

MSR860, MSRF860

SWITCHMODE™ Soft Recovery Power Rectifiers Plastic TO-220 Package

These state-of-the-art devices are designed for use as free wheeling diodes in variable speed motor control applications and switching power supplies.

Features

- Soft Recovery with Guaranteed Low Reverse Recovery Charge (Q_{RR}) and Peak Reverse Recovery Current (I_{RRM})
- 150°C Operating Junction Temperature
- Epoxy meets UL 94 V-0 @ 0.125 in
- Low Forward Voltage
- Low Leakage Current
- Pb-Free Package is Available

Mechanical Characteristics:

- Case: Epoxy, Molded
- Weight: 1.9 Grams (Approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads Readily Solderable
- Lead Temperature for Soldering Purposes: 260°C Max. for 10 Seconds

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	V_{RRM} V_{RWM} V_R	600	V
Average Rectified Forward Current (Rated V_R , $T_C = 125^\circ\text{C}$)	I_O	8.0	A
Peak Repetitive Forward Current (Rated V_R , Square Wave, 20 kHz, $T_C = 125^\circ\text{C}$)	I_{FRM}	16	A
Non-Repetitive Peak Surge Current (Surge Applied at Rated Load Conditions Halfwave, Single Phase, 60 Hz)	I_{FSM}	100	A
Storage/Operating Case Temperature	T_{stg}, T_C	-65 to +150	°C
Operating Junction Temperature	T_J	-65 to +150	°C

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
MSR860 Thermal Resistance, Junction-to-Case Thermal Resistance, Junction-to-Ambient	$R_{\theta JC}$ $R_{\theta JA}$	1.6 72.8	°C/W
MSRF860 Thermal Resistance, Junction-to-Case Thermal Resistance, Junction-to-Ambient	$R_{\theta JC}$ $R_{\theta JA}$	4.75 75	°C/W

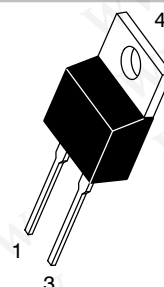
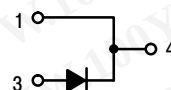
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.



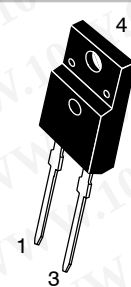
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SOFT RECOVERY POWER RECTIFIER 8.0 AMPERES, 600 VOLTS

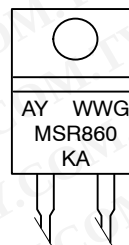


TO-220AC
CASE 221B
STYLE 1



TO-220 FULLPAK
CASE 221E
STYLE 1

MARKING DIAGRAMS



A = Assembly Location
Y = Year
WW = Work Week
G = Pb-Free Package
KA = Diode Polarity

ORDERING INFORMATION

Device	Package	Shipping
MSR860	TO-220AC	50 Units/Rail
MSR860G	TO-220AC (Pb-Free)	50 Units/Rail
MSRF860G	TO-220FP (Pb-Free)	50 Units/Rail

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ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Value		Unit
Maximum Instantaneous Forward Voltage ($I_F = 8.0$ A) (Note 1) Maximum Typical	V_F	$T_J = 25^\circ\text{C}$ 1.7 1.4	$T_J = 150^\circ\text{C}$ 1.3 1.1	V
Maximum Instantaneous Reverse Current ($V_R = 600$ V) Maximum Typical	I_R	$T_J = 25^\circ\text{C}$ 10 2.0	$T_J = 150^\circ\text{C}$ 1000 80	μA
Maximum Reverse Recovery Time (Note 2) ($V_R = 400$ V, $I_F = 8.0$ A, $di/dt = 200$ A/ μs) Maximum Typical	t_{rr}	$T_J = 25^\circ\text{C}$ 120 95	$T_J = 125^\circ\text{C}$ 190 125	ns
Typical Recovery Softness Factor ($V_R = 400$ V, $I_F = 8.0$ A, $di/dt = 200$ A/ μs)	$s = t_b/t_a$	2.5	3.0	
Maximum Peak Reverse Recovery Current ($V_R = 400$ V, $I_F = 8.0$ A, $di/dt = 200$ A/ μs)	I_{RRM}	5.8	8.3	A
Maximum Reverse Recovery Charge ($V_R = 400$ V, $I_F = 8.0$ A, $di/dt = 200$ A/ μs)	Q_{RR}	350	700	nC

