

N-Channel Super Junction Power MOSFET

General Description

The series of devices use advanced trench gate super junction technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, and industrial power applications.

Features

- New technology for high voltage device
- Low on-resistance and low conduction losses
- small package
- Ultra Low Gate Charge cause lower driving requirements
- 100% Avalanche Tested
- ROHS compliant

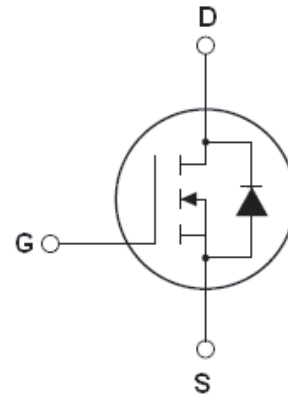
Application

- Power factor correction (PFC)
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply (UPS)

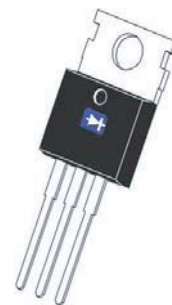
Package Marking And Ordering Information

Device	Device Package	Marking
RM12N500T2	TO-220	12N500

V_{DS}	500	V
$R_{DS(ON)MAX}$	520	m Ω
I_D	12	A



Schematic diagram



TO-220

Table 1. Absolute Maximum Ratings ($T_C=25^\circ\text{C}$)

Parameter	Symbol	RM12N500T2		Unit
Drain-Source Voltage ($V_{GS}=0V$)	V_{DS}	500		V
Gate-Source Voltage ($V_{DS}=0V$), AC($f>1\text{HZ}$)	V_{GS}	± 30		V
Continuous Drain Current at $T_C = 25^\circ\text{C}$	$I_D (DC)$	12		A
Pulsed drain current ^(Note 1)	$I_{DM} (pulse)$	46		A
Maximum Power Dissipation($T_C=25^\circ\text{C}$) Derate above 25°C	P_D	101 0.97	32.6 0.26	W W/ $^\circ\text{C}$
Single pulse avalanche energy ^(Note2)	E_{AS}	144		mJ
Avalanche current ^(Note 1)	I_{AR}	6		A
Repetitive Avalanche energy , t_{AR} limited by T_{Jmax} ^(Note 1)	E_{AR}	0.5		mJ

Parameter	Symbol	RM12N500T2	Unit
Drain Source voltage slope, $V_{DS} \leq 480 \text{ V}$,	dv/dt	50	V/ns
Reverse diode dv/dt , $V_{DS} \leq 480 \text{ V}, I_{SD} < I_D$	dv/dt	15	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55...+150	°C

* limited by maximum junction temperature

Table 2. Thermal Characteristic

Parameter	Symbol	RM12N500T2		Unit
Thermal Resistance, Junction-to-Case (Maximum)	R_{thJC}	1.24	3.83	°C /W
Thermal Resistance, Junction-to-Ambient (Maximum)	R_{thJA}	62	80	°C /W

Table 3. Electrical Characteristics (TA=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
On/off states						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	500			V
Zero Gate Voltage Drain Current(Tc=25℃)	I _{DSS}	V _{DS} = 500V,V _{GS} =0V		0.05	1	μA
Zero Gate Voltage Drain Current(Tc=125℃)	I _{DSS}	V _{DS} = 500V,V _{GS} =0V			100	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V,V _{DS} =0V			±100	nA
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} ,I _D =250μA	3	3.5	4	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =7A		400	520	mΩ
Dynamic Characteristics						
Forward Transconductance	g _{FS}	V _{DS} = 20V, I _D =7A		8		S
Input Capacitance	C _{iss}	V _{DS} =50V,V _{GS} =0V, F=1.0MHz		1285	1450	pF
Output Capacitance	C _{oss}			45	60	pF
Reverse Transfer Capacitance	C _{rss}			3.5	6	pF
Total Gate Charge	Q _g	V _{DS} =480V,I _D = 12 A, V _{GS} =10V		24	30	nC
Gate-Source Charge	Q _{gs}			8.5		nC
Gate-Drain Charge	Q _{gd}			7.5		nC
Switching times						
Turn-on Delay Time	t _{d(on)}	V _{DD} =380V,I _D =5.8A, R _G =3Ω,V _{GS} =10V		11		nS
Turn-on Rise Time	t _r			5		nS
Turn-Off Delay Time	t _{d(off)}			55	70	nS
Turn-Off Fall Time	t _f			5	9	nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I _{SD}	T _C =25℃			11.5	A
Pulsed Source-drain current(Body Diode)	I _{SDM}				46	A
Forward on voltage	V _{SD}	T _j =25℃,I _{SD} =11.5A,V _{GS} =0V		0.9	1.2	V
Reverse Recovery Time	t _{rr}	T _j =25℃,I _F =5.8A, di/dt=100A/μs		220		nS
Reverse Recovery Charge	Q _{rr}			2.2		uC
Peak Reverse Recovery Current	I _{rrm}			19		A

