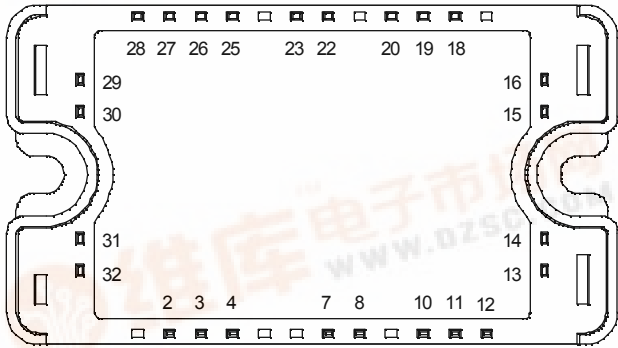
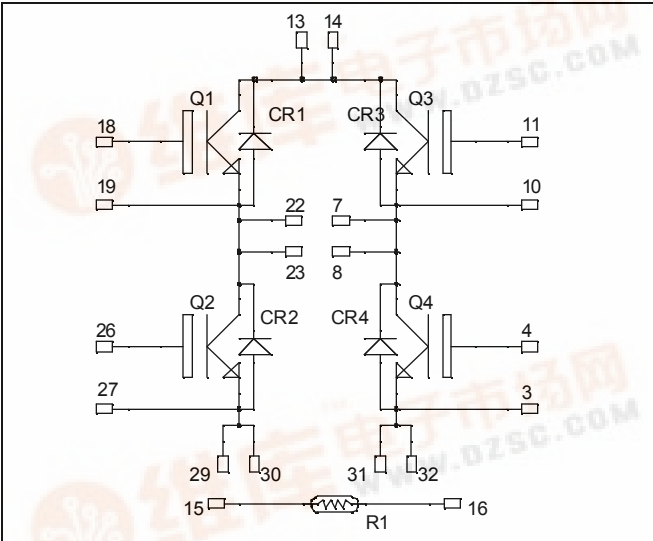


# APTGF50H60T3G

## Full - Bridge NPT IGBT Power Module

**$V_{CES} = 600V$**   
 **$I_C = 50A @ T_c = 80^\circ C$**



All multiple inputs and outputs must be shorted together  
Example: 13/14 ; 29/30 ; 22/23 ...

### Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

### Features

- Non Punch Through (NPT) Fast IGBT®
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 50 kHz
  - Soft recovery parallel diodes
  - Low diode VF
  - Low leakage current
  - Avalanche energy rated
  - RBSOA and SCSOA rated
  - Symmetrical design
- Kelvin emitter for easy drive
- Very low stray inductance
- High level of integration
- Internal thermistor for temperature monitoring

### Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Low profile
- Easy paralleling due to positive  $T_C$  of  $V_{CEsat}$
- Each leg can be easily paralleled to achieve a phase leg of twice the current capability
- RoHS compliant

### Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
$V_{CES}$	Collector - Emitter Breakdown Voltage	600	V
$I_C$	Continuous Collector Current	$T_C = 25^\circ C$	65
		$T_C = 80^\circ C$	50
$I_{CM}$	Pulsed Collector Current	$T_C = 25^\circ C$	230
$V_{GE}$	Gate - Emitter Voltage	$\pm 20$	V
$P_D$	Maximum Power Dissipation	$T_C = 25^\circ C$	250
RBSOA	Reverse Bias Safe Operating Area	$T_j = 125^\circ C$	100A @ 500V

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.