1. Pulse Test: Pulse Width ≤ 380 μs , Duty Cycle $\leq 2\%$
2. T_{RR} measured projecting from 25% of I_{RRM} to zero current

TYPICAL ELECTRICAL CHARACTERISTICS

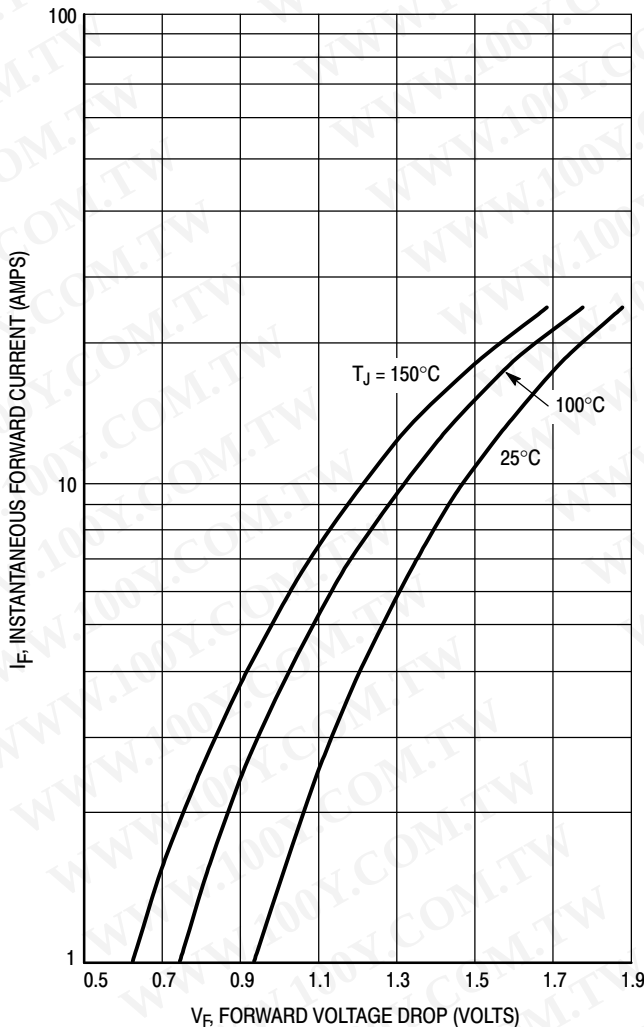


Figure 1. Typical Forward Voltage

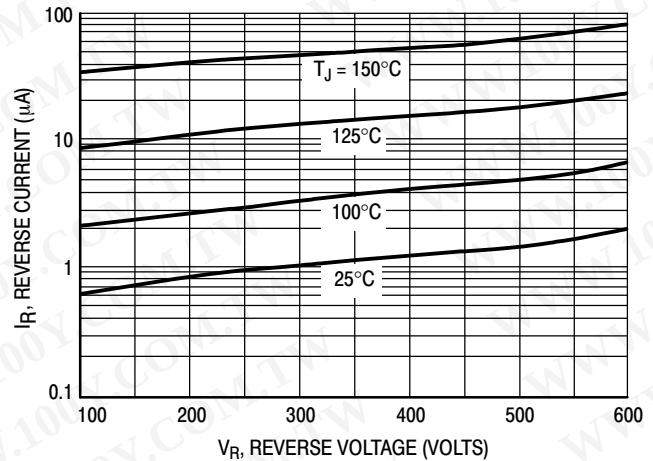


Figure 2. Typical Reverse Current

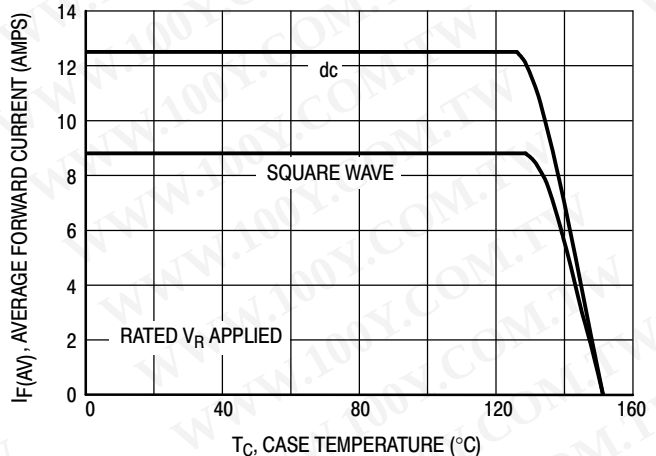