Notes: 1.Repetitive Rating: Pulse width limited by maximum junction temperature

2. $T_J=25^\circ C, V_{DD}=50V, V_G=10V, R_G=25\Omega$

RATING AND CHARACTERISTICS CURVES (RM12N500T2)

Figure1. Safe operating area

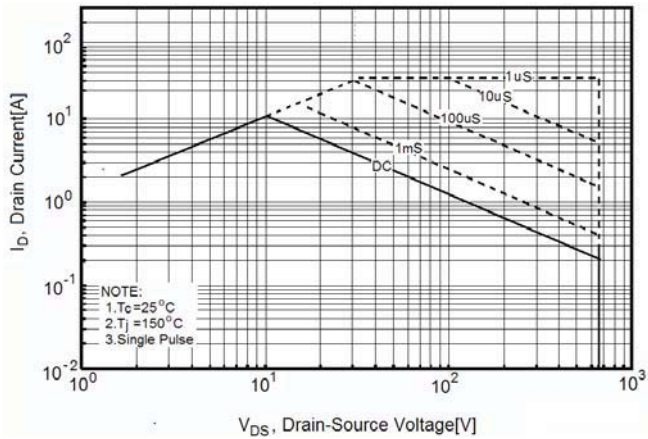


Figure2. Static drain-source on resistance

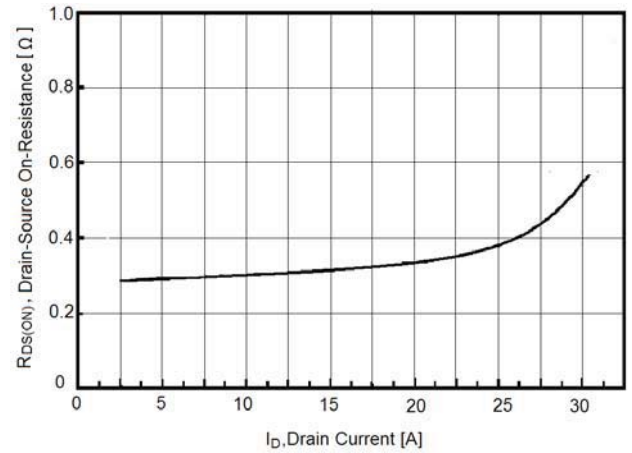


