

Single-Channel: 6N138M, 6N139M Dual-Channel: HCPL2730M, HCPL2731M (Preliminary) Low Input Current High Gain Split Darlington Optocouplers

Features

- Low current – 0.5mA
- Superior CTR-2000%
- Superior CMR-10kV/μs
- CTR guaranteed 0–70°C
- U.L. recognized (File # E90700, Vol. 2)
- VDE recognition (pending)
 - Ordering option V, e.g., 6N138VM
- Dual Channel – HCPL2730M, HCPL2731M (coming soon)

Applications

- Digital logic ground isolation
- Telephone ring detector
- EIA-RS-232C line receiver
- High common mode noise line receiver
- μP bus isolation
- Current loop receiver

Description

The 6N138M/9M and HCPL2730M/31M optocouplers consist of an AlGaAs LED optically coupled to a high gain split darlington photodetector.

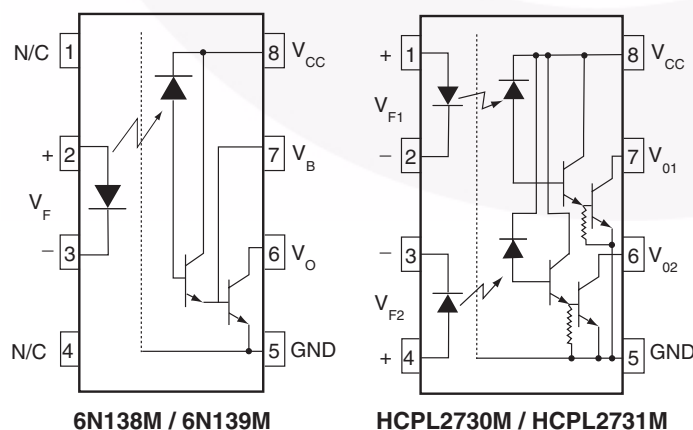
The split darlington configuration separating the input photodiode and the first stage gain from the output transistor permits lower output saturation voltage and higher speed operation than possible with conventional darlington phototransistor optocoupler. In the dual channel devices, HCPL2730M/HCPL2731M, an integrated emitter-base resistor provides superior stability over temperature.

The combination of a very low input current of 0.5mA and a high current transfer ratio of 2000% makes this family particularly useful for input interface to MOS, CMOS, LSTTL and EIA RS232C, while output compatibility is ensured to CMOS as well as high fan-out TTL requirements. An internal noise shield provides exceptional common mode rejection of 10 kV/μs.

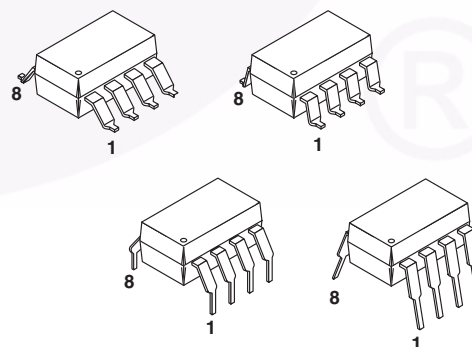
Related Resources

- www.fairchildsemi.com/products/opto/
- www.fairchildsemi.com/pf/Hc/HCPL0700.html
- www.fairchildsemi.com/pf/Hc/HCPL0730.html
- www.fairchildsemi.com/pf/Hc/HCPL0731.html

Schematic



Package Outlines



Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise specified)

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Value	Units
T_{STG}	Storage Temperature	-40 to +125	$^\circ\text{C}$
T_{OPR}	Operating Temperature	-40 to +100	$^\circ\text{C}$
T_{SOL}	Lead Solder Temperature (Wave solder only. See recommended reflow profile graph on page 13 for SMD mounting)	260 for 10 sec	$^\circ\text{C}$

EMITTER

I_F (avg)	DC/Average Forward Input Current	Each Channel	20	mA
I_F (pk)	Peak Forward Input Current (50% duty cycle, 1 ms P.W.)	Each Channel	40	mA
I_F (trans)	Peak Transient Input Current – ($\leq 1\mu\text{s}$ P.W., 300 pps)		1.0	A
V_R	Reverse Input Voltage	Each Channel	5	V
P_D	Input Power Dissipation ⁽¹⁾	Each Channel	35	mW

DETECTOR

I_O (avg)	Average Output Current	Each Channel	60	mA
V_{ER}	Emitter-Base Reverse Voltage	6N138M and 6N139M	0.5	V
V_{CC}, V_O	Supply Voltage, Output Voltage	6N138M and HCPL2730M	-0.5 to 7	V
		6N139M and HCPL2731M	-0.5 to 18	
P_O	Output Power Dissipation ⁽¹⁾	Each Channel	100	mW

Note:

1. No derating required for devices operated within the T_{OPR} specification (6N138 and 6N139 only). HCPL2730 and HCPL2731 derating TBD.

Electrical Characteristics

($T_A = 0$ to 70°C unless otherwise specified. Typical value is measured at $T_A = 25^\circ\text{C}$ and $V_{CC} = 5.0\text{V}$.)

Individual Component Characteristics

Symbol	Parameter	Test Conditions	Device	Min.	Typ.	Max.	Unit
EMITTER							
V_F	Input Forward Voltage	$T_A = 25^\circ\text{C}$ Each channel ($I_F = 1.6\text{mA}$)	All		1.30	1.7	V
BV_R	Input Reverse Breakdown Voltage	$T_A = 25^\circ\text{C}$, $I_R = 10\mu\text{A}$	All	5.0	19		V
$\Delta V_F / \Delta T_A$	Temperature Coefficient of Forward Voltage	$I_F = 1.6\text{mA}$	All		-1.94		mV/ $^\circ\text{C}$
DETECTOR							
I_{OH}	Logic HIGH Output Current	$I_F = 0\text{mA}$, $V_O = V_{CC} = 18\text{V}$ Each Channel	6N139M HCPL2731M		0.0036	100	μA
		$I_F = 0\text{mA}$, $V_O = V_{CC} = 7\text{V}$ Each Channel	6N138M HCPL2730M		0.001	250	
I_{CCL}	Logic LOW supply	$I_F = 1.6\text{mA}$, $V_O = \text{Open}$, $V_{CC} = 18\text{V}$ $I_{F1} = I_{F2} = 1.6\text{mA}$, $V_{O1} = V_{O2} = \text{Open}$	6N138M, 6N139M HCPL2731M HCPL2730M		0.4	1.5	mA
		$V_{CC} = 18\text{V}$ $V_{CC} = 7\text{V}$				3	
I_{CCH}	Logic HIGH Supply	$I_F = 0\text{mA}$, $V_O = \text{Open}$, $V_{CC} = 18\text{V}$ $I_{F1} = I_{F2} = 0\text{mA}$, $V_{O1} = V_{O2} = \text{Open}$	6N138M, 6N139M HCPL2731M HCPL2730M		0.0003	10	μA
		$V_{CC} = 18\text{V}$ $V_{CC} = 7\text{V}$				20	

