

## HIGH VOLTAGE MEDIUM CURRENT DRIVER ARRAYS

### DESCRIPTION

The SG2000 series integrates seven NPN Darlington pairs with internal suppression diodes to drive lamps, relays, and solenoids in many military, aerospace, and industrial applications that require severe environments. All units feature open collector outputs with greater than 50V breakdown voltages combined with 500mA current carrying capabilities. Five different input configurations provide optimized designs for interfacing with DTL, TTL, PMOS, or CMOS drive signals. These devices are designed to operate from -55°C to 125°C ambient temperature in a 16 pin dual in line ceramic (J) package and 20 pin Leadless Chip Carrier (LCC). The plastic dual in-line (N) is designed to operate over the commercial temperature range of 0°C to 70°C.

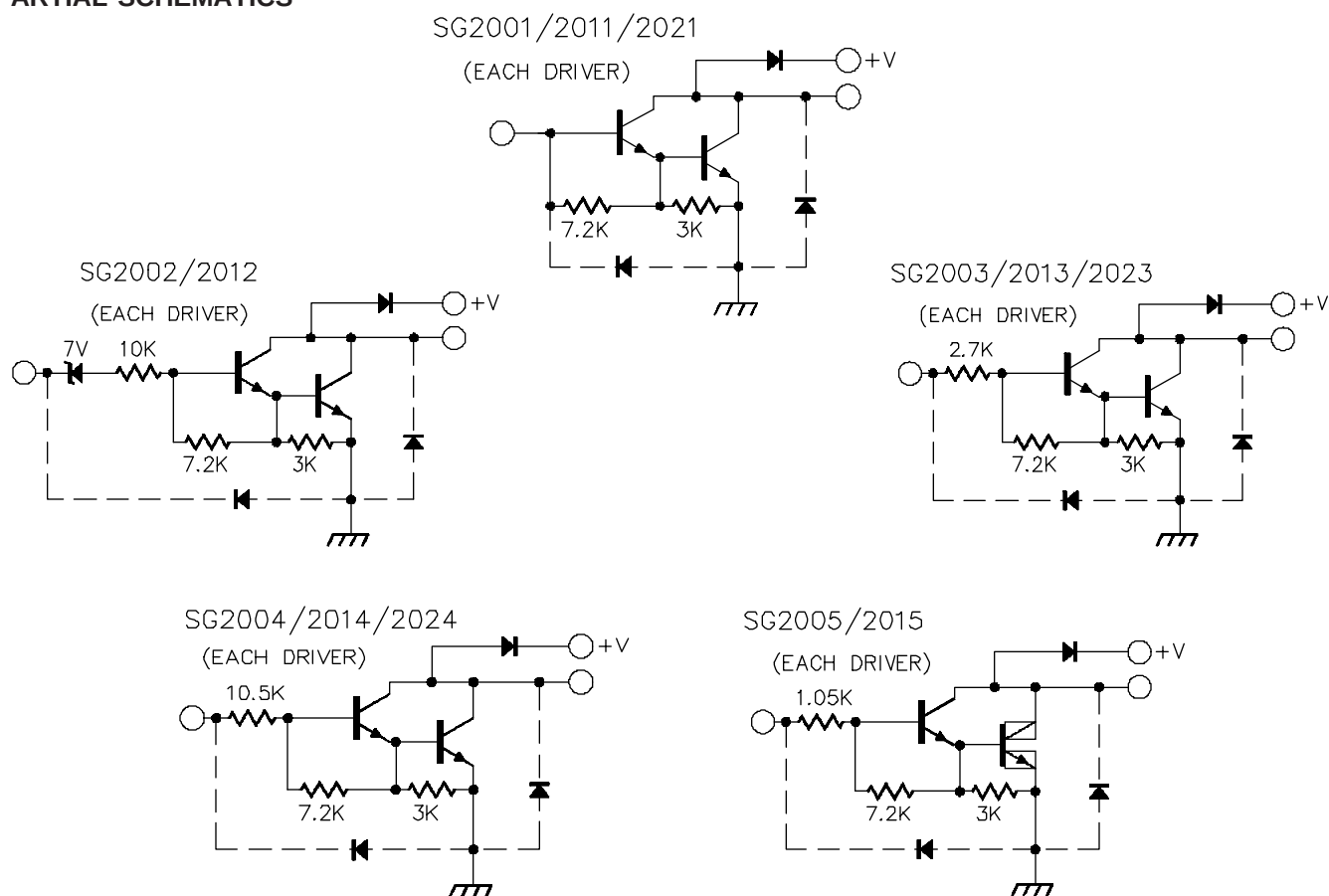
### FEATURES

- Seven npn Darlington pairs
- -55°C to 125°C ambient operating temperature range
- Collector currents to 600mA
- Output voltages from 50V to 95V
- Internal clamping diodes for inductive loads
- DTL, TTL, PMOS, or CMOS compatible inputs
- Hermetic ceramic package

