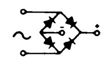
MOTOROLA

BYT 25—50 thru BYT 25—1000 SERIES



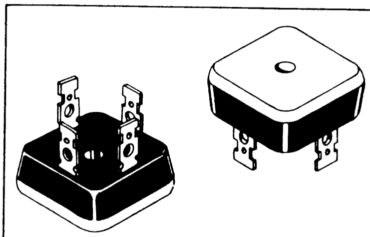
MINIATURE SINGLE PHASE FULL-WAVE BRIDGE

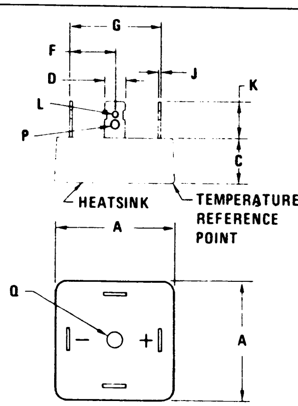
25 AMPERES
50–1000 VOLTS

RECTIFIER ASSEMBLY

. . . utilizing individual void-free molded rectifiers, interconnected and mounted on an electrically isolated aluminum heat sink by a high thermal-conductive epoxy resin.

- 400 Ampere Surge Capability
- Electrically Isolated Base
- 1800 Volt Heat Sink Isolation
- Maximum space saving





NOTE:

1. DIM "Q" SHALL BE MEASURED ON HEATSINK SIDE OF PKG.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	25.65	26.16	1.010	1.030
C	12.44	13.97	0.490	0.550
D	6.10	6.60	0.240	0.260
F	10.01	10.49	0.394	0.413
G	19.99	21.01	0.787	0.827
J	0.71	0.86	0.028	0.034
K	10.41	11.43	0.410	0.450
L	1.52	2.06	0.060	0.081
P	2.79	2.92	0.110	0.115
Q	4.42	4.67	0.174	0.184

CASE 309A-03

MAXIMUM RATINGS

Rating (Per Diode)	Symbol	BYT25 50	100	200	400	600	800	1000	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	V_{RRM} V_{RWM} V_R	50	100	200	400	600	800	1000	Volts
DC Output Voltage Resistive Load Capacitive Load	Vdc	30 50	62 100	124 200	250 400	380 600	500 800	630 1000	Volts
Sine Wave RMS Input Voltage	$V_{R(RMS)}$	35	70	140	280	420	560	700	Volts
Average Rectified Forward Current (Single phase bridge, resistive load, 50 Hz, T_C = 55 °C	I_O	25							Amp
Non-Repetitive Peak Surge Current applied (Surge at rated load conditions)	I_{FSM}	400							Amp
Operating and Storage Junction	T_J, T_{stg}	−60 to +175							°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Typ	Max	Unit
Thermal Resistance, Junction to Case Each Die Total Bridge	$R_{\theta JC}$	 8.0 2.0	 10 2.8	°C/W

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Instantaneous Forward Voltage (Per Diode) (i_F = 40 A)	V_F	–	0.95	1.05	Volts
Reverse Current (Per Diode) (Rated V_R)	I_R	–	–	0.10	mA

MECHANICAL CHARACTERISTICS

CASE: Plastic case with an electrically isolated aluminum base.

POLARITY: Terminal designation embossed on case:
+DC output
−DC output
AC not marked

MOUNTING POSITION: Bolt down. Highest heat transfer efficiency accomplished through the surface opposite the terminals. Use silicone heat sink compound on mounting surface for maximum heat transfer.

WEIGHT: 25 grams (approx.)

TERMINALS: Suitable for fast-on connections. Readily solderable, corrosion resistant. Soldering recommended for applications greater than 15 amperes.

MOUNTING TORQUE: 20 in. lb. max.

FIGURE 1 – FORWARD VOLTAGE

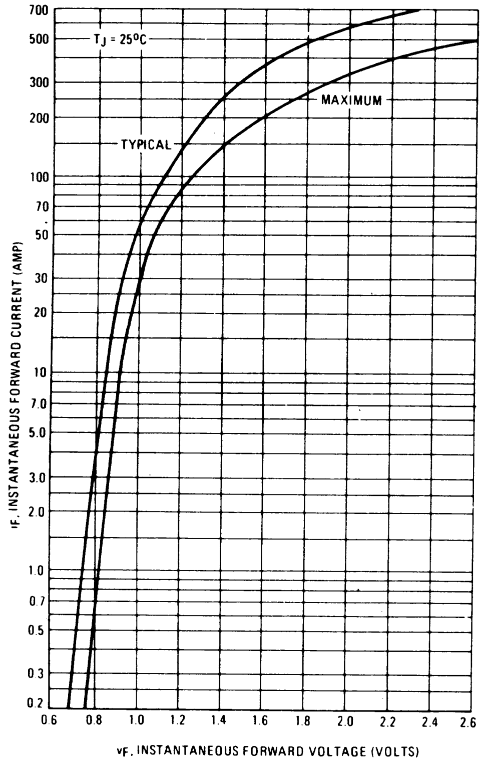


FIGURE 2 – NON REPETITIVE SURGE CURRENT

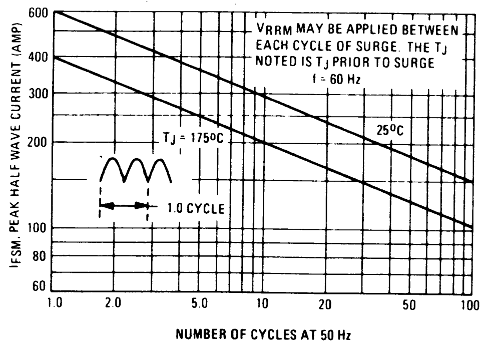


FIGURE 3 – FORWARD VOLTAGE TEMPERATURE COEFFICIENT

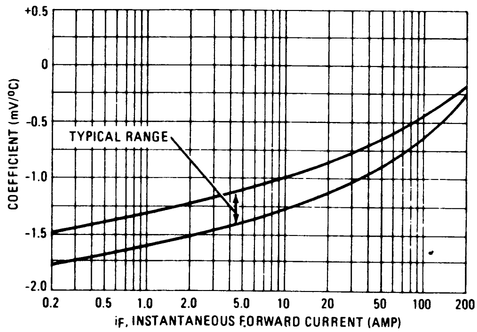


FIGURE 4 – CURRENT DERATING

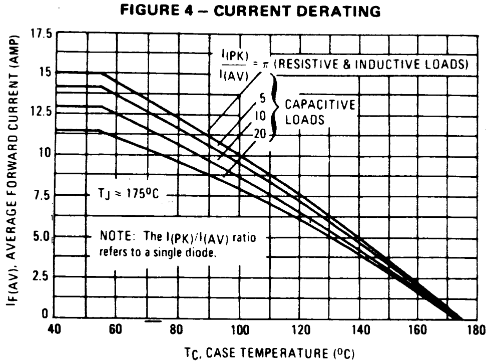


FIGURE 5 – FORWARD POWER DISSIPATION

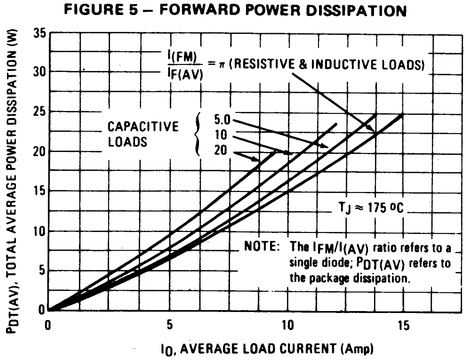
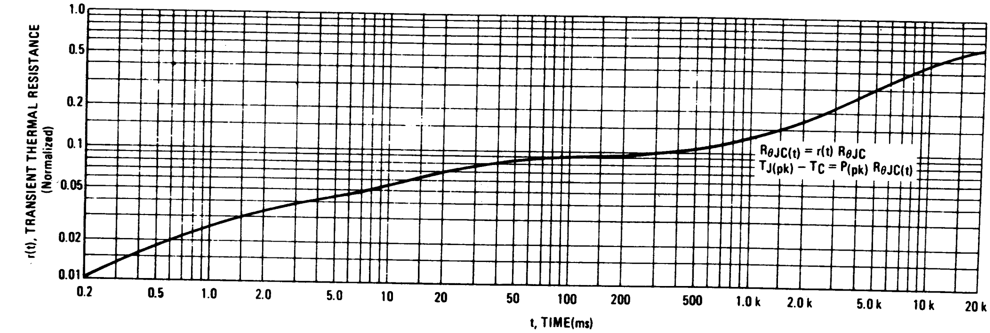
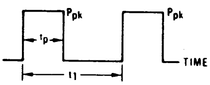


FIGURE 6 – TYPICAL THERMAL RESPONSE



NOTE 1



DUTY CYCLE, $D = t_p/t_1$
PEAK POWER, P_{pk}, is peak of an equivalent square power pulse

To determine maximum junction temperature of the diode in a given situation, the following procedure is recommended.

The temperature of the case should be measured using a thermocouple placed on the case at the temperature reference point (see the outline drawing on page 1). The thermal mass connected to the case is normally large enough so that it will not significantly respond to heat surges generated in the diode as a result of pulsed operation once steady state conditions are achieved. Using the measured value of T_C, the junction temperature may be determined by:

$$T_J = T_C + \Delta T_{JC}$$

where ΔT_{JC} is the increase in junction temperature above the case temperature. It may be determined by:

$$\Delta T_{JC} = P_{pk} \bullet R_{\theta JC}\,[D + (1 - D) \bullet r(t_1 + t_p) + r(t_p) - r(t_1)]$$

where

$r(t)$ = normalized value of transient thermal resistance at time, t, from Figure 8, i.e.,
$r(t_1 + t_p)$ = normalized value of transient thermal resistance at time $t_1 + t_p$.

FIGURE 7 – CAPACITANCE

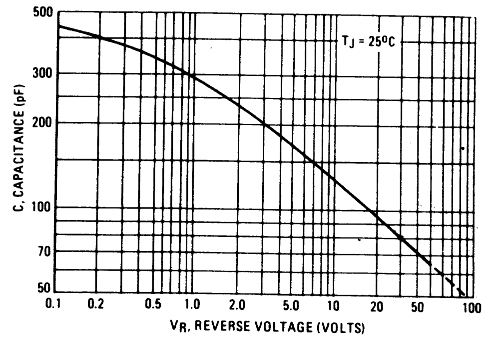


FIGURE 8 – FORWARD RECOVERY TIME

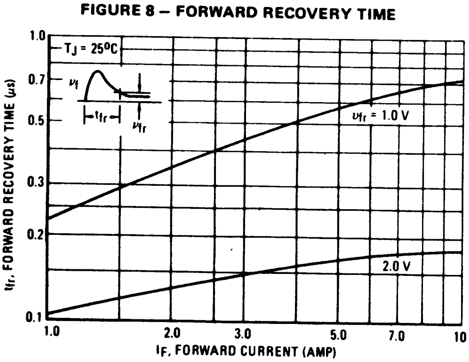
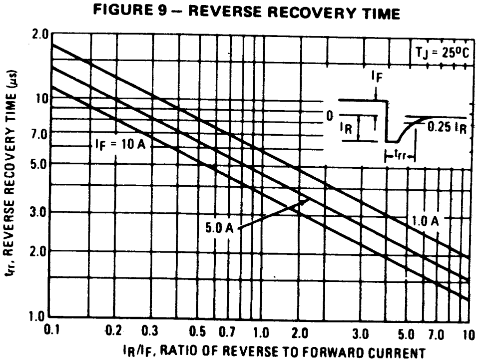
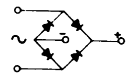


FIGURE 9 – REVERSE RECOVERY TIME



MOTOROLA

BYV25-50 thru BYV25-800



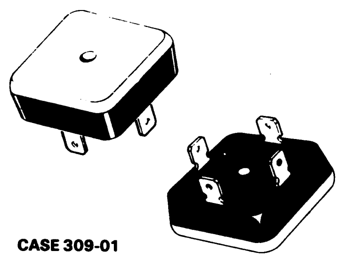
SINGLE-PHASE FULL-WAVE BRIDGE

25 AMPERES
50 – 800 VOLTS

RECTIFIER ASSEMBLY

. . . utilizing individual void-free molded MR2500 Series rectifiers, interconnected and mounted on an electrically isolated aluminium heat sink by a high thermal-conductive epoxy resin.

