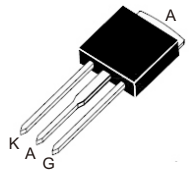
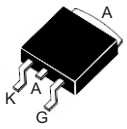
# Sensitive and Standard SCRs, 12A

## Main Features

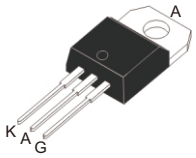
| Symbol | Value | Unit |
|---|---|---|
| $I_{T(RMS)}$ | 12 | A |
| $V_{DRM}/V_{RRM}$ | 600 to 1000 | V |
| $I_{GT}$ | 0.2 to 15 | mA |



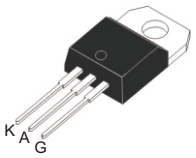

TO-251 **(I-PAK)**
(12PTxxF)



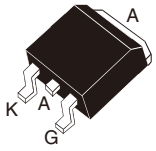

TO-252 **(D-PAK)**
(12PTxxG)



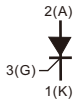

TO-220AB **(Non-Insulated)**
(12PTxxA)




TO-220AB **(Insulated)**
(12PTxxAI)




TO-263 (**D²PAK**)
(12PTxxH)




## DESCRIPTION

Available either in sensitive or standard gate triggering levels, the 12A SCR series is suitable to fit all modes of control found in applications such as overvoltage crowbar protection, motor control circuits in power tools and kitchen aids, inrush current limiting circuits, capacitive discharge ignition and voltage regulation circuits.

Available in through-hole or surface-mount packages, they provide an optimized performance in a limited space.

**ABSOLUTE MAXIMUM RATINGS**

| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUE | UNIT |
|---|---|---|---|---|---|
| RMS on-state current full sine wave (180° conduction angle ) | $I_{T(RMS)}$ | TO-251/TO-252/TO-220AB/TO-263 | $T_C$=105°C | 12 | A |
| | | TO-220AB insulated | $T_C$=90°C | | |
| Average on-state current (180° conduction angle) | $I_{T(AV)}$ | TO-251/TO-252/TO-220AB/TO-263 | $T_C$=105°C | 8 | A |
| | | TO-220AB insulated | $T_C$=90°C | | |
| Non repetitive surge peak on-state current (full cycle, $T_j$ initial = 25°C) | $I_{TSM}$ | F =50 Hz | t = 20 ms | 140 | A |
| | | F =60 Hz | t = 16.7 ms | 145 | |
| $I^2t$ Value for fusing | $I^2t$ | $t_p$ = 10 ms | | 98 | $A^2s$ |
| Critical rate of rise of on-state current $I_G = 2xI_{GT}$, $t_r$≤100ns | dI/dt | F = 60 Hz | $T_j$ = 125°C | 50 | A/µs |
| Peak gate current | $I_{GM}$ | $T_p$ = 20 µs | $T_j$ = 125°C | 4 | A |
| Average gate power dissipation | $P_{G(AV)}$ | $T_j$ =125°C | | 1 | W |
| Storage temperature range | $T_{stg}$ | | | - 40 to + 150 | °C |
| Operating junction temperature range | $T_j$ | | | - 40 to + 125 | |