### HIGH RELIABILITY FEATURES

- ◆ Available to MIL-STD-883 and DESC SMD
- ◆ MIL-M38510/14101BEA - JAN2001J
- ◆ MIL-M38510/14102BEA - JAN2002J
- ◆ MIL-M38510/14103BEA - JAN2003J
- ◆ MIL-M38510/14104BEA - JAN2004J
- ◆ Radiation data available
- ◆ LMI level "S" processing available

### PARTIAL SCHEMATICS



## ABSOLUTE MAXIMUM RATINGS (Note 1)

Output Voltage,  $V_{CE}$   
 (SG2000, 2010 series) ..... 50V  
 (SG2020 series) ..... 95V  
 Input Voltage,  $V_{IN}$   
 (SG2002,3,4) ..... 30V  
 Continuous Input Current,  $I_{IN}$  ..... 25mA

Peak Collector Current,  $I_C$   
 (SG2000, 2020) ..... 500mA  
 (SG2010) ..... 600mA  
 Operating Junction Temperature  
 Hermetic (J, L Packages) ..... 150°C  
 Plastic (N, Packages) ..... 150°C  
 Storage Temperature Range ..... -65°C to 150°C  
 Lead Temperature (Soldering 10 sec.) ..... 300°C

Note 1. Values beyond which damage may occur.

## THERMAL DATA

J Package:

Thermal Resistance-Junction to Case,  $\theta_{JC}$  ..... 30°C/W  
 Thermal Resistance-Junction to Ambient,  $\theta_{JA}$  ..... 80°C/W

N Package:

Thermal Resistance-Junction to Case,  $\theta_{JC}$  ..... 40°C/W  
 Thermal Resistance-Junction to Ambient,  $\theta_{JA}$  ..... 65°C/W

L Package:

Thermal Resistance-Junction to Case,  $\theta_{JC}$  ..... 35°C/W  
 Thermal Resistance-Junction to Ambient,  $\theta_{JA}$  ..... 120°C/W

Note A. Junction Temperature Calculation:  $T_J = T_A + (P_D \times \theta_{JA})$ .

Note B. The above numbers for  $\theta_{JC}$  are maximums for the limiting thermal resistance of the package in a standard mounting configuration. The  $\theta_{JA}$  numbers are meant to be guidelines for the thermal performance of the device/pc-board system. All of the above assume no ambient airflow.

## RECOMMENDED OPERATING CONDITIONS (Note 2)

Output Voltage,  $V_{CE}$   
 SG2000, SG2010 series ..... 50V  
 SG2020 series ..... 95V

Peak Collector Current,  $I_C$   
 SG2000, SG2020 series ..... 50mA  
 SG2010 series ..... 500mA  
 Operating Ambient Temperature Range  
 SG2000 Series - Hermetic ..... -55°C to 125°C  
 SG2000 Series - Plastic ..... 0°C to 70°C

Note 2. Range over which the device is functional.

## SELECTION GUIDE

| Device | $V_{CE}$ Max | $I_C$ Max | Logic Inputs               |
|--------|--------------|-----------|----------------------------|
| SG2001 | 50V          | 500mA     | General Purpose PMOS, CMOS |
| SG2002 | 50V          | 500mA     | 14V-25V PMOS               |
| SG2003 | 50V          | 500mA     | 5V TTL, CMOS               |
| SG2004 | 50V          | 500mA     | 6V-15V CMOS, PMOS          |
| SG2011 | 50V          | 600mA     | General Purpose PMOS, CMOS |
| SG2012 | 50V          | 600mA     | 14V-25V PMOS               |

| Device | $V_{CE}$ Max | $I_C$ Max | Logic Inputs               |
|--------|--------------|-----------|----------------------------|
| SG2013 | 50V          | 600mA     | 5V TTL, CMOS               |
| SG2014 | 50V          | 600mA     | 6V-15V CMOS, PMOS          |
| SG2015 | 50V          | 600mA     | High Output TTL            |
| SG2021 | 95V          | 500mA     | General Purpose PMOS, CMOS |
| SG2023 | 95V          | 500mA     | 5V TTL, CMOS               |
| SG2024 | 95V          | 500mA     | 6V-15V CMOS, PMOS          |
|        |              |           |                            |

## ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, these specifications apply over the operating ambient temperatures for SG2000 series - Hermetic - with  $-55^{\circ}\text{C} \leq T_A \leq 125^{\circ}\text{C}$  and SG2000 series - Plastic - with  $0^{\circ}\text{C} \leq T_A \leq 70^{\circ}\text{C}$ . Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.)

SG2001 thru SG2004

| Parameter                                      | Applicable Devices | Temp.                      | Test Conditions                                         | Limits |      |      | Units         |
|------------------------------------------------|--------------------|----------------------------|---------------------------------------------------------|--------|------|------|---------------|
|                                                |                    |                            |                                                         | Min.   | Typ. | Max. |               |
| Output Leakage Current ( $I_{\text{CEX}}$ )    | All                |                            | $V_{\text{CE}} = 50\text{V}$                            |        |      | 100  | $\mu\text{A}$ |
|                                                | SG2002             |                            | $V_{\text{CE}} = 50\text{V}, V_{\text{IN}} = 6\text{V}$ |        |      | 500  | $\mu\text{A}$ |
|                                                | SG2004             |                            | $V_{\text{CE}} = 50\text{V}, V_{\text{IN}} = 1\text{V}$ |        |      | 500  | $\mu\text{A}$ |
| Collector - Emitter ( $V_{\text{CE(SAT)}}$ )   | All                | $T_A = T_{\text{MIN}}$     | $I_C = 350\text{mA}, I_B = 850\mu\text{A}$              |        | 1.6  | 1.8  | V             |
|                                                |                    | $T_A = T_{\text{MIN}}$     | $I_C = 200\text{mA}, I_B = 550\mu\text{A}$              |        | 1.3  | 1.5  | V             |
|                                                |                    | $T_A = T_{\text{MIN}}$     | $I_C = 100\text{mA}, I_B = 350\mu\text{A}$              |        | 1.1  | 1.3  | V             |
|                                                |                    | $T_A = 25^{\circ}\text{C}$ | $I_C = 350\text{mA}, I_B = 500\mu\text{A}$              |        | 1.25 | 1.6  | V             |
|                                                |                    | $T_A = 25^{\circ}\text{C}$ | $I_C = 200\text{mA}, I_B = 350\mu\text{A}$              |        | 1.1  | 1.3  | V             |
|                                                |                    | $T_A = 25^{\circ}\text{C}$ | $I_C = 100\text{mA}, I_B = 250\mu\text{A}$              |        | 0.9  | 1.1  | V             |
|                                                |                    | $T_A = T_{\text{MAX}}$     | $I_C = 350\text{mA}, I_B = 500\mu\text{A}$              |        | 1.6  | 1.8  | V             |
|                                                |                    | $T_A = T_{\text{MAX}}$     | $I_C = 200\text{mA}, I_B = 350\mu\text{A}$              |        | 1.3  | 1.5  | V             |
|                                                |                    | $T_A = T_{\text{MAX}}$     | $I_C = 100\text{mA}, I_B = 250\mu\text{A}$              |        | 1.1  | 1.3  | V             |
| Input Current ( $I_{\text{IN(ON)}}$ )          | SG2002             |                            | $V_{\text{IN}} = 17\text{V}$                            | 480    | 850  | 1300 | $\mu\text{A}$ |
|                                                | SG2003             |                            | $V_{\text{IN}} = 3.85\text{V}$                          | 650    | 930  | 1350 | $\mu\text{A}$ |
|                                                | SG2004             |                            | $V_{\text{IN}} = 5\text{V}$                             | 240    | 350  | 500  | $\mu\text{A}$ |
|                                                |                    |                            | $V_{\text{IN}} = 12\text{V}$                            | 650    | 1000 | 1450 | $\mu\text{A}$ |
| $(I_{\text{IN(OFF)}}$ )                        | All                | $T_A = T_{\text{MAX}}$     | $I_C = 500\mu\text{A}$                                  | 25     | 50   |      | $\mu\text{A}$ |
| Input Voltage ( $V_{\text{IN(ON)}}$ )          | SG2002             | $T_A = T_{\text{MIN}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 300\text{mA}$         |        |      | 18   | V             |
