

# 6-Pin DIP Optoisolators Darlington Output (On-Chip Resistors)

The H11G1, H11G2 and H11G3 devices consist of gallium arsenide IREDs optically coupled to silicon photodarlington detectors which have integral base-emitter resistors. The on-chip resistors improve higher temperature leakage characteristics. Designed with high isolation, high CTR, high voltage and low leakage, they provide excellent performance.

- High CTR, H11G1 & H11G2 — 1000% (@  $I_F = 10 \text{ mA}$ ), 500% (@  $I_F = 1 \text{ mA}$ )
- High  $V_{(BR)CEO}$ , H11G1 — 100 Volts, H11G2 — 80 Volts
- **To order devices that are tested and marked per VDE 0884 requirements, the suffix "V" must be included at end of part number. VDE 0884 is a test option.**

### Applications

- Interfacing and coupling systems of different potentials and impedances
- Phase and Feedback Controls
- General Purpose Switching Circuits
- Solid State Relays

### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
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#### INPUT LED

Reverse Voltage	$V_R$	6	Volts
Forward Current — Continuous	$I_F$	60	mA
Forward Current — Peak Pulse Width = 300 $\mu\text{s}$ , 2% Duty Cycle	$I_F$	3	Amps
LED Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	120 1.41	mW mW/ $^\circ\text{C}$

#### OUTPUT DETECTOR

Collector–Emitter Voltage	H11G1 H11G2 H11G3	$V_{CEO}$	100 80 55	Volts
Emitter–Base Voltage		$V_{EBO}$	7	Volts
Collector Current — Continuous		$I_C$	150	mA
Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$		$P_D$	150 1.76	mW mW/ $^\circ\text{C}$

#### TOTAL DEVICE

Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	250 2.94	mW mW/ $^\circ\text{C}$
Operating Junction Temperature Range <sup>(2)</sup>	$T_A$	–55 to +100	$^\circ\text{C}$
Storage Temperature Range <sup>(2)</sup>	$T_{stg}$	–55 to +150	$^\circ\text{C}$
Soldering Temperature (10 s)	$T_L$	260	$^\circ\text{C}$
Isolation Surge Voltage <sup>(1)</sup> (Peak ac Voltage, 60 Hz, 1 sec Duration)	$V_{ISO}$	7500	Vac(pk)

1. Isolation surge voltage is an internal device dielectric breakdown rating.  
For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.
2. Refer to Quality and Reliability Section in Opto Data Book for information on test conditions.

Preferred devices are Motorola recommended choices for future use and best overall value.

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**H11G1\***

[CTR = 1000% Min]

**H11G2\***

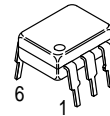
[CTR = 1000% Min]

**H11G3**

[CTR = 200% Min]

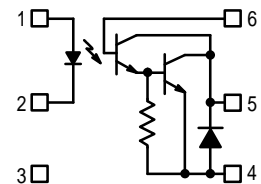
\*Motorola Preferred Devices

### STYLE 1 PLASTIC



STANDARD THRU HOLE  
CASE 730A-04

### SCHEMATIC



- PIN 1. ANODE
- CATHODE
- N.C.
- EMITTER
- COLLECTOR
- BASE

# H11G1 H11G2 H11G3

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)<sup>(1)</sup>

Characteristic	Symbol	Min	Typ <sup>(1)</sup>	Max	Unit
<b>INPUT LED</b>					
Reverse Leakage Current (V <sub>R</sub> = 3 V)	I <sub>R</sub>	—	0.05	10	μA
Forward Voltage I <sub>F</sub> = 10 mA)	V <sub>F</sub>	—	1.1	1.5	Volts
Capacitance (V = 0 V, f = 1 MHz)	C <sub>J</sub>	—	18	—	pF

