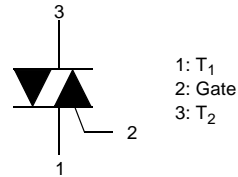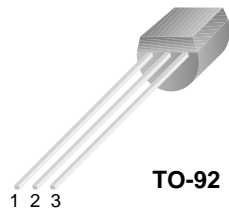**FAIRCHILD**
SEMICONDUCTOR®

August 2006

# FKN1N60SA
## TRIAC (Silicon Bidirectional Thyristor)

### Application Explanation
- Switching mode power supply, light dimmer, electric flasher unit, hair drier
- TV sets, stereo, refrigerator, washing machine
- Electric blanket, solenoid driver, small motor control
- Photo copier, electric tool

**TO-92**

1 2 3

3

1: $T_1$
2: Gate
3: $T_2$

2

1

### Absolute Maximum Ratings $T_a = 25°C$ unless otherwise noted

| Symbol | Parameter | Value | | Rating | Units |
|---|---|---|---|---|---|
| $V_{DRM}$ $V_{RRM}$ | Peak Repetitive Off-State Voltage | Sine Wave 50 to 60Hz, Gate Open | | 600 | V |
| $I_{T (RMS)}$ | RMS On-State Current | Commercial frequency, sine full wave 360° conduction, Tc= 70 ℃ | | 1.0 | A |
| $I_{TSM}$ | Surge On-State Current | Sinewave 1 full cycle, peak value, non-repetitive | 50Hz | 9 | A |
| | | | 60Hz | 10 | A |
| $I^2t$ | $I^2t$ for Fusing | Value corresponding to 1 cycle of halfwave, surge on-state current, tp=8.4ms | | 0.41 | $A^2s$ |
| $P_{GM}$ | Peak Gate Power Dissipation | | | 5 | W |
| $P_{G (AV)}$ | Average Gate Power Dissipation | | | 0.1 | W |
| $V_{GM}$ | Peak Gate Voltage | | | 5 | V |
| $I_{GM}$ | Peak Gate Current | | | 1 | A |
| $T_J$ | Junction Temperature | | | - 40 ~ 125 | °C |
| $T_{STG}$ | Storage Temperature | | | - 40 ~ 125 | °C |

### Thermal Characteristics

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case [note1] | 40 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient [note2] | 160 | °C/W |

Note1: Infinite cooling condition.

Note2: JESD51-10 ( Test Borad: FR4 3.0"*4.5"*0.062", Minimum land pad)

## Electrical Characteristics $T_C$ = 25°C unless otherwise noted

| Symbol | Parameter | | Test Condition | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|---|
| $I_{DRM}$ $I_{RRM}$ | Repetieive Peak Off-State Current | | $V_{DRM}/V_{RRM}$ applied | | - | - | 100 | μA |
| $V_{TM}$ | On-State Voltage | | $T_C$=25°C, $I_{TM}$=1.12A Instantaneous measurement | | - | - | 1.8 | V |
| $V_{GT}$ | Gate Trigger Voltage | I | $V_D$=12V, $R_L$=100Ω | T2(+), Gate (+) | - | - | 2.0 | V |
| | | II | | T2(+), Gate (-) | - | - | 2.0 | V |
| | | III | | T2(-), Gate (-) | - | - | 2.0 | V |
| $I_{GT}$ | Gate Trigger Current | I | $V_D$=12V, $R_L$=100Ω | T2(+), Gate (+) | - | - | 5 | mA |
| | | II | | T2(+), Gate (-) | - | - | 5 | mA |
| | | III | | T2(-), Gate (-) | - | - | 5 | mA |
| $V_{GD}$ | Gate Non-Trigger Voltage | | $T_J$=125°C, $V_D$=1/2$V_{DRM}$ | | 0.2 | - | - | V |
| $I_H$ | Holding Current (I, II,III) | | $V_D$ = 12V, $I_{TM}$ = 200mA | | - | - | 15 | mA |
| $I_L$ | Latching Current | I, III | $V_D$ = 12V, $I_G$ = 10mA | | - | - | 15 | mA |
| | | II | | | - | - | 20 | mA |
| dv/dt(s) | Critical Rate of Rise of Off-State Voltag | | $V_{DRM}$ = 63% Rated, $T_j$ = 125°C, Exponential Rise | | 20 | - | - | V/μs |
| dv/dt(c) | Critical-Rate of Rise of Off-State Commutating Voltage (di/dt=-0.7A/uS) | | | | 3.0 | - | - | V/μs |

