

# ***crydom***<sup>®</sup>

## **DP Series Solid State Contactors**



**The Global Expert in Solid State Relay Technology**

*A brand of*  
**CST**  
CUSTOM SENSORS & TECHNOLOGIES

### ABOUT US

Crydom, a brand of Custom Sensors & Technologies (CST) and **global expert in Solid State Relay Technology**, has a distinguished record of providing high quality, world class Solid State Relay and Control Products for a variety of heating, lighting and motion control applications. Crydom products, coupled with **unparalleled technical support, timely delivery and competitive pricing**, provide Crydom's clients with the innovative products and support necessary to succeed in today's competitive and fast paced global markets.

Crydom's extensive selection of standard off-the-shelf products is constantly being updated and expanded through its continuous improvement and aggressive new product development programs. Utilizing state of the art designs, materials and technology, Crydom offers a wide range of AC and DC output SSRs in industry standard Panel Mount, PCB Mount and DIN Rail packages, all **meeting global safety and standards agency requirements** such as CE, RoHS, UL, IEC, etc.

Bolstered by four decades of Solid State Relay operations experience, Crydom also specializes and encourages **adapted and fully custom-designed SSR products** for nearly any application where unique specifications and optimized performance are critical for success.

Crydom's modern purpose-built **100,000 square foot manufacturing facility** houses all aspects of its ISO certified operation including Design and Development Engineering, Manufacturing Operations and Quality Assurance, Customer Service, Finance, Marketing and General Management, permitting close coordination of all aspects of Crydom's activities. Applications Engineering and Sales support are both performed in the field to provide Crydom's Customers with the unparalleled technical and commercial support.

Following rigid design guidelines and standards, Crydom products have set the bench mark for SSR performance and reliability world wide. In addition to **award winning designs**, Crydom has acquired an impressive list of **patents** related to SSRs and Solid State Controls, while continuing to develop new circuit and technology-related inventions as part of **extensive R&D programs**.

To learn more about Crydom SSR technology and products, or how an alliance with Crydom can contribute to the success of your project, visit **www.crydom.com** or contact your authorized Crydom Distributor or Crydom Customer Service Representative today.

### DP SERIES SOLID STATE CONTACTORS

#### Panel Mounted DC Load Reversing Solid State Contactors

The **DP Series** of DC Load Reversing Solid State Contactors (SSCs) include four optically isolated DC low dissipation FET outputs rated up to 60 amps at 48 VDC, wired in an H-Bridge configuration with a common input control to provide a convenient method to both power on and off and reverse the polarity to a variety of DC loads including motors, brakes, clutches, electro magnets, solenoids, plating baths and electrolytic cells. The **DP Series** is housed in a compact encapsulated industry standard 75 x 105 mm panel mount package featuring screw termination for power and load connections and a 4 conductor connector for control connections.

#### Flexible Control of DC Load

In addition to the on/off and reversing functions, **DP Series** Contactors include an internal interlock circuit to prevent damage due to overlapping forward/reverse control commands. The **DP Series** also offers options for a variety of combinations of Internal PWM Soft Start/Ramp Up, PWM Soft Stop/Ramp Down and Dynamic Brake functions. Available with a selection of set ramp times, the soft start and stop functions provide a convenient means to eliminate or reduce the mechanical shocks associated with starting and stopping DC electro-mechanical loads.

#### Ratings & Approvals

The **DP Series** of Solid State Contactors are available with either 20, 40 or 60 Amp general use ratings in a 40°C ambient temperature with appropriate heat sinking. The output will switch from 1 to 48 VDC. Available control inputs are conveniently matched to the input logic supply to accept either 4.5 to 15 VDC or 18 to 32 VDC from a common power supply. **DP Series** SSCs are CE Certified, RoHS Compliant, UL/cUL Recognized and carry Motor Control Ratings up to 15 FLA at 48 VDC.

For additional information about the **DP Series** DC Reversers, including available thermal management accessories, contact the nearest Crydom Distributor, Representative or local Crydom Sales Office, or visit our website at [www.crydom.com](http://www.crydom.com).