## STANDARD ELECTRICAL SPECIFICATIONS ($T_J$ = 25 ºC, unless otherwise specified)

| SYMBOL | TEST CONDITIONS | | | 12PTxxxx | | Unit |
|---|---|---|---|---|---|---|
| | | | | T | - | |
| $I_{GT}$ | $V_D$ = 12 V, $R_L$ = 33Ω | | Min. | 0.5 | 2 | mA |
| | | | Max. | 5 | 15 | |
| $V_{GT}$ | | | Max. | 1.3 | | V |
| $V_{GD}$ | $V_D = V_{DRM}$, $R_L$ = 3.3KΩ | $T_j$ = 125°C | Min. | 0.2 | | V |
| $I_H$ | $I_T$ = 500 mA, gate open | | Max. | 15 | 30 | mA |
| $I_L$ | $I_G$ = 1.2 $I_{GT}$ | | Max. | 30 | 60 | mA |
| dV/dt | $V_D$ = 67% $V_{DRM}$, gate open | $T_j$ = 125°C | Min. | 40 | 200 | V/μs |
| $V_{TM}$ | $I_{TM}$ = 24A, $t_P$ = 380 μs | $T_j$ = 25°C | Max. | 1.6 | | V |
| $V_{to}$ | Threshold voltage | $T_j$ = 125°C | Max. | 0.85 | | V |
| $R_d$ | Dynamic resistance | $T_j$ = 125°C | Max. | 30 | | mΩ |
| $I_{DRM}$ $I_{RRM}$ | $V_{DRM} = V_{RRM}$ | $T_j$ = 25°C | Max. | 5 | | μA |
| | | $T_j$ = 125°C | | 2 | | mA |

## SENSITIVE ELECTRICAL CHARACTERISTICS ($T_j$ = 25 ºC, unless otherwise specified)

| SYMBOL | TEST CONDITIONS | | | 12PTxxxx-S | Unit |
|---|---|---|---|---|---|
| $I_{GT}$ | $V_D$ = 12 V, $R_L$ = 140Ω | | Max. | 200 | μA |
| $V_{GT}$ | | | Max. | 0.8 | V |
| $V_{GD}$ | $V_D = V_{DRM}$, $R_L$ = 3.3KΩ, $R_{GK}$=220Ω | $T_j$ = 125°C | Min. | 0.1 | V |
| $V_{RG}$ | $I_{RG}$ = 10 μA | | Min. | 8 | V |
| $I_H$ | $I_T$ = 50 mA, $R_{GK}$ = 1 KΩ | | Max. | 5 | mA |
| $I_L$ | $I_G$ = 1 mA, $R_{GK}$ = 1 KΩ | | Max. | 6 | mA |
| dV/dt | $V_D$ = 67% $V_{DRM}$, $R_{GK}$ = 220Ω | $T_j$ = 125°C | Min. | 10 | V/μs |
| $V_{TM}$ | $I_{TM}$ = 24A, $t_P$ = 380 μs | $T_j$ = 25°C | Max. | 1.6 | V |
| $V_{to}$ | Threshold voltage | $T_j$ = 125°C | Max. | 0.85 | V |
| $R_d$ | Dynamic resistance | $T_j$ = 125°C | Max. | 30 | mΩ |
| $I_{DRM}$ $I_{RRM}$ | $V_{DRM} = V_{RRM}$, $R_{GK}$ = 220Ω | $T_j$ = 25°C | Max. | 5 | μA |
| | | $T_j$ = 125°C | | 2 | mA |

## DYNAMIC CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITIONS | VALUE | | | UNIT |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $t_{gt}$ | Gate-controlled turn-on time | $I_{TM}$ = 40A, $V_D = V_{DRM}$ (Max.), $I_G$ = 0.1A, $dI_G/dt$ = 5A/μs, $T_J$ = 25°C | - | 2.0 | - | μS |
| $t_q$ | Commutated turn-off time | $V_D$ = 67% $V_{DRM}$, $I_{TM}$ = 20A, $V_R$ = 25V, $R_{GK}$ = 100Ω, $dI_{TM}/dt$ = 30A/μs, $dV_D/dt$ = 50V/μs, $T_J$ = 125°C | - | 70 | - | μS |

## THERMAL RESISTANCE

| SYMBOL | Parameter | | | VALUE | UNIT |
|---|---|---|---|---|---|
| $R_{th(j-c)}$ | Junction to case (DC) | | IPAK/DPAK/TO-220AB/TO-263 | 1.3 | °C/W |
| | | | TO-220AB insulated | 4.6 | |
| $R_{th(j-a)}$ | Junction to ambient (DC) | S = 0.5 $cm^2$ | D-PAK | 70 | °C/W |
| | | S = 1 $cm^2$ | D²PAK | 45 | |
| | | | I-PAK | 100 | |
| | | | TO-220AB, TO-220AB insulated | 60 | |

