# GSRU SERIES

NPN Silicon Epitaxial Transistor

## HIGH POWER NPN

GSRU20030
GSRU20035
GSRU20040

The GSRU series of NPN sillicon transistors is designed for high speed switching systems.

This unique series features manufacturing process which provides surface stabilization for high voltage operation and enhaces long term reliability.

**NPN**
**300, 350, 400V**
**20 AMP SWITCHING**
**$t_f$ -100ns TYPICAL**

**TO-204AA (TO-3)**

- **High Speed**
- **Rugged**
- **Cost Effective**
- **Offline Power Suplies**
- **Switching Amplifilers**
- **Inverters/Converters**
- **Motor Speed Control Circuits**
- **Switching Regulators**
- **Solenoid & Relay Drivers**

**MAXIMUM RATINGS** ($T_C$=25° C unless otherwise noted)

| RATING | SYMBOL | GSRU20030 | GSRU20035 | GSRU20040 | UNIT |
|---|---|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 400 | 450 | 500 | Volts |
| Collector-Emitter Voltage | $V_{CEO}$ | 300 | 350 | 400 | Volts |
| Emitter-Base Voltage | $V_{EBO}$ | 8.0 | 8.0 | 8.0 | Volts |
| Collector Current-Continuous<br>Peak | $I_C$<br>$I_{GM}$ | 25<br>30 | 25<br>30 | 25<br>30 | Amps<br>Amps |
| Base Current-Continuous | $I_B$ | 10 | 10 | 10 | Amps |
| Total Power Dissipation @ $T_C$=25°C | $P_D$ | 200 | 200 | 200 | Watts |
| $O_{J-C1}$ Junction to Case Thermal Resistance | $R_{EJC}$ | .875 | .875 | .875 | °C/W |
| Operating and Storage Junction Temp Range | $T_{(LOPER)}$<br>$T_{STG}$ | -65 to+200 | -65 to +200 | -65 to +200 | °C |

| ELECTRIACL CHARACTERISTICS ($T_C$ = 25°C unless otherwise noted) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | GSRU20030 | | GSRU20035 | | GSRU20040 | | |
| SYMBOL | CONDITIONS | Min | Max | Min | Max | Min | Max | Unit |
| $V_{CBO}$ | $I_C$ = 1.0mA | 400 | - | 450 | - | 500 | - | Volts |
| $V_{CEO}$ | $I_D$ = 50mA | 300 | - | 350 | - | 400 | - | Volts |
| $V_{EBO}$ | $I_E$ = 1.0mA | 8.0 | - | 8.0 | - | 8.0 | - | Volts |
| $I_{CBO}$ | $V_{CB}$ =80% of Rated $V_{CBO}$ | - | 100 | - | 100 | - | 100 | µA |
| $I_{EBO}$ | $V_{EB}$=5.0V | - | 10 | - | 10 | - | 10 | µA |
| $H_{FET}$ | $V_{CE}$=5.0V, $I_C$ =20A | 8.0 | - | 8.0 | - | 8.0 | - | - |
| $V_{CE(SA)}$ t | $I_C$=20A, $I_B$=4.0A | - | 1.5 | -1.5 | - | 1.5 | - | Volts |
| $V_{BE(SA)}$ t | $I_C$=20A, $I_B$=4.0A | - | 1.6 | - | 1.6 | - | 1.6 | Volts |
| F | $V_{CE}$ = 10V, $I_C$=1.0A, f =10MHZ | 10 | - | 20 | - | 20 | - | MHz |
| $C_{OBO}$ | $V_{CB}$=10V, f=1.0MHZ | - | 500 | - | 500 | - | 500 | pF |
| SWITCHING | | Typ | Max | Typ | Max | Typ | Max | Unit |
| $t_d$ | **Resistive Load**<br>$V_{CC}$ = 250V<br>$I_C$ = 20A, R=12.5 Ω<br>$I_{B1}$ = Ib2 = 4.0A<br>$t_P$ = 50 µSec | 0.025 | 0.07 | 0.05 | 0.07 | 0.05 | 0.07 | µs |
| $t_r$ | | 0.25 | 0.50 | 0.25 | 0.50 | 0.25 | 0.50 | µs |
| $t_s$ | | 2.00 | 2.50 | 2.00 | 2.50 | 2.00 | 2.50 | µs |
| $t_f$ | | 0.10 | 0.20 | 0.10 | 0.20 | 0.10 | 0.20 | µs |
| $t_s$ | **Inductive Load**<br>$V_{CLAMP}$ = 250V<br>$I_C$ = 20A, L = 100 µH<br>$I_{B1}$=$I_{B2}$ = 4.0A<br>$t_P$ = 50 µsec | 1.70 | 2.40 | 1.70 | 2.40 | 1.70 | 2.40 | µs |
| $t_{rv}$ | | 0.20 | 0.35 | 0.20 | 0.35 | 0.20 | 0.35 | µs |
| $t_{fi}$ | | 0.07 | 0,12 | 0.07 | 0.12 | 0.08 | 0.12 | µs |
| $t_c$ | | 0.30 | 0.50 | 0.30 | 0.50 | 0.30 | 0.50 | µs |
| $t_s$ 100 °C | | 2.00 | 3.00 | 2.00 | 3.00 | 2.00 | 3.00 | µs |
| $t_{rv}$ 100 °C | | 0.25 | 0.40 | 0.25 | 0.40 | 0.25 | 0.40 | µs |
| $t_{fi}$ 100 °C | | 0.10 | 0.20 | 0.10 | 0.20 | 0.10 | 0.20 | µs |
| $t_c$ 100 °C | | 0.40 | 0.70 | 0.40 | 0.70 | 0.40 | 0.70 | µs |

t pulse conditions: width=300µs; duty cycls<=2% (measured using kelvin connections).