## DP Series DC Load Reversing Solid State Contactors

- Convenient FET switches in H-Bridge configuration
- Control features to combine Soft Start/Ramp Up, Soft Stop/Ramp Down & Braking functions on each polarity
- Built-in protective Forward/Reverse interlock function
- 20, 40 & 60 Amps Operational Current rating
- 48 VDC Rated Operating Voltage
- UL & IEC ratings for general use & Motor loads
- 4.5 to 15 VDC & 18 to 32 VDC Input Control Voltage options available
- LED Status indicators for Operating Modes
- Industry standard 75 x 105 mm Panel Mount package

Output Specifications (A)	DP4Rxx60x20xx	DP4Rxx60x40xx	DP4Rxx60x60xx
Operating Voltage Range [VDC]	1-60	1-60	1-60
Rated Operating Voltage [VDC]	48	48	48
Maximum Off-State Leakage Current @ Rated Voltage [µA]	20	20	20
Minimum Load Current [A]	0.10	0.10	0.10
Maximum Surge Current (10 ms) [ADC] (B)	80	140	240
Maximum On-State Resistance, per FET switch (RDS-ON) [Ohm]	0.014	0.007	0.005
Maximum On-State Voltage Drop @ Rated Current [VDC]	0.28	0.28	0.3
Total Power Dissipation per module, 2 FET switches conducting, T <sub>j</sub> =100° C [Watts]	20	40	60
Combined Thermal Resistance Junction to Case (R <sub>jc</sub> ) [°C/W]	0.4	0.2	0.13
Internal PWM For Soft Start/Stop Versions (Duty Cycle 10-100%) [Hz]	200	200	200
UL 508 General Use Load Current @ Rated Voltage [A] (C)	20	40	60
UL 508 Motor Controller Load Current @ Rated Voltage [FLA] (C)	13	14	15
IEC 60947-4-1 DC-1 Load Current @ Rated Voltage [ADC] (C)	20	40	60
IEC 60947-4-1 DC-3 Load Current @ Rated Voltage [FLA] (C)	13	14	15

Input Specifications (A)	DP4Rxx60D40xx	DP4Rxx60E40xx
Logic Supply Voltage Range (pin 5) [VDC]	4.5 - 15	18 - 32
Min/Max Logic Supply Current (pin 5) [mA] (D)	16/20	20/25
Control Voltage Range (pin 7, pin 8) [VDC]	4.5 - 15	18 - 32
Minimum Control Input Current @ Min voltage (pin 7, pin 8) [mA]	0.20	1
Maximum Control Input Current @ Max voltage (pin 7, pin 8) [mA]	1	2
Typical Interlocking Time [msec]	200	200

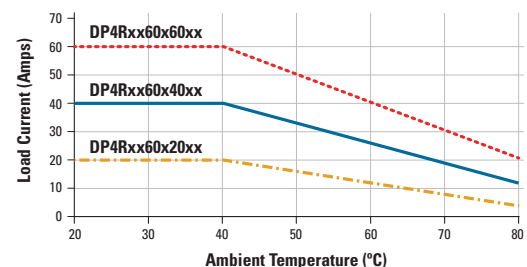
General Specifications (A)	DP4Rxx60x20xx	DP4Rxx60x40xx	DP4Rxx60x60xx
Dielectric Strength, Input-Output to Baseplate (50/60Hz) [Vrms]		2500	
Minimum Insulation Resistance @ 500 VDC [Ohm]		10 <sup>9</sup>	
Maximum Capacitance, Input to Output [pF]		28	
Ambient Operating Temperature Range [°C]		-30 to 80	
Ambient Storage Temperature Range[°C]		-40 to 125	
Housing Material (Shell)		Black, UL 94 V-0	
Encapsulation		Thermally conductive Epoxy	
Weight (typical) [oz] (gr)	10.93 (310)	12.16 (345)	
Input Locking Connector		Rectangular Header, Male Pin 4 Positions, 0.100 in [2.54] Pitch (E)	
Output Terminals	Screw / Clamp Combo Type 10-32	Hex Screw Type 1/4-20 with lock washers	
Maximum Torque [in-lbs] (Nm)	20 (2.2597)	25 (2.8246)	
Input Connector Wire Capacity		AWG #24 (0.2 mm <sup>2</sup> )	
Wire Size for Maximum Ratings (with terminals)	AWG #12 (IEC 3.3 mm <sup>2</sup> )	AWG #8 (8.4 mm <sup>2</sup> )	AWG #6 (IEC 13.3 mm <sup>2</sup> )
IP rating		IP00	
LED Status Indicator		Green LED (Forward), Yellow LED (Reverse). See TABLE 2	
IEC 60068-2-6 : Vibration		Compliant (1.5 mm / 10-55 Hz)	
IEC 60068-2-27 : Shock		Compliant (15 G / 11 ms)	
IEC 61000-4-2 : Electrostatic Discharge		Level 2	
IEC 61000-4-4 : Electrically Fast Transients		Level 2 - Criteria A	
IEC 61000-4-5 : Electrical Surges		Level 2 - Criteria B	