S=Copper surface under tab

## PRODUCT SELECTOR

| PART NUMBER | VOLTAGE (xx) | | | SENSITIVITY | PACKAGE |
|---|---|---|---|---|---|
| | 600 V | 800 V | 1000 V | | |
| 12PTxxA-S/12PTxxAI-S | V | V | V | 200 µA | TO-220AB |
| 12PTxxA-T/12PTxxAI-T | V | V | V | 0.5~5 mA | TO-220AB |
| 12PTxxA/12PTxxAI | V | V | V | 2~15 mA | TO-220AB |
| 12PTxxF-S | V | V | V | 200 µA | I-PAK |
| 12PTxxF-T | V | V | V | 0.5~5 mA | I-PAK |
| 12PTxxF | V | V | V | 2~15 mA | I-PAK |
| 12PTxxG-S | V | V | V | 200 µA | D-PAK |
| 12PTxxG-T | V | V | V | 0.5~5 mA | D-PAK |
| 12PTxxG | V | V | V | 2~15 mA | D-PAK |
| 12PTxxH-S | V | V | V | 200 µA | D²-PAK |
| 12PTxxH-T | V | V | V | 0.5~5 mA | D²-PAK |
| 12PTxxH | V | V | V | 2~15 mA | D²-PAK |

## ORDERING INFORMATION

| ORDERING TYPE | MARKING | PACKAGE | WEIGHT | BASE Q'TY | DELIVERY MODE |
|---|---|---|---|---|---|
| 12PTxxA-y | 12PTxxA-y | TO-220AB | 2.0g | 50 | Tube |
| 12PTxxAI-y | 12PTxxAI-y | TO-220AB (insulated) | 2.3g | 50 | Tube |
| 12PTxxF-y | 12PTxxF-y | TO-251(I-PAK) | 0.40g | 80 | Tube |
| 12PTxxG-y | 12PTxxG-y | TO-252(D-PAK) | 0.38g | 80 | Tube |
| 12PTxxH-y | 12PTxxH-y | TO-263(D²-PAK) | 2.0g | 50 | Tube |

**Note**: xx = voltage, y = sensitivity

## ORDERING INFORMATION SCHEME

**12 PT 06 AI - S**

**Current**
12 = 12A, $I_{T(RMS)}$

**SCR series**

**Voltage Code**
06 = 600V
08 = 800V
10 = 1000V

**Package type**
A = TO-220AB (non-insulated)
AI = TO-220AB ( insulated)
F = TO-251 (I-PAK)
G = TO-252 (D-PAK)
H = TO-263 ($D^2$PAK)

**$I_{GT}$ Sensitivity**
S = 70~200 μA
T = 0.5~5 mA
Blank = 2~15 mA

Fig.1 Maximum average power dissipation versus average on-state current

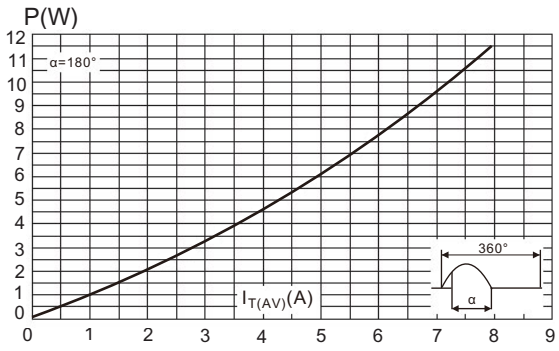



Fig.2 Average and DC on-state current versus case temperature

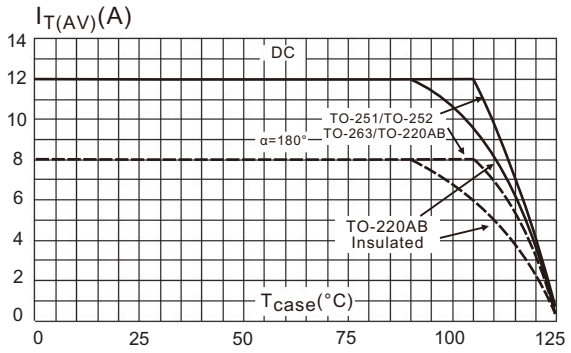



Fig.3 Average and DC on-state current versus ambient temperature (DPAK)