All ratings @  $T_j = 25^\circ\text{C}$  unless otherwise specified

### Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit	
$I_{CES}$	Zero Gate Voltage Collector Current	$V_{GE} = 0\text{V}$ $V_{CE} = 600\text{V}$	$T_j = 25^\circ\text{C}$	1	500	$\mu\text{A}$	
			$T_j = 125^\circ\text{C}$	1		$\text{mA}$	
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15\text{V}$ $I_C = 50\text{A}$	$T_j = 25^\circ\text{C}$	1.7	2.0	2.45	V
			$T_j = 125^\circ\text{C}$		2.2		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}, I_C = 1\text{mA}$	4		6	V	
$I_{GES}$	Gate – Emitter Leakage Current	$V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$			400	$\text{nA}$	

### Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{ies}$	Input Capacitance	$V_{GE} = 0\text{V}$ $V_{CE} = 25\text{V}$ $f = 1\text{MHz}$		2200		pF
$C_{oes}$	Output Capacitance			323		
$C_{res}$	Reverse Transfer Capacitance			200		
$Q_g$	Total gate Charge	$V_{GE} = 15\text{V}$ $V_{Bus} = 300\text{V}$ $I_C = 50\text{A}$		166		nC
$Q_{ge}$	Gate – Emitter Charge			20		
$Q_{gc}$	Gate – Collector Charge			100		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $25^\circ\text{C}$ ) $V_{GE} = 15\text{V}$ $V_{Bus} = 400\text{V}$ $I_C = 50\text{A}$ $R_G = 2.7\Omega$		40		ns
$T_r$	Rise Time			9		
$T_{d(off)}$	Turn-off Delay Time			120		
$T_f$	Fall Time			12		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching ( $125^\circ\text{C}$ ) $V_{GE} = 15\text{V}$ $V_{Bus} = 400\text{V}$ $I_C = 50\text{A}$ $R_G = 2.7\Omega$		42		ns
$T_r$	Rise Time			10		
$T_{d(off)}$	Turn-off Delay Time			130		
$T_f$	Fall Time			21		
$E_{on}$	Turn-on Switching Energy			0.5		
$E_{off}$	Turn-off Switching Energy			1		

### Reverse diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		600			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 600\text{V}$	$T_j = 25^\circ\text{C}$		250	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		500	
$I_F$	DC Forward Current	$T_c = 70^\circ\text{C}$		30		A
$V_F$	Diode Forward Voltage	$I_F = 30\text{A}$		1.6	1.8	V
		$I_F = 60\text{A}$		1.9		
		$I_F = 30\text{A}$	$T_j = 125^\circ\text{C}$		1.4	
$t_{rr}$	Reverse Recovery Time	$I_F = 30\text{A}$ $V_R = 400\text{V}$ $di/dt = 200\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$	85		ns
			$T_j = 125^\circ\text{C}$	160		
$Q_{rr}$	Reverse Recovery Charge		$T_j = 25^\circ\text{C}$	130		nC
			$T_j = 125^\circ\text{C}$	700		

**Temperature sensor NTC** (see application note APT0406 on [www.advancedpower.com](http://www.advancedpower.com) for more information).

Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>25</sub>	Resistance @ 25°C		50		kΩ
B <sub>25/85</sub>	T <sub>25</sub> = 298.15 K		3952		K

