



## EMAlert® Series EMI Protection Modules CTC012 • CTC016 • CTC022 • CTC026

EMAlert® is a family of electromagnetic field protection modules designed specifically for markets where excessive EM field or ESD may jeopardize normal operation of equipment, such as medical devices, aviation, military, etc.

EMAlert modules reside in a host product and monitor the electromagnetic environment right in the most sensitive areas of the host's circuitry. Should the electromagnetic field or its amplitude modulation reach preset level, the EMAlert module will signal the potentially dangerous situation (EM Event™) to the outside and will begin to test the operation of the host equipment in a way similar to a watchdog timer. If the host equipment does not respond, the EMAlert module produces signal that may be used to reset the host equipment or as an alert signal to the outside. In addition, EMAlert™ modules supply DC voltage that is a function of a field strength for constant monitoring.

### Applications:

- ⚡ Avionics
- ⚡ Medical equipment
- ⚡ Marine
- ⚡ Military
- ⚡ Industrial control
- ⚡ Power plants
- ⚡ Robotics
- ⚡ Automotive



**CTC012**  
PCB-Mounted  
Radiated Emission  
1"x 1.5"x 0.5"



**CTC016**  
PCB-Mounted  
Conducted Emission  
1"x 2"x 0.5"



**CTC022**  
Chassis-Mounted  
Radiated Emission  
1.3"x 2.38"x 0.8"



**CTC026**  
Chassis-Mounted  
Conducted Emission  
1.3"x 2.38"x 0.8"

### Summary of Features

- ⚡ Detection of electromagnetic (EM) emission in a broad range
- ⚡ EM Event logic output.
- ⚡ EM analog DC output as a function of field strength.
- ⚡ Selectable field strength threshold.
- ⚡ Amplitude modulation (AM) detection.
- ⚡ Watchdog timer-type reset output in case of system lock-up during EM event.
- ⚡ Signalization of a system failure to the outside.
- ⚡ Multiple Modules Interlink.
- ⚡ 3.3V to 5V operation.

PIN	I/O	DESCRIPTION
Vcc	I	Power Input, 3.3V to 5V
GND	I	Ground
EM	O	EM Event Output. Normally low. High when EM field strength exceeds pre-set level.
WDOCLK	O	Normally low. Pulses during EM event.
WDI	I	Normally low. Response pulses from host system. Absence of these pulses during EM Event determines state of malfunction of the host system.
WDO	O	Normally high. Produces pulses to reset host system in case of EM malfunction.
EMLVL	O	DC voltage that is a function to a field strength measured by the module (0 .. 3V).
RESET	I	Input from the host system master RESET. Normally high. When pulled low by the system, WDOCLK, WDI and WDO do not operate.
MM	I/O	Multiple Modules I/O. Links up to 10 EMAlert modules.
LEVEL 1	I	EM Field Threshold Set. Connect to Vcc to set, ground for default setting.
LEVEL 2	I	EM Field Threshold Set. Connect to Vcc to set, ground for default setting.
WDTS	I	Connect optional capacitor in order to increase WDO pulse interval.
AMDIS	I	Disable AM (amplitude modulation) detection. Connect to Vcc to disable, ground to enable.

## EMI Protection Modules

### ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	VALUE	UNITS
Supply Voltage Range	V <sub>CC</sub>	-0.5 .. 7	V
Input Voltage	V <sub>IN</sub>	-0.5 .. V <sub>CC</sub> +0.5	V
Output Voltage	V <sub>OUT</sub>	-0.5 .. V <sub>CC</sub> +0.5	V

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. Extended temperature range devices available -- contact factory.

### ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITIONS	MIN	NOM	MAX	UNITS
Operating Voltage Range	V <sub>CC</sub>		3.3		5	V
Supply Current, Idle mode	I <sub>supply</sub>			5		mA
Frequency Range	f	Radiated	1		2500	MHz
		Conducted	0.15		30	MHz
Field Strength Threshold	E <sub>tr</sub>	0% AM	1		5	V/m
Output Voltage Levels	Low High	All outputs	0		0.1	V
			V <sub>CC</sub> -0.2		V <sub>CC</sub>	V
Input Thresholds	Low High	All logic inputs	0		V <sub>CC</sub> -3	V
			V <sub>CC</sub> -1		V <sub>CC</sub>	V
WDO Pulse Width	t <sub>WDO</sub>			10		μS
WDO Pulse Interval	t <sub>WDPI</sub>			3		mS
RST Input Threshold						
Watchdog Timeout Period	t <sub>WDT</sub>		1.2	2	2.8	S
Output Drive Capability		All logic outputs			5	LSTTL loads

## DETAILED DESCRIPTION

### General

The need for EMAlert modules is determined by the electromagnetic (EM) susceptibility of the host equipment. EMAlert serves as a "backup" protection in case host equipment experiences problems performing under the influence of the external EM fields or ESD.