Figure 3. Current Derating, Case

TYPICAL ELECTRICAL CHARACTERISTICS

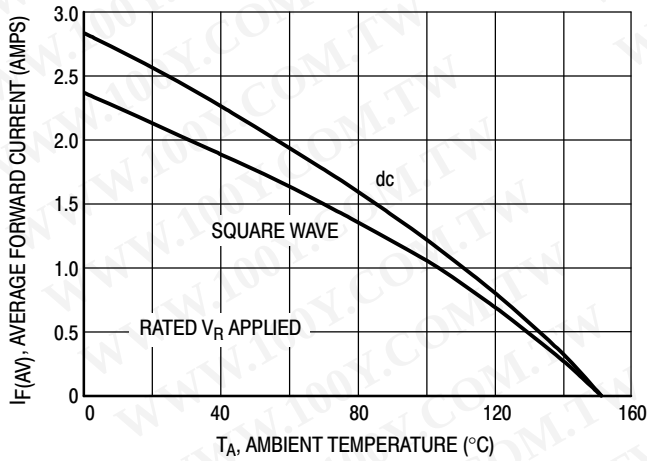


Figure 4. Current Derating, Ambient

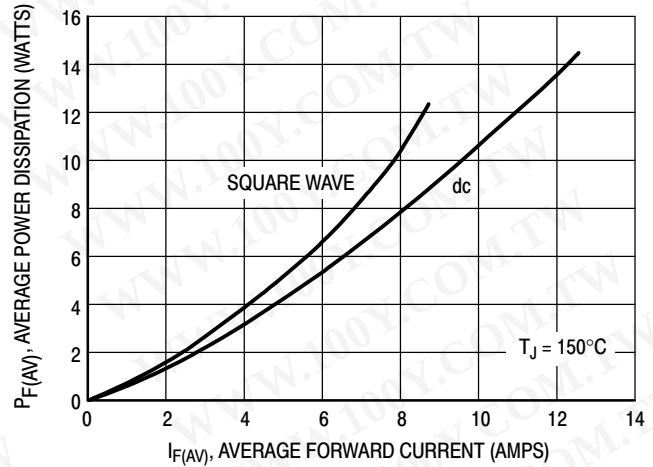


Figure 5. Power Dissipation

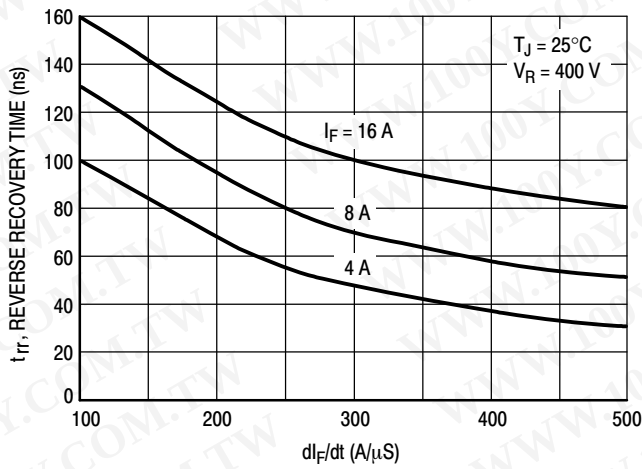


Figure 6. Typical Reverse Recovery Time