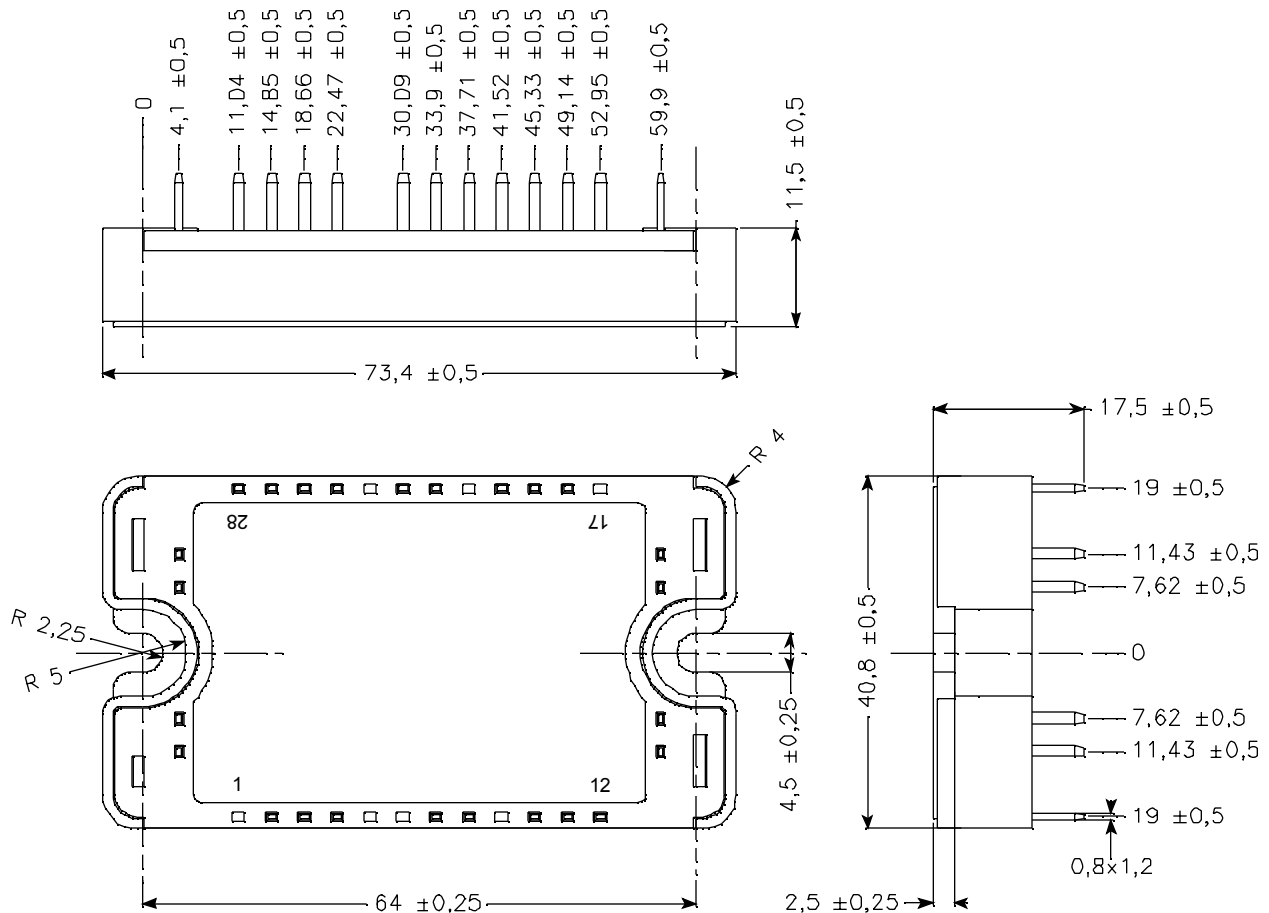
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T} - \frac{1}{T_{25}}\right)\right]}$$