Figure3. Source-Drain Diode Forward Voltage

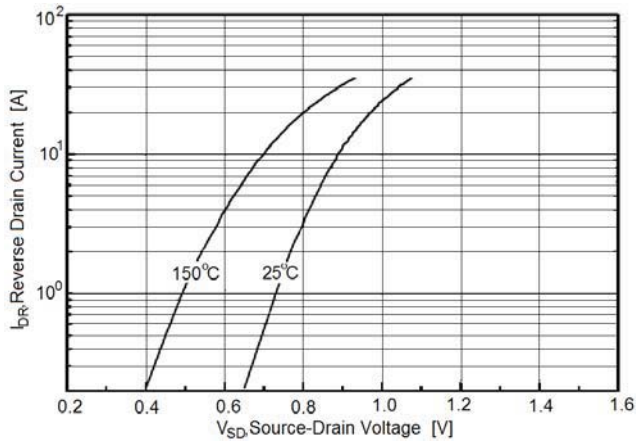


Figure4. Output characteristics

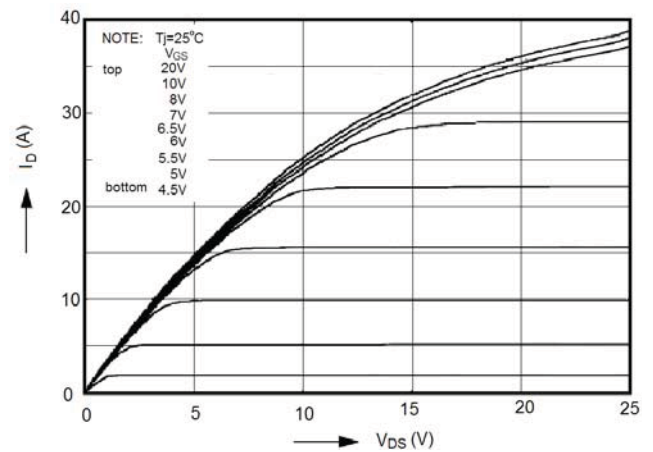


Figure5. Transfer characteristics

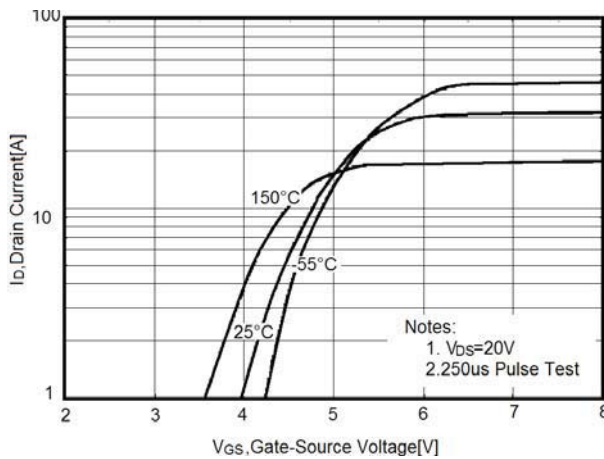
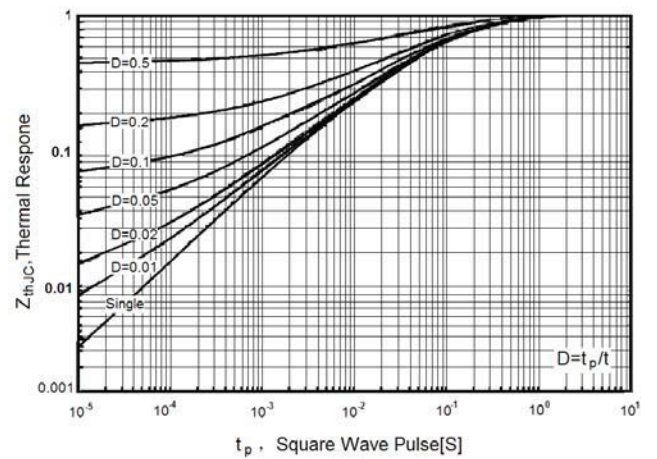


Figure6. Transient Thermal Impedance



RATING AND CHARACTERISTICS CURVES (RM12N500T2)