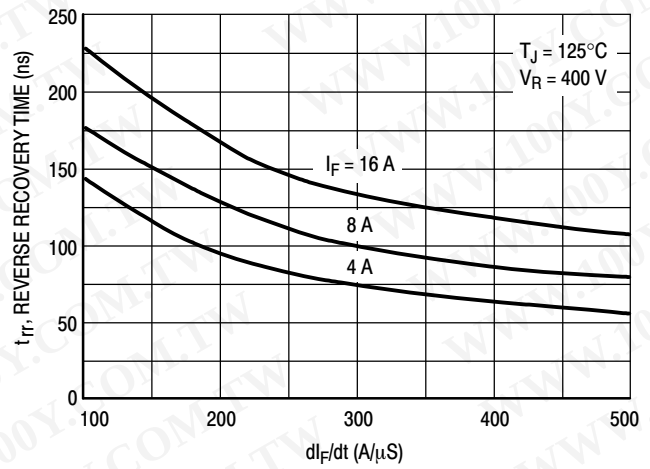


Figure 7. Typical Reverse Recovery Time

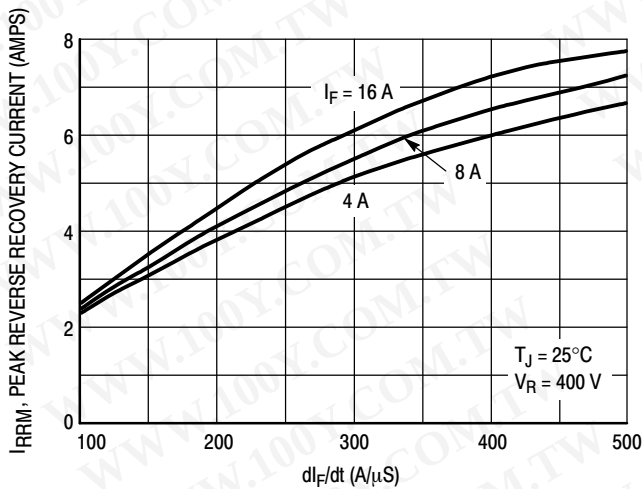


Figure 8. Typical Peak Reverse Recovery Current

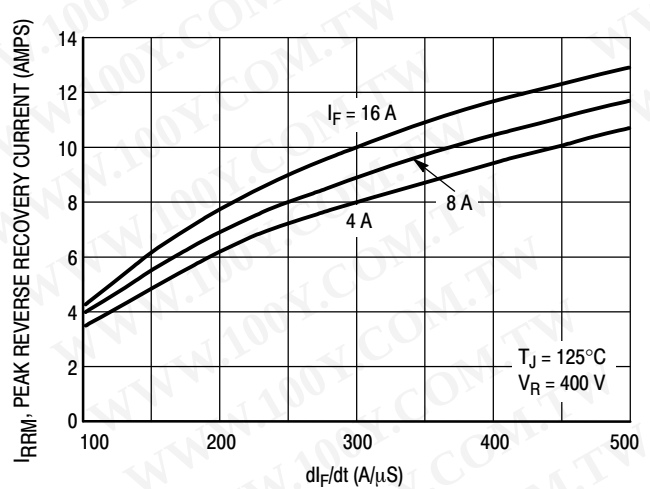


Figure 9. Typical Peak Reverse Recovery Current

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TYPICAL ELECTRICAL CHARACTERISTICS