- 400 Ampere surge capability
- Electrically isolated base 1800 volts up to 400 volts products and 2500 volts above
- Fast recovery available on request
- Cost effective in lower current applications
- Maximum power dissipation 67 Watts



CASE 309-01

3

MAXIMUM RATINGS

Rating (per diode)	Symbol	BYV25- 50	100	200	400	600	800	Unit
Peak repetitive reverse voltage Working peak reverse voltage DC blocking voltage	V_{RRM} V_{RWM} V_R	50	100	200	400	600	800	Volts
DC output voltage resistive load Capacitive load	Vdc	30 50	62 100	124 200	250 400	380 600	500 800	Volts Volts
Sine wave RMS input voltage	$V_{R(RMS)}$	35	70	140	280	420	560	Volts
Average rectified forward current (single phase bridge, resistive load, 50 Hz, T_C = 90°C)	I_O	25						Amps
Non-repetitive peak surge current applied (surge at rated load conditions)	I_{FSM}	400						Amps
Operating and storage junction temperature range	T_J, T_{stg}	−65 to +175						°C

THERMAL CHARACTERISTICS (total bridge)

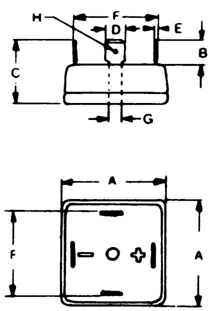
Characteristic		Typ	Max.	Unit
Thermal resistance, junction to case	$R_{\theta JC}$	1.4	1.87	°C/W

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min.	Typ	Max.	Unit
Instantaneous forward voltage (per diode) (I_F = 39 A)	V_F	–	1.0	1.1	Volts
Reverse current (per diode) (rated V_R)	I_R	–	–	0.10	mA

MECHANICAL CHARACTERISTICS

Case: plastic case with electrically isolated aluminium base.
Polarity: terminal designation embossed on case: + DC output,
− DC output,
AC not marked.
Mounting position: bolt down, highest heat transfer efficiency accomplished through the surface opposite the terminals. Use silicon grease on mounting surface for maximum heat transfer.
Weight: 40 grams (approx.).
Terminals: suitable for fast-on connections. Readily solderable, corrosion resistant. Soldering recommended for applications greater than 15 Amperes.
Mounting torque: 0.23 kg/m max.



DIM	MILLIMETERS MIN	MAX	INCHES MIN	MAX
A	1.368	1.387	34.75	35.25
B	.344	.364	8.75	9.25
C	.836	.875	21.25	22.25
D	.244	.251	6.20	6.40
E	.030	.032	0.77	0.83
F	1.102	1.125	28.00	28.60
G	.165	.177	4.20	4.50
H	.064	.068	1.65	1.75

NOTES
1. Hole is counter sunk for # 6 socket head screw.
2. Dim. "B", "C", "D", "E" and "H" are typical.

CASE 309-01

FIGURE 1 – FORWARD VOLTAGE

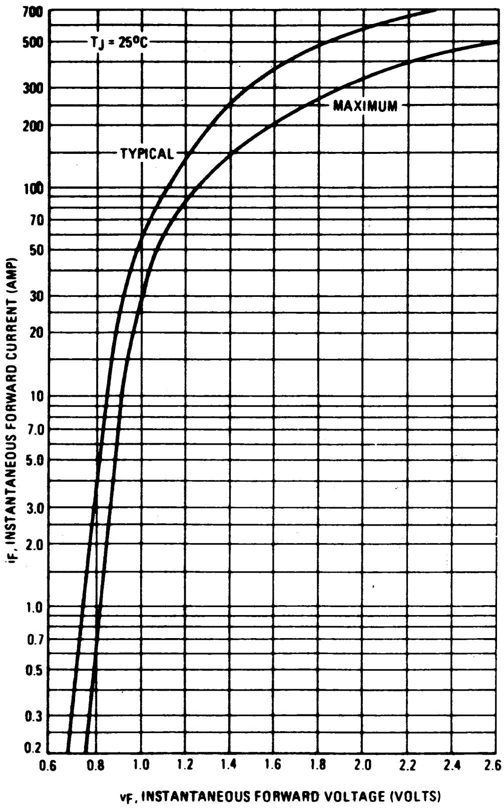


FIGURE 2 – NON REPETITIVE SURGE CURRENT

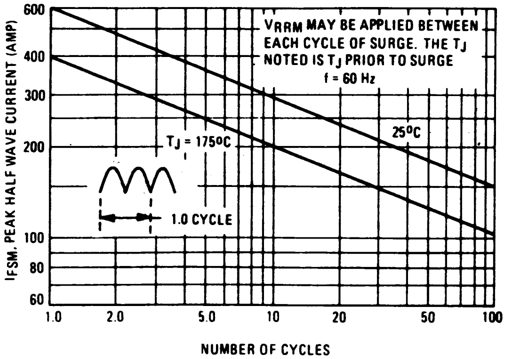


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FIGURE 3 – FORWARD VOLTAGE TEMPERATURE COEFFICIENT

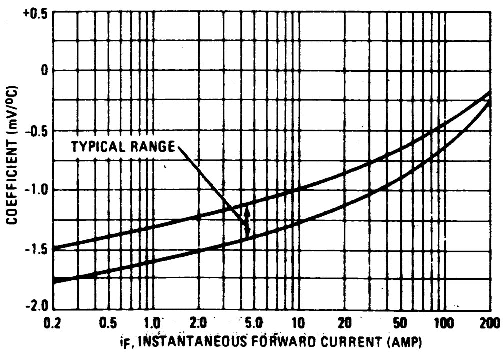


FIGURE 4 – CURRENT DERATING

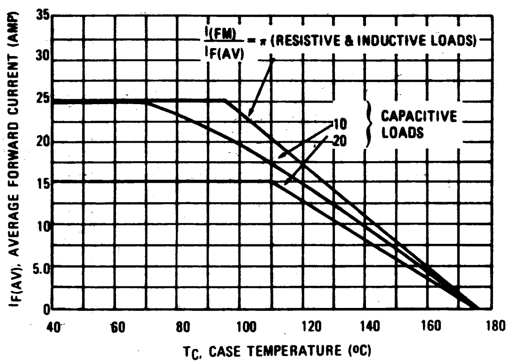


FIGURE 5 – FORWARD POWER DISSIPATION

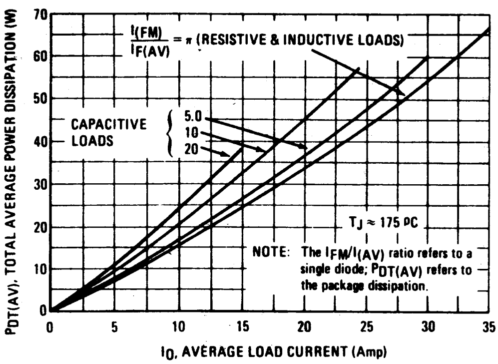
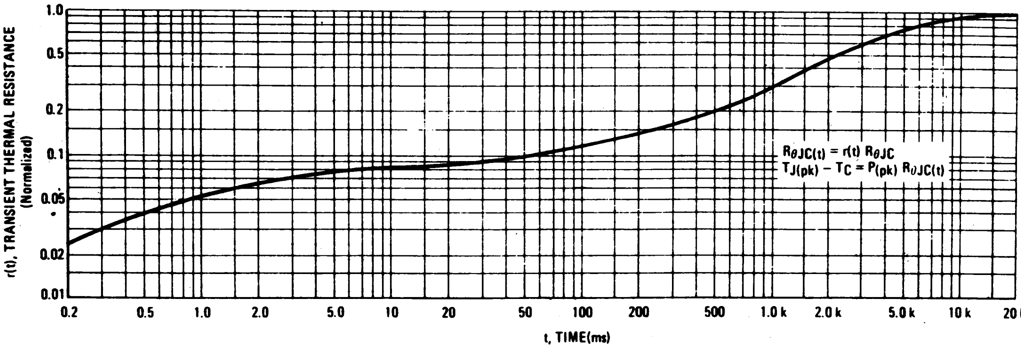


FIGURE 6 – TYPICAL THERMAL RESPONSE



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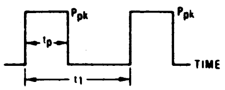
NOTE 1



DUTY CYCLE, $D = t_p / t_1$
PEAK POWER, P_{pk}, is peak of an equivalent square power pulse

To determine maximum junction temperature of the diode in a given situation, the following procedure is recommended.

The temperature of the case should be measured using a thermocouple placed on the case at the temperature reference point (see the outline drawing on page 1). The thermal mass connected to the case is normally large enough so that it will not significantly respond to heat surges generated in the diode as a result of pulsed operation once steady state conditions are achieved. Using the measured value of T_C, the junction temperature may be determined by:

$$T_J = T_C + \Delta T_{JC}$$

where ΔT_{JC} is the increase in junction temperature above the case temperature. It may be determined by:

$$\Delta T_{JC} = P_{pk} \bullet R_{\theta JC} [D + (1 - D) \bullet r(t_1 + t_p) + r(t_p) - r(t_1)]$$

where

$r(t)$ = normalized value of transient thermal resistance at time, t, from Figure 8, i.e.,
$r(t_1 + t_p)$ = normalized value of transient thermal resistance at time $t_1 + t_p$.

FIGURE 7 – CAPACITANCE

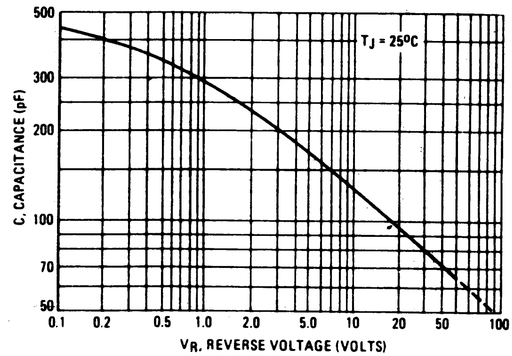


FIGURE 8 – FORWARD RECOVERY TIME

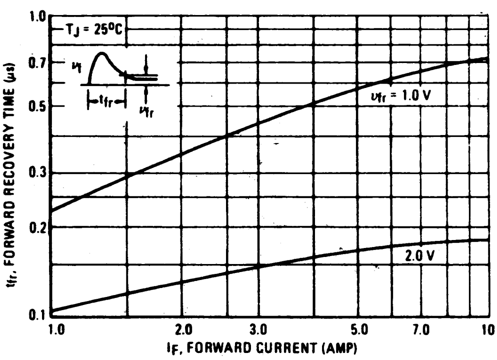
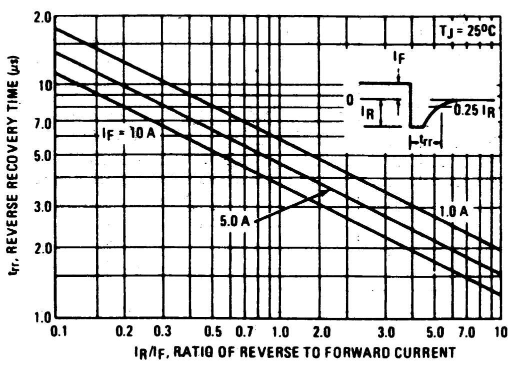


FIGURE 9 – REVERSE RECOVERY TIME



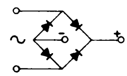
MOTOROLA

BYW 20 SERIES

RECTIFIER ASSEMBLY

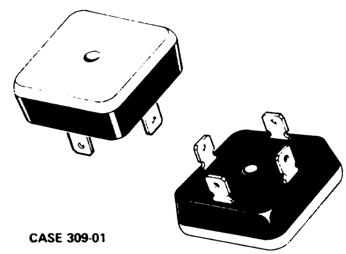
. . . utilizing individual void-free molded MR2500 Series rectifiers, interconnected and mounted on an electrically isolated aluminium heat sink by a high thermal-conductive epoxy resin.