|                                                |                    | $T_A = T_{\text{MAX}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 300\text{mA}$         |        |      | 13   | V             |
|                                                | SG2003             | $T_A = T_{\text{MIN}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 200\text{mA}$         |        |      | 3.3  | V             |
|                                                |                    | $T_A = T_{\text{MIN}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 250\text{mA}$         |        |      | 3.6  | V             |
|                                                |                    | $T_A = T_{\text{MIN}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 300\text{mA}$         |        |      | 3.9  | V             |
|                                                |                    | $T_A = T_{\text{MIN}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 200\text{mA}$         |        |      | 2.4  | V             |
|                                                |                    | $T_A = T_{\text{MAX}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 250\text{mA}$         |        |      | 2.7  | V             |
|                                                |                    | $T_A = T_{\text{MAX}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 300\text{mA}$         |        |      | 3.0  | V             |
|                                                | SG2004             | $T_A = T_{\text{MIN}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 125\text{mA}$         |        |      | 6.0  | V             |
|                                                |                    | $T_A = T_{\text{MIN}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 200\text{mA}$         |        |      | 8.0  | V             |
|                                                |                    | $T_A = T_{\text{MIN}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 275\text{mA}$         |        |      | 10   | V             |
|                                                |                    | $T_A = T_{\text{MIN}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 350\text{mA}$         |        |      | 12   | V             |
|                                                |                    | $T_A = T_{\text{MAX}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 125\text{mA}$         |        |      | 5.0  | V             |
|                                                |                    | $T_A = T_{\text{MAX}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 200\text{mA}$         |        |      | 6.0  | V             |
|                                                |                    | $T_A = T_{\text{MAX}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 275\text{mA}$         |        |      | 7.0  | V             |
|                                                |                    | $T_A = T_{\text{MAX}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 350\text{mA}$         |        |      | 8.0  | V             |
| D-C Forward Current                            | SG2001             | $T_A = T_{\text{MIN}}$     | $V_{\text{CE}} = 2\text{V}, I_C = 350\text{mA}$         | 500    |      |      |               |
| Transfer Ratio ( $h_{\text{FE}}$ )             |                    | $T_A = 25^{\circ}\text{C}$ | $V_{\text{CE}} = 2\text{V}, I_C = 350\text{mA}$         | 1000   |      |      |               |
| Input Capacitance ( $C_{\text{IN}}$ ) (Note 3) | All                | $T_A = 25^{\circ}\text{C}$ |                                                         |        | 15   | 25   | pF            |
| Turn-On Delay (TPLH)                           | All                | $T_A = 25^{\circ}\text{C}$ | $0.5 E_{\text{IN}}$ to $0.5 E_{\text{OUT}}$             |        | 250  | 1000 | ns            |
| Turn-Off Delay (TPHL)                          | All                | $T_A = 25^{\circ}\text{C}$ | $0.5 E_{\text{IN}}$ to $0.5 E_{\text{OUT}}$             |        | 250  | 1000 | ns            |
| Clamp Diode Leakage Current ( $I_{\text{R}}$ ) | All                |                            | $V_{\text{R}} = 50\text{V}$                             |        |      | 50   | $\mu\text{A}$ |
| Clamp Diode Forward Voltage ( $V_{\text{F}}$ ) | All                |                            | $I_{\text{F}} = 350\text{mA}$                           |        | 1.7  | 2.0  | V             |

Note 3. These parameters, although guaranteed, are not tested in production.