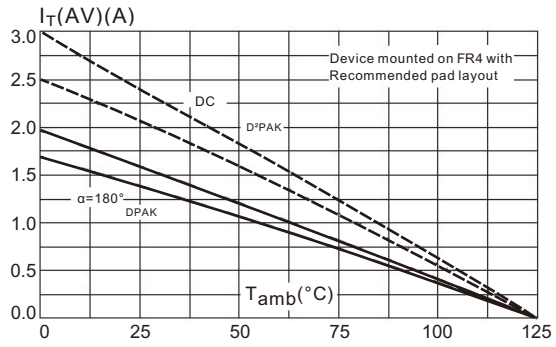



Fig.4 Relative variation of thermal impedance junction to case versus pulse duration

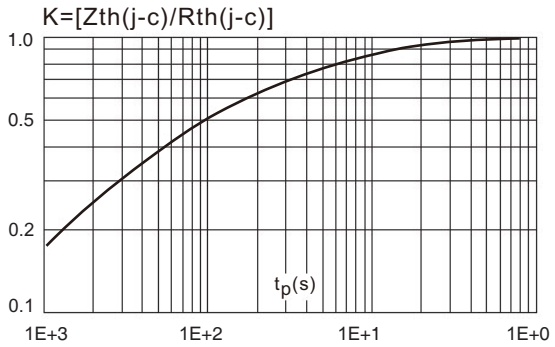


Fig.5 Relative variation of thermal impedance Junction to ambient versus pulse duration (DANK)

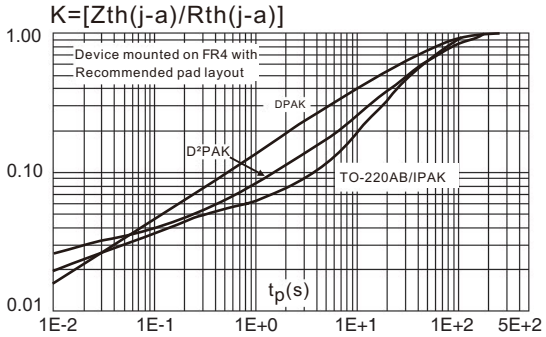



Fig.6 Relative variation of gate trigger and holding current versus junction temperature for $I_{GT}$=200µA

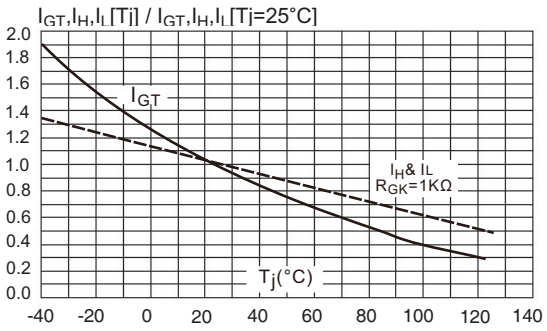



Fig.7 Relative variation of gate trigger and holding current versus junction temperature

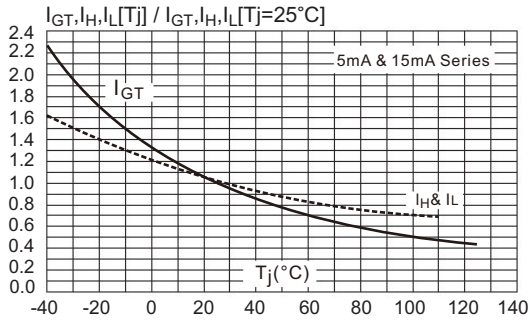



Fig.8 Relative variation of holding current versus gate-cathode resistance (typical values)