## Commutation dv/dt test

| Device | Test Condition | Commutating voltage and current waveforms (inductive load) |
|---|---|---|
| FKN1N60SA | 1. Junction Temperature $T_J$=125°C 2. Rate of decay of on-state commutating current (di/dt)$_C$ 3. Peak off-state voltage $V_D$ = 300V |  |

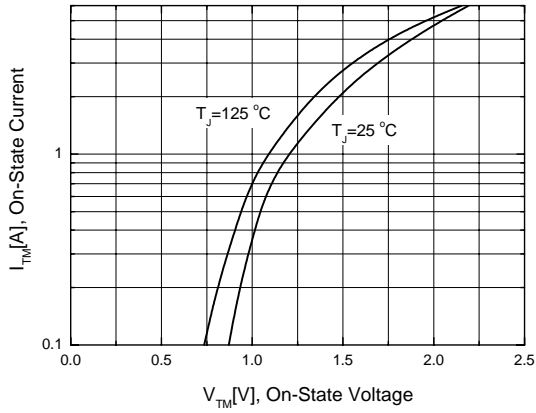FKN1N60SA Rev. A

## Quadrant Definitions for a Triac
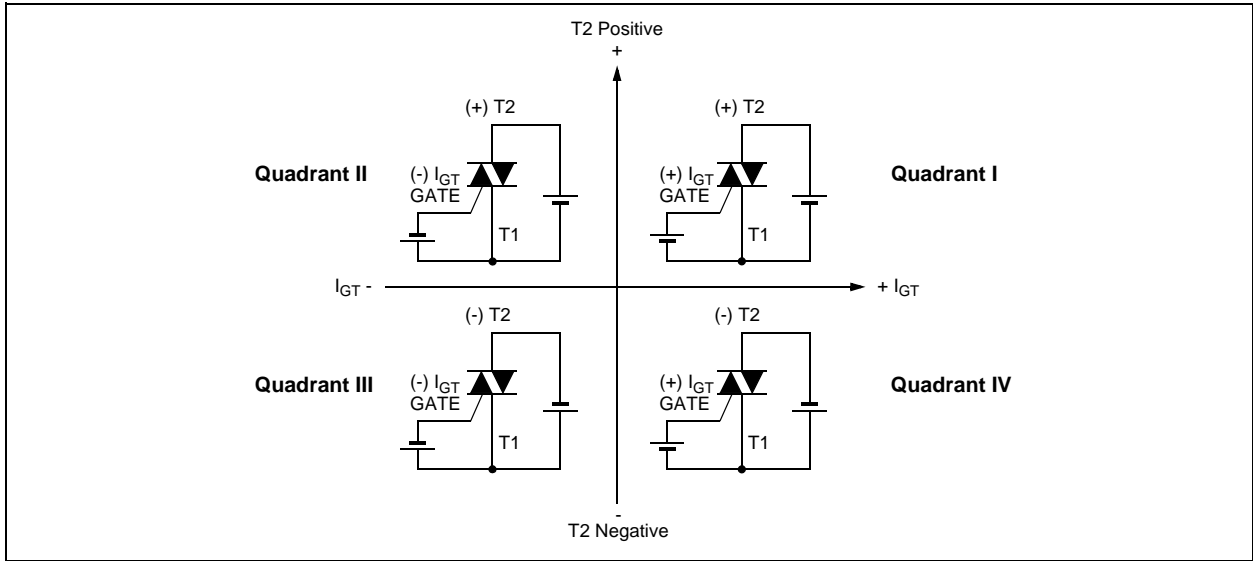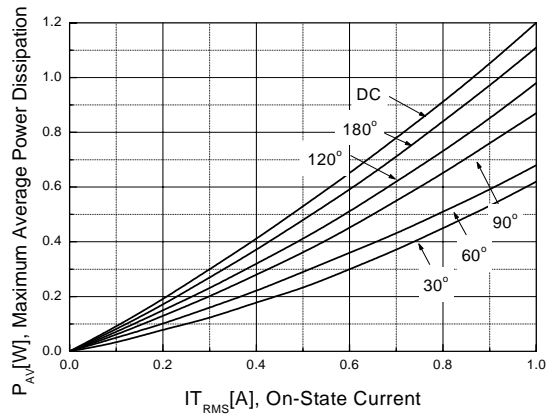


## Package Marking and Ordering Information

| Device Marking | Device | Package | Packing | Tape Width | Quantity |
|---|---|---|---|---|---|
| K1N60SA | FKN1N60SA | TO-92 | Bulk | -- | -- |