Transfer Characteristics

Symbol	Parameter	Test Conditions	Device	Min.	Typ.	Max.	Unit
COUPLED							
CTR	Current Transfer Ratio ⁽²⁾⁽³⁾	$I_F = 0.5\text{mA}$, $V_O = 0.4\text{V}$, $V_{CC} = 4.5\text{V}$ Each Channel	6N139M HCPL2731M	400	2000		%
		$I_F = 1.6\text{mA}$, $V_O = 0.4\text{V}$, $V_{CC} = 4.5\text{V}$ Each Channel	6N139M HCPL2731M	500	1600		
		$I_F = 1.6\text{mA}$, $V_O = 0.4\text{V}$, $V_{CC} = 4.5\text{V}$ Each Channel	6N138M HCPL2730M	300	1600		
V_{OL}	Logic LOW Output Voltage ⁽³⁾	$I_F = 0.5\text{mA}$, $I_O = 2\text{mA}$, $V_{CC} = 4.5\text{V}$ $I_F = 1.6\text{mA}$, $I_O = 8\text{mA}$, $V_{CC} = 4.5\text{V}$ Each Channel	6N139M 6N139M HCPL2731M		0.05 0.093	0.4	V
		$I_F = 5\text{mA}$, $I_O = 15\text{mA}$, $V_{CC} = 4.5\text{V}$ Each Channel	6N139M HCPL2731M		0.13	0.4	
		$I_F = 12\text{mA}$, $I_O = 24\text{mA}$, $V_{CC} = 4.5\text{V}$ Each Channel	6N139M HCPL2731M		0.18	0.4	
		$I_F = 1.6\text{mA}$, $I_O = 4.8\text{mA}$, $V_{CC} = 4.5\text{V}$ Each Channel	6N138M HCPL2730M		0.06	0.4	

Electrical Characteristics (Continued)

($T_A = 0$ to 70°C unless otherwise specified. Typical value is measured at $T_A = 25^\circ\text{C}$ and $V_{CC} = 5.0\text{V}$.)

Switching Characteristics ($V_{CC} = 5\text{V}$)

Symbol	Parameter	Test Conditions	Device	Min.	Typ.	Max.	Unit
t_{PHL}	Propagation Delay Time to Logic LOW ⁽³⁾ (Fig. 12)	$R_L = 4.7\text{k}\Omega$, $I_F = 0.5\text{mA}$ $T_A = 25^\circ\text{C}$	6N139M		2.5	30	μs
		$R_L = 4.7\text{k}\Omega$, $I_F = 0.5\text{mA}$ Each Channel $T_A = 25^\circ\text{C}$	HCPL2731M			120	
		$R_L = 270\Omega$, $I_F = 12\text{mA}$ $T_A = 25^\circ\text{C}$	6N139M		0.24	2	
		$R_L = 270\Omega$, $I_F = 12\text{mA}$, Each Channel $T_A = 25^\circ\text{C}$	HCPL2730M HCPL2731M			3 2	
		$R_L = 2.2\text{k}\Omega$, $I_F = 1.6\text{mA}$ $T_A = 25^\circ\text{C}$	6N138M		1	15 10	
		$R_L = 2.2\text{k}\Omega$, $I_F = 1.6\text{mA}$, Each Channel $T_A = 25^\circ\text{C}$	HCPL2731M HCPL2730M			25 20	
t_{PLH}	Propagation Delay Time to Logic HIGH ⁽³⁾ (Fig. 12)	$R_L = 4.7\text{k}\Omega$, $I_F = 0.5\text{mA}$ Each Channel	6N139M HCPL2731M			90	μs
		$R_L = 4.7\text{k}\Omega$, $I_F = 0.5\text{mA}$, $T_A = 25^\circ\text{C}$ Each Channel	6N139M HCPL2731M		13.6	60	
		$R_L = 270\Omega$, $I_F = 12\text{mA}$ $T_A = 25^\circ\text{C}$	6N139M		1.3	10 7	
		$R_L = 270\Omega$, $I_F = 12\text{mA}$, Each Channel $T_A = 25^\circ\text{C}$	HCPL2730M HCPL2731M			15 10	
		$R_L = 2.2\text{k}\Omega$, $I_F = 1.6\text{mA}$ Each Channel	6N138M HCPL2730M HCPL2731M			50	
		$R_L = 2.2\text{k}\Omega$, $I_F = 1.6\text{mA}$, $T_A = 25^\circ\text{C}$ Each Channel	6N138M HCPL2730M HCPL2731M		7.3	35	
ICM_{HI}	Common Mode Transient Immunity at Logic HIGH ⁽⁴⁾ (Fig. 13)	$I_F = 0\text{mA}$, $ V_{CM} = 10\text{V}_{P-P}$, $T_A = 25^\circ\text{C}$, $R_L = 2.2\text{k}\Omega$ Each Channel	6N138M 6N139M HCPL2730M HCPL2731M	1,000	10,000		$\text{V}/\mu\text{s}$
ICM_{LI}	Common Mode Transient Immunity at Logic LOW ⁽⁴⁾ (Fig. 13)	$(I_F = 1.6\text{mA}, V_{CM} = 10\text{V}_{P-P}, R_L = 2.2\text{k}\Omega)$ $T_A = 25^\circ\text{C}$ Each Channel	6N138M 6N139M HCPL2730M HCPL2731M	1,000	10,000		$\text{V}/\mu\text{s}$