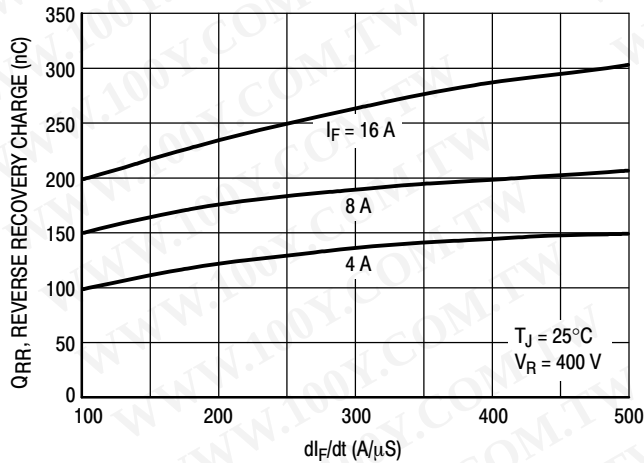


Figure 10. Typical Reverse Recovery Charge

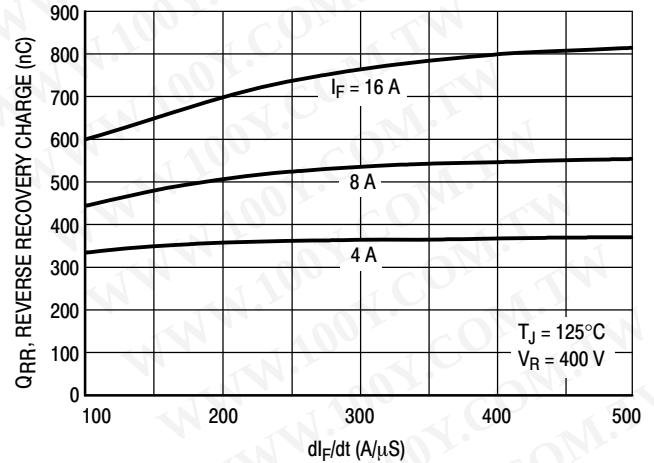


Figure 11. Typical Reverse Recovery Charge

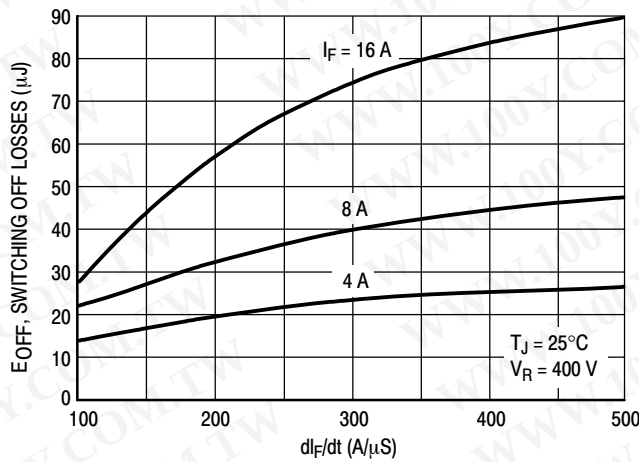


Figure 12. Typical Switching Off Losses

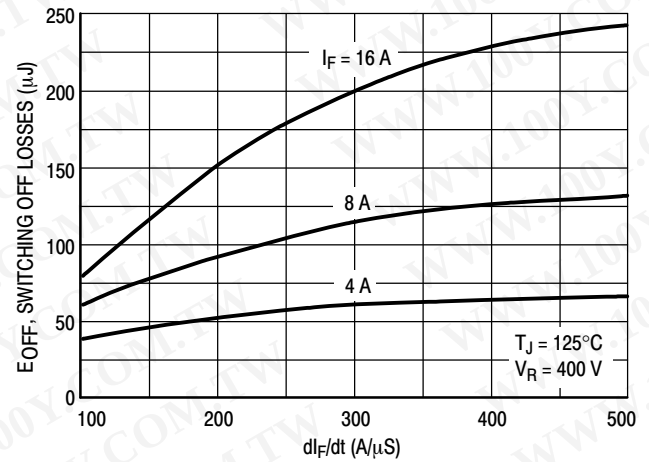