# Typical Performance Characteristics

### Figure 1. On-State Characteristics



$I_{TM}$[A], On-State Current vs $V_{TM}$[V], On-State Voltage

$T_J$=125 °C
$T_J$=25 °C

### Figure 2. Power Dissipation



$P_{AV}$[W], Maximum Average Power Dissipation vs $IT_{RMS}$[A], On-State Current

DC
180°
120°
90°
60°
30°

### Figure 3. RMS Current Rating



Maximum Allowable Case Temperature, $T_C$[°C] vs $IT_{RMS}$[A], On-State Current

30°
60°
90°
120°
180°
DC
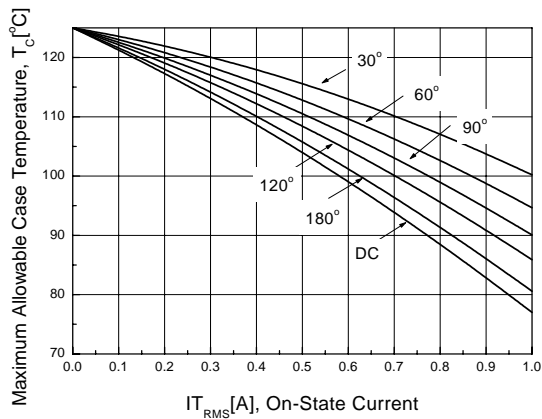
### Figure 4. Typical Gate Trigger Current vs Junction Temperature



$I_{GT}$[mA], Gate Trigger Current vs $T_J$[°C], Junction Temperature

Q3
Q2
Q1
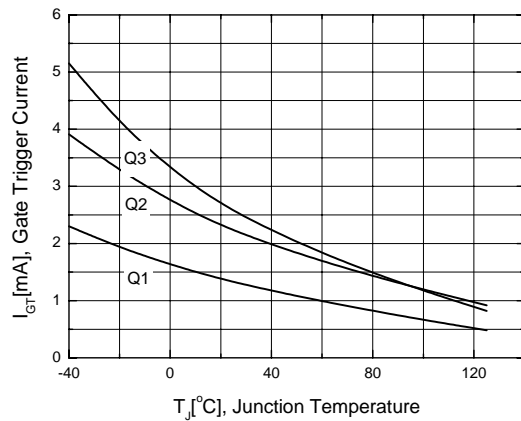
### Figure5. Typical Gate Voltage vs Junction Temperarure



$V_{GT}$[mA], Gate Trigger Voltage vs $T_J$[°C], Junction Temperature

Q3
Q1
Q2
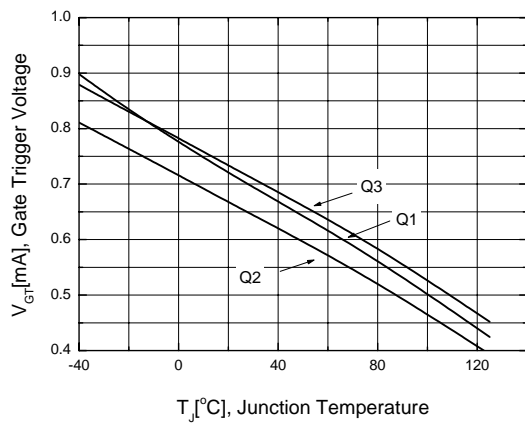
### Figure6. Typical Latching Currrent vs Junction Temperature



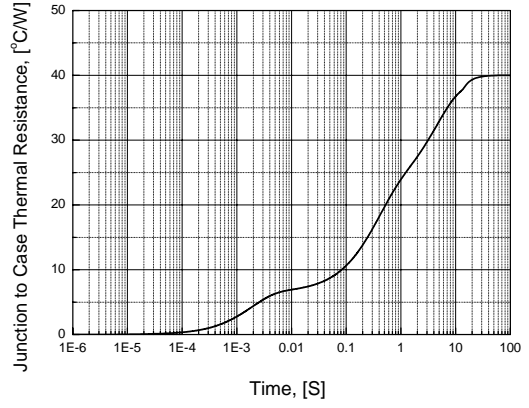$V_{GT}$[mA], Gate Trigger Voltage vs $T_J$[°C], Junction Temperature