- 400 Ampere Surge Capability
- Electrically Isolated Base (Isolation Breakdown Voltage 2.5 KV).
- Cost Effective in Lower Current Applications
- Maximum Power Dissipation 25 Watts



SINGLE-PHASE FULL-WAVE BRIDGE

15 AMPERES
50-1000 VOLTS



CASE 309-01

MAXIMUM RATINGS

Rating (Per Diode)	Symbol	BYW 20	BYW 21	BYW 22	BYW 24	BYW 26	BYW 28	BYW 79	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	V_{RRM} V_{RWM} V_R	50	100	200	400	600	800	1000	Volts
DC Output Voltage Resistive Load Capacitive Load	Vdc	30 50	62 100	124 200	250 400	380 600	500 800	630 1000	Volts
Sine Wave RMS Input Voltage	$V_{R(RMS)}$	35	70	140	280	420	560	700	Volts
Average Rectified Forward Current (Single phase bridge, resistive load, 50 Hz, T_C = 55 °C	I_O	15							Amp
Non-Repetitive Peak Surge Current applied (Surge at rated load conditions)	I_{FSM}	400							Amp
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +175							°C

THERMAL CHARACTERISTICS (Total Bridge)

Characteristic	Symbol	Typ	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	2.1	2.75	°C/W

ELECTRICAL CHARACTERISTICS (T_C = 25 °C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Instantaneous Forward Voltage (Per Diode) (I_F = 24 A)	V_F	–	1,0	1,10	Volts
Reverse Current (Per Diode) (Rated V_R)	I_R	–	–	0.10	mA

MECHANICAL CHARACTERISTICS

CASE: Plastic case with electrically isolated aluminum base.

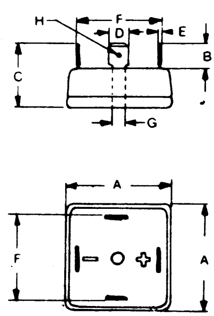
POLARITY: Terminal designation embossed on case:
+ DC output,
− DC output,
AC not marked.

MOUNTING POSITION: Bolt down. Highest heat transfer efficiency accomplished through the surface opposite the terminals. Use silicon grease on mounting surface for maximum heat transfer.

WEIGHT: 40 grams (approx.)

TERMINALS: Suitable for fast-on connections. Readily solderable, corrosion resistant. Soldering recommended for applications greater than 15 Amperes.

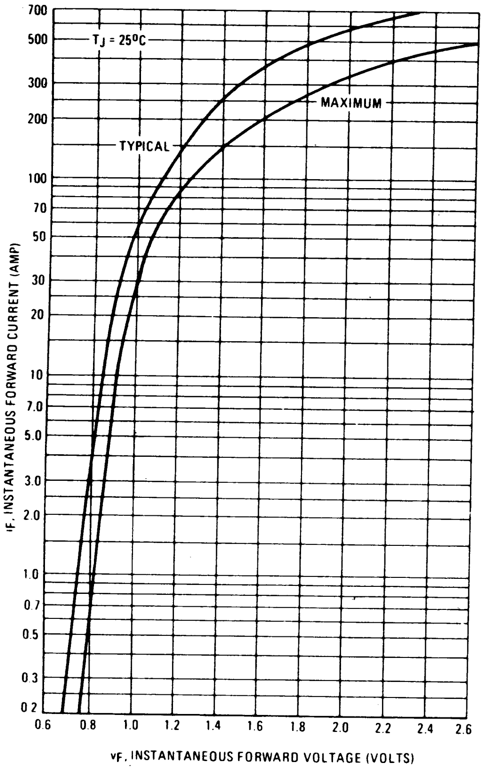
MOUNTING TORQUE: 0,23 Kg.-m. Max.



Dim	Inches Min	Inches Max	Millimeters Min	Millimeters Max
A	1.368	1.387	34.75	35.25
B	.344	.364	8.75	9.25
C	.836	.875	21.25	22.25
D	.244	.251	6.20	6.40
E	.030	.032	0.77	0.83
F	1.102	1.125	28.00	28.60
G	.165	.177	4.20	4.50
H	.064	.068	1.65	1.75

NOTES
1. Hole is counter sunk for # 6 socket head screw.
2. Dim. "B", "C", "D", "E" and "H" are typical.

FIGURE 1 – FORWARD VOLTAGE



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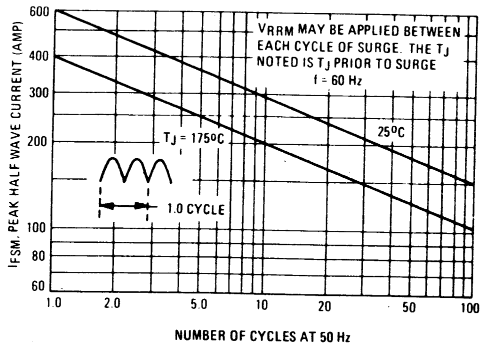

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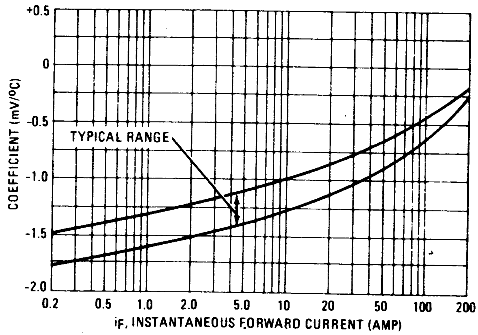
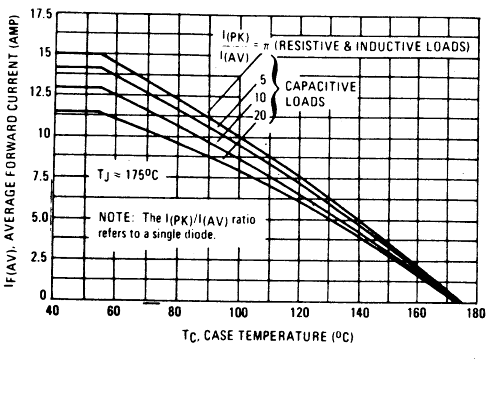


FIGURE 4 – CURRENT DERATING



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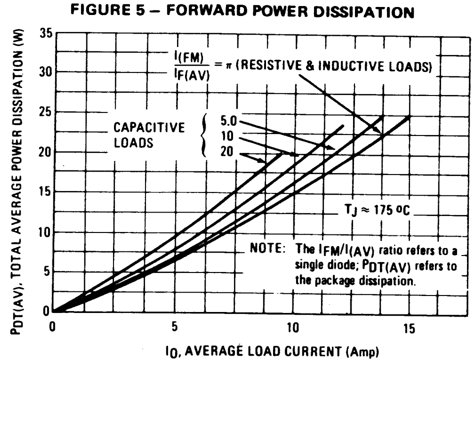
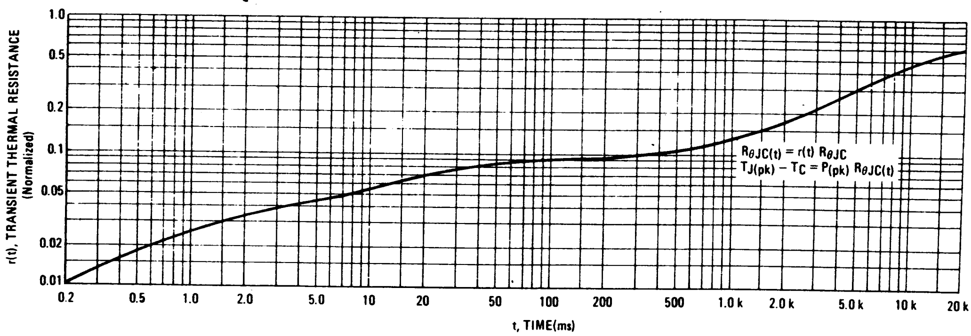
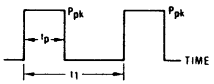


FIGURE 6 – TYPICAL THERMAL RESPONSE



NOTE 1



DUTY CYCLE, $D = t_p/t_1$
PEAK POWER, P_{pk}, is peak of an equivalent square power pulse

To determine maximum junction temperature of the diode in a given situation, the following procedure is recommended.

The temperature of the case should be measured using a thermocouple placed on the case at the temperature reference point (see the outline drawing on page 1). The thermal mass connected to the case is normally large enough so that it will not significantly respond to heat surges generated in the diode as a result of pulsed operation once steady state conditions are achieved. Using the measured value of T_C, the junction temperature may be determined by:

$$T_J = T_C + \Delta T_{JC}$$

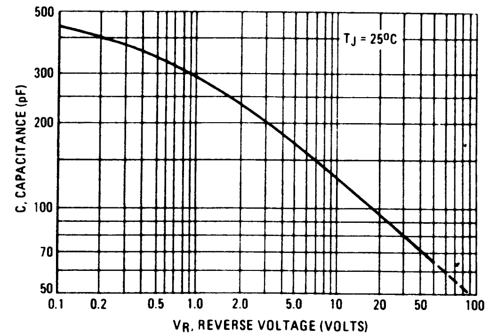
where ΔT_{JC} is the increase in junction temperature above the case temperature. It may be determined by:

$$\Delta T_{JC} = P_{pk} \bullet R_{\theta JC}\,[D + (1 - D) \bullet r(t_1 + t_p) + r(t_p) - r(t_1)]$$

where

$r(t)$ = normalized value of transient thermal resistance at time, t, from Figure 8, i.e.,
$r(t_1 + t_p)$ = normalized value of transient thermal resistance at time $t_1 + t_p$.

FIGURE 7 – CAPACITANCE



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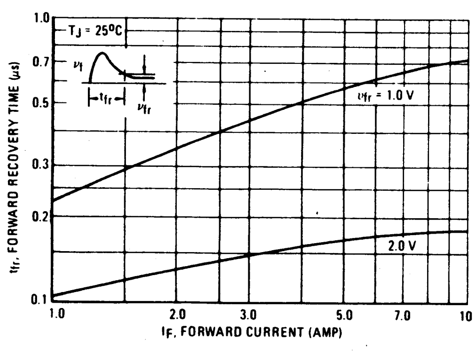

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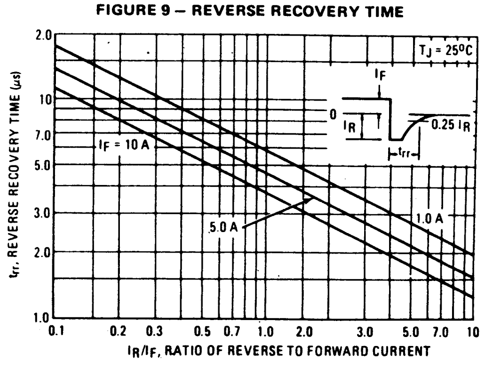


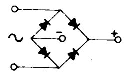
MOTOROLA

BYW 60 SERIES

RECTIFIER ASSEMBLY

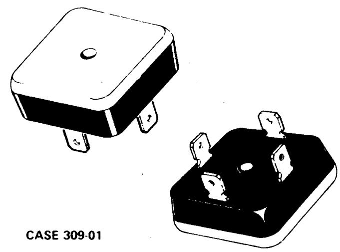
. . . utilizing individual void-free molded MR2500 Series rectifiers, interconnected and mounted on an electrically isolated aluminium heat sink by a high thermal-conductive epoxy resin.

- 400 Ampere Surge Capability
- Electrically Isolated Base (Isolation Breakdown Voltage 2.5 KV).
- Fast Recovery Available on Request
- Cost Effective in Lower Current Applications
- Maximum Power Dissipation 67 Watts



SINGLE-PHASE FULL-WAVE BRIDGE

35 AMPERES
50-1000 VOLTS



CASE 309-01

MAXIMUM RATINGS

Rating (Per Diode)	Symbol	BYW 60	BYW 61	BYW 62	BYW 64	BYW 66	BYW 68	BYW 89	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	V_{RRM} V_{RWM} V_R	50	100	200	400	600	800	1000	Volts
DC Output Voltage Resistive Load Capacitive Load	Vdc	30 50	62 100	124 200	250 400	380 600	500 800	630 1000	Volts
Sine Wave RMS Input Voltage	$V_{R(RMS)}$	35	70	140	280	420	560	700	Volts
Average Rectified Forward Current (Single phase bridge, resistive load, 50 Hz, T_C = 55 °C	I_O	35							Amp
Non-Repetitive Peak Surge Current applied (Surge at rated load conditions)	I_{FSM}	400							Amp
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +175							°C

THERMAL CHARACTERISTICS (Total Bridge)

Characteristic	Symbol	Typ	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.4	1.87	°C/W

ELECTRICAL CHARACTERISTICS (T_C = 25 °C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Instantaneous Forward Voltage (Per Diode) (I_F = 55 A)	V_F	–	1.0	1.1	Volts
Reverse Current (Per Diode) (Rated V_R)	I_R	–	–	0.10	mA

MECHANICAL CHARACTERISTICS

CASE: Plastic case with electrically isolated aluminum base.