## ELECTRICAL CHARACTERISTICS (continued)

SG2011 thru SG2015

| Parameter                               | Applicable Devices | Temp.              | Test Conditions                | Limits |      |      | Units   |
|-----------------------------------------|--------------------|--------------------|--------------------------------|--------|------|------|---------|
|                                         |                    |                    |                                | Min.   | Typ. | Max. |         |
| Output Leakage Current ( $I_{CEX}$ )    | All                |                    | $V_{CE} = 50V$                 |        |      | 100  | $\mu A$ |
|                                         | SG2012             |                    | $V_{CE} = 50V, V_{IN} = 6V$    |        |      | 500  | $\mu A$ |
|                                         | SG2014             |                    | $V_{CE} = 50V, V_{IN} = 1V$    |        |      | 500  | $\mu A$ |
| Collector - Emitter ( $V_{CE(SAT)}$ )   | All                | $T_A = T_{MIN}$    | $I_C = 500mA, I_B = 1100\mu A$ |        | 1.8  | 2.1  | V       |
|                                         |                    | $T_A = T_{MIN}$    | $I_C = 350mA, I_B = 850\mu A$  |        | 1.6  | 1.8  | V       |
|                                         |                    | $T_A = T_{MIN}$    | $I_C = 200mA, I_B = 550\mu A$  |        | 1.3  | 1.5  | V       |
|                                         |                    | $T_A = 25^\circ C$ | $I_C = 500mA, I_B = 600\mu A$  |        | 1.7  | 1.9  | V       |
|                                         |                    | $T_A = 25^\circ C$ | $I_C = 350mA, I_B = 500\mu A$  |        | 1.25 | 1.6  | V       |
|                                         |                    | $T_A = 25^\circ C$ | $I_C = 200mA, I_B = 350\mu A$  |        | 1.1  | 1.3  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $I_C = 500mA, I_B = 600\mu A$  |        | 1.8  | 2.1  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $I_C = 350mA, I_B = 500\mu A$  |        | 1.6  | 1.8  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $I_C = 200mA, I_B = 350\mu A$  |        | 1.3  | 1.5  | V       |
| Input Current ( $I_{IN(ON)}$ )          | SG2012             |                    | $V_{IN} = 17V$                 | 480    | 850  | 1300 | $\mu A$ |
|                                         | SG2013             |                    | $V_{IN} = 3.85V$               | 650    | 930  | 1350 | $\mu A$ |
|                                         | SG2014             |                    | $V_{IN} = 5V$                  | 240    | 350  | 500  | $\mu A$ |
|                                         |                    |                    | $V_{IN} = 12V$                 | 650    | 1000 | 1450 | $\mu A$ |
|                                         | SG2015             |                    | $V_{IN} = 3V$                  | 1180   | 1500 | 2400 | $\mu A$ |
|                                         | All                |                    | $I_C = 500\mu A$               | 25     | 50   |      | $\mu A$ |
| Input Voltage ( $V_{IN(ON)}$ )          | SG2012             | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 500mA$     |        |      | 23.5 | V       |
|                                         |                    | $T_A = T_{MIN}$    | $V_{CE} = 2V, I_C = 500mA$     |        |      | 17   | V       |
|                                         |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 250mA$     |        |      | 3.6  | V       |
|                                         | SG2013             | $T_A = T_{MIN}$    | $V_{CE} = 2V, I_C = 300mA$     |        |      | 3.9  | V       |
|                                         |                    | $T_A = T_{MIN}$    | $V_{CE} = 2V, I_C = 500mA$     |        |      | 6.0  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 250mA$     |        |      | 2.7  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 300mA$     |        |      | 3.0  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 500mA$     |        |      | 3.5  | V       |
|                                         | SG2014             | $T_A = T_{MIN}$    | $V_{CE} = 2V, I_C = 275mA$     |        |      | 10   | V       |
|                                         |                    | $T_A = T_{MIN}$    | $V_{CE} = 2V, I_C = 350mA$     |        |      | 12   | V       |
|                                         |                    | $T_A = T_{MIN}$    | $V_{CE} = 2V, I_C = 500mA$     |        |      | 17   | V       |
|                                         |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 275mA$     |        |      | 7.0  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 350mA$     |        |      | 8.0  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 500mA$     |        |      | 9.5  | V       |
|                                         | SG2015             | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 350mA$     |        |      | 3.0  | V       |
|                                         |                    | $T_A = T_{MIN}$    | $V_{CE} = 2V, I_C = 500mA$     |        |      | 3.5  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 350mA$     |        |      | 2.4  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 500mA$     |        |      | 2.6  | V       |
| D-C Forward Current                     | SG2011             | $T_A = T_{MIN}$    | $V_{CE} = 2V, I_C = 500mA$     | 450    |      |      |         |
| Transfer Ratio ( $h_{FE}$ )             |                    | $T_A = 25^\circ C$ | $V_{CE} = 2V, I_C = 500mA$     | 900    |      |      |         |
| Input Capacitance ( $C_{IN}$ ) (Note 3) | All                | $T_A = 25^\circ C$ |                                |        | 15   | 25   | pF      |
| Turn-On Delay (TPLH)                    | All                | $T_A = 25^\circ C$ | $0.5 E_{IN}$ to $0.5 E_{OUT}$  |        | 250  | 1000 | ns      |
| Turn-Off Delay (TPHL)                   | All                | $T_A = 25^\circ C$ | $0.5 E_{IN}$ to $0.5 E_{OUT}$  |        | 250  | 1000 | ns      |
| Clamp Diode Leakage Current ( $I_R$ )   | All                |                    | $V_R = 50V$                    |        |      | 50   | $\mu A$ |
| Clamp Diode Forward Voltage ( $V_F$ )   | All                |                    | $I_F = 350mA$                  |        | 1.7  | 2.0  | V       |
|                                         |                    |                    | $I_F = 500mA$                  |        |      | 2.5  | V       |

