Bulletin I27504 08/97

International
IOR Rectifier

MT..KB SERIES

THREE PHASE AC SWITCH

Power Modules

50 A
90 A
100 A

Features

- Package fully compatible with the industry standard INT-A-pak power modules series
- High thermal conductivity package, electrically insulated case
- Outstanding number of power encapsulated components
- Excellent power volume ratio
- 4000 V_{RMS} isolating voltage
- UL E78996 approved

Description

A range of extremely compact, encapsulated three phase AC-switches offering efficient and reliable operation. They are intended for use in general purpose and heavy duty applications as control motor starter.

Major Ratings and Characteristics

Parameters		54MT..KB	94MT..KB	104MT..KB	Units
I_O		50	90	100	A
	@ T_C	80	80	80	°C
I_{FSM}	@ 50Hz	390	950	1130	A
	@ 60Hz	410	1000	1180	A
I^2t	@ 50Hz	770	4525	6380	A^2s
	@ 60Hz	700	4130	5830	A^2s
$I^2\sqrt{t}$		7700	45250	63800	$A^2\sqrt{s}$
V_{RRM}	range	800 to 1600			V
T_{STG}	range	-40 to 125			°C
T_J	range	-40 to 125			°C

ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number	Voltage Code	V_{RRM}, maximum repetitive peak reverse voltage V	V_{RSM}, maximum non-repetitive peak reverse voltage V	V_{DRM}, max. repetitive peak off-state voltage, gate open circuit V	I_{RRM}/I_{DRM} max. @ T_J = 125°C mA
54MT..KB	80	800	900	800	20 *
	100	1000	1100	1000	
	120	1200	1300	1200	
	140	1400	1500	1400	
	160	1600	1700	1600	
94/104MT..KB	80	800	900	800	40 *
	100	1000	1100	1000	
	120	1200	1300	1200	
	140	1400	1500	1400	
	160	1600	1700	1600	

* For single AC switch

Forward Conduction

	Parameter	54MT.KB	94MT.KB	104MT.KB	Units	Conditions		
I_O	Maximum I_{RMS} output current	50	90	100	A	For all conduction angle		
	@ Case temperature	80	80	80	°C			
I_{TSM}	Maximum peak, one-cycle forward, non-repetitive on state surge current	390	950	1130	A	t = 10ms	No voltage reapplied	Initial $T_J = T_J$ max.
		410	1000	1180		t = 8.3ms		
		330	800	950		t = 10ms	100% V_{RRM} reapplied	
		345	840	1000		t = 8.3ms		
I^2t	Maximum I^2t for fusing	770	4525	6380	A^2s	t = 10ms	No voltage reapplied	
		700	4130	5830		t = 8.3ms		
		540	3200	4510		t = 10ms	100% V_{RRM} reapplied	
		500	2920	4120		t = 8.3ms		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	7700	45250	63800	$A^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reapplied		
$V_{T(TO)1}$	Low level value of threshold voltage	1.16	0.99	0.99	V	(16.7% x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), @ T_J max.		
$V_{T(TO)2}$	High level value of threshold voltage	1.44	1.19	1.15		(I > π x $I_{T(AV)}$), @ T_J max.		
r_{t1}	Low level value on-state slope resistance	12.54	4.16	3.90	mΩ	(16.7% x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), @ T_J max.		
r_{t2}	High level value on-state slope resistance	11.00	3.56	3.48		(I > π x $I_{T(AV)}$), @ T_J max.		
V_{TM}	Maximum on-state voltage drop	2.68	1.55	1.53	V	I_{pk} = 150A, T_J = 25°C t_p = 400µs single junction		
di/dt	Max. non-repetitive rate of rise of turned on current	150			A/µs	T_J = 25°C, from 0.67 V_{DRM}, I_{TM} = π x $I_{T(AV)}$, I_g = 500mA, t_r < 0.5 µs, t_p > 6µs		
I_H	Max. holding current	200			mA	T_J = 25°C, anode supply = 6V, resistive load, gate open circuit		
I_L	Max. latching current	400				T_J = 25°C, anode supply = 6V, resistive load		

Blocking

	Parameter	54MT.KB	94MT.KB	104MT.KB	Units	Conditions
V_{INS}	RMS isolation voltage	4000			V	T_J = 25°C all terminal shorted f = 50Hz, t = 1s
dv/dt	Max. critical rate of rise of off-state voltage (*)	500			V/µs	T_J = T_J max., linear to 0.67 V_{DRM} gate open circuit

(*) Available with dv/dt = 1000V/µs, to complete code add S90 i.e. 104MT160KBS90.