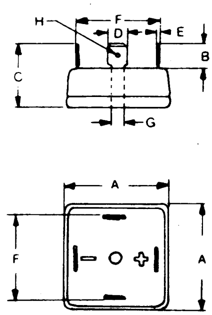
POLARITY: Terminal designation embossed on case:
+ DC output,
– DC output,
AC not marked.

MOUNTING POSITION: Bolt down. Highest heat transfer efficiency accomplished through the surface opposite the terminals. Use silicon grease on mounting surface for maximum heat transfer.

WEIGHT: 40 grams (approx.)

TERMINALS: Suitable for fast-on connections. Readily solderable, corrosion resistant. Soldering recommended for applications greater than 15 Amperes.

MOUNTING TORQUE: 0,23 Kg.-m. Max.



Dim	Inches Min	Inches Max	Millimeters Min	Millimeters Max
A	1.368	1.387	34.75	35.25
B	.344	.364	8.75	9.25
C	.836	.875	21.25	22.25
D	.244	.251	6.20	6.40
E	.030	.032	0.77	0.83
F	1.102	1.125	28.00	28.60
G	.165	.177	4.20	4.50
H	.064	.068	1.65	1.75

NOTES
1. Hole is counter sunk for # 6 socket head screw.
2. Dim. "B", "C", "D", "E" and "H" are typical.

FIGURE 1 – FORWARD VOLTAGE

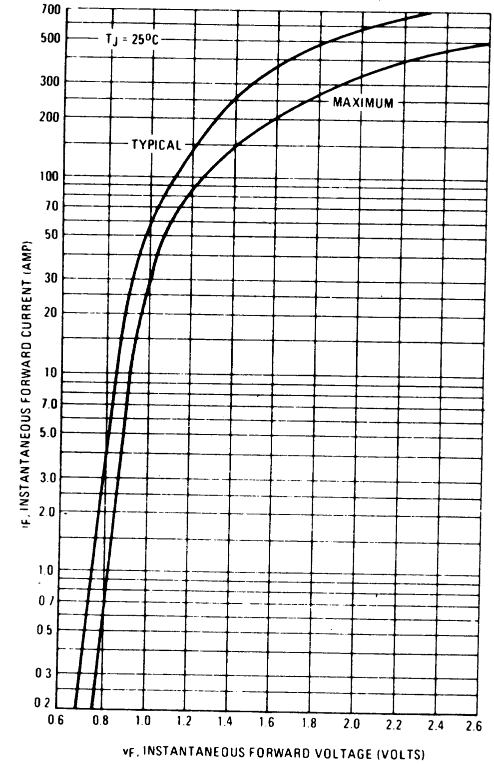


FIGURE 2 – NON REPETITIVE SURGE CURRENT

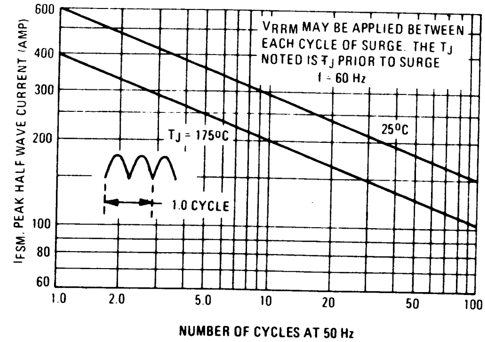


FIGURE 3 – FORWARD VOLTAGE TEMPERATURE COEFFICIENT

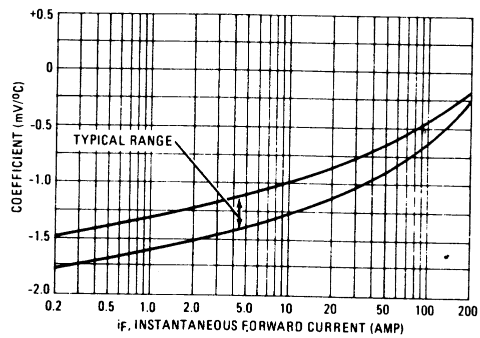


FIGURE 4 – CURRENT DERATING

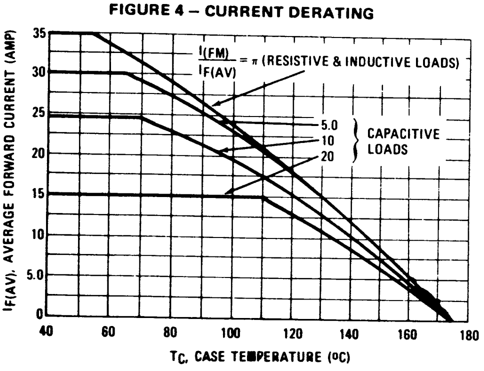


FIGURE 5 – FORWARD POWER DISSIPATION

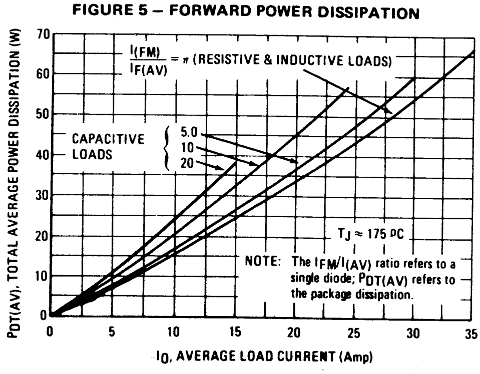
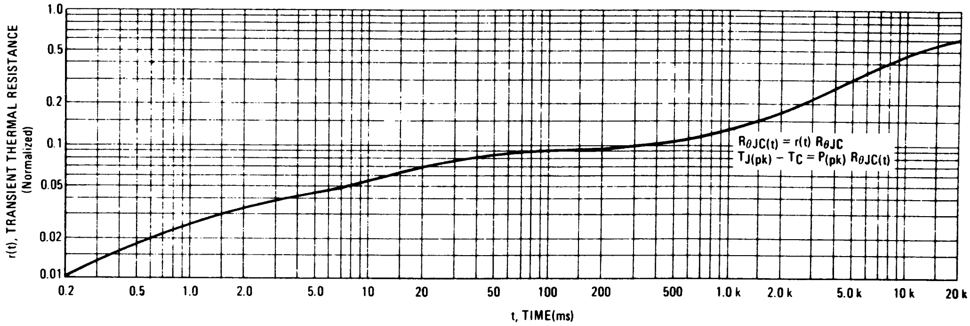
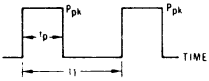


FIGURE 6 – TYPICAL THERMAL RESPONSE



NOTE 1



DUTY CYCLE $D = t_p/t_1$
PEAK POWER, P_{pk}, is peak of an equivalent square power pulse

To determine maximum junction temperature of the diode in a given situation, the following procedure is recommended.

The temperature of the case should be measured using a thermocouple placed on the case at the temperature reference point (see the outline drawing on page 1). The thermal mass connected to the case is normally large enough so that it will not significantly respond to heat surges generated in the diode as a result of pulsed operation once steady state conditions are achieved. Using the measured value of T_C, the junction temperature may be determined by:

$$T_J = T_C + \Delta T_{JC}$$

where ΔT_{JC} is the increase in junction temperature above the case temperature. It may be determined by:

$$\Delta T_{JC} = P_{pk} \bullet R_{\theta JC} [D + (1 - D) \bullet r(t_1 + t_p) + r(t_p) - r(t_1)]$$

where

$r(t)$ = normalized value of transient thermal resistance at time, t, from Figure 8, i.e.,
$r(t_1 + t_p)$ = normalized value of transient thermal resistance at time $t_1 + t_p$.

FIGURE 7 – CAPACITANCE

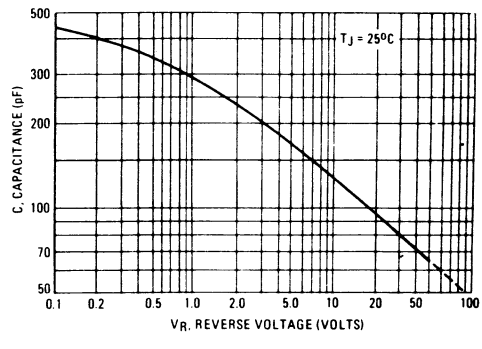


FIGURE 8 – FORWARD RECOVERY TIME

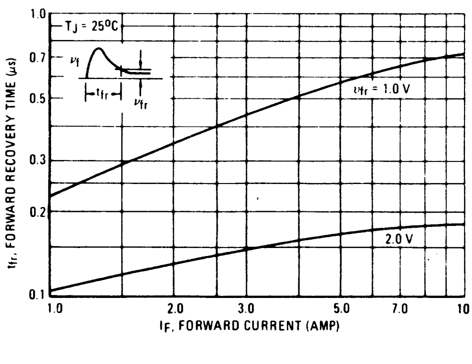
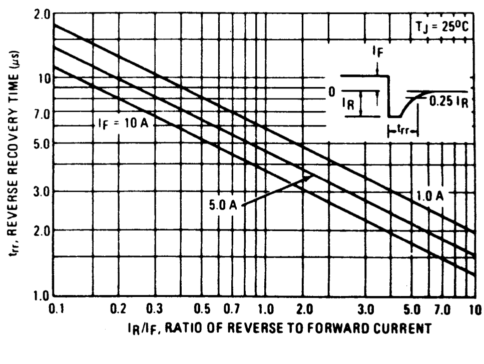


FIGURE 9 – REVERSE RECOVERY TIME



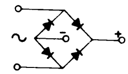
MOTOROLA

BYW 60 M SERIES

RECTIFIER ASSEMBLY

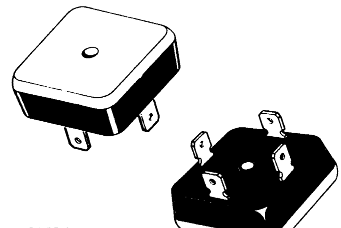
. . . utilizing individual void-free molded MR2500 Series rectifiers, interconnected and mounted on an electrically isolated aluminium heat sink by a high thermal-conductive epoxy resin.

- 400 Ampere Surge Capability
- Electrically Isolated Base (Isolation Breakdown Voltage 2.5 KV).
- Cost Effective in Lower Current Applications
- Maximum Power Dissipation 67 Watts



SINGLE-PHASE FULL-WAVE BRIDGE

30 AMPERES
50–1000 VOLTS



CASE 309-01

MAXIMUM RATINGS

Rating (Per Diode)	Symbol	BYW 60M	BYW 61 M	BYW 62 M	BYW 64 M	BYW 66 M	BYW 68 M	BYW 89 M	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	V_{RRM} V_{RWM} V_R	50	100	200	400	600	800	1000	Volts
DC Output Voltage Resistive Load Capacitive Load	Vdc	30 50	62 100	124 200	250 400	380 600	500 800	630 1000	Volts
Sine Wave RMS Input Voltage	$V_{R(RMS)}$	35	70	140	280	420	560	700	Volts
Average Rectified Forward Current Single phase bridge, resistive loads, 50 Hz Comman Heatsink mounting, Case temp.: 50° C	I_O	30							Amp
Non-Repetitive Peak Surge Current applied (Surge at rated load conditions)	I_{FSM}	400							Amp
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–65 to +175							°C

THERMAL CHARACTERISTICS (Total Bridge)

Characteristic	Symbol	Typ	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.4	1.87	° C/W

ELECTRICAL CHARACTERISTICS (T_C = 25 °C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Instantaneous Forward Voltage (Per Diode) (I_F = 55 A)	V_F	–	1.0	1.1	Volts
Reverse Current (Per Diode) (Rated V_R)	I_R	–	–	0.10	mA

MECHANICAL CHARACTERISTICS

CASE: Plastic case with electrically isolated aluminum base.