Note 3. These parameters, although guaranteed, are not tested in production.

## ELECTRICAL CHARACTERISTICS (continued)

SG2021 thru SG2024

| Parameter                               | Applicable Devices | Temp.              | Test Conditions               | Limits |      |      | Units   |
|-----------------------------------------|--------------------|--------------------|-------------------------------|--------|------|------|---------|
|                                         |                    |                    |                               | Min.   | Typ. | Max. |         |
| Output Leakage Current ( $I_{CEX}$ )    | All                |                    | $V_{CE} = 95V$                |        |      | 100  | $\mu A$ |
|                                         | SG2024             |                    | $V_{CE} = 95V, V_{IN} = 1V$   |        |      | 500  | $\mu A$ |
| Collector - Emitter ( $V_{CE(SAT)}$ )   | All                | $T_A = T_{MIN}$    | $I_C = 350mA, I_B = 850\mu A$ |        | 1.6  | 1.8  | V       |
|                                         |                    | $T_A = T_{MIN}$    | $I_C = 200mA, I_B = 550\mu A$ |        | 1.3  | 1.5  | V       |
|                                         |                    | $T_A = T_{MIN}$    | $I_C = 100mA, I_B = 350\mu A$ |        | 1.1  | 1.3  | V       |
|                                         |                    | $T_A = 25^\circ C$ | $I_C = 350mA, I_B = 500\mu A$ |        | 1.25 | 1.6  | V       |
|                                         |                    | $T_A = 25^\circ C$ | $I_C = 200mA, I_B = 350\mu A$ |        | 1.1  | 1.3  | V       |
|                                         |                    | $T_A = 25^\circ C$ | $I_C = 100mA, I_B = 250\mu A$ |        | 0.9  | 1.1  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $I_C = 350mA, I_B = 500\mu A$ |        | 1.6  | 1.8  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $I_C = 200mA, I_B = 350\mu A$ |        | 1.3  | 1.5  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $I_C = 100mA, I_B = 250\mu A$ |        | 1.1  | 1.3  | V       |
| Input Current ( $I_{IN(ON)}$ )          | SG2023             |                    | $V_{IN} = 3.85V$              | 650    | 930  | 1350 | $\mu A$ |
|                                         | SG2024             |                    | $V_{IN} = 5V$                 | 240    | 350  | 500  | $\mu A$ |
|                                         |                    |                    | $V_{IN} = 12V$                | 650    | 1000 | 1450 | $\mu A$ |
| ( $I_{IN(OFF)}$ )                       | All                | $T_A = T_{MAX}$    | $I_C = 500\mu A$              | 25     | 50   |      | $\mu A$ |
| Input Voltage ( $V_{IN(ON)}$ )          |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 300mA$    |        |      | 13   | V       |
|                                         | SG2023             | $T_A = T_{MIN}$    | $V_{CE} = 2V, I_C = 200mA$    |        |      | 3.3  | V       |
|                                         |                    | $T_A = T_{MIN}$    | $V_{CE} = 2V, I_C = 250mA$    |        |      | 3.6  | V       |
|                                         |                    | $T_A = T_{MIN}$    | $V_{CE} = 2V, I_C = 300mA$    |        |      | 3.9  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 200mA$    |        |      | 2.4  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 250mA$    |        |      | 2.7  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 300mA$    |        |      | 3.0  | V       |
|                                         | SG2024             | $T_A = T_{MIN}$    | $V_{CE} = 2V, I_C = 125mA$    |        |      | 6.0  | V       |
|                                         |                    | $T_A = T_{MIN}$    | $V_{CE} = 2V, I_C = 200mA$    |        |      | 8.0  | V       |
|                                         |                    | $T_A = T_{MIN}$    | $V_{CE} = 2V, I_C = 275mA$    |        |      | 10   | V       |
|                                         |                    | $T_A = T_{MIN}$    | $V_{CE} = 2V, I_C = 350mA$    |        |      | 12   | V       |
|                                         |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 125mA$    |        |      | 5.0  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 200mA$    |        |      | 6.0  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 275mA$    |        |      | 7.0  | V       |
|                                         |                    | $T_A = T_{MAX}$    | $V_{CE} = 2V, I_C = 350mA$    |        |      | 8.0  | V       |
| D-C Forward Current                     | SG2021             | $T_A = T_{MIN}$    | $V_{CE} = 2V, I_C = 350mA$    | 500    |      |      |         |
| Transfer Ratio ( $h_{FE}$ )             |                    | $T_A = 25^\circ C$ | $V_{CE} = 2V, I_C = 350mA$    | 1000   |      |      |         |
| Input Capacitance ( $C_{IN}$ ) (Note 3) | All                | $T_A = 25^\circ C$ |                               |        | 15   | 25   | pF      |
| Turn-On Delay (TPLH)                    | All                | $T_A = 25^\circ C$ | $0.5 E_{IN}$ to $0.5 E_{OUT}$ |        | 250  | 1000 | ns      |
| Turn-Off Delay (TPHL)                   | All                | $T_A = 25^\circ C$ | $0.5 E_{IN}$ to $0.5 E_{OUT}$ |        | 250  | 1000 | ns      |
| Clamp Diode Leakage Current ( $I_R$ )   | All                |                    | $V_R = 95V$                   |        |      | 50   | $\mu A$ |
| Clamp Diode Forward Voltage ( $V_F$ )   | All                |                    | $I_F = 350mA$                 |        | 1.7  | 2.0  | V       |