Figure7. $R_{DS(ON)}$ vs Junction Temperature

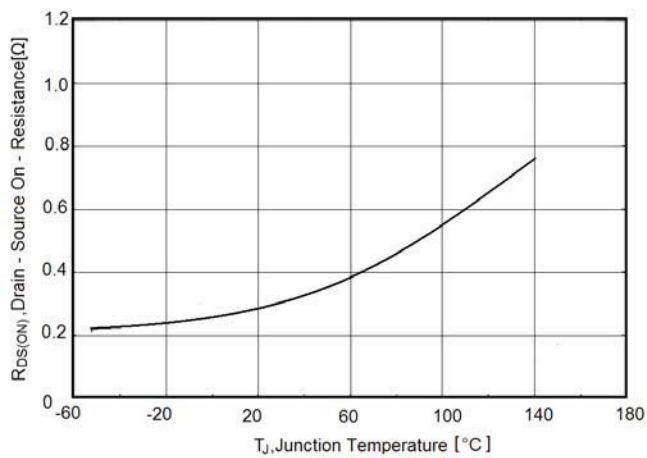


Figure8. BV_{DSS} vs Junction Temperature

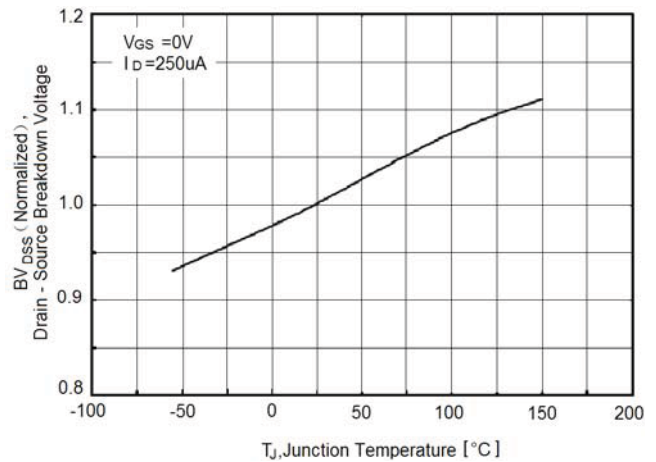


Figure9. Maximum I_D vs Junction Temperature

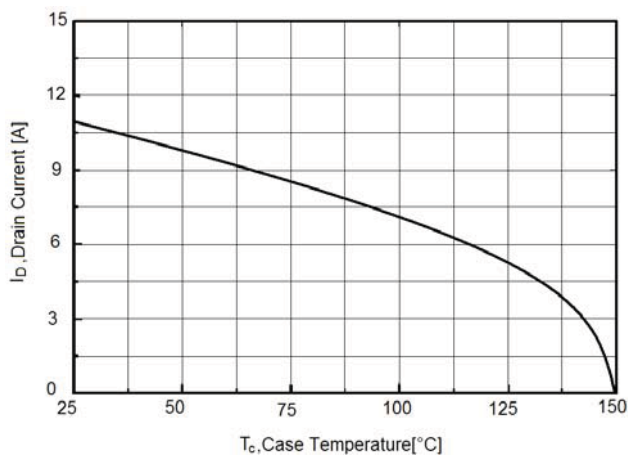


Figure10. Gate charge waveforms

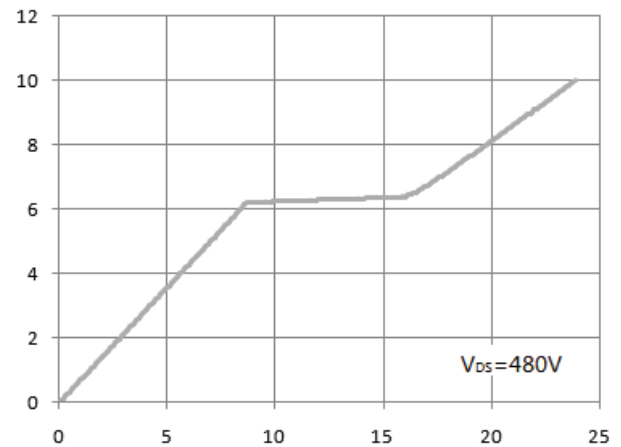
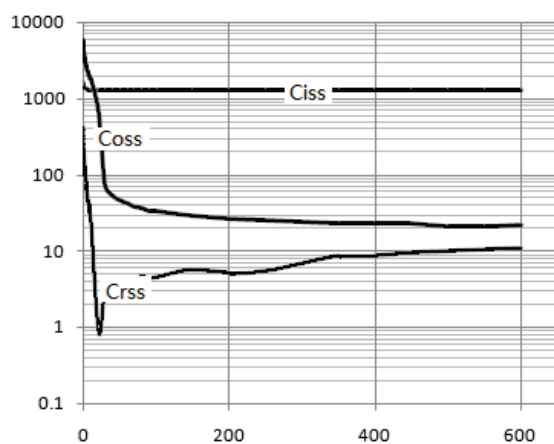
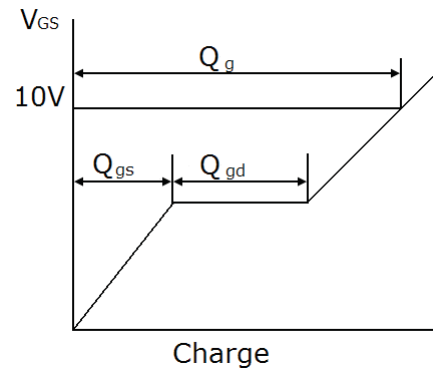
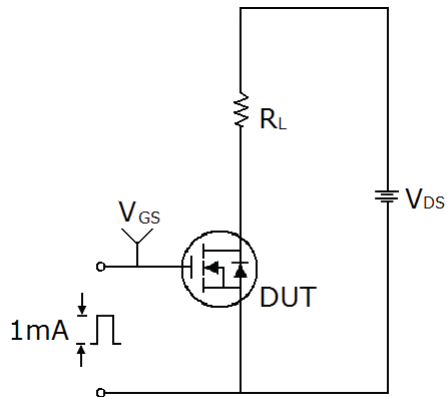