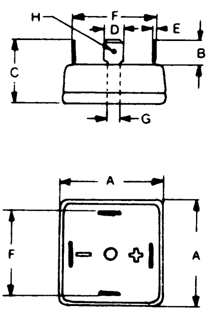
POLARITY: Terminal designation embossed on case:
+ DC output,
– DC output,
AC not marked.

MOUNTING POSITION: Bolt down. Highest heat transfer efficiency accomplished through the surface opposite the terminals. Use silicon grease on mounting surface for maximum heat transfer.

WEIGHT: 40 grams (approx.)

TERMINALS: Suitable for fast-on connections. Readily solderable, corrosion resistant. Soldering recommended for applications greater than 15 Amperes.

MOUNTING TORQUE: 0,23 Kg.-m. Max.



Dim	Inches Min	Inches Max	Millimeters Min	Millimeters Max
A	1.368	1.387	34.75	35.25
B	.344	.364	8.75	9.25
C	.836	.875	21.25	22.25
D	.244	.251	6.20	6.40
E	.030	.032	0.77	0.83
F	1.102	1.125	28.00	28.60
G	.165	.177	4.20	4.50
H	.064	.068	1.65	1.75

NOTES
1. Hole is counter sunk for # 6 socket head screw.
2. Dim. "B", "C", "D", "E" and "H" are typical.

BYW 60M SERIES

FIGURE 1 – FORWARD VOLTAGE

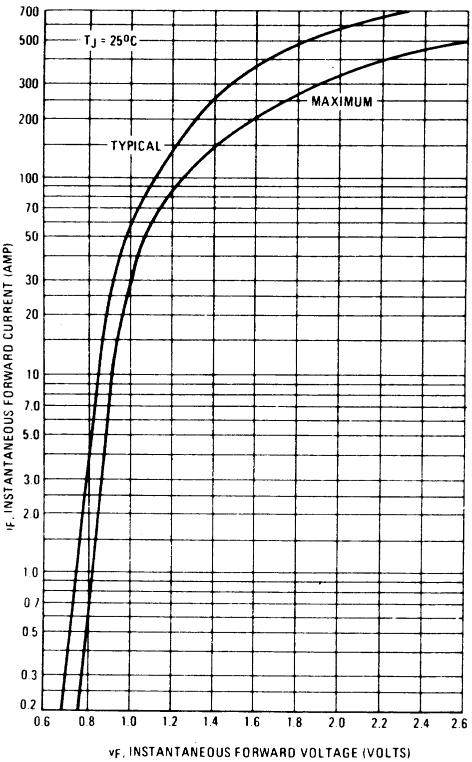


FIGURE 2 – NON REPETITIVE SURGE CURRENT

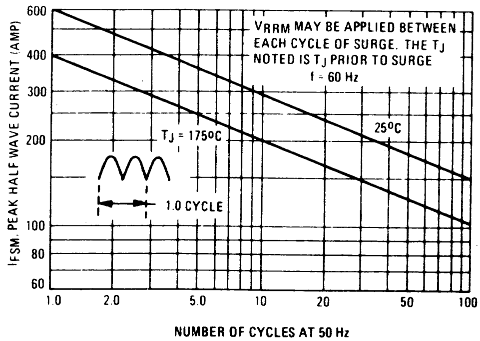


FIGURE 3 – FORWARD VOLTAGE TEMPERATURE COEFFICIENT

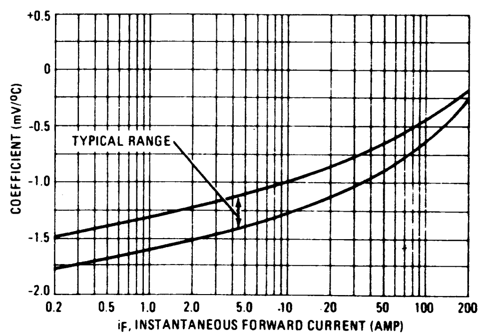


FIGURE 4 – CURRENT DERATING

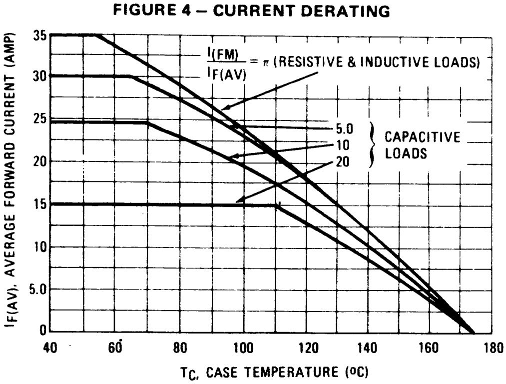


FIGURE 5 – FORWARD POWER DISSIPATION

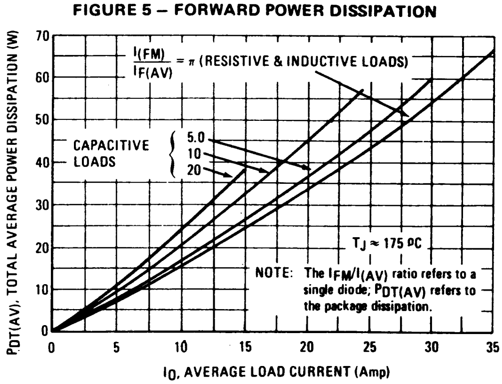
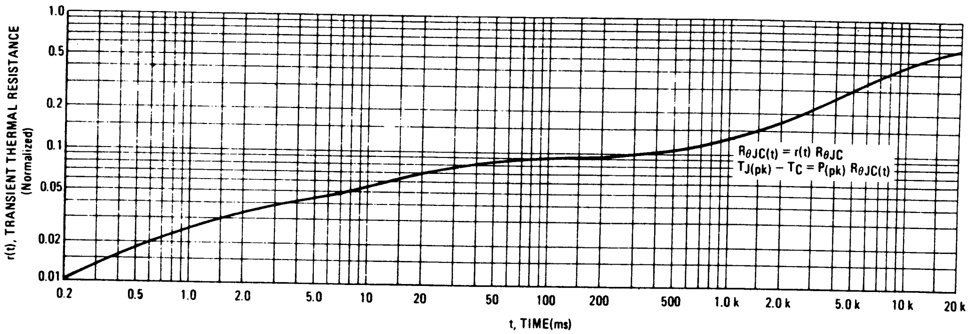
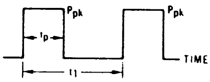


FIGURE 6 – TYPICAL THERMAL RESPONSE



NOTE 1



DUTY CYCLE $D = t_p/t_1$
PEAK POWER, P_{pk}, is peak of an equivalent square power pulse

To determine maximum junction temperature of the diode in a given situation, the following procedure is recommended.

The temperature of the case should be measured using a thermocouple placed on the case at the temperature reference point (see the outline drawing on page 1). The thermal mass connected to the case is normally large enough so that it will not significantly respond to heat surges generated in the diode as a result of pulsed operation once steady state conditions are achieved. Using the measured value of T_C, the junction temperature may be determined by:

$$T_J = T_C + \Delta T_{JC}$$

where ΔT_{JC} is the increase in junction temperature above the case temperature. It may be determined by:

$$\Delta T_{JC} = P_{pk} \bullet R_{\theta JC} [D + (1 - D) \bullet r(t_1 + t_p) + r(t_p) - r(t_1)]$$

where

$r(t)$ = normalized value of transient thermal resistance at time, t, from Figure 8, i.e.,
$r(t_1 + t_p)$ = normalized value of transient thermal resistance at time $t_1 + t_p$.

FIGURE 7 – CAPACITANCE

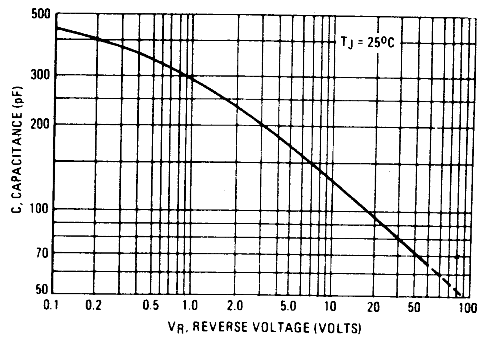


FIGURE 8 – FORWARD RECOVERY TIME

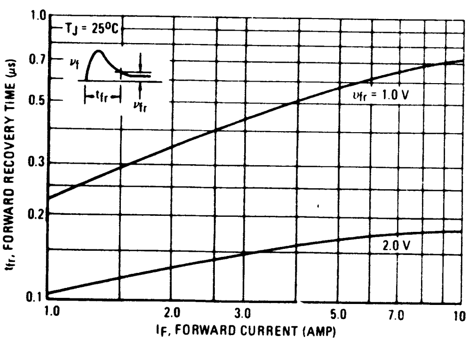
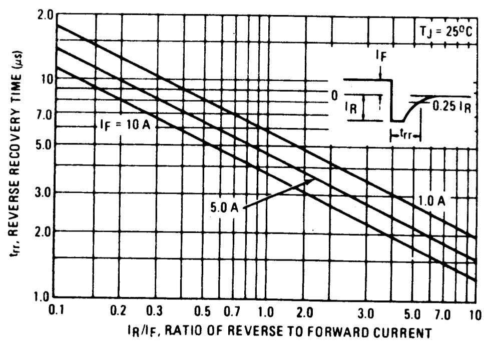


FIGURE 9 – REVERSE RECOVERY TIME



MOTOROLA

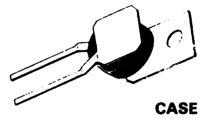
BYW90-50 thru BYW90-600

TAB-MOUNTED MEDIUM-CURRENT SILICON RECTIFIERS

. . . compact, highly efficient silicon rectifiers for medium current applications requiring:

- High current surge — 400 Amperes at T_J = 175°C
- Peak performance at elevated temperature — 24 Amperes at T_C = 150°C
- Low cost
- Same mounting as a TO-220AB

MEDIUM-CURRENT SILICON RECTIFIERS
50 – 600 VOLTS
24 AMPERES



CASE 339-02

3

MAXIMUM RATINGS

Rating	Symbol	BYW90-50	BYW90-100	BYW90-200	BYW90-400	BYW90-600	Unit
Peak repetitive reverse voltage Working peak reverse voltage DC blocking voltage	V_{RRM} V_{RWM} V_R	50	100	200	400	600	Volts
Non repetitive peak reverse voltage (half wave, single phase, 60 Hz peak)	V_{RSM}	60	120	240	480	720	Volts
Average rectified forward current (Single phase, resistive load, 60 Hz, T_C = 150°C)	I_O	24					Amps
Non repetitive peak surge current (surge applied at rated load conditions, half wave, single phase, 60 Hz)	I_{FSM}	400 (for 1 cycle)					Amps
Operating and storage junction Temperature range	T_J, T_{stg}	−65 to +175					°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max.	Unit
Thermal resistance, junction to case	$R_{\theta JC}$	0.8	°C/W
Thermal resistance, junction to air, PC board mounts; perpendicular to surface	$R_{\theta JA}$	55	°C/W

ELECTRICAL CHARACTERISTICS

Characteristics and Conditions	Symbol	Max.	Unit
Maximum instantaneous forward voltage (i_F = 75.4 Amp, T_C = 25°C)	v_F	1.18	Volts
Maximum reverse current (rated dc voltage) T_C = 25°C T_C = 100°C	I_R	 100 500	μA

MECHANICAL CHARACTERISTICS

CASE: Plastic en encapsulated, metal tabs.

FINISH: All external surfaces are corrosion resistant and the leads are readily soliderable.

POLARITY: Cathode to tab with hole; Reverse polarity available by adding "R" Suffix, BYW90-50R.

MOUNTING TORQUE: 8 in-lb. max.

MAXIMUM TEMPERATURE FOR SOLDERING PURPOSES: 350°C, 3/8" from case for 10 seconds.

WEIGHT: 3.6 Grams (approximately).