EMAlert modules continuously monitor the field strength of radiated or conducted EM emission, provide electrical signals when the emission exceeds the preset level, and can check whether the host equipment malfunctions under influence of EMI (including ESD).

### Mounting

Board-mounted modules (CTC012 and CTC016) should be soldered to the PC board or installed into the appropriate component socket. The need for fastening CTC012/CTC016 to the board when used with the socket needs to be gauged against shock and vibration requirements for the entire product.

Chassis-mounted modules (CTC022 and CTC026) should be mounted on the chassis in the immediate vicinity to the most EMI-sensitive section of the circuitry.

Conducted emission modules (CTC022 and CTC026) should be in-

stalled in the immediate vicinity of the cable entry. Monitored wire(s) or cables need to be put through the opening in the case of EMAlert module. The bottom lid of CTC026 opens for that purpose.

### Setting the Field Strength Threshold

EMAlert modules have four different field strength threshold settings. In order to set proper threshold, either ground or tie to V<sub>CC</sub> pins LEVEL1 and/or LEVEL2. The connections should be done in the immediate vicinity of these pins.

The proper threshold level is specific to the particular type of the host equipment. If the host equipment itself is a source of high-strength EM field, the threshold level needs to be high enough to prevent EMAlert from triggering on the internally generated fields.

### Amplitude Modulation (AM)

Should the detection of AM be found unnecessary, simply connect AMDIS pin to V<sub>CC</sub>. The connection should be done in the immediate vicinity of this pin. If not used, AMDIS pin needs to be grounded.

The need for AM detection depends on the host equipment. Normally, AM detection should be left enabled.

## EM Output

Normally set low, the EM pin pulls high when the EM field exceeds the preset strength (EM Event™) and resets to the low state when the field strength goes below the threshold. The threshold detector has built-in hysteresis in order to prevent jittering of the EM output.

## Watchdog Timer Operation

The watchdog timer built into EMAlert modules functions only during the EM Event and is inactive at all other times. As seen in Fig. 2, as soon as the EM Event has occurred, WDOCLK output begins to generate pulses that are going to a host microprocessor. If the host is functioning properly, it is expected to return pulses into WDI input of EMAlert. If the host equipment is not returning pulses, this is pre-

sumed to be a sign of malfunctioning of the host. In this case, in approximately 2 seconds of the "grace period" the EMAlert module starts issuing WDO pulses (see Fig. 1). These pulses can be used for resetting the host or to inform the external supervisory system that the host is no longer functioning properly. As soon as the host system begins to return WDI pulses, the WDO pulse train stops. The

WDOCLK pulse interval is set such that it will allow most of the microprocessors to start producing WDI pulses after reset before the next WDO pulse arrives. It can be made longer by connecting a capacitor between pin WDTS and the ground. If the host microprocessor does not need WDOCLK pulses and can generate repetitive pulses on its own, leave WDOCLK open. The normally high RST signal generated by the host system prevents the watchdog timer operation during reset by disabling the WDOCLK (see Fig. 2). RESET input of EMAlert should be connected to Vcc if not used.

If the watchdog function of EMAlert is not needed by the host system, WDOCLK and WDO should be left open and WDI input should be connected to the ground.

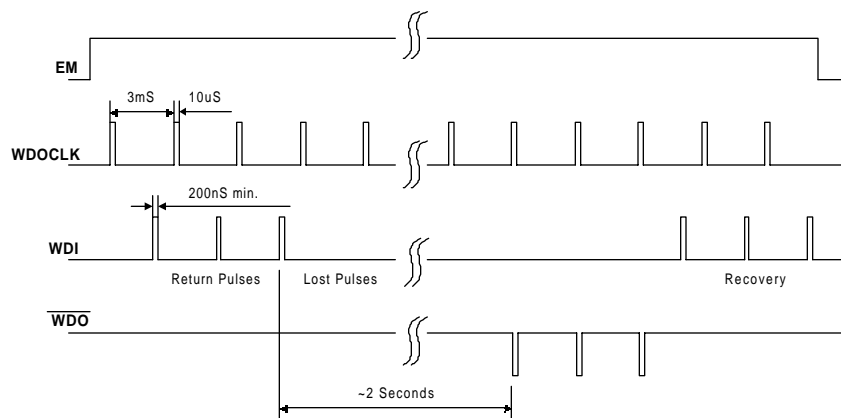


FIGURE 1



FIGURE 2

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## ESD and Surge Detection

EMAlert modules react to ESD as well. Though EM output lasts only for the duration of the actual discharge, testing host equipment for a malfunction continues for some time after the ESD pulse is gone in order to assure its proper operation.

## Multiple Modules Interlink

Up to 10 EMAlert modules can be linked together in order to provide one interface with the host when more than one module is installed. Regardless of which module detects EMI, all linked EMAlert modules know about it and any of them can be connected to a host system for fault detection. Each module still provides individual EM outputs.