T: Thermistor temperature  
R<sub>T</sub>: Thermistor value at T

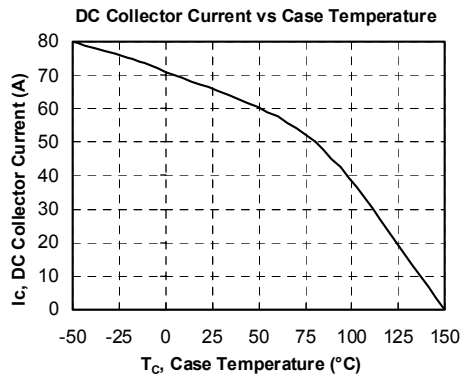
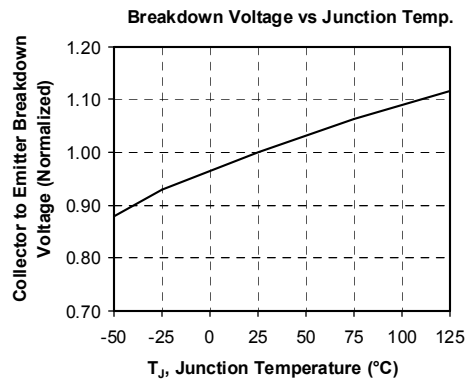
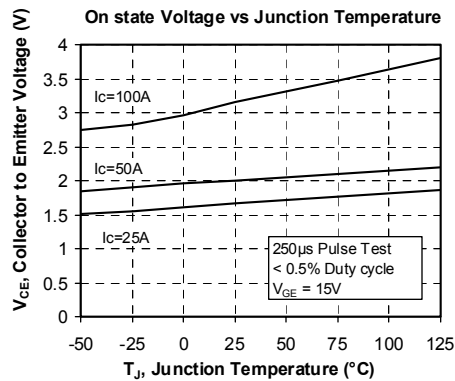
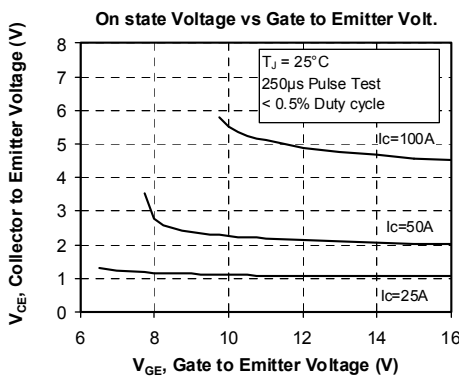
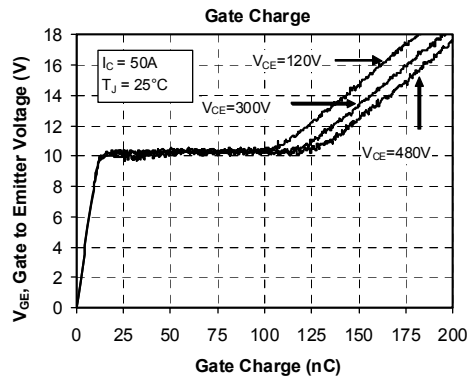
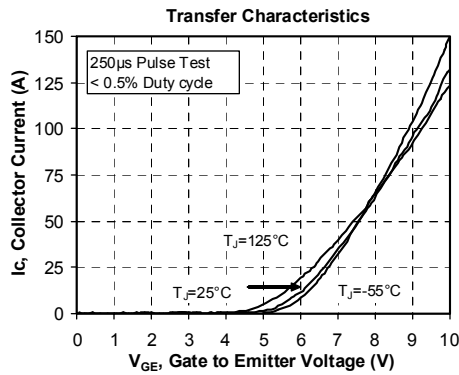
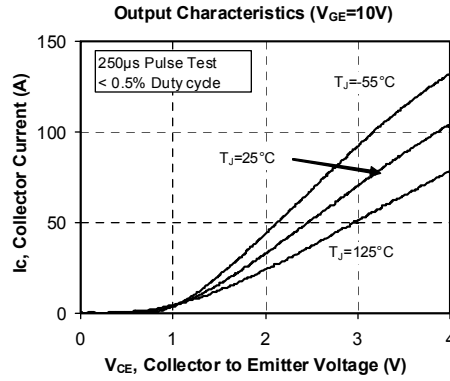
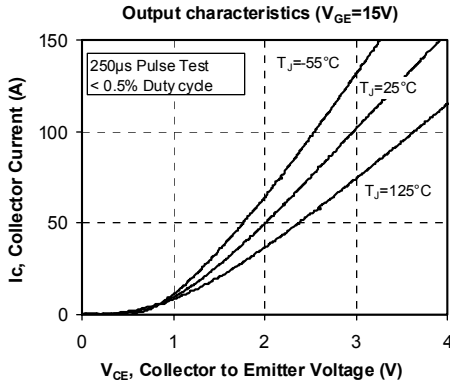
### Thermal and package characteristics