**Tel. 1-973-377-9566, Fax. 1-973-377-3078**
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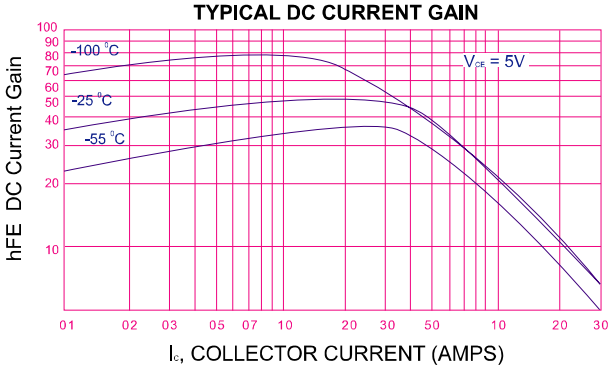
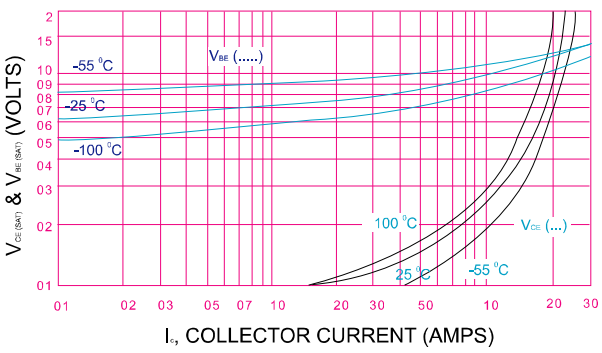
**Aerospace Mgmt. Sys. Cert.**
AS/EN/JISQ9100:2009 Rev. C
ISO9001:2008
Cert No. 45325

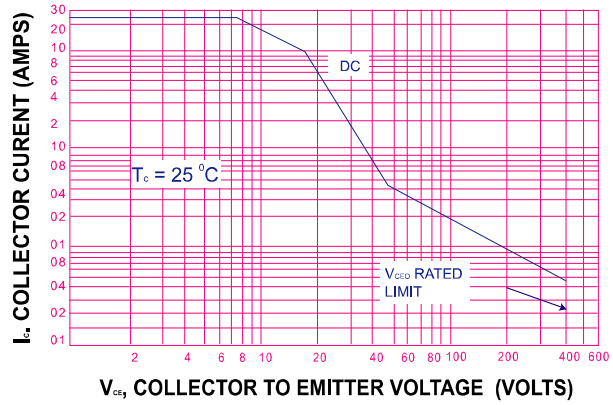
## TYPICAL DC CURRENT GAIN



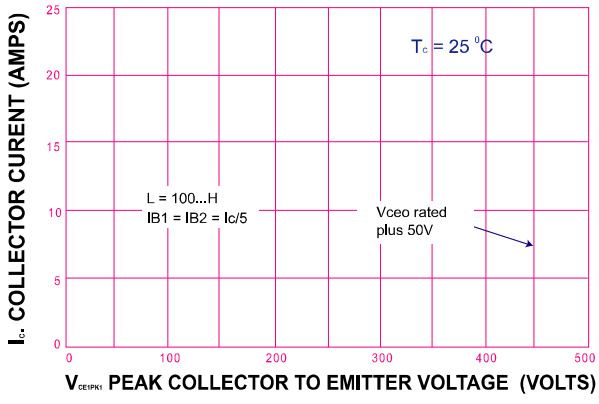

## TYPICAL SATURATION VOLTAGE



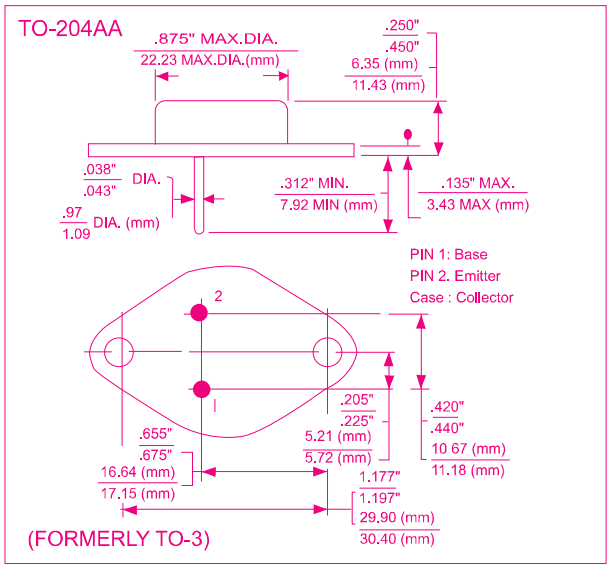

## FORWARD BIASED SAFE OPERATING AREA

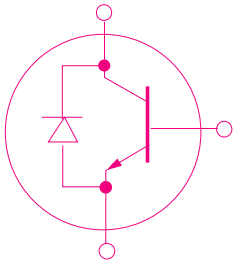



## TURN-OFF SAFE OPERATING AREA




## PACKAGE OUTLINE



Note:
The technology utilized to produce these devlces results in an internal diode between the collector and emitter. In some cases this may eliminate the need for an external diode to clamp inductive loads. At 20 A, tr = 600 ns and Vf = 1.25V (typical).

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