Electrical Characteristics (Continued)(T_A = 0 to 70°C unless otherwise specified. Typical value is measured at T_A = 25°C and V_{CC} = 5.0V.)**Isolation Characteristics**

Symbol	Characteristics	Test Conditions	Min.	Typ.	Max.	Unit
V _{ISO}	Withstand Insulation Test Voltage ⁽⁵⁾	RH ≤ 50%, T _A = 25°C, I _{I-O} ≤ 10μA, 50Hz, t = 1 min.	5000			V _{RMS}
R _{I-O}	Resistance (Input to Output) ⁽⁵⁾	V _{I-O} = 500VDC		10 ¹¹		Ω
C _{I-O}	Capacitance (Input to Output) ⁽⁵⁾⁽⁶⁾	f = 1MHz, V _{I-O} = 500V		1		pF
I _{I-I}	Input-Input Insulation Leakage Current ⁽⁷⁾	RH ≤ 45%, V _{I-I} = 500VDC, t = 5s, HCPL2730M/2731M only		0.005		μA
R _{I-I}	Input-Input Resistance ⁽⁷⁾	V _{I-I} = 500VDC, HCPL2730M/2731M only		10 ¹¹		Ω
C _{I-I}	Input-Input Capacitance ⁽⁷⁾	f = 1MHz, HCPL2730M/2731M only		0.03		pF

Notes:

- Current Transfer Ratio is defined as a ratio of output collector current, I_O, to the forward LED input current, I_F, times 100%.
- Pin 7 open. (6N138M and 6N139M only)
- Common mode transient immunity in logic HIGH level is the maximum tolerable (positive) dV_{cm}/dt on the leading edge of the common mode pulse signal V_{CM}, to assure that the output will remain in a logic HIGH state (i.e., V_O > 2.0V). Common mode transient immunity in logic LOW level is the maximum tolerable (negative) dV_{cm}/dt on the trailing edge of the common mode pulse signal, V_{CM}, to assure that the output will remain in a logic LOW state (i.e., V_O < 0.8V).
- Device is considered a two terminal device: Pins 1, 2, 3 and 4 are shorted together and Pins 5, 6, 7 and 8 are shorted together.
- For dual channel devices, C_{I-O} is measured by shorting pins 1 and 2 or pins 3 and 4 together and pins 5 through 8 shorted together.
- Measured between pins 1 and 2 shorted together, and pins 3 and 4 shorted together.

Electrical Characteristics (Continued) $T_A = 25^\circ\text{C}$ unless otherwise specified)

Current Limiting Resistor Calculations

$$R_1 \text{ (Non-Invert)} = \frac{V_{DD1} - V_{DF} - V_{OL1}}{I_F}$$

$$R_1 \text{ (Invert)} = \frac{V_{DD1} - V_{OH1} - V_{DF}}{I_F}$$

$$R_2 = \frac{V_{DD2} - V_{OLX} (@ I_L - I_2)}{I_L}$$

Where:

V_{DD1} = Input Supply Voltage

V_{DD2} = Output Supply Voltage

V_{DF} = Diode Forward Voltage

V_{OL1} = Logic "0" Voltage of Driver

V_{OH1} = Logic "1" Voltage of Driver

I_F = Diode Forward Current

V_{OLX} = Saturation Voltage of Output Transistor

I_L = Load Current Through Resistor R_2

I_2 = Input Current of Output Gate

INPUT		R1 (V)	OUTPUT						
			CMOS @ 5V	CMOS @ 10V	74XX	74LXX	74SXX	74LSXX	74HXX
			R2 (V)	R2 (V)	R2 (V)	R2 (V)	R2 (V)	R2 (V)	R2 (V)
CMOS @ 5V	NON-INV.	2000	1000	2200	750	1000	1000	1000	560
	INV.	510							
CMOS @ 10V	NON-INV.	5100							
	INV.	4700							
74XX	NON-INV.	2200							
	INV.	180							
74LXX	NON-INV.	1800							
	INV.	100							
74SXX	NON-INV.	2000							
	INV.	360							
74LSXX	NON-INV.	2000							
	INV.	180							
74HXX	NON-INV.	2000							
	INV.	180							

Fig. 1 Resistor Values for Logic Interface



Fig. 2 Non-Inverting Logic Interface



Fig. 3 Inverting Logic Interface

Typical Performance Curves

Fig. 4 LED Forward Current vs. Forward Voltage

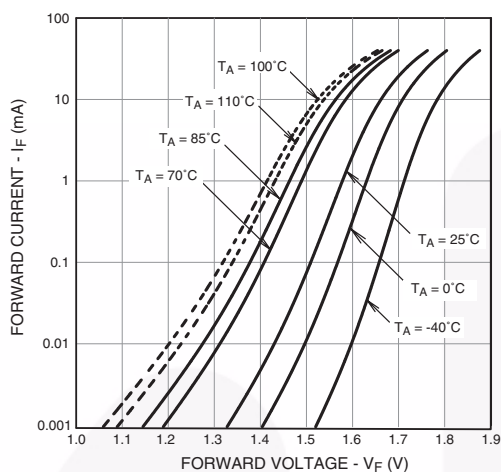


Fig. 5 LED Forward Voltage vs. Temperature

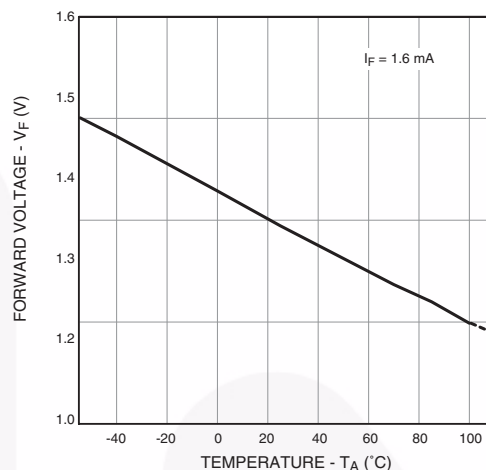


Fig. 6 Current Transfer Ratio vs. Forward Current (6N138M / 6N139M Only)