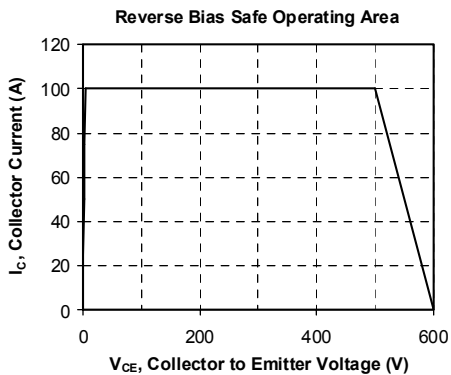
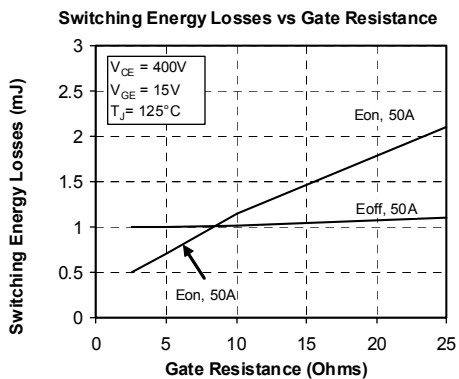
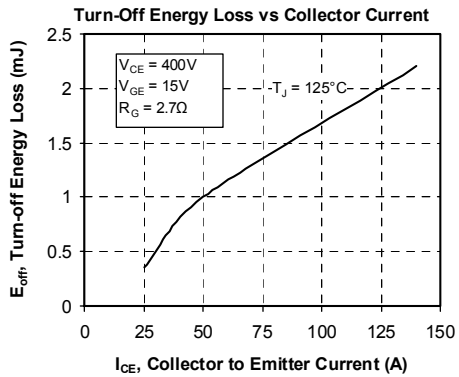
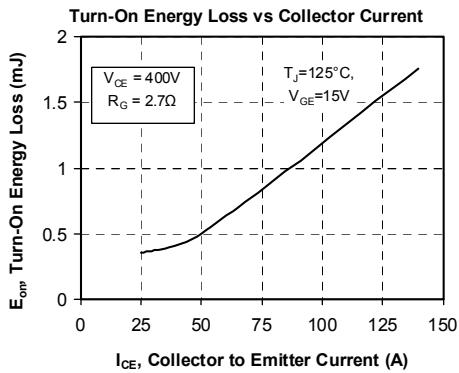
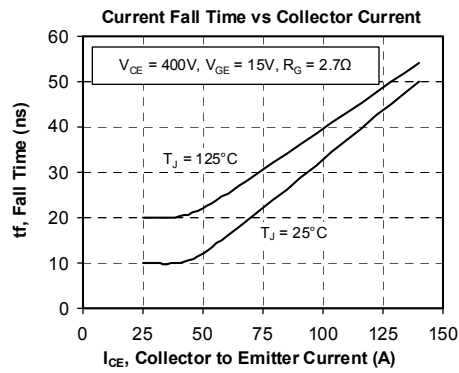
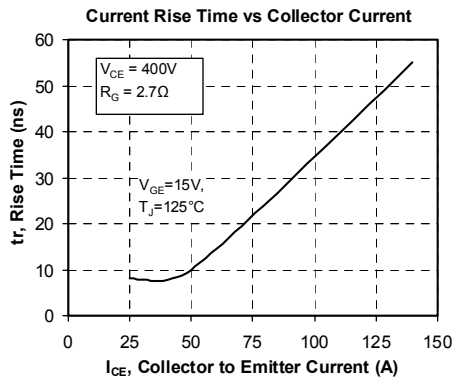
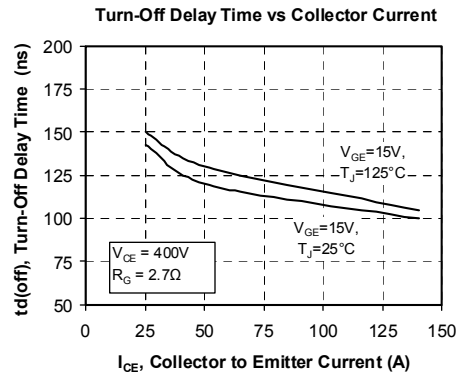
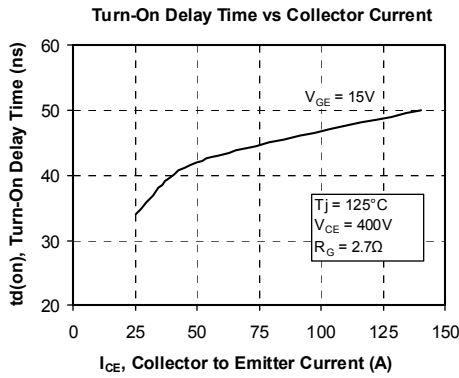
Symbol	Characteristic	Min	Typ	Max	Unit	
R <sub>thJC</sub>	Junction to Case Thermal Resistance	IGBT		0.5	°C/W	
		Diode		1.2		
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t = 1 min, I <sub>isol</sub> < 1 mA, 50/60 Hz	2500			V	
T <sub>J</sub>	Operating junction temperature range	-40		150	°C	
T <sub>STG</sub>	Storage Temperature Range	-40		125		
T <sub>C</sub>	Operating Case Temperature	-40		100		
Torque	Mounting torque	To heatsink	M4	1.5	4.7	N.m
Wt	Package Weight			110		g