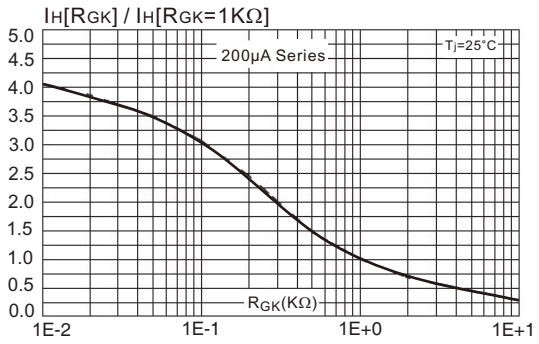



Fig.9 Relative variation of dV/dt immunity versus gate-cathode resistance (Typical values)

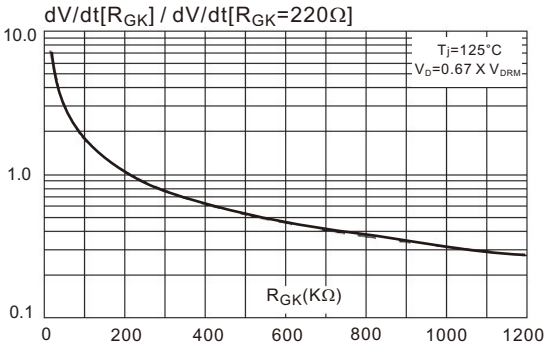



Fig.10 Relative variation of dV/dt immunity versus gate-cathode capacitance (typical values) for $I_{GT}$=200µA

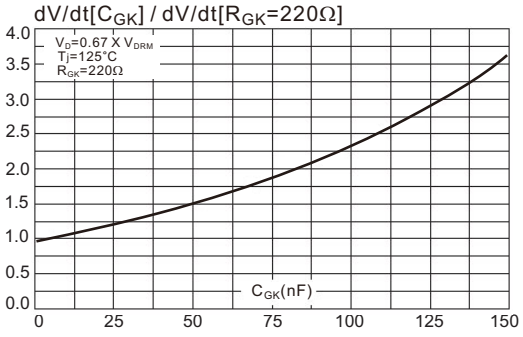


Fig.11 Surge peak on-state current versus number of cycles

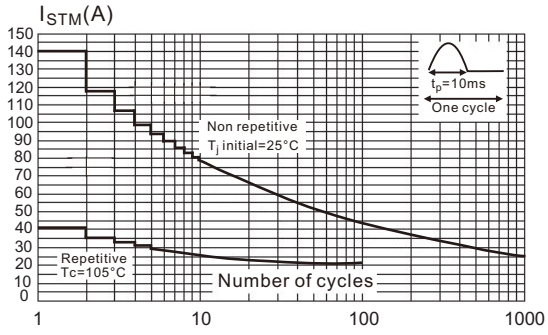



Fig.12 Non-repetitive surge peak on-state current and corresponding values of I²t versus sinusoidal pulse width

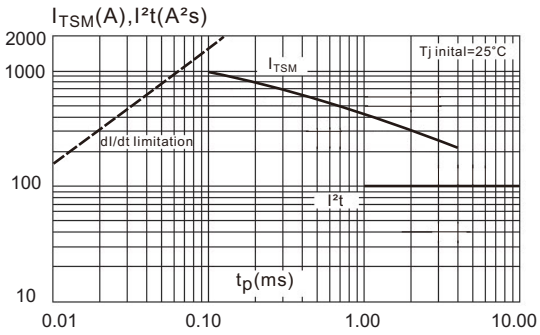



Fig.13 On-state characteristics (maximum values)