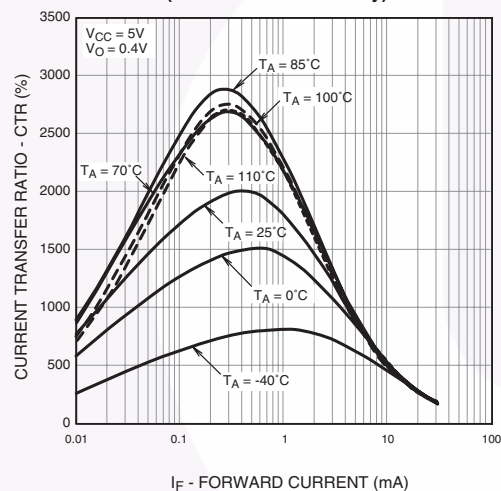


Fig. 7 Normalized Current Transfer Ratio vs. Ambient Temperature (6N138M / 6N139M Only)

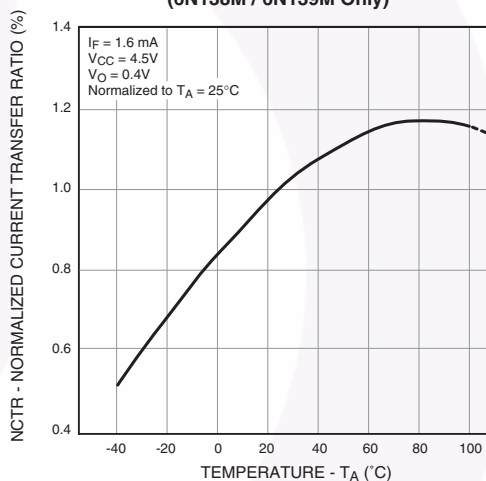


Fig. 8 Current Transfer Ratio vs. Base-Emitter Resistance (6N138M / 6N139M Only)

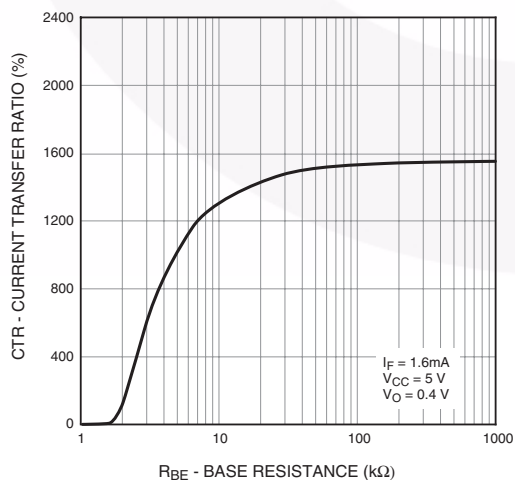
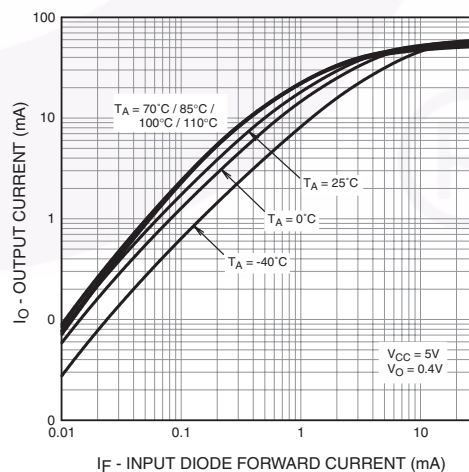


Fig. 9 Output Current vs. Input Diode Forward Current (6N138M / 6N139M Only)



Typical Performance Curves (Continued)

Fig. 10 Output Current vs Output Voltage
(6N138M / 6N139M Only)

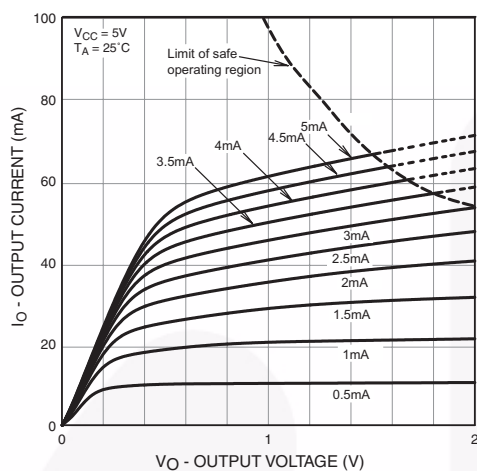


Fig. 11 Logic Low Supply Current vs. Input Diode Forward Current
(6N138M / 6N139M Only)