### General Notes

- (A) All parameters at 25°C unless otherwise specified.  
 (B) Maximum Surge Current rating not to be exceeded during motor Starting or Dynamic Braking.  
 (C) For maximum ratings use heat sink ratings in TABLE 1.  
 (D) Input circuit incorporates active current limitation.  
 (E) Suggested mating connector/plug : Crimp Housing, Positive Latch (Molex 050579404).

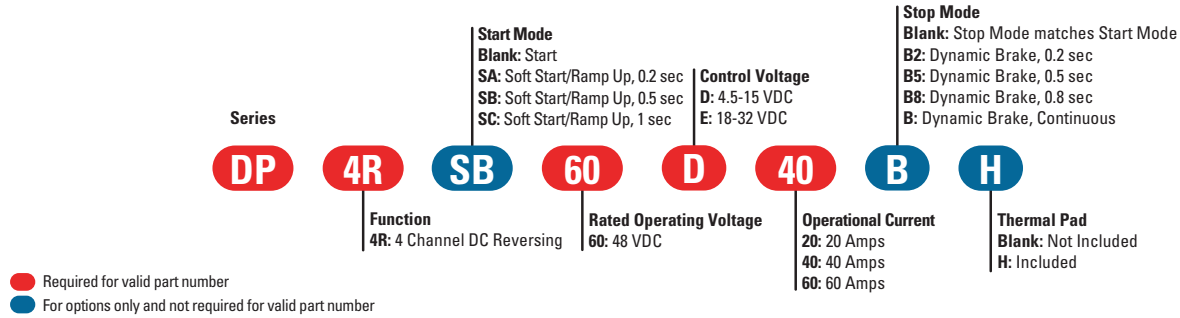
TABLE 1		
DP Series Part No.	Required Heat Sink [°C/W]	Crydom Heat Sink Part No.
DP4Rxx60x20xx	1.5	HS103 / HS103DR
DP4Rxx60x40xx	1.0	HS103 / HS103DR
DP4Rxx60x60xx	0.5	HS053

### Derating Curves (C)



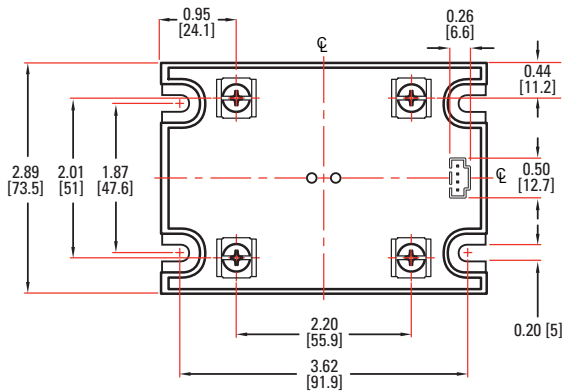
Complete specifications of these & other Crydom products available at: [www.crydom.com](http://www.crydom.com)