Figure 13. Typical Switching Off Losses

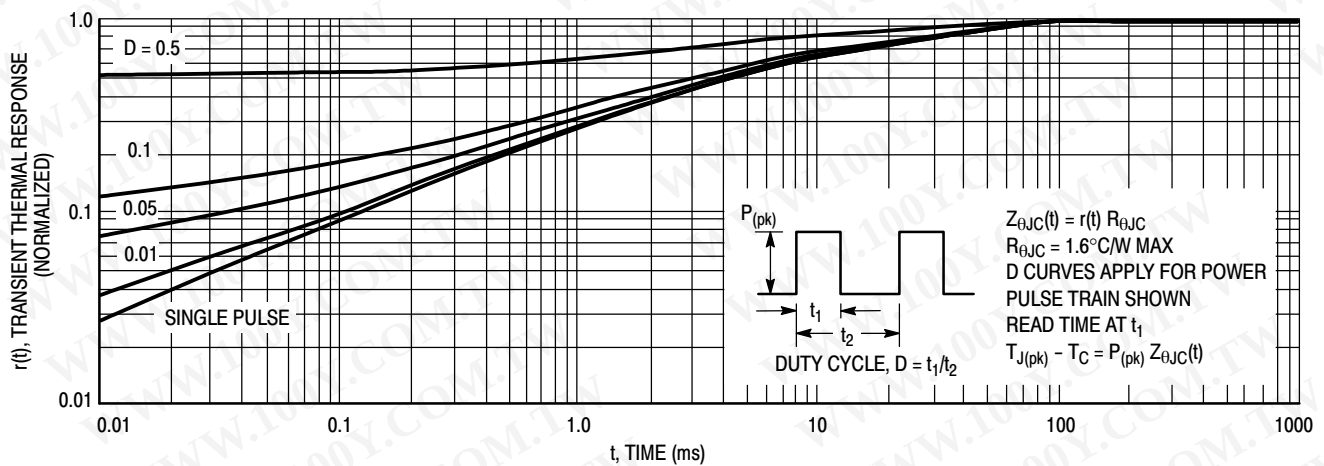


Figure 14. Thermal Response (MSR860)

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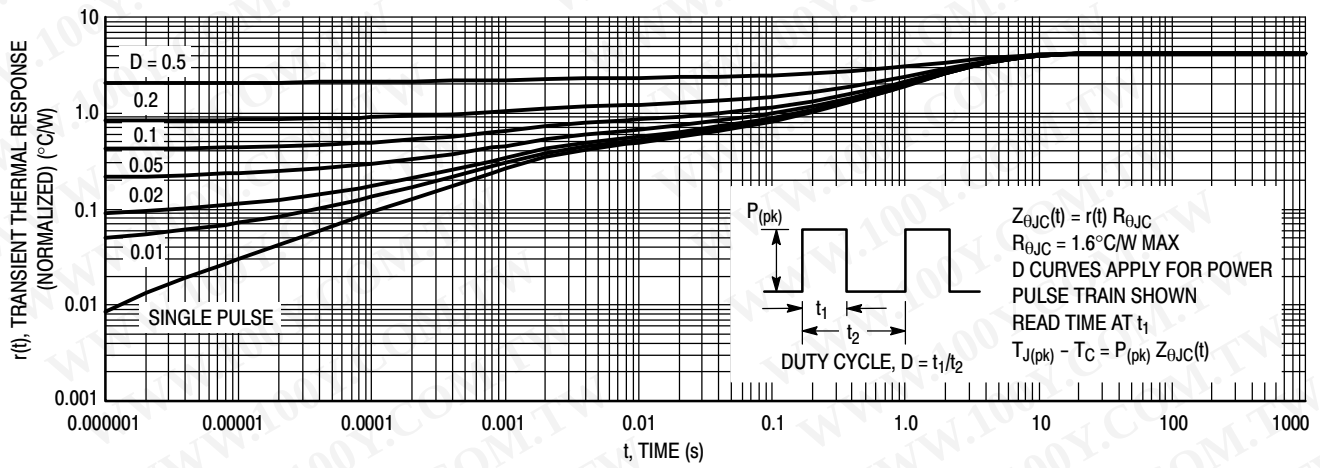


Figure 15. Thermal Response, (MSRF860) Junction-to-Case ($R_{\theta JC}$)