Note 3. These parameters, although guaranteed, are not tested in production.

## CHARACTERISTIC CURVES

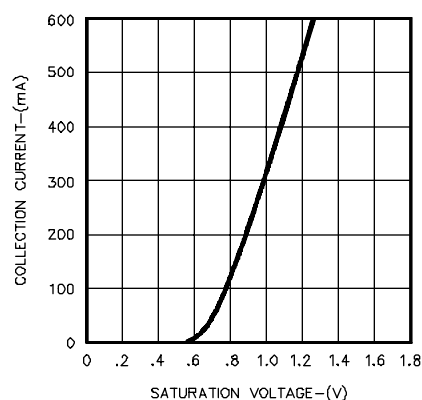


FIGURE 1.  
OUTPUT CHARACTERISTICS

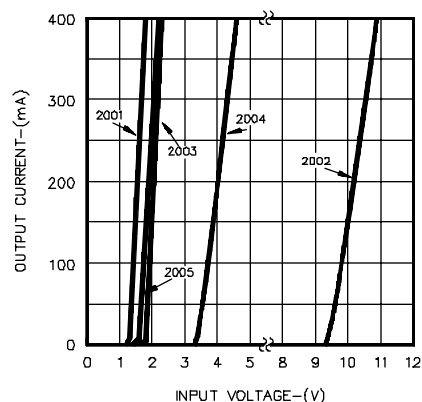


FIGURE 2.  
OUTPUT CURRENT VS. INPUT VOLTAGE

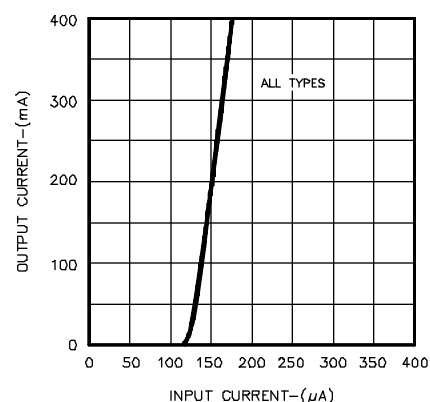


FIGURE 3.  
OUTPUT CURRENT VS. INPUT CURRENT

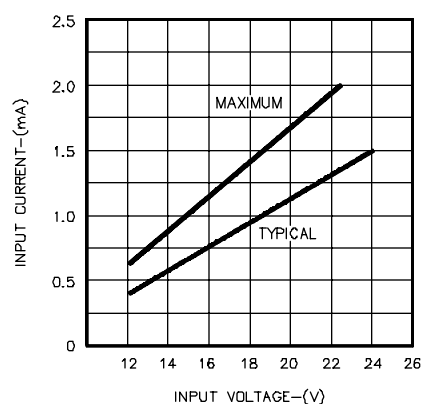


FIGURE 4.  
INPUT CHARACTERISTICS - SG2002

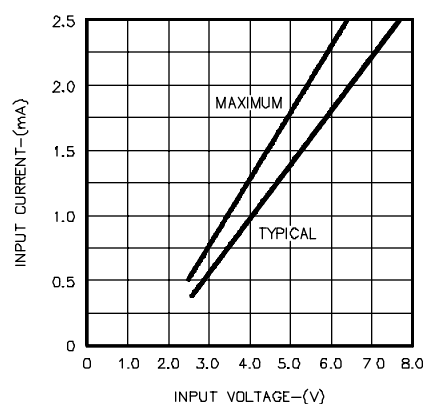


FIGURE 5.  
INPUT CHARACTERISTICS - SG2003

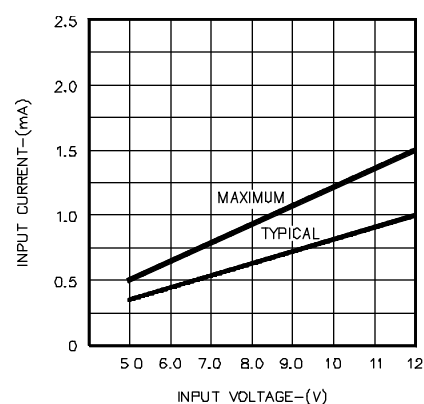


FIGURE 6.  
INPUT CHARACTERISTICS - SG2004

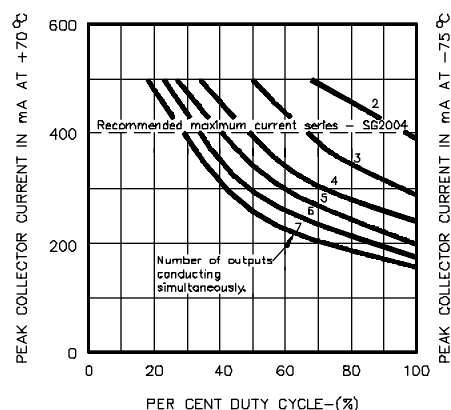
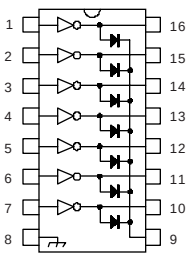
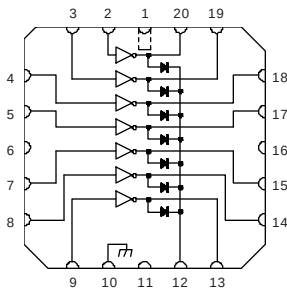


FIGURE 7.  
PEAK COLLECTOR CURRENT VS. DUTY CYCLE

## CONNECTION DIAGRAMS & ORDERING INFORMATION (See Notes Below)

| Package                                                | Part No. (Note 3)                                                                       | Ambient Temperature Range                                                                                                  | Connection Diagram                                                                  |
|--------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 16-PIN CERAMIC DIP<br>J - PACKAGE                      | SG2XXXJ/883B<br>SG2023J/DESC<br>JAN2001J<br>JAN2002J<br>JAN2003J<br>JAN2004J<br>SG2XXXJ | -55°C to 125°C<br>-55°C to 125°C<br>-55°C to 125°C<br>-55°C to 125°C<br>-55°C to 125°C<br>-55°C to 125°C<br>-55°C to 125°C |  |
| 16-PIN PLASTIC DIP<br>N - PACKAGE                      | SG2003N<br>SG2023N                                                                      | 0°C to 70°C<br>0°C to 70°C                                                                                                 |                                                                                     |
| 20-PIN CERAMIC<br>LEADLESS CHIP CARRIER<br>L - PACKAGE | SG2XXXL/883B<br>SG2XXXL                                                                 | -55°C to 125°C<br>-55°C to 125°C                                                                                           |  |

Note 1. Contact factory for JAN and DESC product availability.

2. All parts are viewed from the top.

3. See selection guide for specific device types.