3

FIGURE 1 — FORWARD VOLTAGE

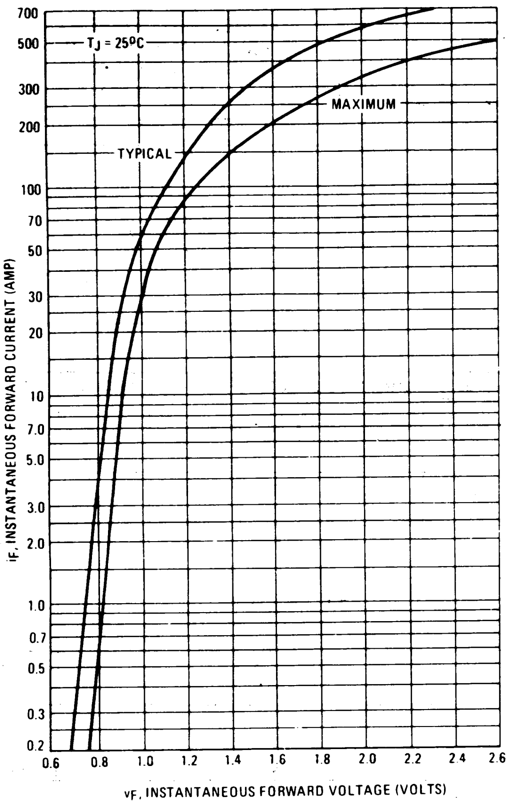


FIGURE 2 — NONREPETITIVE SURGE CURRENT

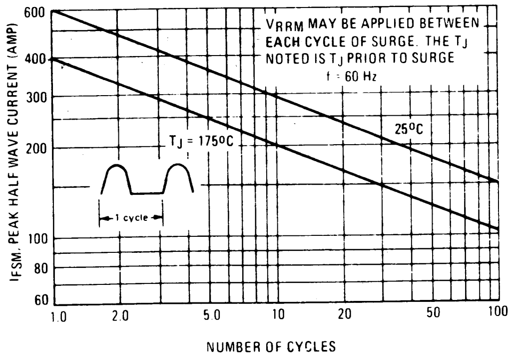


FIGURE 3 — FORWARD VOLTAGE TEMPERATURE COEFFICIENT

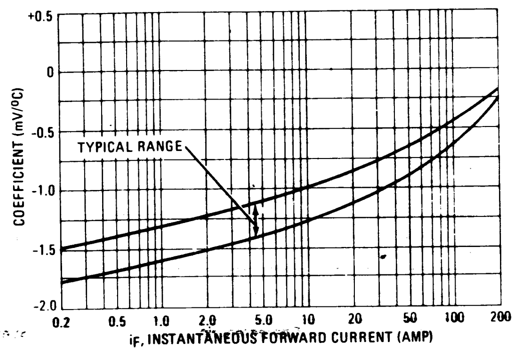


FIGURE 4 — CURRENT DERATING

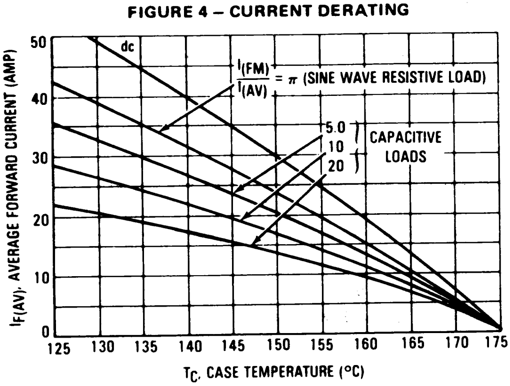


FIGURE 5 — FORWARD POWER DISSIPATION

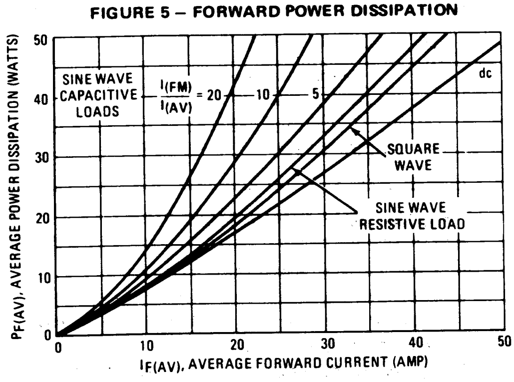
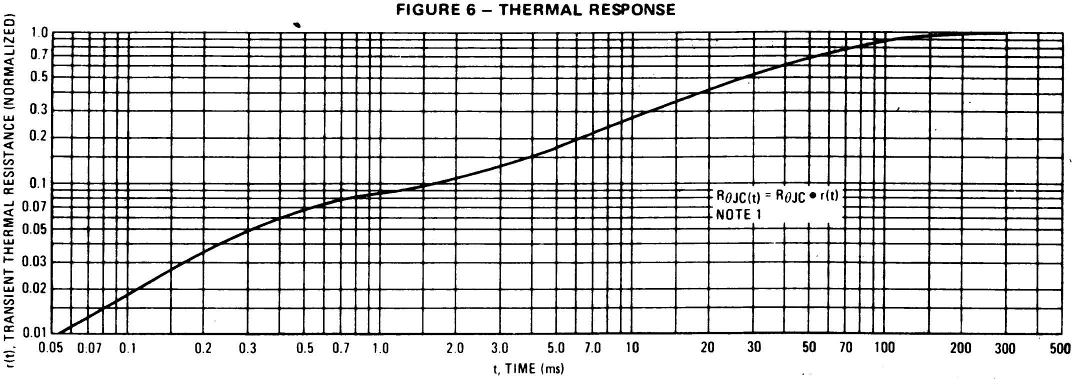
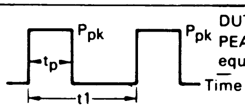


FIGURE 6 – THERMAL RESPONSE



3

NOTE 1



DUTY CYCLE, $D = t_p/t1$
PEAK POWER, P_{pk}, is peak of an equivalent square power pulse.

To determine maximum junction temperature of the diode in a given situation, the following procedure is recommended.

The temperature of the case should be measureed using a thermocouple placed on the case at the temperature reference point. The thermal mass connected to the case is normally large enough so that it will not significantly respond to heat surges generated in the diode as a result of pulsed operation once steady-state conditions are achieved. Using the measured value of T_C, the junction temperature may be determined by:

$$T_J = T_C + \Delta T_{JC}$$

where ΔT_{JC} is the increase in junction temperature above the case temperature. It may be determined by:

$$\Delta T_{JC} = P_{pk} \bullet R_{\theta JC} [D + (1 - D) \bullet r(t1 + t_p) + r(t_p) - r(t1)]$$

where

$r(t)$ = normalized value of transient thermal resistance at time, t, from Figure 3, i.e.:

$r(t1 + t_p)$ = normalized value of transient thermal resistance at time $t1 + t_p$.

FIGURE 7 – CAPACITANCE

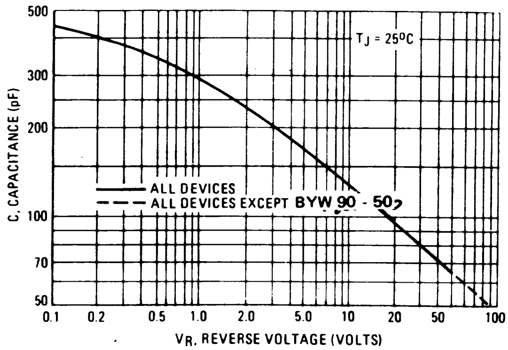


FIGURE 8 – FORWARD RECOVERY TIME

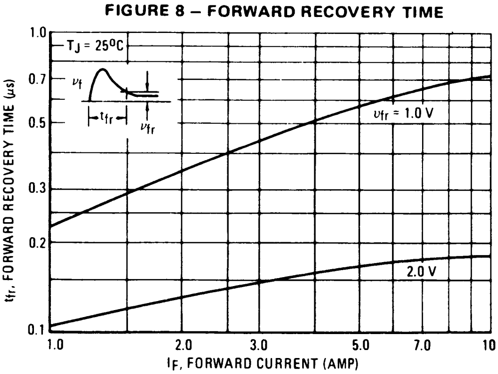


FIGURE 9 – REVERSE RECOVERY TIME

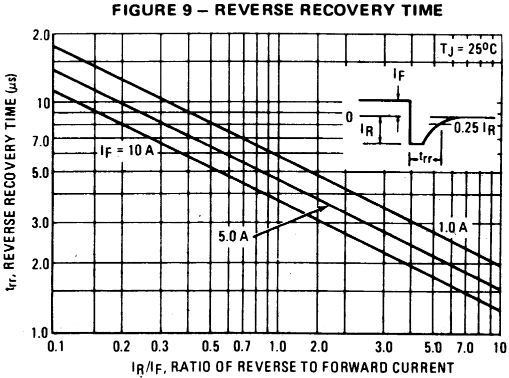
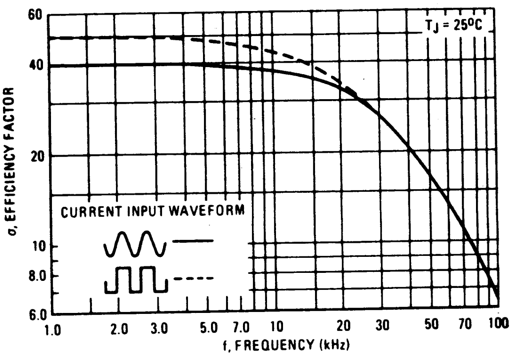
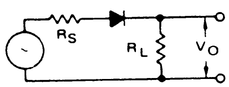


FIGURE 10 – RECTIFICATION WAVEFORM EFFICIENCY



RECTIFICATION EFFICIENCY NOTE



The rectification efficiency factor σ shown in Figure 10 was calculated using the formula:

$$\sigma = \frac{P_{dc}}{P_{rms}} = \frac{\frac{V^2_{O(dc)}}{R_L}}{\frac{V^2_{O(rms)}}{R_L}} \bullet 100\% = \frac{V^2_{O(dc)}}{V^2_{O(ac)} + V^2_{O(dc)}} \bullet 100\% \quad (1)$$

For a sine wave input $V_m \sin(\omega t)$ to the diode, assume lossless, the maximum theoretical efficiency factor becomes:

$$\sigma_{(sine)} = \frac{\frac{V^2_m}{\pi^2 R_L}}{\frac{V^2_m}{4R_L}} \bullet 100\% = \frac{4}{\pi^2} \bullet 100\% = 40.6\% \quad (2)$$

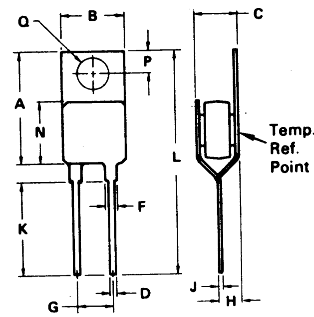
For a square wave input of amplitude V_m, the efficiency factor becomes:

$$\sigma_{(square)} = \frac{\frac{V^2_m}{2R_L}}{\frac{V^2_m}{R_L}} \bullet 100\% = 50\% \quad (3)$$

(A full wave circuit has twice these efficiencies)

As the frequency of the input signal is increased, the reverse recovery time of the diode (Figure 9) becomes significant, resulting in an increasing ac voltage component across R_L which is opposite in polarity to the forward current, thereby reducing the value of the efficiency factor σ, as shown on Figure 10.

It should be emphasized that Figure 10 shows waveform efficiency only; it does not provide a measure of diode losses. Data was obtained by measuring the ac component of V_O with a true rms ac voltmeter and the dc component with a dc voltmeter. The data was used in Equation 1 to obtain points for Figure 10.