## Part Number Nomenclature (F)

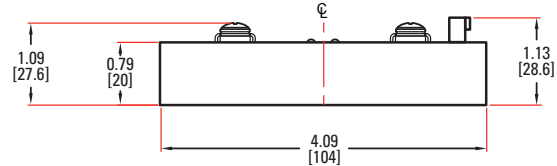


## Mechanical Dimensions (G)

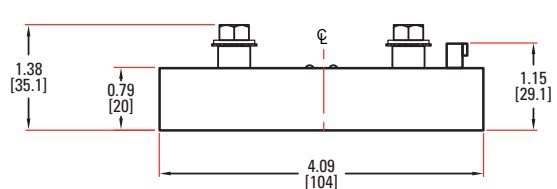
Tolerances: ±0.02 in / 0.5 mm  
 All dimensions are in: inches [millimeters]



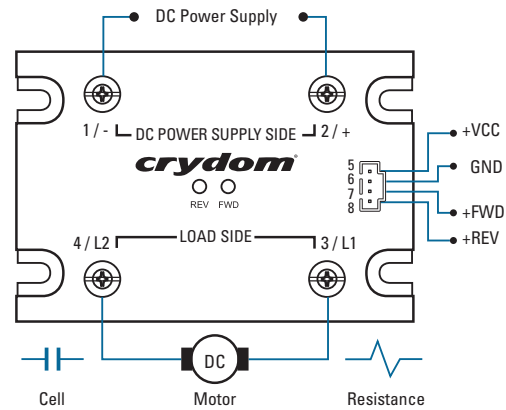
DP4Rxxxxx20



DP4Rxxxxx40 & DP4Rxxxxx60



## Wiring Diagram



## Block Diagram

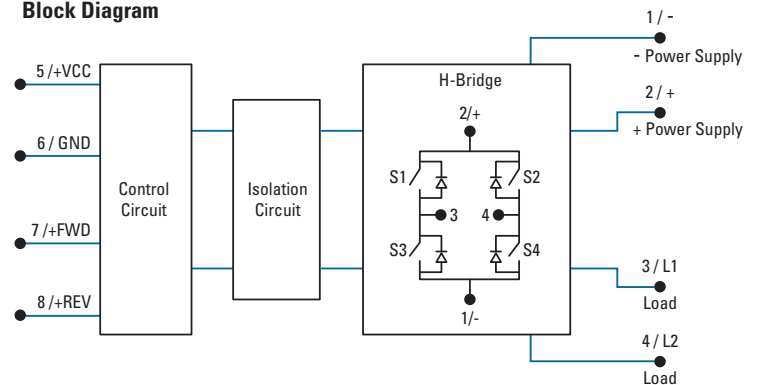








TABLE 2

Status Functions	Green LED (Forward)	Yellow LED (Reverse)
Initial Logic Supply Voltage On	Flash Twice	Flash Twice
Forward ON	ON	OFF
Reverse ON	OFF	ON
Dynamic Brake	Flash Once	Flash Once
Interlocking	Flash 3x Intermittently	Flash 3x Intermittently

TABLE 3

DP Series Part No.	Accessories						
							
	HK1	HS053	HS103 HS103DR	HSP-3 HSP-5	TRM1	TRM6	
	DP4Rxx60x20xx	◆		◆			◆
	DP4Rxx60x40xx	◆		◆	◆		
DP4Rxx60x60xx	◆	◆		◆	◆		

(F) For a complete description of available Operating Modes, see definitions on page 5.

(G) Baseplate Thickness 0.125 [3.2]

**Questions?** **America** Tel.: +1 (877) 502 5500  
 Call or e-mail: e-mail: sales@crydom.com

**EMEA** Tel.: +44 (0) 1202 606030  
 e-mail: sales-europe@crydom.com

**Asia** Tel.: +86 (0) 21 2401 7766  
 e-mail: sales-cn@crydom.com

## Operating Modes

**Start:** When either FWD or REV Control signal is applied, and after Control Signal Validation Delay, DC power supply on terminals 1/- and 2/+ is directly connected to Load at terminals 3/L1 and 4/L2 with a polarity according to the control signal. The start option can be combined with Stop and/or Dynamic Brake options.