## DARLINGTON OUTPUT (T<sub>A</sub> = 25°C and I<sub>F</sub> = 0 unless otherwise noted)

Collector–Emitter Breakdown Current (I <sub>C</sub> = 1 mA, I <sub>F</sub> = 0)	H11G1 H11G2 H11G3	V <sub>(BR)CEO</sub>	100 80 55	— — —	— — —	Volts
Collector–Base Breakdown Voltage (I <sub>C</sub> = 100 μA, I <sub>F</sub> = 0)	H11G1 H11G2 H11G3	V <sub>(BR)CBO</sub>	100 80 55	— — —	— — —	Volts
Emitter–Base Breakdown Voltage (I <sub>E</sub> = 100 μA, I <sub>F</sub> = 0)		V <sub>(BR)EBO</sub>	7	—	—	Volts
Collector–Emitter Dark Current (V <sub>CE</sub> = 80 V)	H11G1	I <sub>CEO</sub>	—	—	100	nA
(V <sub>CE</sub> = 80 V, T <sub>A</sub> = 80°C)	H11G1		—	—	100	μA
(V <sub>CE</sub> = 60 V)	H11G2		—	—	100	nA
(V <sub>CE</sub> = 60 V, T <sub>A</sub> = 80°C)	H11G2		—	—	100	μA
(V <sub>CE</sub> = 30 V)	H11G3		—	—	100	nA
Capacitance (V <sub>CB</sub> = 10 V, f = 1 MHz)		C <sub>CB</sub>	—	6	—	pF

## COUPLED (T<sub>A</sub> = 25°C unless otherwise noted)

Collector Output Current (V <sub>CE</sub> = 1 V, I <sub>F</sub> = 10 mA)	H11G1, 2	I <sub>C</sub> (CTR) <sup>(2)</sup>	100 (1000)	—	—	mA (%)
(V <sub>CE</sub> = 5 V, I <sub>F</sub> = 1 mA)	H11G1, 2		5 (500)	—	—	
(V <sub>CE</sub> = 5 V, I <sub>F</sub> = 1 mA)	H11G3		2 (200)	—	—	
Collector–Emitter Saturation Voltage (I <sub>F</sub> = 1 mA, I <sub>C</sub> = 1 mA)	H11G1, 2	V <sub>CE(sat)</sub>	—	0.75	1	Volts
(I <sub>F</sub> = 16 mA, I <sub>C</sub> = 50 mA)	H11G1, 2		—	0.85	1	
(I <sub>F</sub> = 20 mA, I <sub>C</sub> = 50 mA)	H11G3		—	0.85	1.2	
Isolation Surge Voltage <sup>(3,4)</sup> (60 Hz ac Peak, 1 Second)		V <sub>ISO</sub>	7500	—	—	Vac(pk)
Isolation Resistance <sup>(3)</sup> (V = 500 Vdc)			—	10 <sup>11</sup>	—	Ohms
Isolation Capacitance <sup>(3)</sup> (V = 0 V, f = 1 MHz)		C <sub>IO</sub>	—	2	—	pF

## SWITCHING (T<sub>A</sub> = 25°C)

Turn–On Time	(I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 100 Ω, Pulse Width ≤ 300 μs, f = 30 Hz)	t <sub>on</sub>	—	5	—	μs
Turn–Off Time		t <sub>off</sub>	—	100	—	

1. Always design to the specified minimum/maximum electrical limits (where applicable).
2. Current Transfer Ratio (CTR) = I<sub>C</sub>/I<sub>F</sub> x 100%.
3. For this test, Pins 1 and 2 are common, and Photodarlington Pins 4 and 5 are common.
4. Isolation Surge Voltage, V<sub>ISO</sub>, is an internal device dielectric breakdown rating.