Triggering

	Parameter	54MT.KB	94MT.KB	104MT.KB	Units	Conditions	
P_{GM}	Max. peak gate power	10			W	T_J=T_J max.	
$P_{G(AV)}$	Max. average gate power	2.5					
I_{GM}	Max. peak gate current	2.5			A		
$-V_{GT}$	Max. peak negative gate voltage	10			V		
V_{GT}	Max. required DC gate voltage to trigger	4.0			V	T_J=-40°C	Anode supply=6V, resistive load
		2.5				T_J=25°C	
		1.7				T_J=125°C	
I_{GT}	Max. required DC gate current to trigger	270			mA	T_J=-40°C	Anode supply=6V, resistive load
		150				T_J=25°C	
		80				T_J=125°C	
V_{GD}	Max. gate voltage that will not trigger	0.25			V	@ T_J=T_J max., rated V_{DRM} applied	
I_{GD}	Max. gate current that will not trigger	6			mA		

Thermal and Mechanical Specifications

	Parameter		54MT.KB	94MT.KB	104MT.KB	Units	Conditions
T_J	Max. junction operating temperature range		-40 to 125			°C	
T_{stg}	Max. storage temperature range		-40 to 125			°C	
R_{thJC}	Max. thermal resistance, junction to case		0.52	0.39	0.34	K/W	DC operation per single AC switch
			1.05	0.77	0.69		DC operation per junction
			0.56	0.40	0.36		180° Sine cond. angle per single AC switch
			1.12	0.80	0.72		180° Sine cond. angle per junction
R_{thCS}	Max. thermal resistance, case to heatsink		0.03			K/W	Per module Mounting surface smooth, flat and greased
T	Mounting torque ± 10%	to heatsink	4 to 6			Nm	A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow for the spread of the compound. Lubricated threads.
		to terminal	3 to 4				
wt	Approximate weight		225			g	

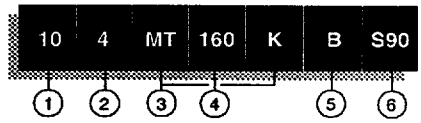
ΔR Conduction (per Junction)

(The following table shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC)

Devices	Sinusoidal conduction @ T_J max.					Rectangular conduction @ T_J max.					Units
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
54MT.KB	0.072	0.085	0.108	0.152	0.233	0.055	0.091	0.117	0.157	0.236	K/W
94MT.KB	0.033	0.039	0.051	0.069	0.099	0.027	0.044	0.055	0.071	0.100	
104MT.KB	0.027	0.033	0.042	0.057	0.081	0.023	0.037	0.046	0.059	0.082	

Ordering Information Table

Device Code



1 - Current rating code: 5 = 50 A (Avg)
9 = 90 A (Avg)
10 = 100 A (Avg)

2 - AC Switch

3 - Essential part number

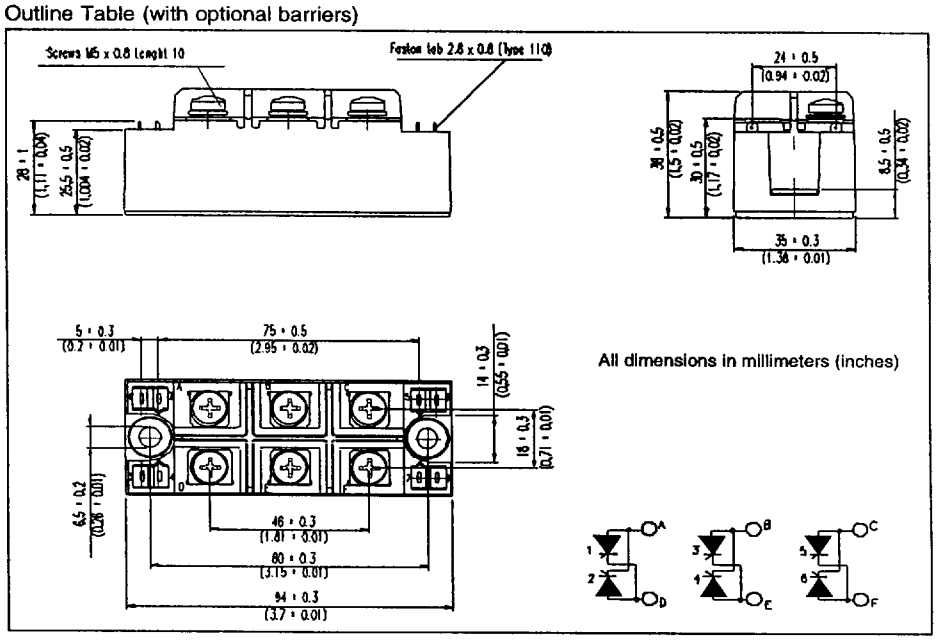
4 - Voltage code: Code x 10 = V_{RRM} (See Voltage Ratings Table)