Figure11. Capacitance

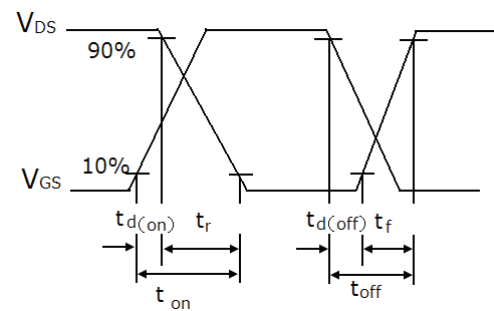
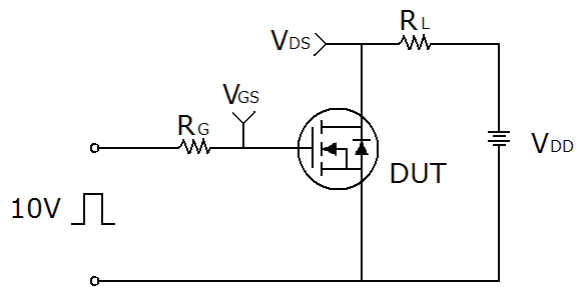


Test circuit

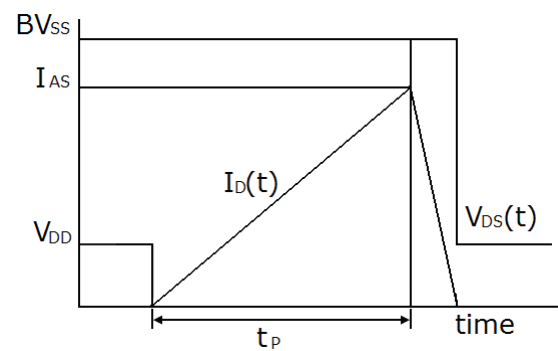
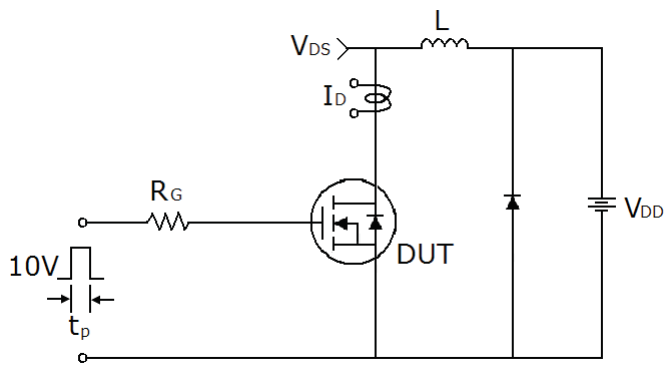
1) Gate charge test circuit & Waveform



2) Switch Time Test Circuit:



3) Unclamped Inductive Switching Test Circuit & Waveforms





RECTRON

Marking on the body



← Rectron Logo

1 2 N 5 0 0 ← Part No.