TYPICAL CHARACTERISTICS

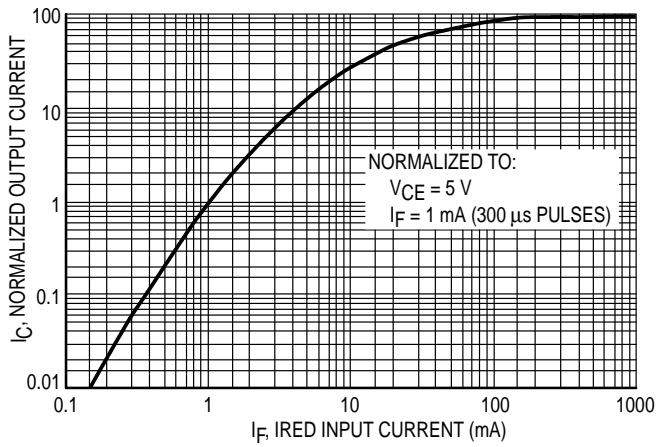


Figure 1. Output Current versus Input Current

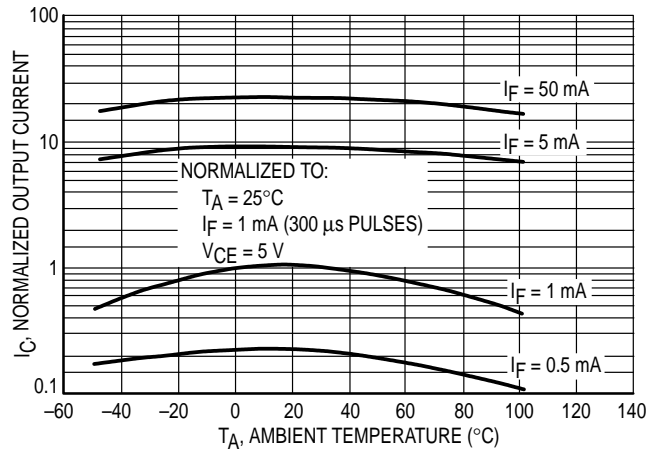


Figure 2. Output Current versus Temperature

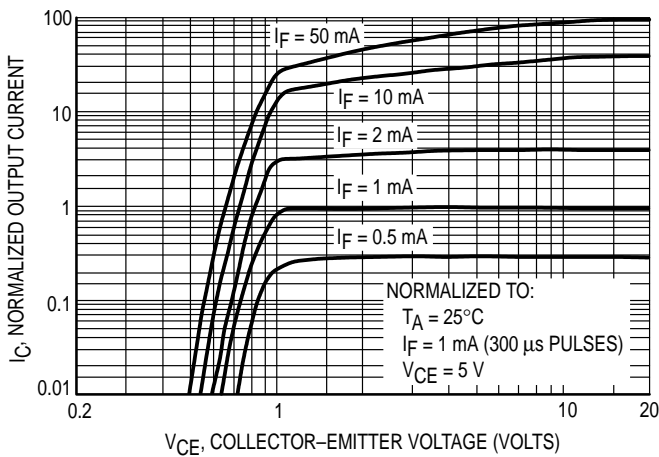


Figure 3. Output Current versus Collector-Emitter Voltage

