**



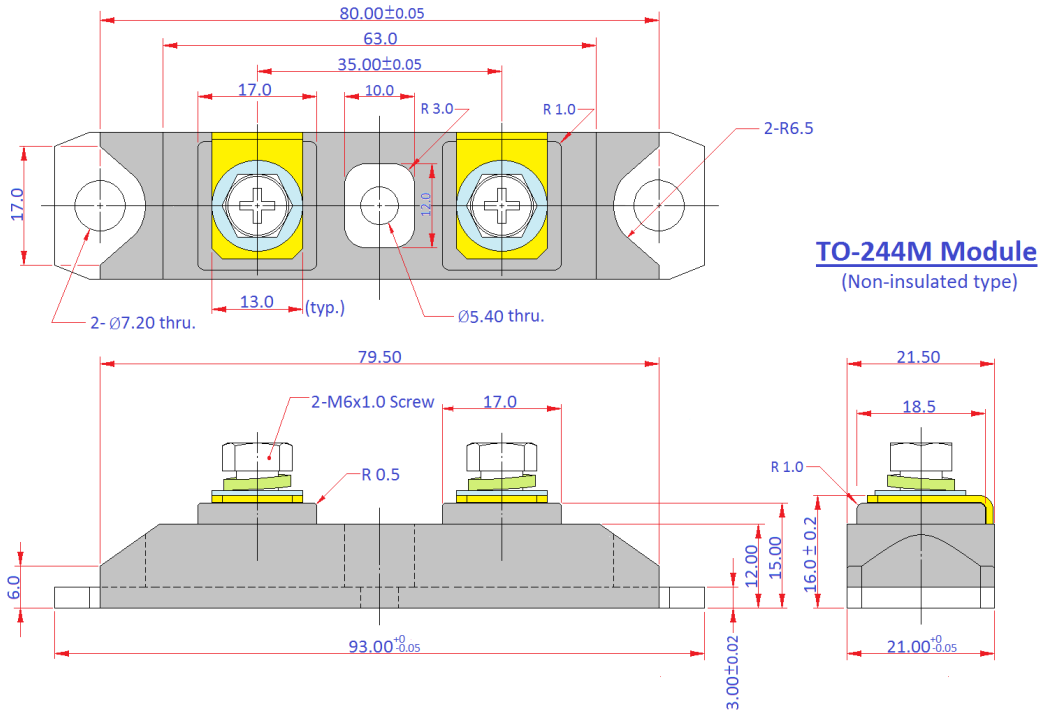

Note

(1) Formula used: $T_C = T_J - (Pd+Pd_{REV}) \times R_{thJC}$ ;

Pd = Forward power loss = $I_{F(AV)} \times V_{FM}$ at($I_{F(AV)}$/D)(see fig.6)

$Pd_{REV}$ = Inverse power loss = $V_{R1} \times I_R(1\text{-}D)$; $I_R$ at $V_{R1}$ = 80% rated $V_R$

**TO-244M** (Non-Insulated)




All dimensions in millimeters