**Stop:** Load is disconnected from DC power supply. All FET switches (S1, S2, S3 & S4) inside the DP Series SSC are turned off. This simple Stop option is available only in combination with the simple Start option (suffix Blank).

**Soft Start/Ramp Up:** It is a modified Start where the DC power supply is connected to the load using a 200 Hz pulse width modulation with a duty cycle going from 10% to 100%. Soft Start/Ramp Up time is defined by SA, SB and SC suffixes. After Soft Start/Ramp Up time is elapsed, the Load will remain continuously energized for as long as FWD or REV Control signal is applied. This option can be combined with Soft Stop/Ramp Down and Dynamic Braking modes, but not with simple Stop.

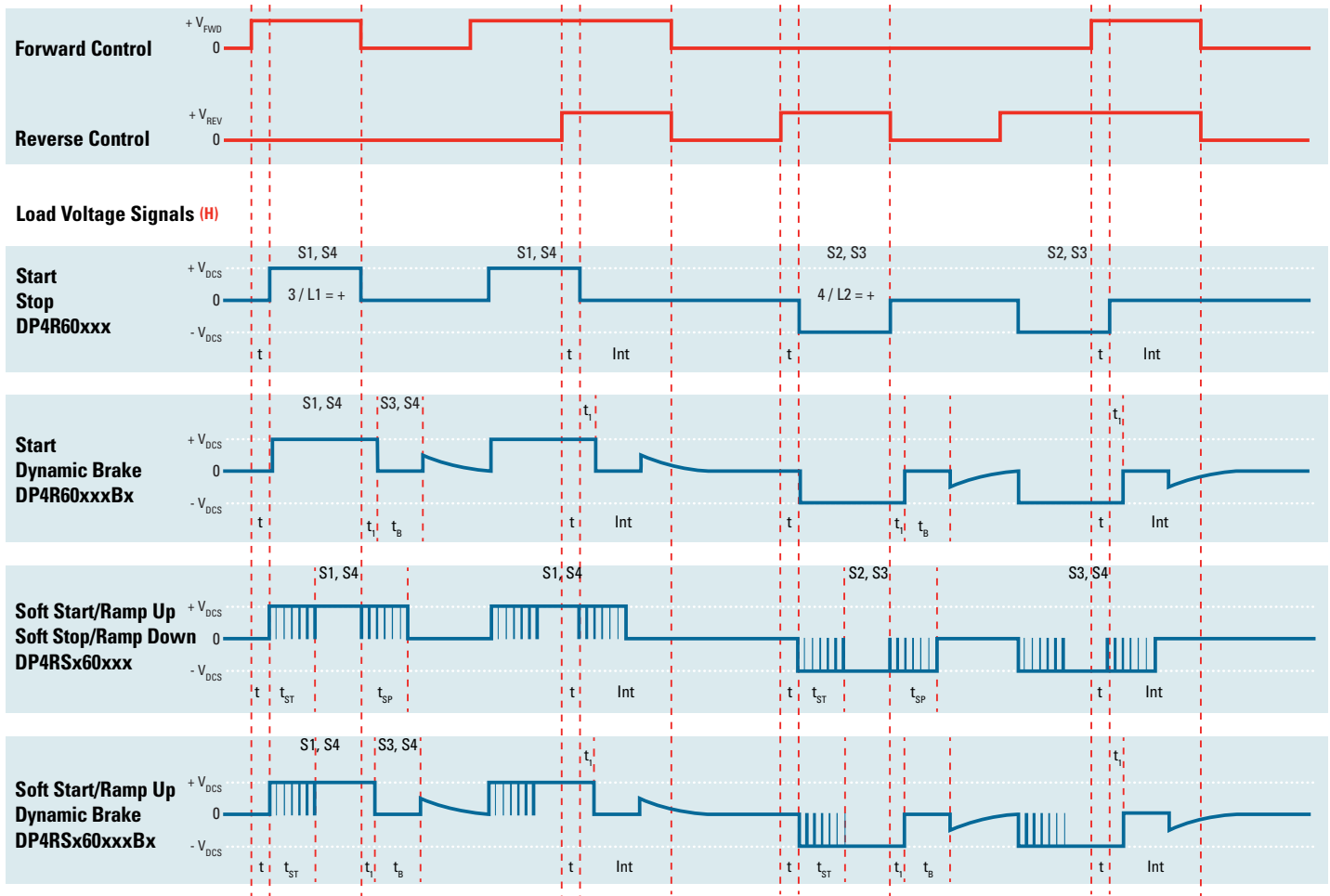
**Soft Stop/Ramp Down:** It is a modified Stop where the DC power supply is disconnected from the Load