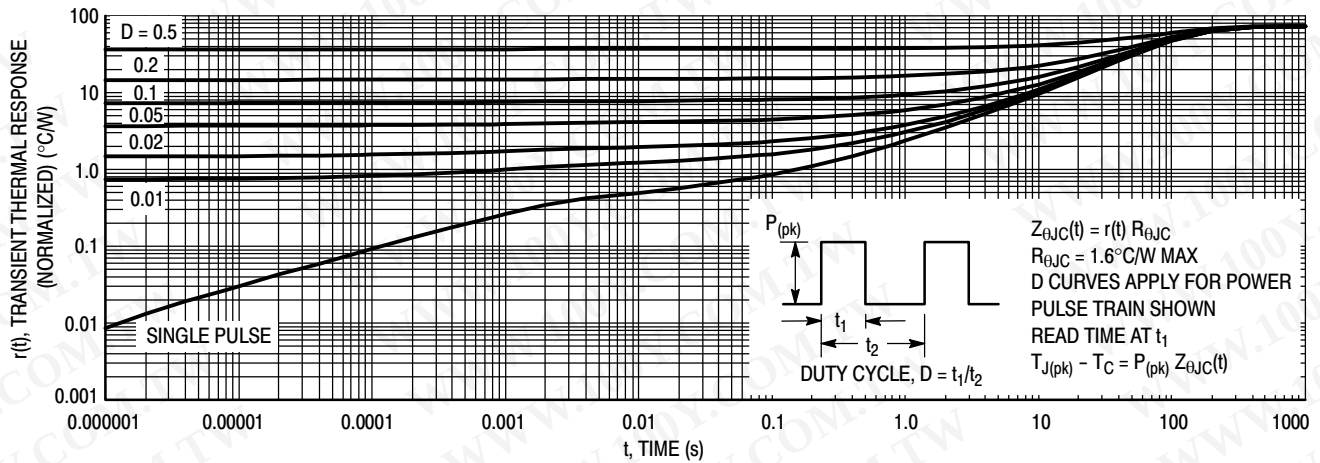
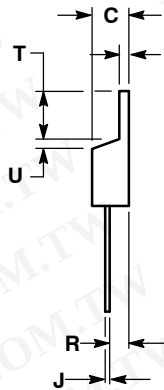
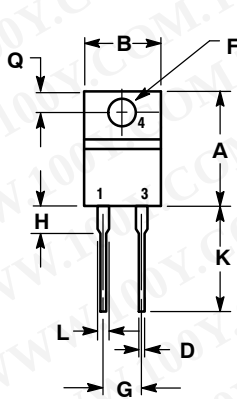


Figure 16. Thermal Response, (MSRF860) Junction-to-Ambient ($R_{\theta JA}$)

MSR860, MSRF860

PACKAGE DIMENSIONS

TO-220 TWO-LEAD CASE 221B-04 ISSUE E



NOTES:

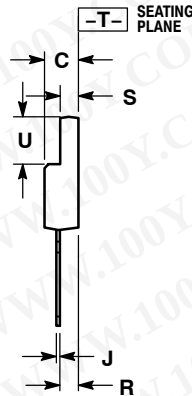
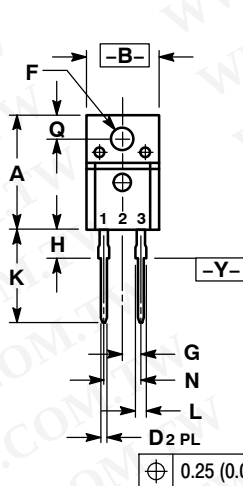
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.595	0.620	15.11	15.75
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.82
D	0.025	0.035	0.64	0.89
F	0.142	0.161	3.61	4.09
G	0.190	0.210	4.83	5.33
H	0.110	0.130	2.79	3.30
J	0.014	0.025	0.36	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.14	1.52
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.14	1.39
T	0.235	0.255	5.97	6.48
U	0.000	0.050	0.000	1.27

STYLE 1:

1. CATHODE
2. N/A
3. ANODE
4. CATHODE

TO-220 FULLPAK, 2-LEAD CASE 221E-01 ISSUE A



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.617	0.633	15.67	16.07
B	0.392	0.408	9.96	10.36
C	0.177	0.193	4.50	4.90
D	0.024	0.039	0.60	1.00
F	0.121	0.129	3.08	3.28
G	0.100 BSC		2.54 BSC	
H	0.117	0.133	2.98	3.38
J	0.018	0.025	0.45	0.64
K	0.499	0.562	12.68	14.27
L	0.045	0.060	1.14	1.52
N	0.200 BSC		5.08 BSC	
Q	0.122	0.138	3.10	3.50
R	0.101	0.117	2.56	2.96
S	0.092	0.108	2.34	2.74
U	0.255	0.271	6.48	6.88

STYLE 1:

1. CATHODE
2. N/A
3. ANODE

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