

2N6609
(See 2N3773)

2N6667
2N6668

PNP SILICON
DARLINGTON
POWER TRANSISTORS
10 AMPERES
60–80 VOLTS
65 WATTS

Darlington Silicon Power Transistors

... designed for general-purpose amplifier and low speed switching applications.

- High DC Current Gain — $h_{FE} = 3500$ (Typ) @ $I_C = 4$ Adc
- Collector–Emitter Sustaining Voltage — @ 200 mAdc
 $V_{CEO(sus)} = 60$ Vdc (Min) — 2N6667
 $= 80$ Vdc (Min) — 2N6668
- Low Collector–Emitter Saturation Voltage — $V_{CE(sat)} = 2$ Vdc (Max) @ $I_C = 5$ Adc
- Monolithic Construction with Built-In Base–Emitter Shunt Resistors
- TO–220AB Compact Package
- Complementary to 2N6387, 2N6388

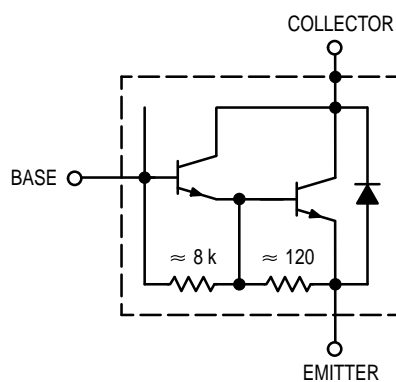
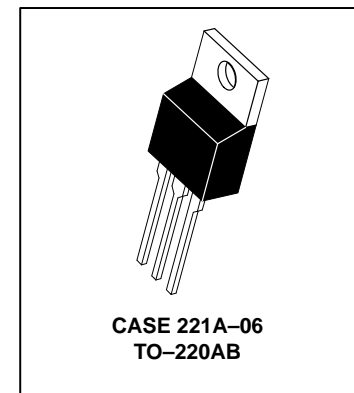


Figure 1. Darlington Schematic



MAXIMUM RATINGS (1)

Rating	Symbol	2N6667	2N6668	Unit
Collector–Emitter Voltage	V_{CEO}	60	80	Vdc
Collector–Base Voltage	V_{CB}	60	80	Vdc
Emitter–Base Voltage	V_{EB}	5		Vdc
Collector Current — Continuous — Peak	I_C	10 15		A dc
Base Current	I_B	250		mA dc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	65 0.52		watts W/ $^\circ\text{C}$
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	2 0.016		Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–65 to +150		$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.92	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$

(1) Indicates JEDEC Registered Data.

REV 1

2N6667 2N6668

*ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit	
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (1) ($I_C = 200\text{ mAdc}$, $I_B = 0$)	2N6667 2N6668	$V_{CEO(sus)}$	60 80	— —	Vdc
Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 80\text{ Vdc}$, $I_B = 0$)	2N6667 2N6668	I_{CEO}	— —	1 1	mAdc
Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 80\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 60\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 125^\circ\text{C}$) ($V_{CE} = 80\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 125^\circ\text{C}$)	2N6667 2N6668 2N6667 2N6668	I_{CEX}	— — — —	300 300 3 3	μAdc mAdc
Emitter Cutoff Current ($V_{BE} = 5\text{ Vdc}$, $I_C = 0$)		I_{EBO}	—	5	mAdc
ON CHARACTERISTICS (1)					
DC Current Gain ($I_C = 5\text{ Adc}$, $V_{CE} = 3\text{ Vdc}$) ($I_C = 10\text{ Adc}$, $V_{CE} = 3\text{ Vdc}$)		h_{FE}	1000 100	20000 —	—
Collector-Emitter Saturation Voltage ($I_C = 5\text{ Adc}$, $I_B = 0.01\text{ Adc}$) ($I_C = 10\text{ Adc}$, $I_B = 0.1\text{ Adc}$)		$V_{CE(sat)}$	— —	2 3	Vdc
Base-Emitter Saturation Voltage ($I_C = 5\text{ Adc}$, $I_B = 0.01\text{ Adc}$) ($I_C = 10\text{ Adc}$, $I_B = 0.1\text{ Adc}$)		$V_{BE(sat)}$	— —	2.8 4.5	Vdc
DYNAMIC CHARACTERISTICS					
Current Gain — Bandwidth Product ($I_C = 1\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$, $f_{test} = 1\text{ MHz}$)		$ h_{fe} $	20	—	—
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 1\text{ MHz}$)		C_{ob}	—	200	pF
Small-Signal Current Gain ($I_C = 1\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$, $f = 1\text{ kHz}$)		h_{fe}	1000	—	—

* Indicates JEDEC Registered Data

(1) Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$.