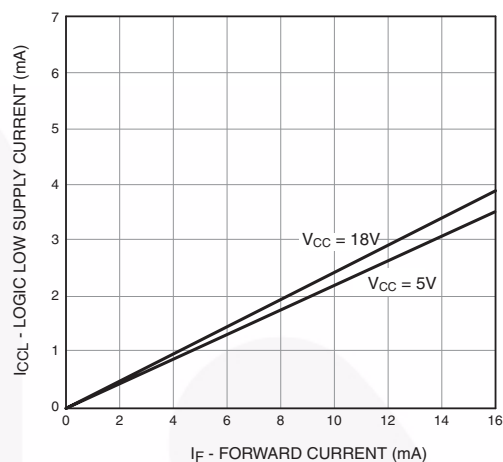
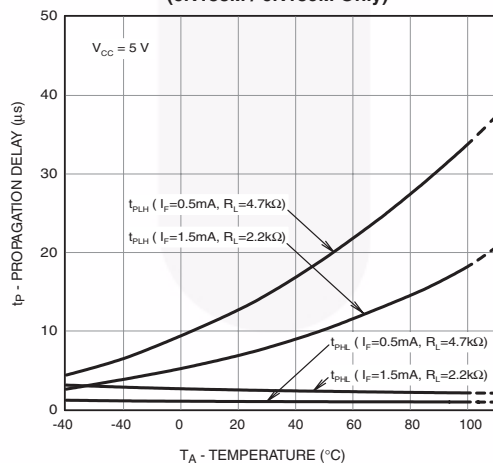
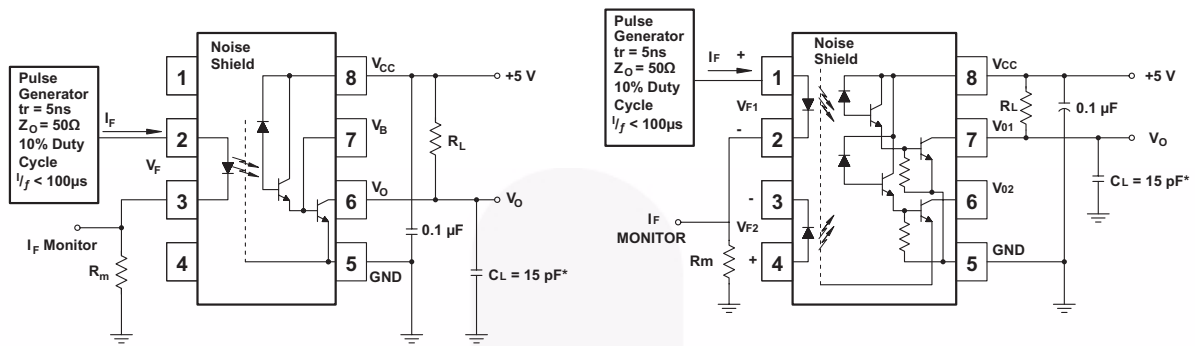


Fig. 12 Propagation Delay vs. Temperature
(6N138M / 6N139M Only)



Test Circuits



Test Circuit for 6N138M, 6N139M

Test Circuit for HCPL2730M and HCPL2731M

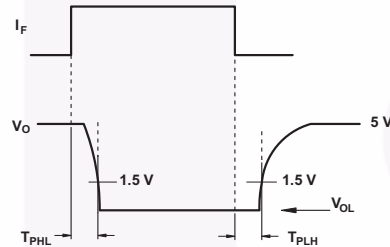
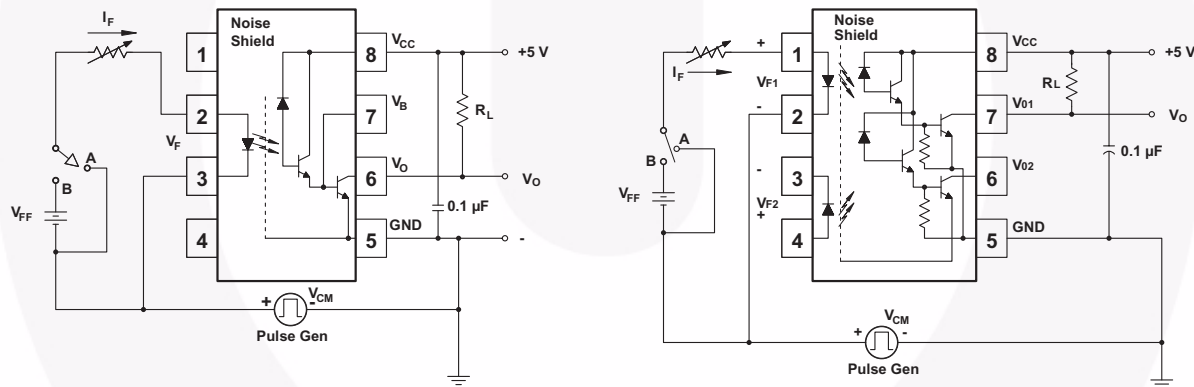


Fig. 13 Switching Time Test Circuit



Test Circuit for 6N138M and 6N139M

Test Circuit for HCPL2730M and HCPL2731M

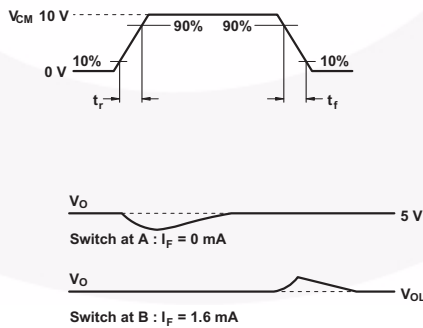
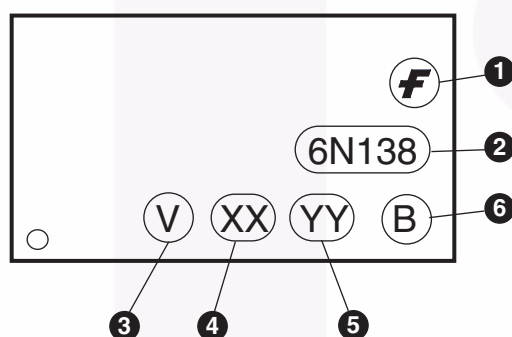


Fig. 14 Common Mode Immunity Test Circuit

Ordering Information

Option	Example Part Number	Description
No Suffix	6N138M	Standard Through Hole Device, 50 pcs per tube
S	6N138SM	Surface Mount Lead Bend
SD	6N138SDM	Surface Mount; Tape and reel
V	6N138VM	IEC60747-5-2 approval pending (VDE)
TV	6N138TVM	IEC60747-5-2 approval pending (VDE); 0.4" lead spacing
SV	6N138SVM	IEC60747-5-2 approval pending (VDE); surface mount
SDV	6N138SDVM	IEC60747-5-2 approval pending (VDE); surface mount; tape and reel