1 6 X X

Year – Code

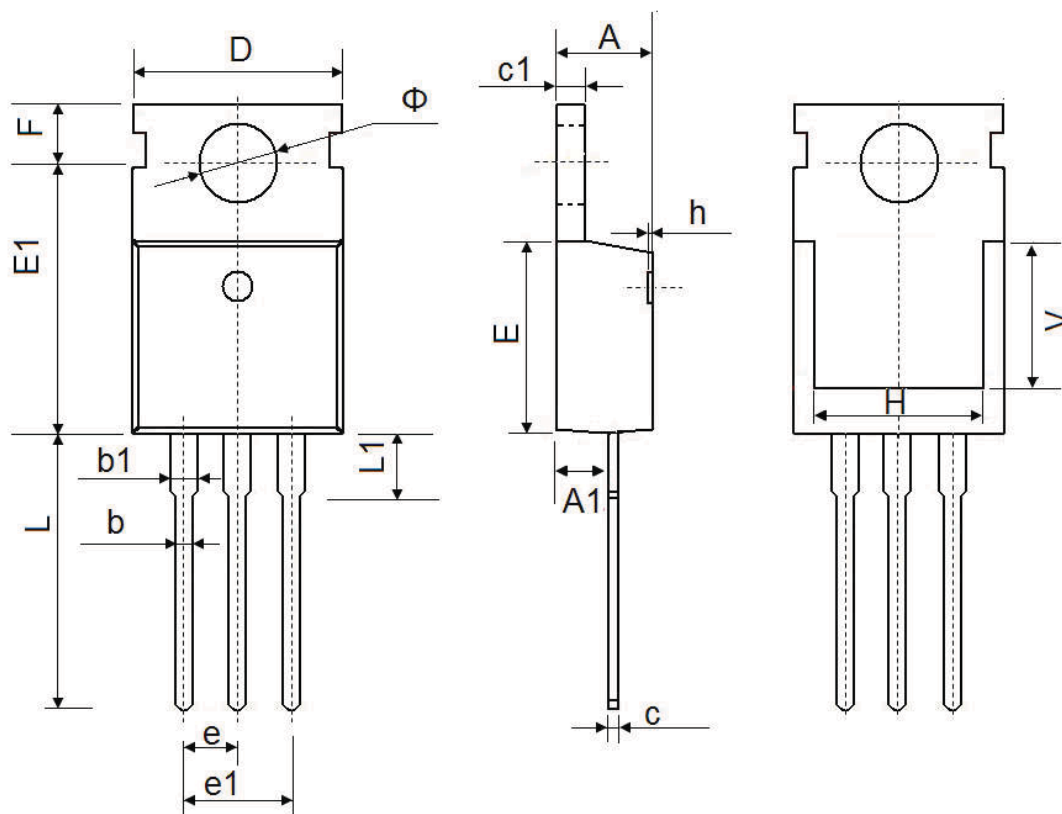
(Y:16-----2016

17-----2017.....)

Week – code

(WW:01~52)

TO-220-3L-C Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.9500	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	7.500 REF.		0.295 REF.	
Φ	3.400	3.800	0.134	0.150

DISCLAIMER NOTICE

Rectron Inc reserves the right to make changes without notice to any product specification herein, to make corrections, modifications, enhancements or other changes. Rectron Inc or anyone on its behalf assumes no responsibility or liability for any errors or inaccuracies. Data sheet specifications and its information contained are intended to provide a product description only. "Typical" parameters which may be included on RECTRON data sheets and/ or specifications can and do vary in different applications and actual performance may vary over time. Rectron Inc does not assume any liability arising out of the application or use of any product or circuit.

Rectron products are not designed, intended or authorized for use in medical, life-saving implant or other applications intended for life-sustaining or other related applications where a failure or malfunction of component or circuitry may directly or indirectly cause injury or threaten a life without expressed written approval of Rectron Inc. Customers using or selling Rectron components for use in such applications do so at their own risk and shall agree to fully indemnify Rectron Inc and its subsidiaries harmless against all claims, damages and expenditures.