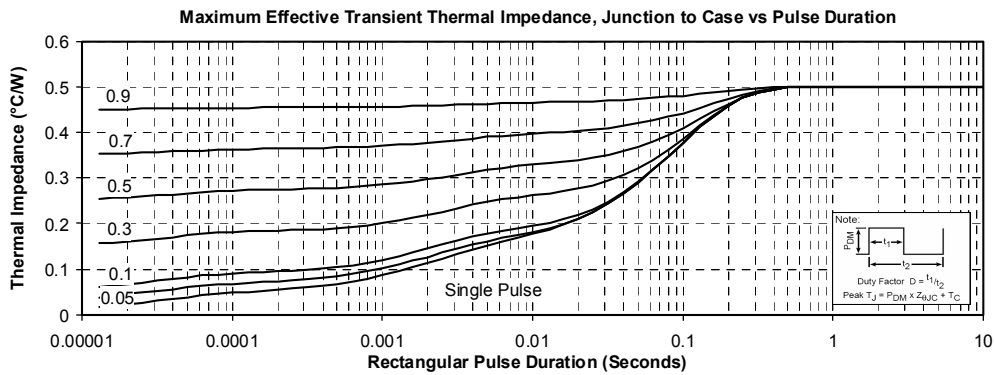
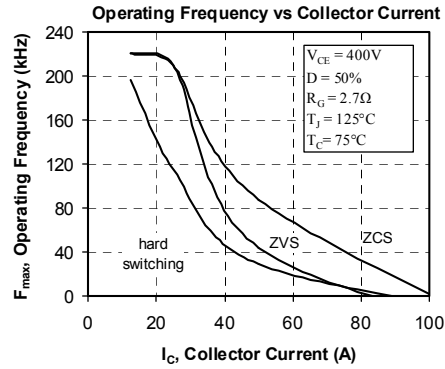
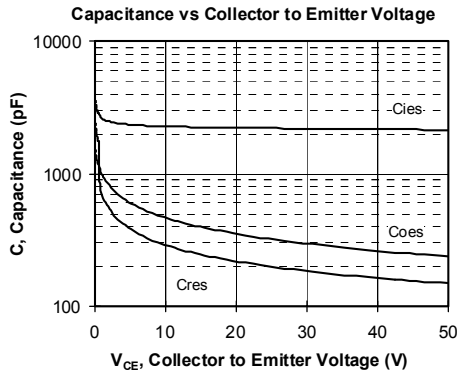
### SP3 Package outline (dimensions in mm)



## Typical Performance Curve







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APT's products are covered by one or more of U.S. patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 and foreign patents. U.S. and Foreign patents pending. All Rights Reserved.