Marking Information



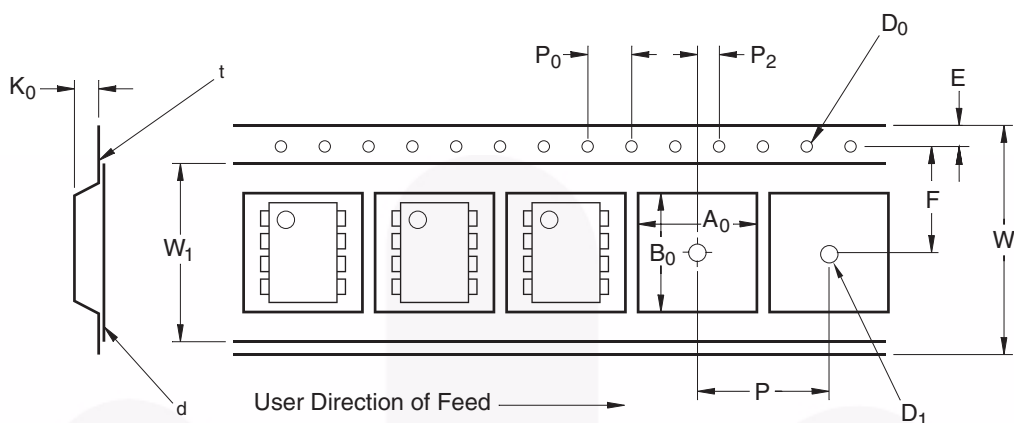
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table) (pending approval)
4	Two digit year code, e.g., '07'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

Note:

'HCPL' devices are marked only with the numerical characters (for example, HCPL2730 is marked as '2730').

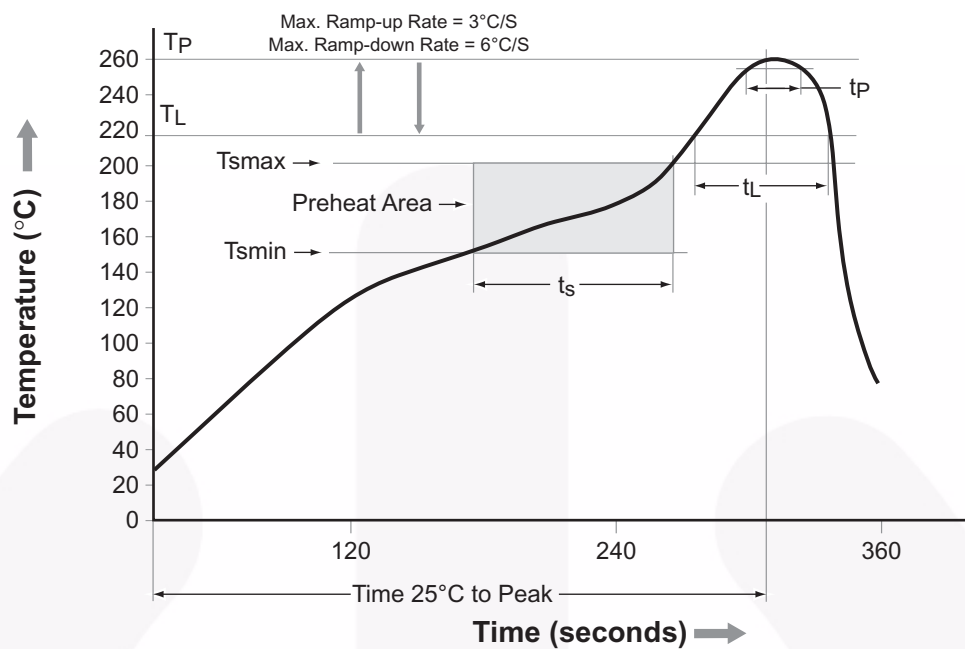
The 'M' suffix on the part number is an order identifier only. It is used to identify orders for the white package version. The 'M' does not appear on the device's top mark.

Carrier Tape Specifications (Option SD)

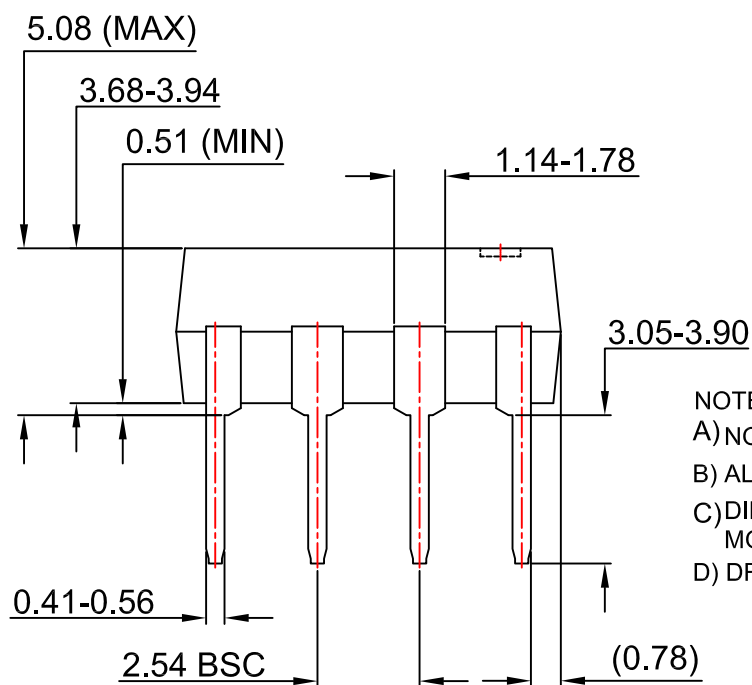
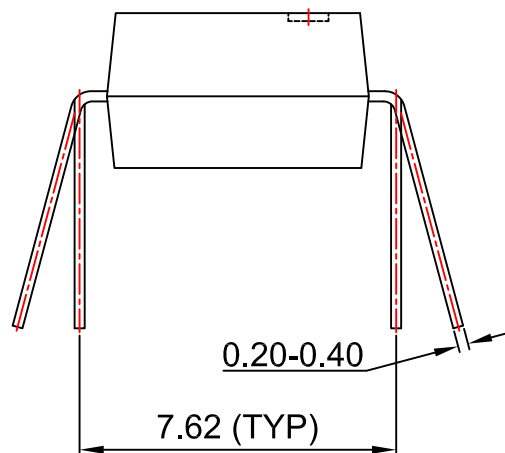
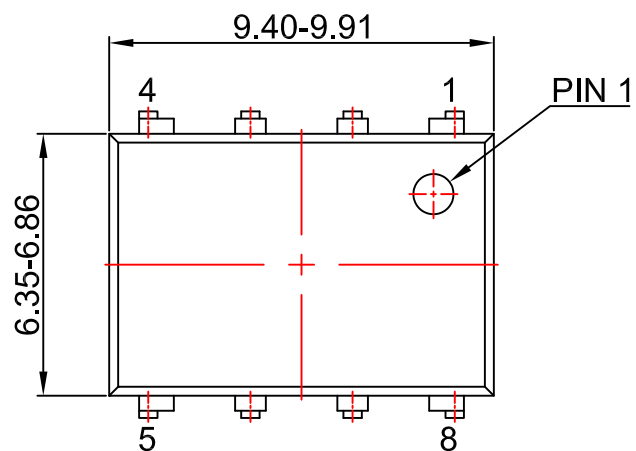