R_B & R_C VARIED TO OBTAIN DESIRED CURRENT LEVELS

D_1 , MUST BE FAST RECOVERY TYPES e.g.,

1N5825 USED ABOVE $I_B \approx 100\text{ mA}$

MSD6100 USED BELOW $I_B \approx 100\text{ mA}$

FOR t_d AND t_r , D_1 IS DISCONNECTED AND $V_2 = 0$

t_r , $t_f \leq 10\text{ ns}$

DUTY CYCLE = 1.0%

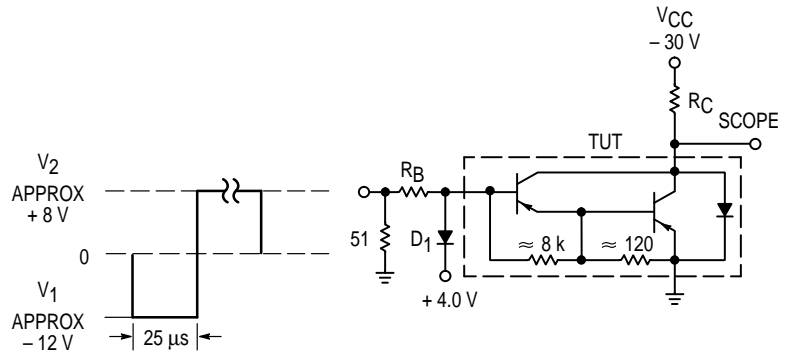


Figure 2. Switching Times Test Circuit

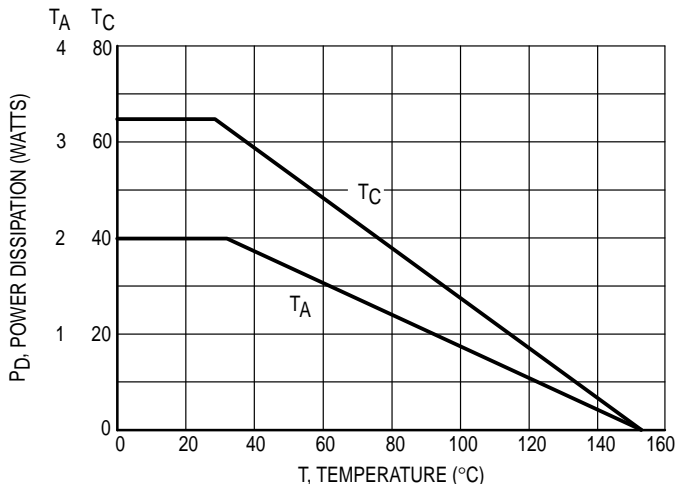


Figure 3. Power Derating

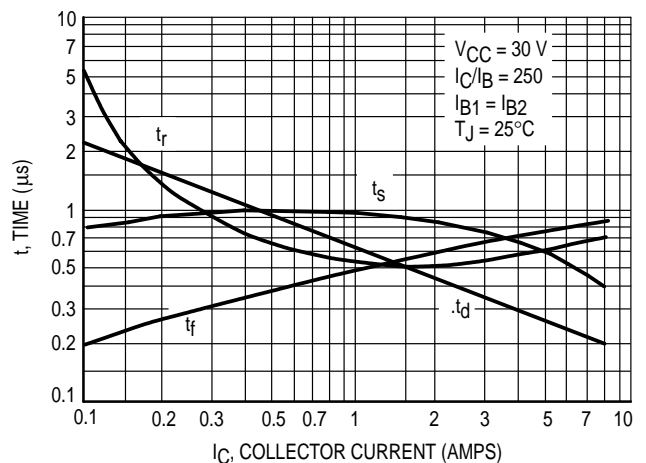