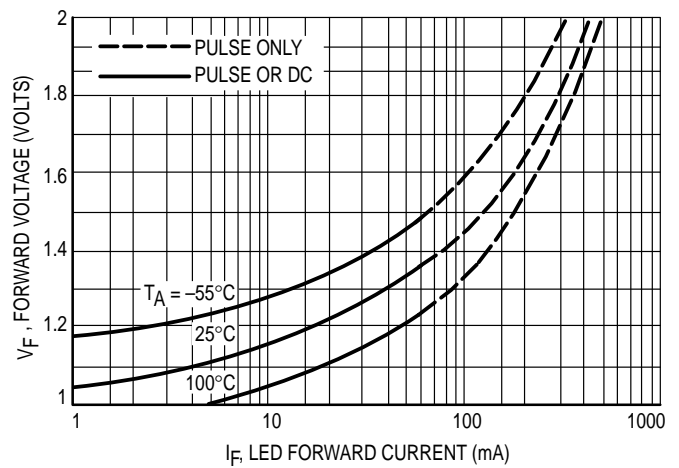


Figure 4. LED Forward Characteristics

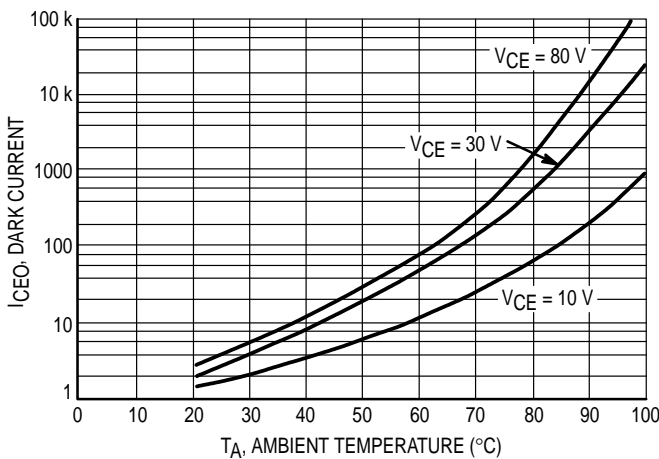


Figure 5. Collector-Emitter Dark Current versus Temperature

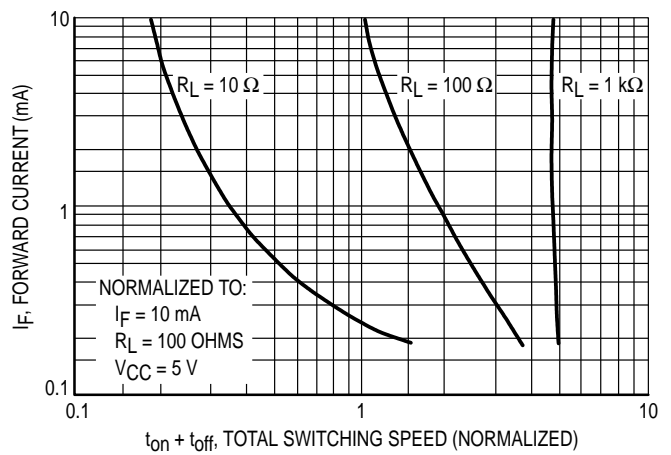
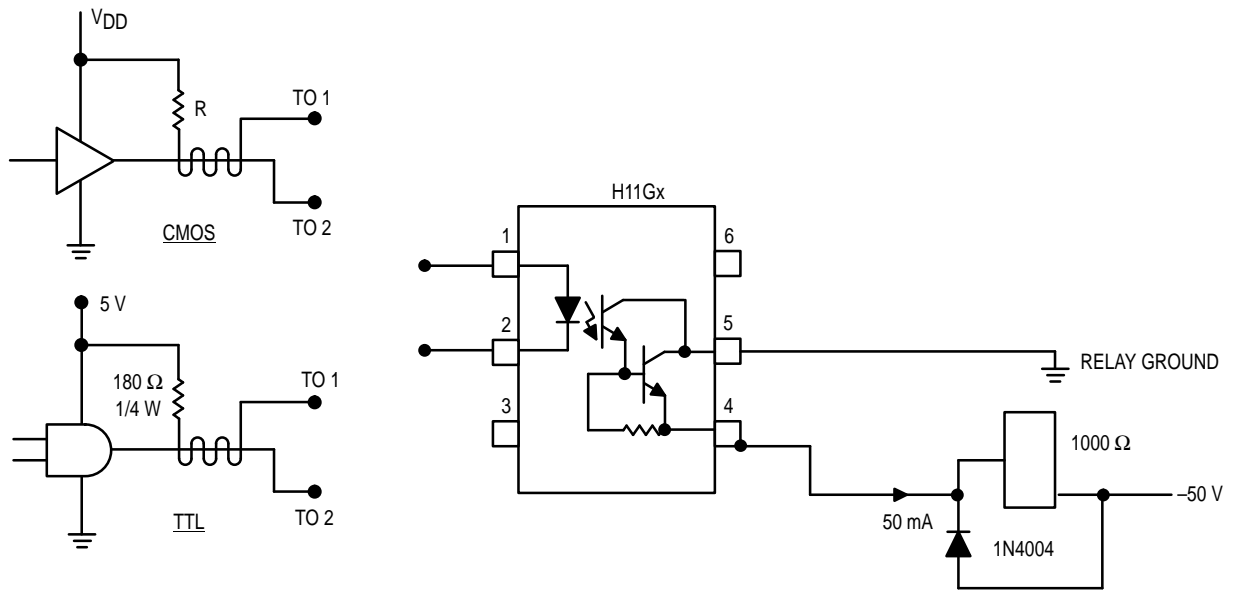