Symbol	Description	Dimension in mm
W	Tape Width	16.0 ± 0.3
t	Tape Thickness	0.30 ± 0.05
P ₀	Sprocket Hole Pitch	4.0 ± 0.1
D ₀	Sprocket Hole Diameter	1.55 ± 0.05
E	Sprocket Hole Location	1.75 ± 0.10
F	Pocket Location	7.5 ± 0.1
P ₂		2.0 ± 0.1
P	Pocket Pitch	12.0 ± 0.1
A ₀	Pocket Dimensions	10.30 ±0.20
B ₀		10.30 ±0.20
K ₀		4.90 ±0.20
W ₁	Cover Tape Width	13.2 ± 0.2
d	Cover Tape Thickness	0.1 max
	Max. Component Rotation or Tilt	10°
R	Min. Bending Radius	30

Reflow Profile



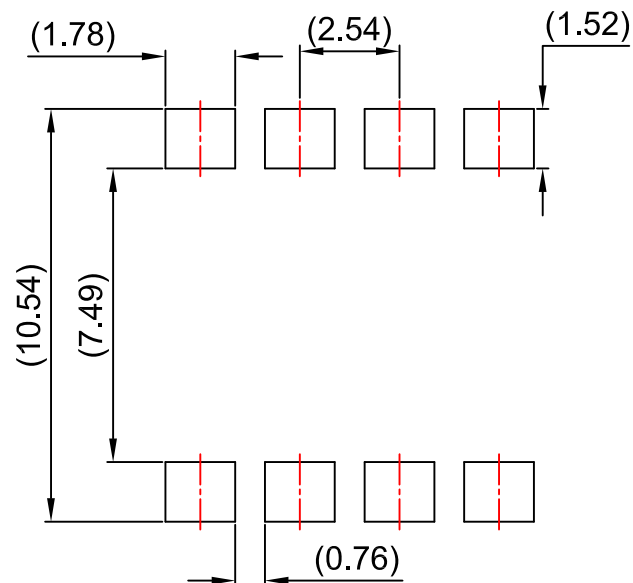
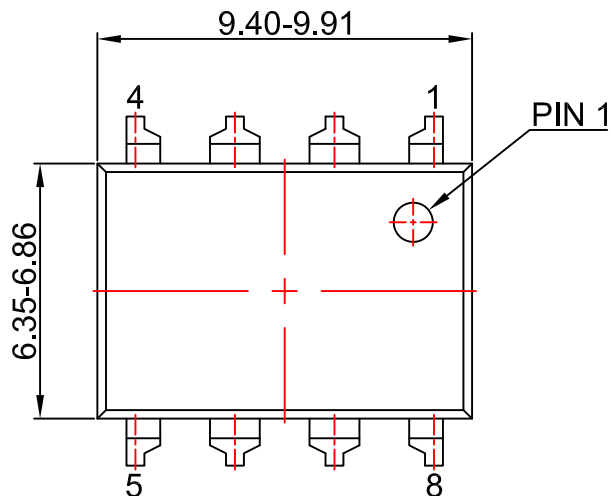
Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tsmmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (ts) from (Tsmmin to Tsmax)	60–120 seconds
Ramp-up Rate (tL to tp)	3°C/second max.
Liquidous Temperature (TL)	217°C
Time (tL) Maintained Above (TL)	60–150 seconds
Peak Body Package Temperature	260°C +0°C / –5°C
Time (tp) within 5°C of 260°C	30 seconds
Ramp-down Rate (TP to TL)	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.



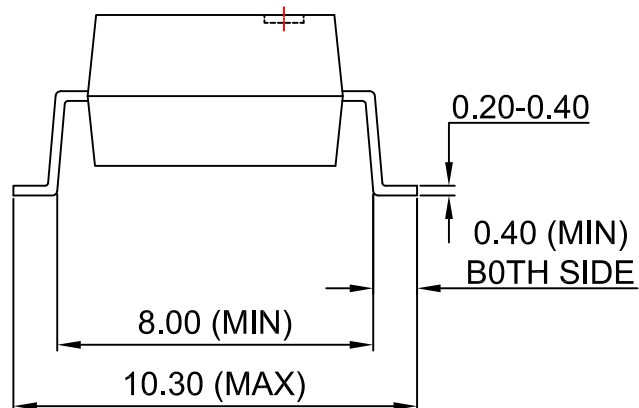
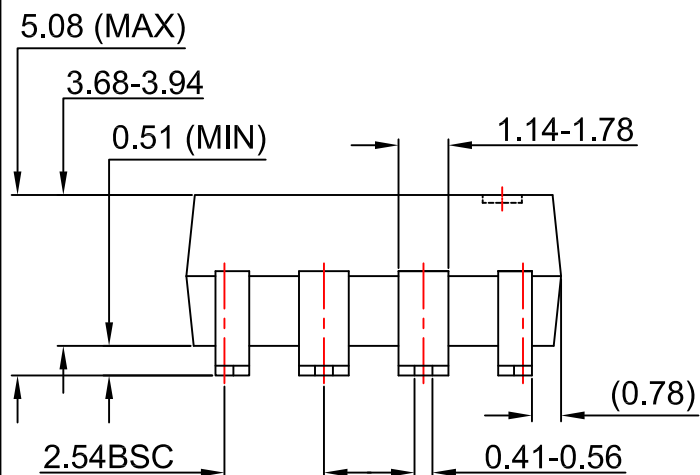
NOTES:

- A) NO STANDARD APPLIES TO THIS PACKAGE
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION
- D) DRAWING FILENAME AND REVISION: MKT-N08GREV7





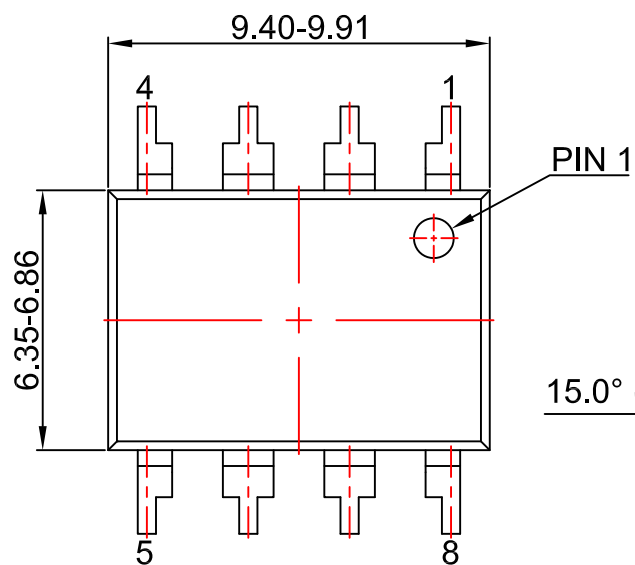
LAND PATTERN RECOMMENDATION



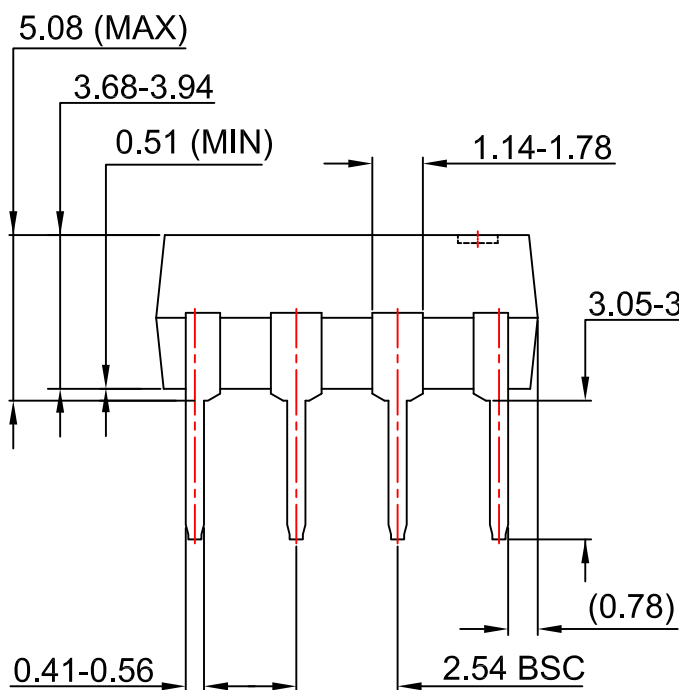
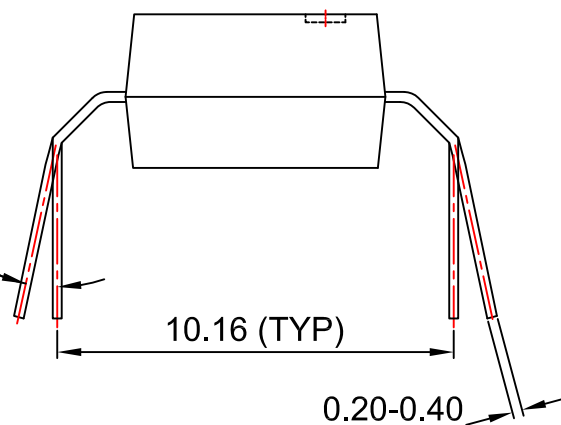
NOTES:

- A) NO STANDARD APPLIES TO THIS PACKAGE
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION
- D) DRAWING FILENAME AND REVSION: MKT-N08Hrev7.





15.0° (MAX)



NOTES:

- A) NO STANDARD APPLIES TO THIS PACKAGE
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION
- D) DRAWING FILENAME AND REVISION: MKT-N08REV7



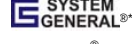


TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™
AttitudeEngine™
Awinda®
AX-CAP®*
BitSiC™
Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficientMax™
ESBC™
F®
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FastvCore™
FETBench™
FPS™
F-PFS™
FRFET®
Global Power ResourceSM
GreenBridge™
Green FPS™
Green FPS™ e-Series™
Gmax™
GTO™
IntelliMAX™
ISOPLANAR™
Making Small Speakers Sound Louder and Better™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MicroPak2™
MillerDrive™
MotionMax™
MotionGrid®
MTi®
MTx®
MVN®
mWSaver®
OptoHit™
OPTOLOGIC®

OPTOPLANAR®
®
Power Supply WebDesigner™
PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
™
Saving our world, 1mW/W/kW at a time™
SignalWise™
SmartMax™
SMART START™
Solutions for Your Success™
SPM®
STEALTH™
SuperFET®
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS®
SyncFET™
Sync-Lock™

 SYSTEM GENERAL®*
TinyBoost®
TinyBuck®
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TranSiC™
TriFault Detect™
TRUECURRENT®*
μSerDes™
 SerDes®
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
VoltagePlus™
XS™
Xsens™
仙童®

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT [HTTP://WWW.FAIRCHILDSEMI.COM](http://www.fairchildsemi.com). FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

AUTHORIZED USE

Unless otherwise specified in this data sheet, this product is a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability. This product may not be used in the following applications, unless specifically approved in writing by a Fairchild officer: (1) automotive or other transportation, (2) military/aerospace, (3) any safety critical application – including life critical medical equipment – where the failure of the Fairchild product reasonably would be expected to result in personal injury, death or property damage. Customer's use of this product is subject to agreement of this Authorized Use policy. In the event of an unauthorized use of Fairchild's product, Fairchild accepts no liability in the event of product failure. In other respects, this product shall be subject to Fairchild's Worldwide Terms and Conditions of Sale, unless a separate agreement has been signed by both Parties.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Terms of Use

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I77