Figure 4. Typical Switching Times

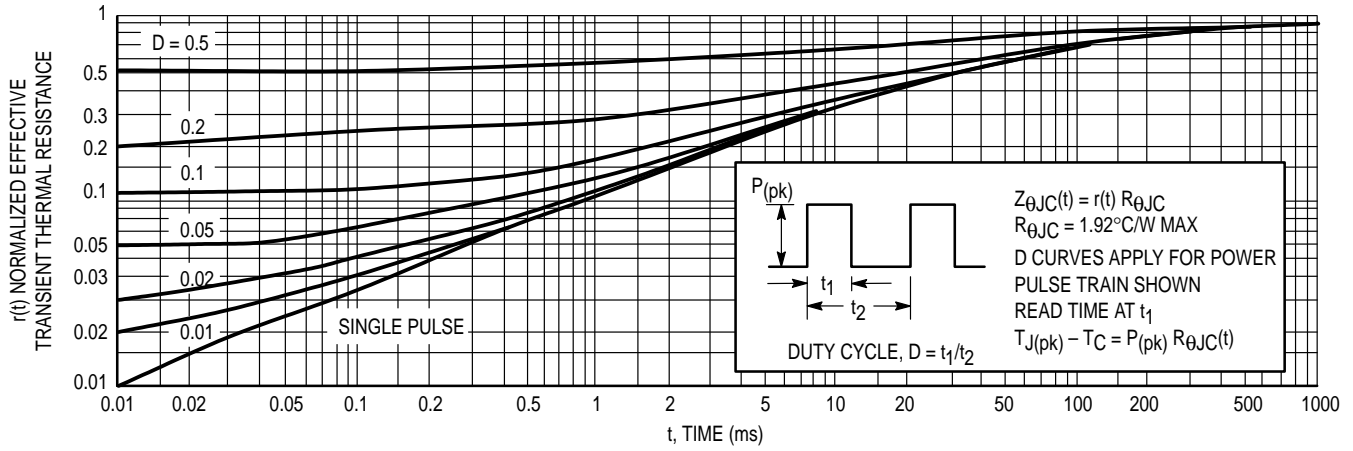


Figure 5. Thermal Response

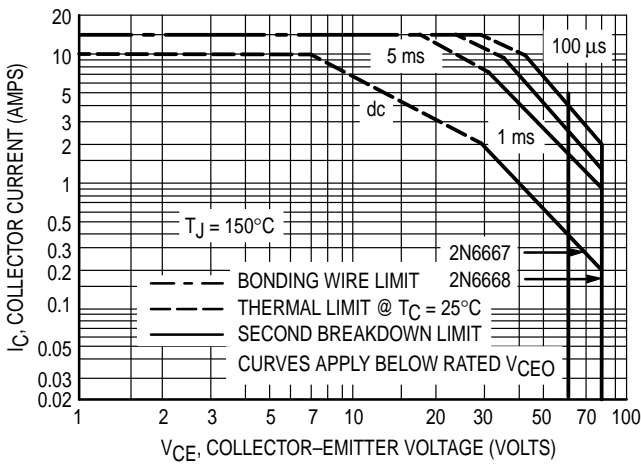


Figure 6. Maximum Safe Operating Area

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 6 is based on $T_J(pk) = 150^\circ\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_J(pk) < 150^\circ\text{C}$. $T_J(pk)$ may be calculated from the data in Figure 5. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