	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	5.60	6.60	0.221	0.260
B	9.85	10.65	0.388	0.420
C	7.20	7.85	0.284	0.309
D	0.80	1.15	0.031	0.045
F	1.60	2.30	0.063	0.091
G	4.65	5.35	0.183	0.210
H	2.97	3.35	0.117	0.134
J	0.58	0.74	0.023	0.029
K	8.51	9.72	0.335	0.383
L	28.30	30.15	1.115	1.188
P	2.54	3.05	0.100	0.120
Q	3.53	3.73	0.139	0.145

CASE 339-02

MOTOROLA

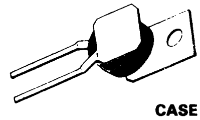
BYW91-50 thru BYW91-400

TAB-MOUNTED FAST RECOVERY POWER RECTIFIERS

. . . designed for special applications such as dc power supplies, inverters, converters, ultrasonic systems, choppers, low RF interference, sonar power supplies and free wheeling diodes. A complete line of fast recovery rectifiers having typical recovery time of 150 nanoseconds providing high efficiency at frequencies to 250 kHz.

- Same mounting as a TO-220AB
- Cost effective in low current applications
- Lead or chassis mounted
- High surge current capability

FAST RECOVERY POWER RECTIFIERS
50 – 400 VOLTS
24 AMPERES



CASE 339-02

3

MAXIMUM RATINGS

Rating	Symbol	BYW91-50	BYW91-100	BYW91-200	BYW91-400	Unit
Peak repetitive reverse voltage Working peak reverse voltage DC blocking voltage	V_{RRM} V_{RWM} V_R	50	100	200	400	Volts
Non repetitive peak reverse voltage	V_{RSM}	75	150	250	450	Volts
RMS reverse voltage	$V_{R(RMS)}$	35	70	140	280	Volts
Average rectified forward current (Single phase, resistive load, $T_C = 125°C$)	I_O	24				Amps
Non repetitive peak surge current (surge applied at rated load conditions)	I_{FSM}	300 (for 1 cycle)				Amps
Operating junction temperature range	T_J	−65 to +150				°C
Storage temperature range	T_{stg}	−65 to +175				°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max.	Unit
Thermal resistance, junction to case	$R_{\theta JC}$	0.8	°C/W
Thermal resistance, junction to air, PC board mounts; perpendicular to surface	$R_{\theta JA}$	55	°C/W

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ	Max.	Unit
Instantaneous forward voltage ($I_F = 75$ Amp, $T_J = 150°C$)	V_F	–	1.15	1.29	Volts
Forward voltage ($I_F = 24$ Amp, $T_C = 25°C$)	V_F	–	1.00	1.15	Volts
Reverse current (rated dc voltage) $T_C = 25°C$ $T_C = 100°C$ $T_C = 150°C$	I_R	– – –	10 0.5 7.0	25 1.0 10	μA mA mA

REVERSE RECOVERY CHARACTERISTICS

Characteristic	Symbol	Min.	Typ	Max.	Unit
Reverse recover time — Soft recovery ($I_F = 1.0$ Amp to $V_R = 30$ Vdc, Figure 19) ($I_{FM} = 36$ Amp, di/dt = 25 A/μs, Figure 20)	t_{rr}	 – –	 150 200	 200 300	ns
Reverse recovery current ($I_F = 1.0$ Amp to $V_R = 30$ Vdc, Figure 19)	$I_{RM(REC)}$	–	–	4.0	Amps

FIGURE 1 — MAXIMUM FORWARD VOLTAGE

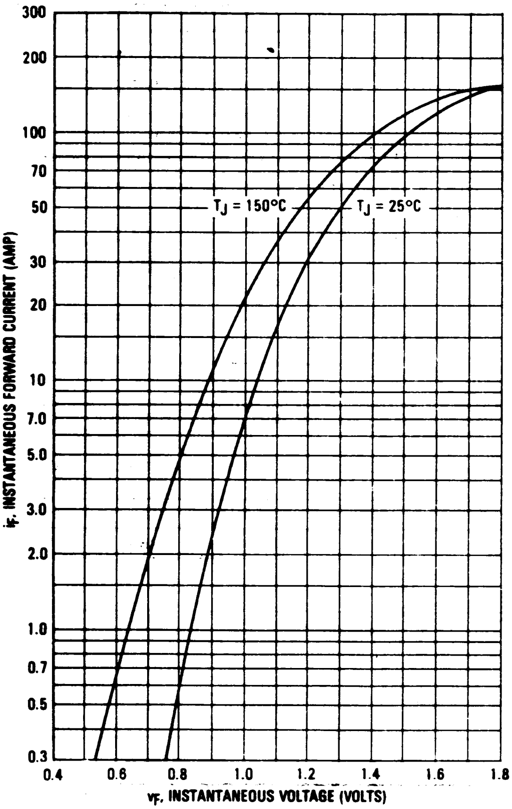
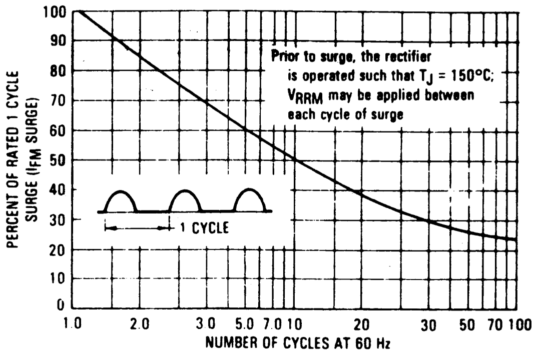
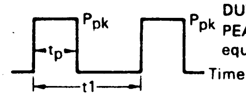


FIGURE 2 — MAXIMUM SURGE CAPABILITY



NOTE 1



DUTY CYCLE, $D = t_p/t1$
PEAK POWER, P_{pk}, is peak of an equivalent square power pulse.

To determine maximum junction temperature of the diode in a given situation, the following procedure is recommended.

The temperature of the case should be measureed using a thermocouple placed on the case at the temperature reference point. The thermal mass connected to the case is normally large enough so that it will not significantly respond to heat surges generated in the diode as a result of pulsed operation once steady-state conditions are achieved. Using the measured value of T_C, the junction temperature may be determined by:

$$T_J = T_C + \Delta T_{JC}$$

where ΔT_{JC} is the increase in junction temperature above the case temperature. It may be determined by:

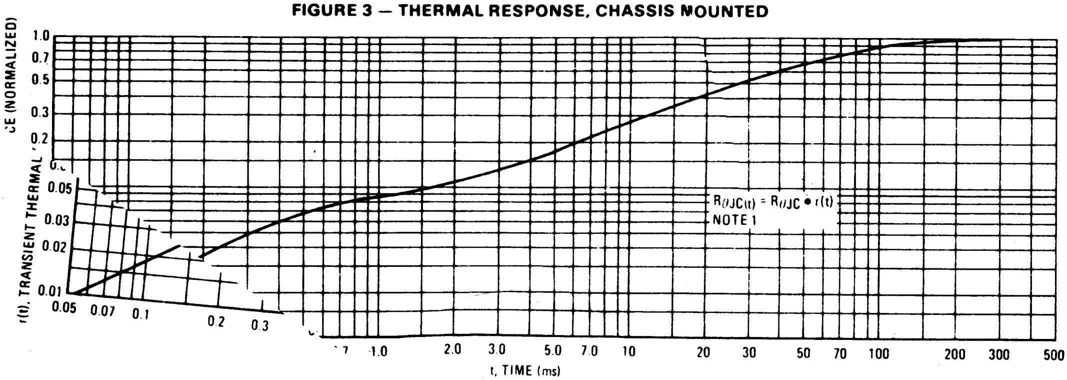
$$\Delta T_{JC} = P_{pk} \bullet R_{\theta JC} [D + (1 - D) \bullet r(t1 + t_p) + r(t_p) - r(t1)]$$

where

$r(t)$ = normalized value of transient thermal resistance at time, t, from Figure 3, i.e.:

$r(t1 + t_p)$ = normalized value of transient thermal resistance at time $t1 + t_p$.

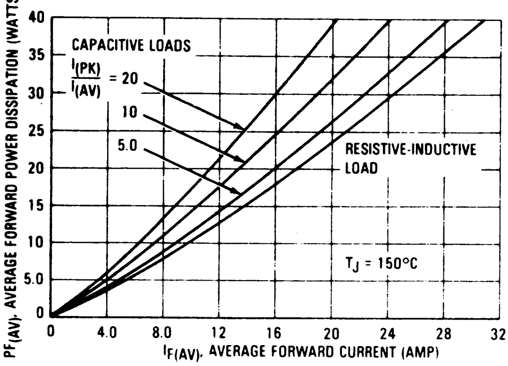
FIGURE 3 — THERMAL RESPONSE, CHASSIS MOUNTED



CHASSIS MOUNT RATING DATA

Sine Wave Input

FIGURE 4 — FORWARD POWER DISSIPATION



Square Wave Input

FIGURE 5 — FORWARD POWER DISSIPATION

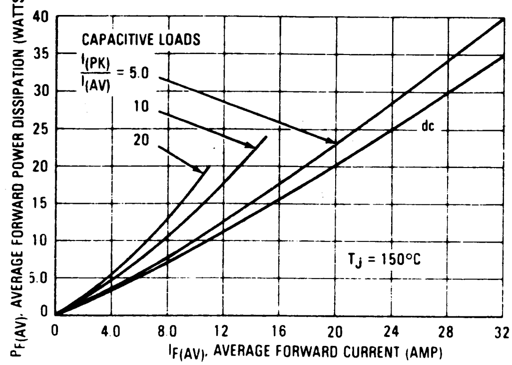


FIGURE 6 — CURRENT DERATING

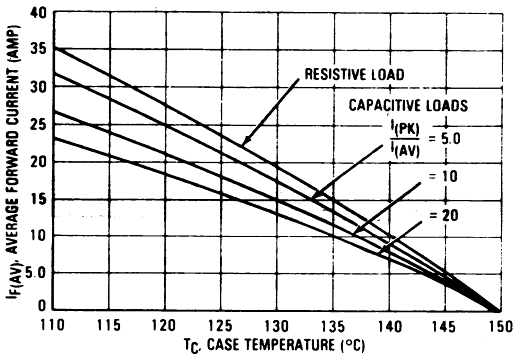
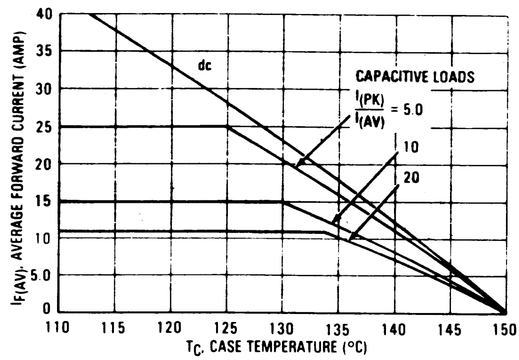


FIGURE 7 — CURRENT DERATING



PRINTED CIRCUIT BOARD RATING DATA

FIGURE 8 — FORWARD POWER DISSIPATION

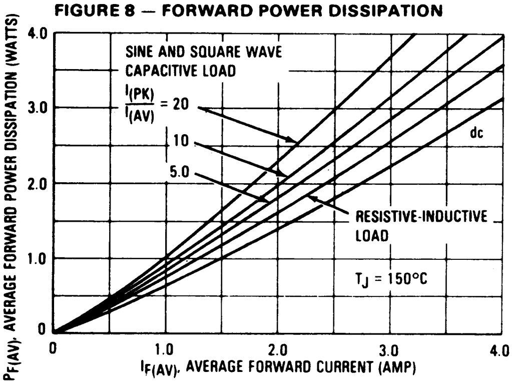
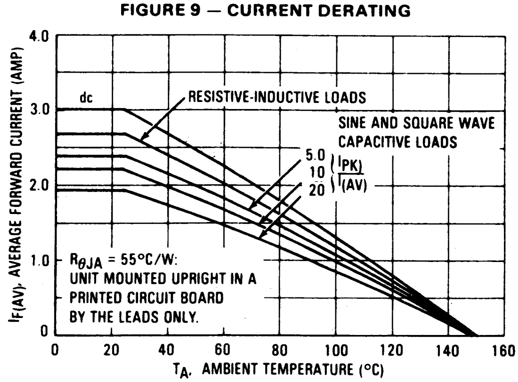