## Analog DC Output

Each EMAlert module continually provides analog DC voltage that is a function of the field strength (amplitude modulation is not included) when the field strength reaches appreciable levels. This DC output can be used for data recording, remote monitoring, etc. EM or MM outputs can be used for triggering recording, if needed.

## How Do I Know That EMAlert Itself Works?

The state of EMAlert itself can be checked by monitoring of WDO pin. When the host equipment operates properly, this pin is High (Vcc). When the host equipment malfunctions under the influence of EMI, WDO produces short pulses that are active Low. Any other state of WDO pin would indicate malfunction of EMAlert itself.

### Typical Application

A typical application schematic of EMAlert modules is shown in Fig. 3. Although EMAlert modules have Vcc in-line EMI filter built in, it is recommended that you install an additional filter as shown.

EMAlert should be placed as close as possible to the most sensitive part of the host system. It is highly recommended to have good ground plane under EMAlert modules and keep all the connections as short as possible in order to prevent false triggering of the device.

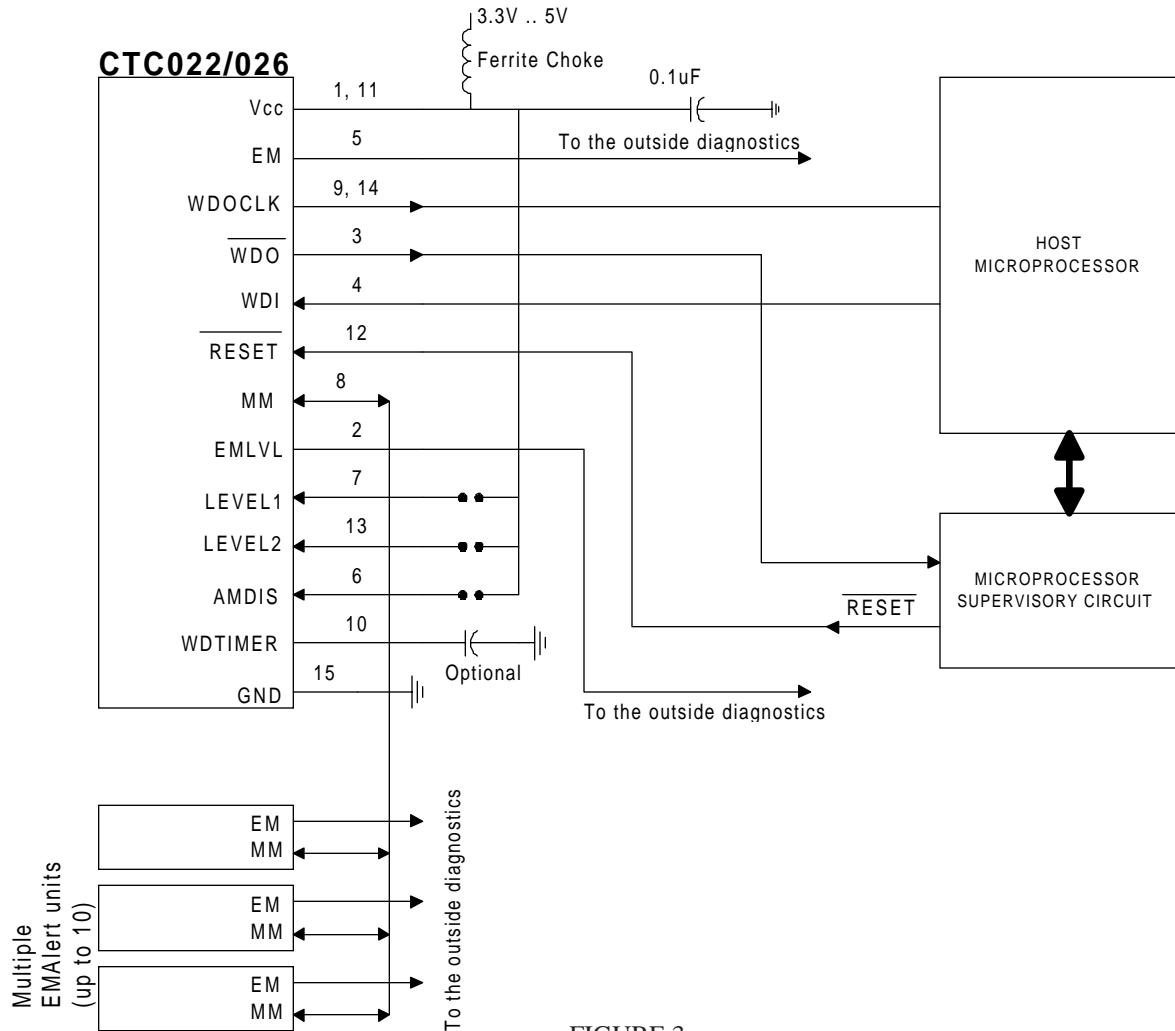


FIGURE 3

#### LIFE SUPPORT POLICY

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