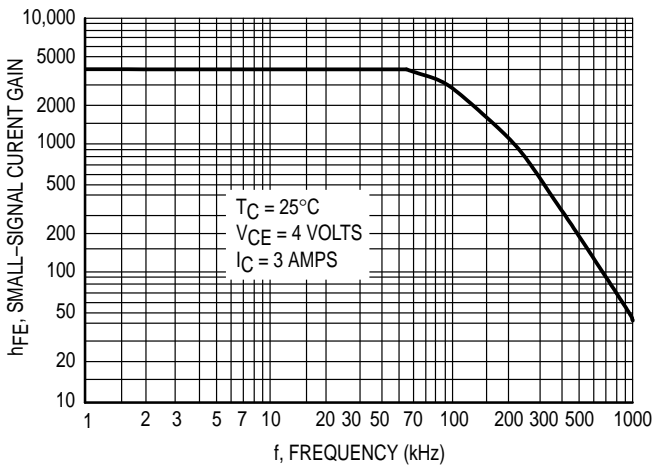


Figure 7. Typical Small-Signal Current Gain

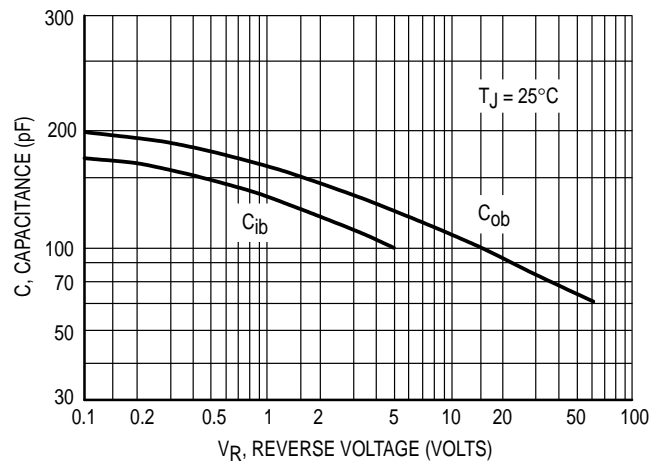


Figure 8. Typical Capacitance

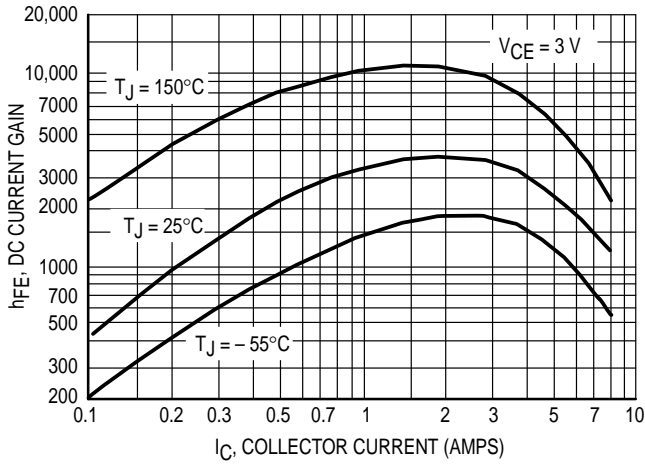


Figure 9. Typical DC Current Gain

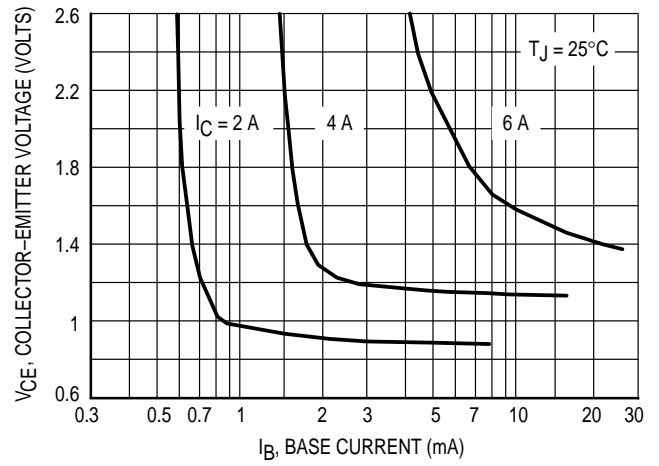


Figure 10. Typical Collector Saturation Region

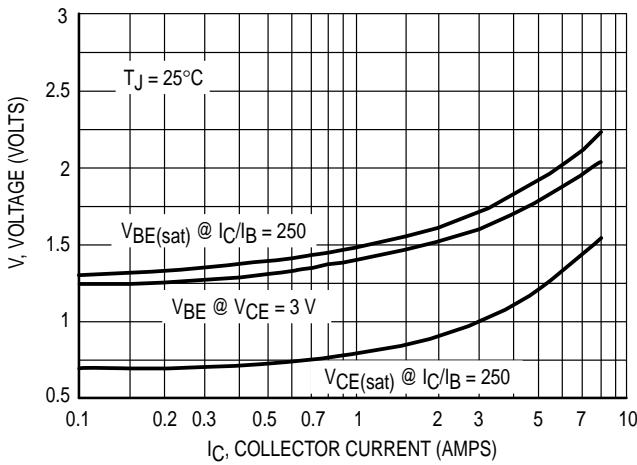


Figure 11. Typical "On" Voltages

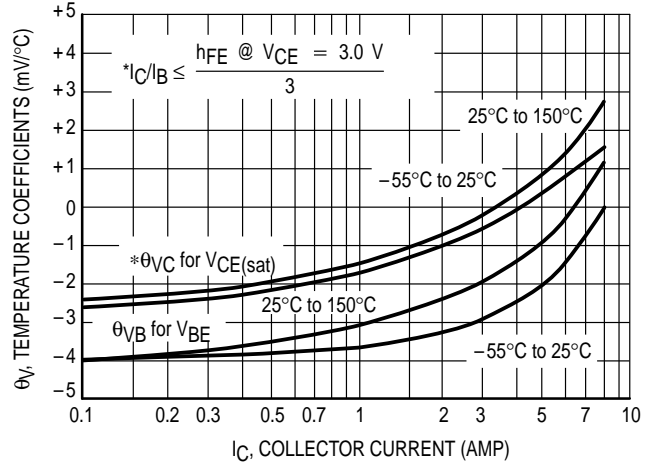


Figure 12. Typical Temperature Coefficients

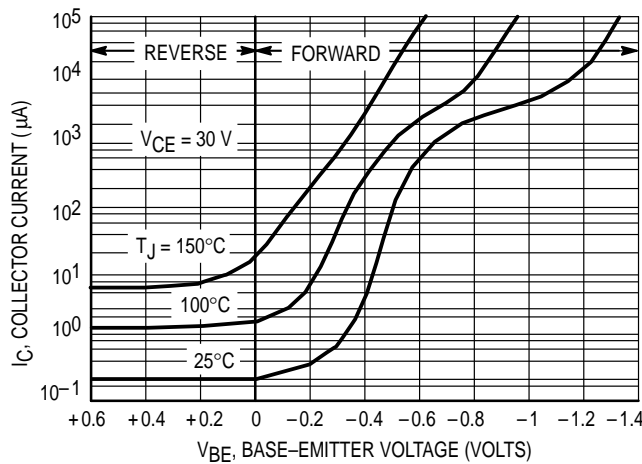
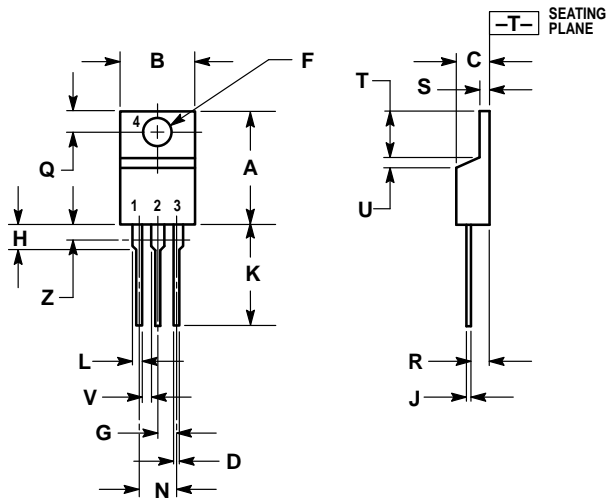


Figure 13. Typical Collector Cut-Off Region

PACKAGE DIMENSIONS



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	—	1.15	—
Z	—	0.080	—	2.04

- STYLE 1:
- PIN 1. BASE
 - COLLECTOR
 - EMITTER
 - COLLECTOR

CASE 221A-06
TO-220AB
ISSUE Y

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

How to reach us:

USA / EUROPE: Motorola Literature Distribution;
P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447

JAPAN: Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, Toshikatsu Otsuki,
6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-3521-8315

MFAX: RMFAX0@email.sps.mot.com - TOUCHTONE (602) 244-6609
INTERNET: <http://Design-NET.com>

HONG KONG: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