FIGURE 9 — CURRENT DERATING



TYPICAL DYNAMIC CHARACTERISTICS

FIGURE 10 — FORWARD RECOVERY TIME

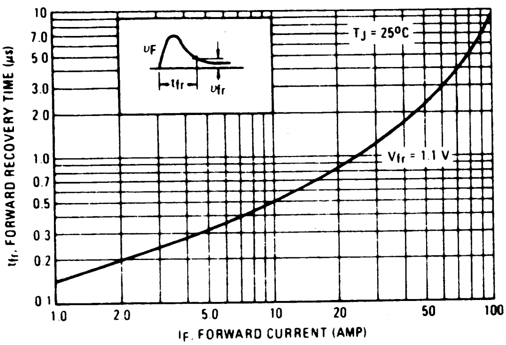


FIGURE 11 — JUNCTION CAPACITANCE

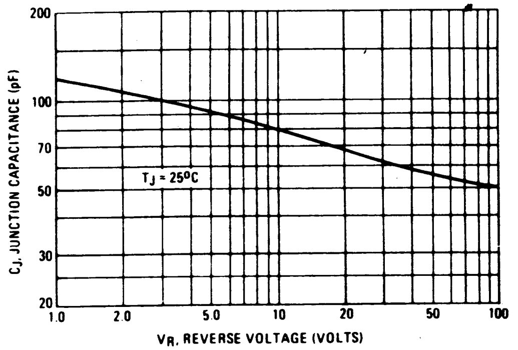


FIGURE 12 — TYPICAL REVERSE CURRENT

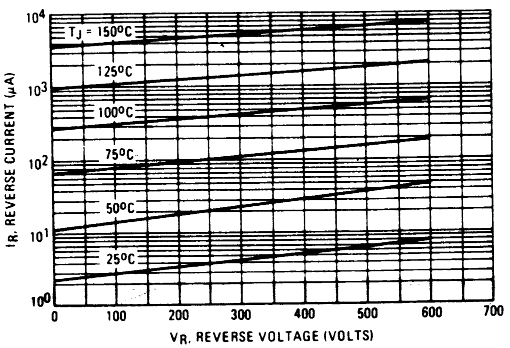
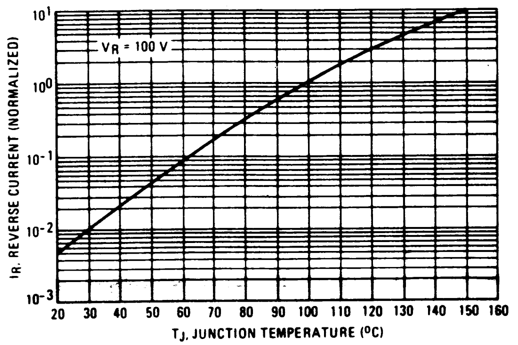
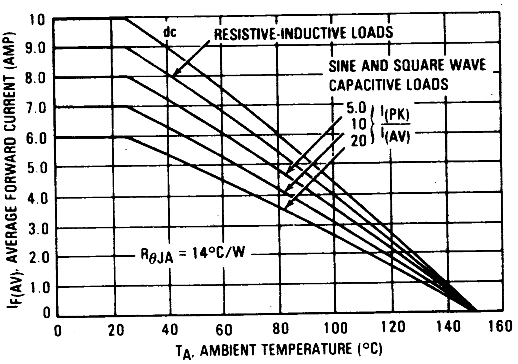


FIGURE 13 — NORMALIZED REVERSE CURRENT



TYPICAL MOUNTING DATA

FIGURE 14 — CURRENT DERATING



NOTE 2

Figure 14 shows the current carrying capability of a device mounted on a printed circuit board with a typical TO-220 type heatsink having a sink-to-air thermal resistance of 12°C/W. Allowing another 2°C/W for $R_{\theta JC}$ plus $R_{\theta CS}$ (case-to-sink) puts the total at 14°C/W as indicated. The unit and heatsink were mounted perpendicular to the printed circuit board for this data.

TYPICAL RECOVERED STORED CHARGE DATA
(See Note 3)

FIGURE 15 — T_J = 25°C

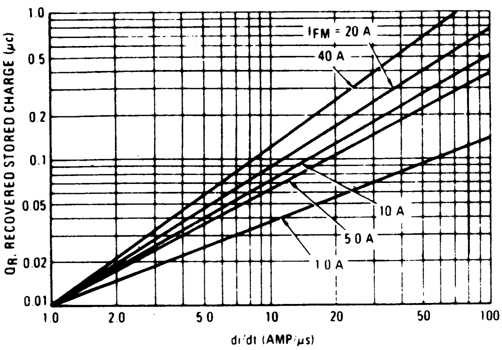


FIGURE 16 — T_J = 75°C

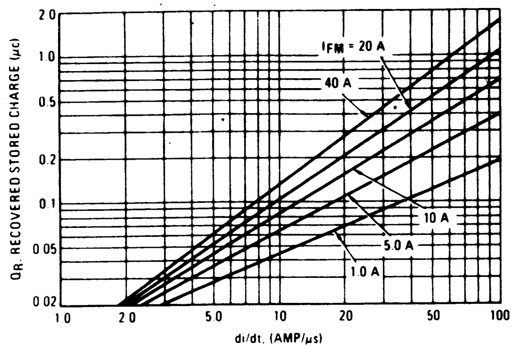


FIGURE 17 — T_J = 100°C

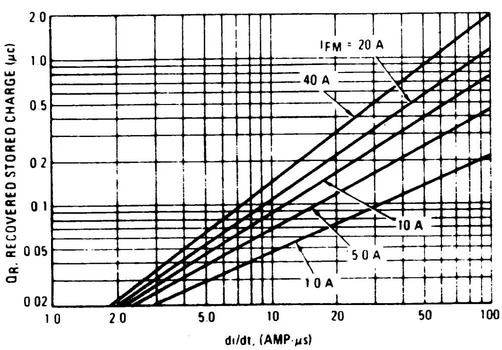
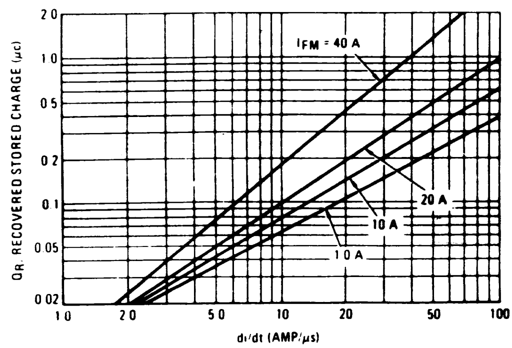


FIGURE 18 — T_J = 150°C



3

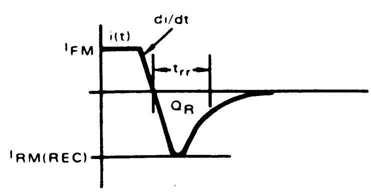
NOTE 3

Reverse recovery time is the period which elapses from the time that the current, thru a previously forward biased rectifier diode, passes thru zero going negatively until the reverse current recovers to a point which is less than 10% peak reverse current.

Reverse recovery time is a direct function of the forward current prior to the application of reverse voltage.

For any given rectifier, recovery time is very circuit dependent. Typical and maximum recovery time of all Motorola fast recovery power rectifiers are rated under a fixed set of conditions using I_F = 1.0 A, V_R = 30 V. In order to cover all circuit conditions, curves are given for typical recovered stored charge versus commutation di/dt for various levels of forward current and for junction temperatures of 25°C, 75°C, 100°C, and 150°C.

To use these curves, it is necessary to know the forward current level just before commutation, the circuit commutation di/dt, and the operating junction temperature. The reverse recovery test current waveform for all Motorola fast recovery rectifiers is shown.

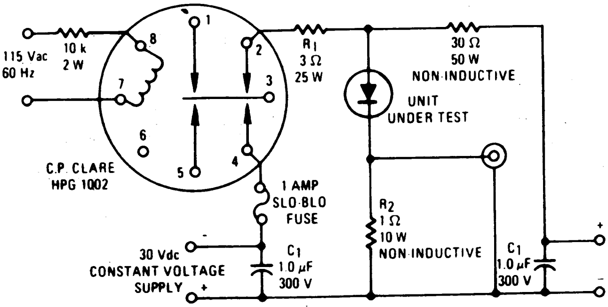


From stored charge curves versus di/dt, recovery time (t_{rr}) and peak reverse recovery current ($I_{RM(REC)}$) can be closely approximated using the following formulas:

$$t_{rr} = 1.41 \times \left[\frac{Q_R}{di/dt}\right]^{1/2}$$

$$I_{RM(REC)} = 1.41 \times \left[Q_R \times di/dt\right]^{1/2}$$

FIGURE 19 — MOTOROLA REVERSE RECOVERY CIRCUIT



A – TEKTRONIX 545A, K PLUG IN PRE-AMP, P6000 PROBE OR EQUIVALENT

R_1 – ADJUSTED FOR 1.4 Ω BETWEEN POINT 2 OF RELAY AND RECTIFIER INDUCTANCE ≈ 38 μH

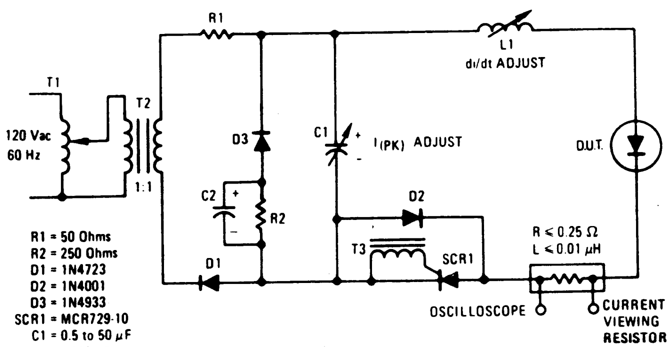
R_2 – TEN-1 W, 10 Ω, 1% CARBON CORE IN PARALLEL

$T_A = 25\ ^{+10}_{-0}$ °C FOR RECTIFIER

MINIMIZE ALL LEAD LENGTHS

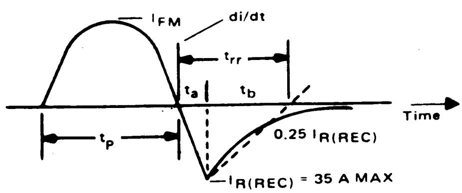
1.0 Adc FROM CONSTANT VOLTAGE SUPPLY
RIPPLE = 3 mVrms MAX
Z_{out} = 1½ Ω MAX, DC to 2 kHz

FIGURE 20 — JEDEC REVERSE RECOVERY CIRCUIT

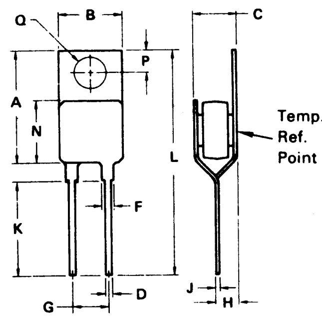


R1 = 50 Ohms
R2 = 250 Ohms
D1 = 1N4723
D2 = 1N4001
D3 = 1N4933
SCR1 = MCR729-10
C1 = 0.5 to 50 μF
C2 ≈ 4000 μF
L1 = 1.0 - 27 μH
T1 = Variac Adjusts $I_{(PK)}$ and di/dt
T2 = 1:1
T3 = 1:1 (to trigger circuit)

FIGURE 21 — REVERSE RECOVERY CHARACTERISTIC



SOFT RECOVERY



	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	5.60	6.60	0.221	0.260
B	9.85	10.65	0.388	0.420
C	7.20	7.85	0.284	0.309
D	0.80	1.15	0.031	0.045
F	1.60	2.30	0.063	0.091
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J	0.58	0.74	0.023	0.029
K	8.51	9.72	0.335	0.383
L	28.30	30.15	1.115	1.188
P	2.54	3.05	0.100	0.120
Q	3.53	3.73	0.139	0.145

CASE 339-02

MECHANICAL CHARACTERISTICS

CASE: Plastic Encapsulated, Metal Tabs.

FINISH: All external surfaces are corrosion resistant and are readily solderable.

POLARITY: Cathode to Tab with hole; Reverse polarity available by adding "R" Suffix, BYW 91 - 50 R

WEIGHT: 3.6 Grams (Approximately).

MOUNTING TORQUE: 8 in-lbs max.

MAXIMUM TEMPERATURE FOR SOLDERING PURPOSES: 350°C, 3/8" from case for 10 seconds.