5 - Generation II

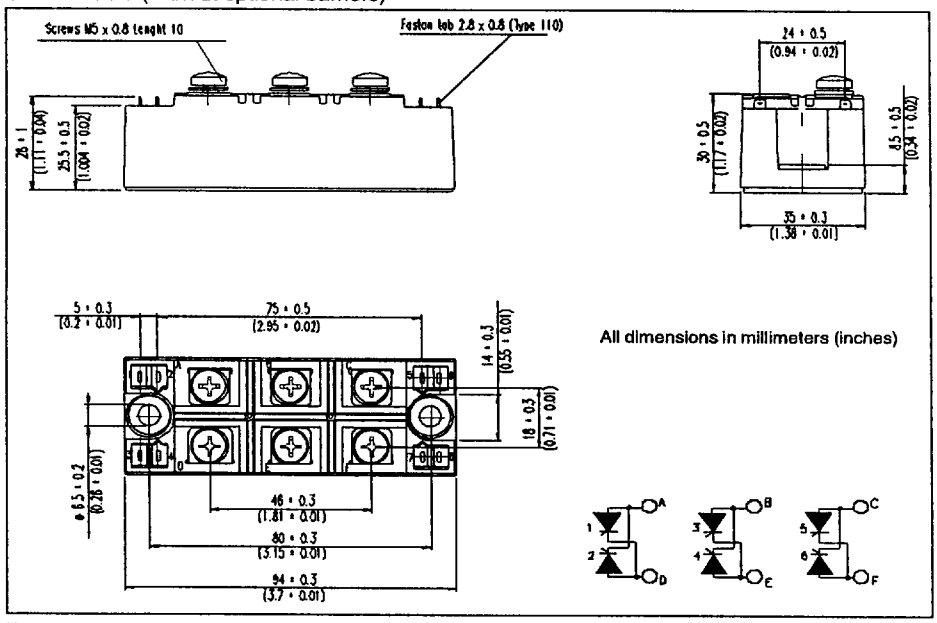
6 - Critical dv/dt: None = 500V/µs (Standard value)
S90 = 1000V/µs (Special selection)

NOTE: To order the Optional Hardware see Bulletin I27900

Outline Table (with optional barriers)



Outline Table (without optional barriers)