using a 200 Hz pulse width modulation with a duty cycle going from 100% to 0%. After Soft Stop/Ramp Down time is elapsed, the Load will remain continuously de-energized waiting for a new FWD or REV Control signal. Soft Stop/Ramp Down time is tied to Soft Start/Ramp Up time selected by SA, SB and SC suffixes and can be combined with Soft Start/Ramp Up only.

**Dynamic Brake:** It could be used as a modified Stop where the FET switches inside the DP Series SSC are arranged in such a way that they provide a path for the Load Current to keep flowing after the DC power supply has been disconnected. This mode allows for energy stored in some type of loads to be discharged. i.e. back EMF on DC motors. Timing for Dynamic Brake is selected by suffixes B2, B5, B8 and B where the latest will keep the braking or discharging path enabled for as long as FWD and REV Control signals are removed.

**Interlock:** It will shut down all FET switches inside the DP Series SSC within 0.2 sec after both control signals FWD and REV are applied at the same time. An Interlock condition will trigger a modified Stop such as Soft Stop/Ramp Down or Dynamic Brake whenever an option has been selected.

## Control Signals



Int : Interlock

t : Control Signal Validation Delay = 0.2 sec, except for Start / Stop (0.025 sec)

t<sub>i</sub> : 0.15 sec Break-before-make delay

t<sub>b</sub> : Dynamic Brake time

B2: 0.2 sec

B5: 0.5 sec

B8: 0.8 sec

B: Continuous

t<sub>SP</sub> : Soft Stop/Ramp Down time = t<sub>ST</sub>

t<sub>ST</sub> : Soft Start/Ramp Up time

SA: 0.2 sec

SB: 0.5 sec

SC: 1 sec

V<sub>DCS</sub> : VDC power supply

V<sub>FWD</sub> : Forward Control Signal

V<sub>REV</sub> : Reverse Control Signal

(H) Load voltage signals shown are typical of a DC motor, behavior may change for other load types.

# crydom®

## AMERICA



### United States & Canada

**Crydom Inc**  
2320 Paseo de las Americas,  
Suite 201  
San Diego, CA 92154

#### Sales Support:

Tel.: +1 (877) 502 5500  
Fax: +1 (619) 210 1590  
[sales@crydom.com](mailto:sales@crydom.com)

#### Technical Support:

Tel.: +1 (877) 702 7700  
[support@crydom.com](mailto:support@crydom.com)

### Mexico

**Automatismo Crouzet  
S.A. de C.V.**  
Calzada Zavaleta 2505-C Col  
Sta Cruz Buenavista C.P.  
72150 - Puebla

#### Sales Support:

Toll free: 01 800 087 6333  
Tel.: +52 (222) 409 7000  
Fax: +52 (222) 409 7810  
[sales-mx@crydom.com](mailto:sales-mx@crydom.com)

#### Technical Support:

Toll free: 01 800 838 3736

### Southern & Central

**American Countries  
CST Latinoamerica**  
Alameda Rio Negro, 1030,  
18º andar - Conjunto 1803  
CEP: 06454-000  
Barueri - São Paulo  
Brasil  
Tel.: +55 (11) 2505 7500  
Fax: +55 (11) 2505 7507  
[info@cst-latinoamerica.com](mailto:info@cst-latinoamerica.com)