Q3
Q1
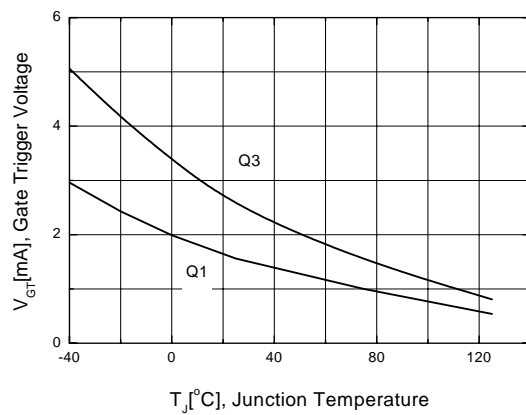
## Typical Performance Characteristics (Continued)

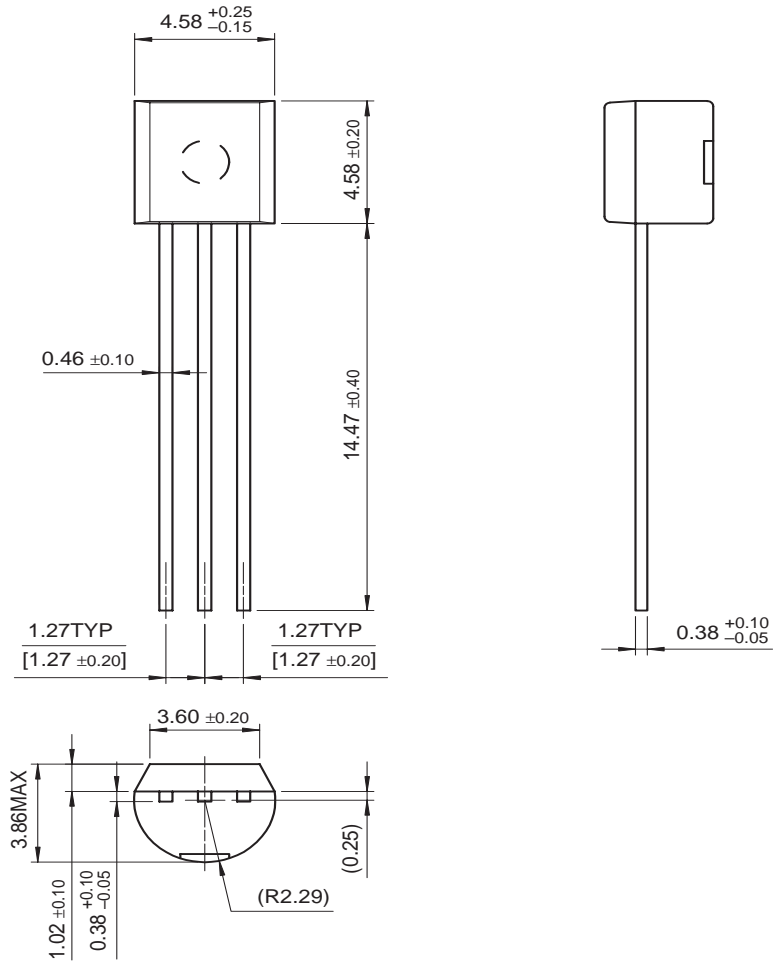**Figure7. Typical Holding Current vs Junction Temperature**
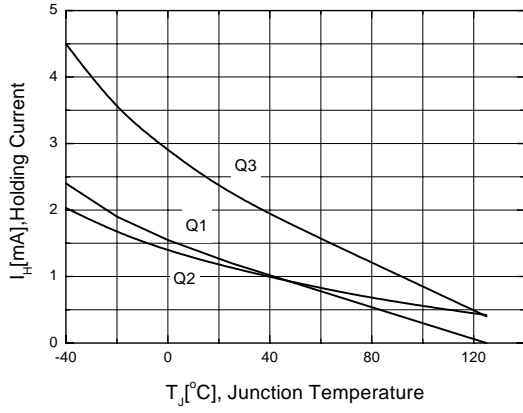


**Figure8. Junction to Case Thermal Resistance**

## Package Dimension

### TO-92

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