Figure 6. Input Current versus Total Switching Speed (Typical Values)

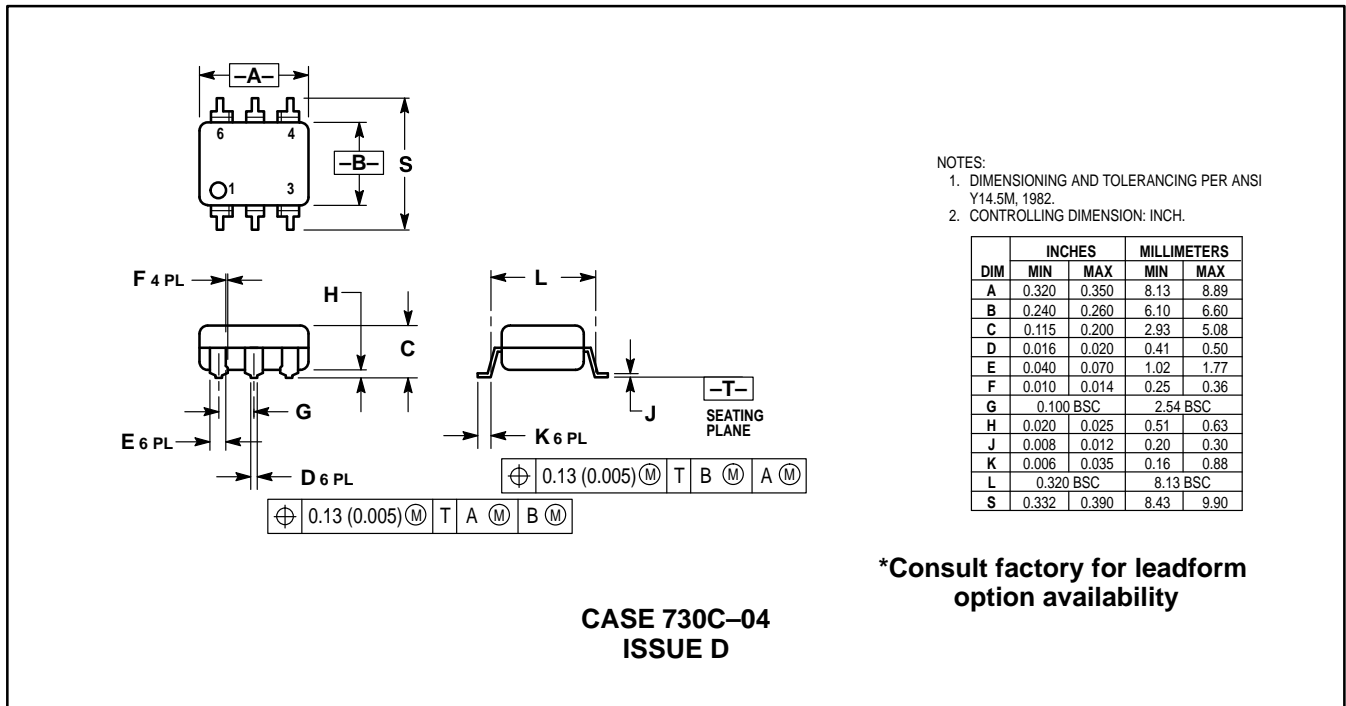
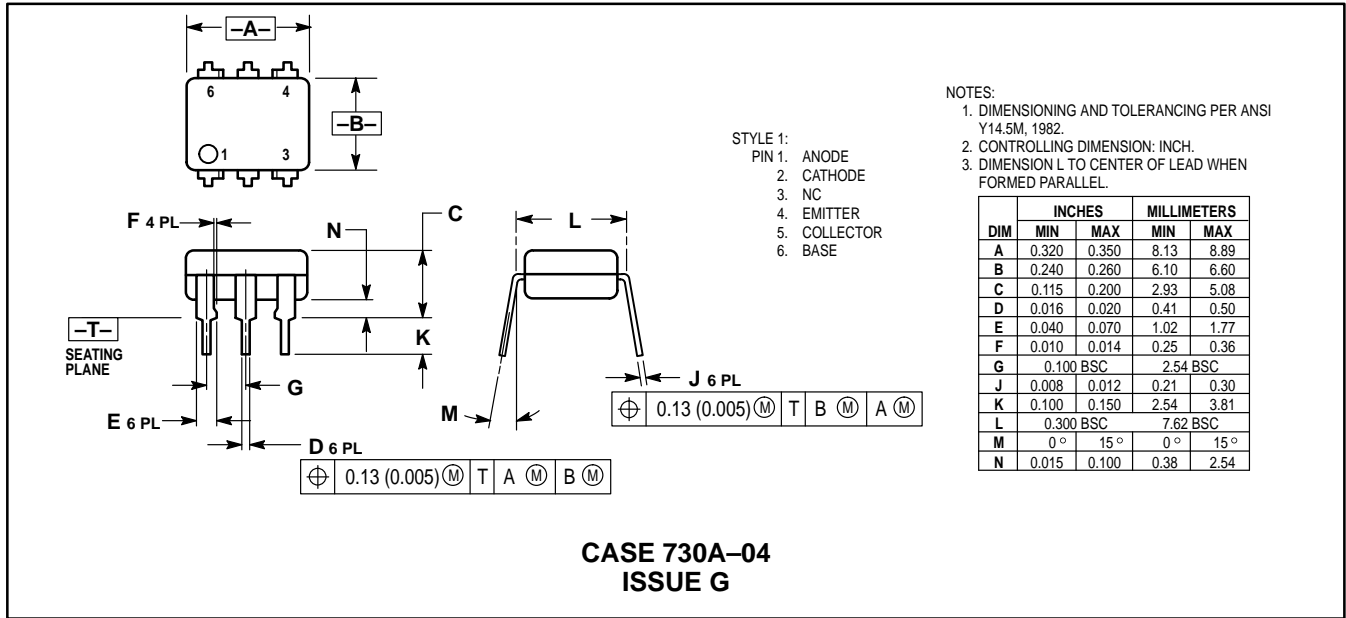
# H11G1 H11G2 H11G3

## INTERFACING TTL OR CMOS LOGIC TO 50-VOLT, 1000-OHMS RELAY FOR TELEPHONY APPLICATIONS

In order to interface positive logic to negative-powered electromechanical relays, a change in voltage level and polarity plus electrical isolation are required. The H11Gx can provide this interface and eliminate the external amplifiers and voltage divider networks previously required. The circuit below shows a typical approach for the interface.



## PACKAGE DIMENSIONS



# H11G1 H11G2 H11G3



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.320	0.350	8.13	8.89
B	0.240	0.260	6.10	6.60
C	0.115	0.200	2.93	5.08
D	0.016	0.020	0.41	0.50
E	0.040	0.070	1.02	1.77
F	0.010	0.014	0.25	0.36
G	0.100 BSC		2.54 BSC	
J	0.008	0.012	0.21	0.30
K	0.100	0.150	2.54	3.81
L	0.400	0.425	10.16	10.80
N	0.015	0.040	0.38	1.02

**\*Consult factory for leadform option availability**

**CASE 730D-05  
ISSUE D**

$\oplus$	0.13 (0.005)	M	T	A	M	B	M
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**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



H11G1/D