## EUROPE, MIDDLE EAST & AFRICA



### United Kingdom

**Crydom SSR Ltd**  
Arena Business Centre  
Holyrood, Close  
Poole, Dorset BH17 7FJ

#### Sales Support

Tel.: +44 (0) 1202 606030  
Fax: +44 (0) 1202 606035  
[sales-europe@crydom.com](mailto:sales-europe@crydom.com)

#### Tech Support

[support-europe@crydom.com](mailto:support-europe@crydom.com)

### Austria & Switzerland

Tel.: +44 (0) 1202 606030  
Fax: +44 (0) 1202 606035  
[vertrieb@crydom.com](mailto:vertrieb@crydom.com)

### Belgium

Tel.: +32 (0) 2 460 4413  
Fax: +32 (0) 2 461 2614  
[sales-europe@crydom.com](mailto:sales-europe@crydom.com)

### France

Tel.: +33 (0) 810 123 963  
Fax: +33 (0) 810 057 605  
[sales-europe@crydom.com](mailto:sales-europe@crydom.com)

### Germany

Tel.: +49 (0) 180 3000 506  
Fax: +49 (0) 180 3205 227  
[vertrieb@crydom.com](mailto:vertrieb@crydom.com)

### Italy

Tel.: +39 (0) 2 665 99 260  
Fax: +39 (0) 2 665 99 268  
[sales-europe@crydom.com](mailto:sales-europe@crydom.com)

### Spain

Tel.: +34 902 876 217  
Fax: +34 902 876 219  
[sales-europe@crydom.com](mailto:sales-europe@crydom.com)

### Netherlands

Tel.: +31 (0) 71 582 0068  
Fax: +31 (0) 71 542 1648  
[sales-europe@crydom.com](mailto:sales-europe@crydom.com)

### Middle East, Africa & Other European Countries

Tel.: +44 (0) 1202 606030  
Fax: +44 (0) 1202 606035  
[sales-europe@crydom.com](mailto:sales-europe@crydom.com)

## ASIA PACIFIC



### China & Hong Kong

**Custom Sensors &  
Technologies Asia  
(Shanghai) Ltd.**  
13th floor  
Chang Feng International  
Tower  
89 Yunling Road (East)  
Putuo District  
Shanghai, 200062

#### Sales Support

Tel.: +86 (0) 21 6065 6699  
Fax: +86 (0) 21 6065 7749  
[sales-cn@crydom.com](mailto:sales-cn@crydom.com)

#### Tech Support

[support-cn@crydom.com](mailto:support-cn@crydom.com)

### Taiwan & Japan

**Custom Sensors &  
Technologies**  
2F, No. 39, Ji-Hu Road  
Nei-Hu Dist.  
Taipei 114  
Tel: +886 2 8751 6388  
Fax: +886 2 2657 8725  
[taiwan@cstsensors.com](mailto:taiwan@cstsensors.com)

### South Korea

**Custom Sensors &  
Technologies**  
2F, Jeil Bldg.,  
94-46 Youngdeungpo-dong  
7-ga Youngdeungpo-gu,  
Seoul, 150-037  
Tel.: +82 2 2629 8312  
Fax: +82 2 2629 8310  
[korea@cstsensors.com](mailto:korea@cstsensors.com)

### India

**CST Sensors India Pvt Ltd**  
4th Floor, Trident Towers,  
No. 23, 100 Ft- Ashoka Pillar Road,  
2nd Block, Jayanagar,  
Bangalore- 560011  
Tel: +91 (80) 4113 2204 /05  
Fax: +91 (80) 4113 2206  
[india@cstsensors.com](mailto:india@cstsensors.com)

### South East Asian & Pacific Countries

**Custom Sensors &  
Technologies**  
2F, No. 39, Ji-Hu Road  
Nei-Hu Dist.  
Taipei 114, Taiwan  
Tel.: +886 2 8751 6388  
Fax: +886 2 2657 8725  
[eap@cstsensors.com](mailto:eap@cstsensors.com)

© 2011 Crydom Inc., All Rights Reserved.

Specifications are subject to change without prior notice.  
Crydom and the Crydom logo are registered trademarks  
of Crydom Inc.

06/2011

CAT/CR/DP/EN

Distributed by :