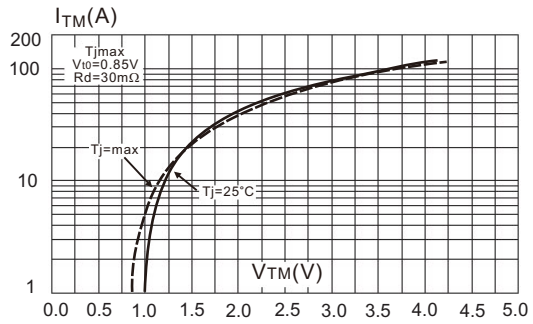
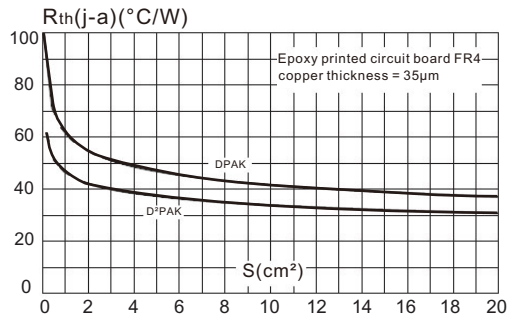
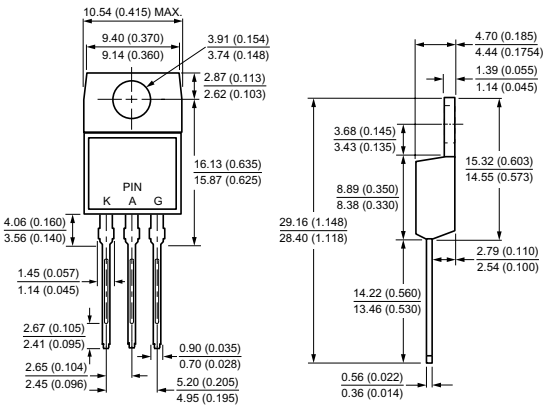


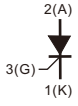

Fig.14 Thermal resistance junction to ambient versus copper surface under tab (D²PAK)




## Case Style

**TO-220AB**

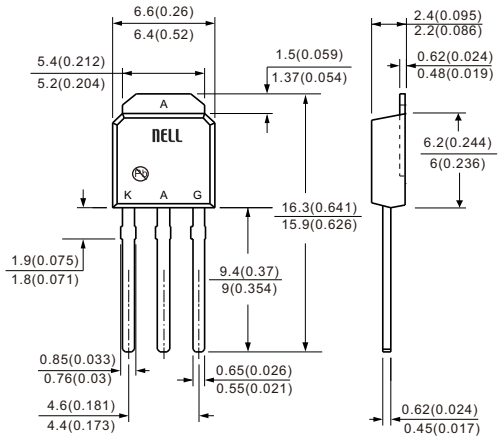


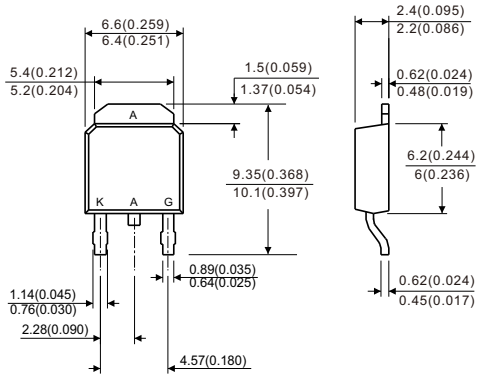

All dimensions in millimeters(inches)

# Case Style

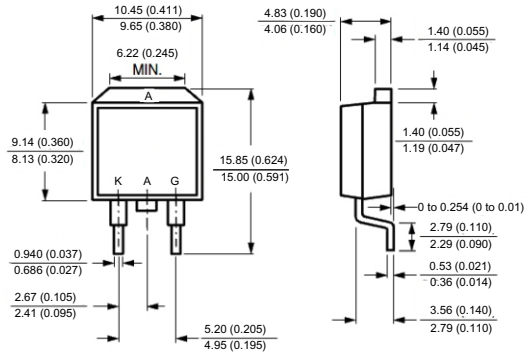
**TO-251**
**(I-PAK)**

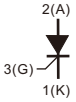



**TO-252**
**(D-PAK)**




**TO-263($D^2PAK$)**




All dimensions in millimeters(inches)