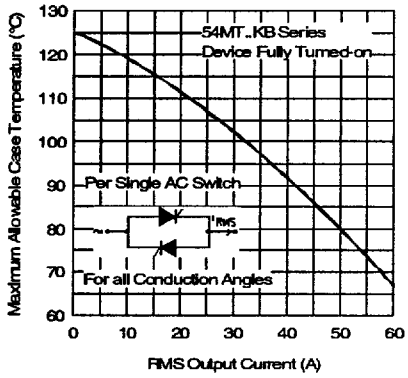


Fig. 1 - Current Ratings Characteristic

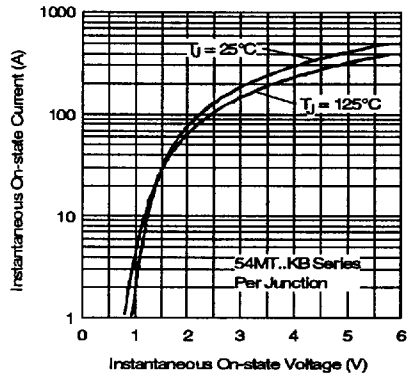


Fig. 2 - Forward Voltage Drop Characteristics

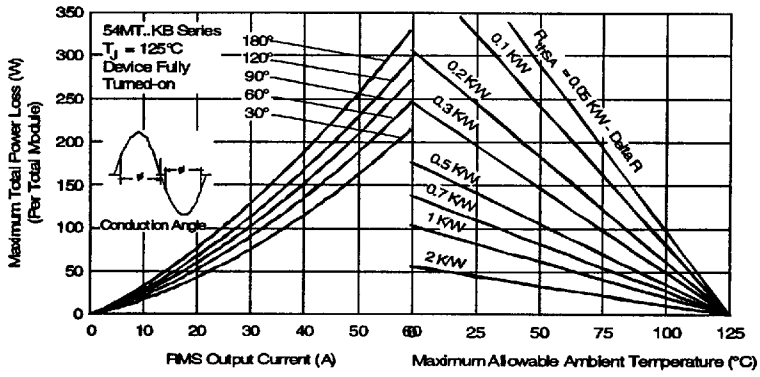


Fig. 3 - Total Power Loss Characteristics

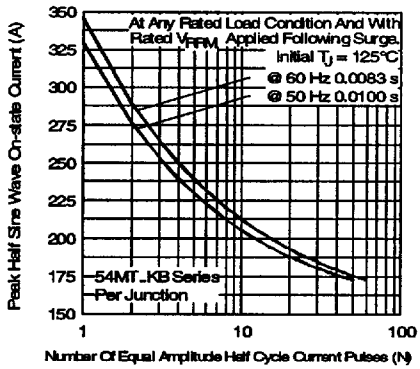


Fig. 4 - Maximum Non-Repetitive Surge Current

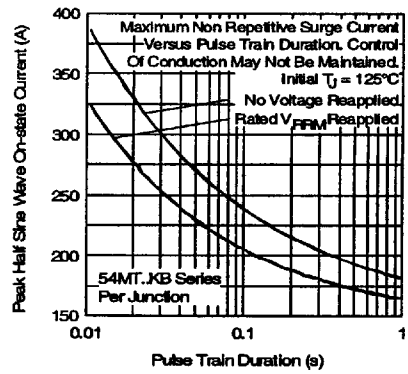


Fig. 5 - Maximum Non-Repetitive Surge Current

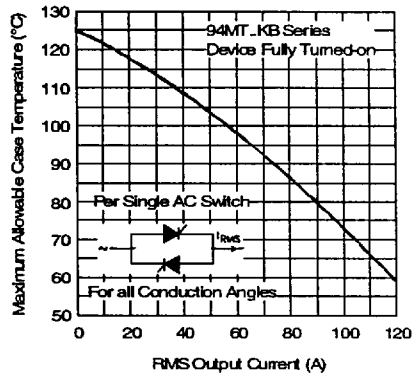


Fig. 6 - Current Ratings Characteristic

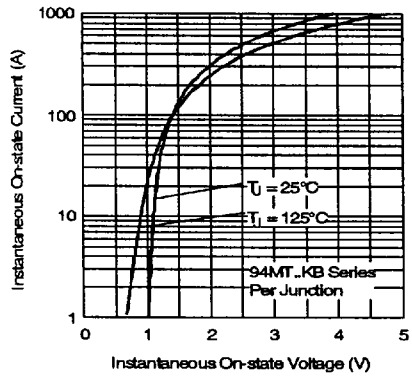


Fig. 7 - Forward Voltage Drop Characteristics

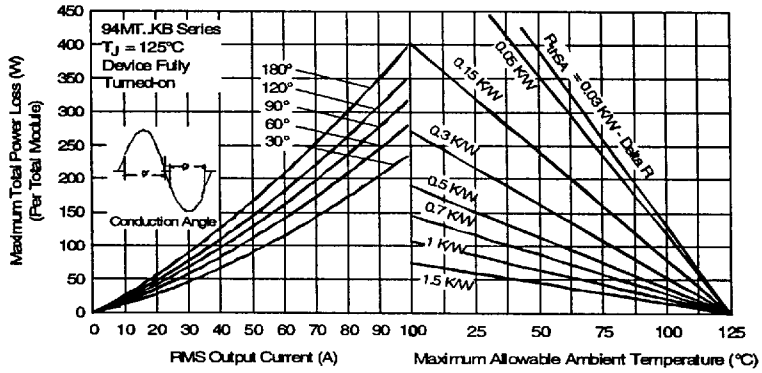


Fig. 8 - Total Power Loss Characteristics

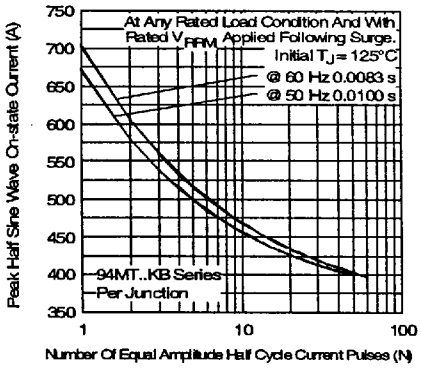


Fig. 9 - Maximum Non-Repetitive Surge Current

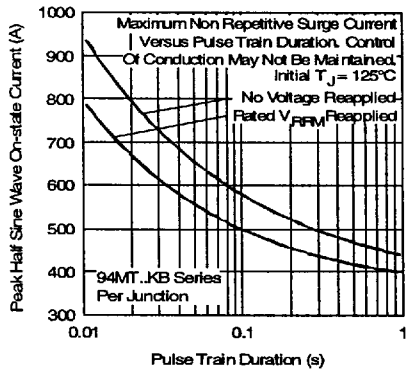


Fig. 10 - Maximum Non-Repetitive Surge Current

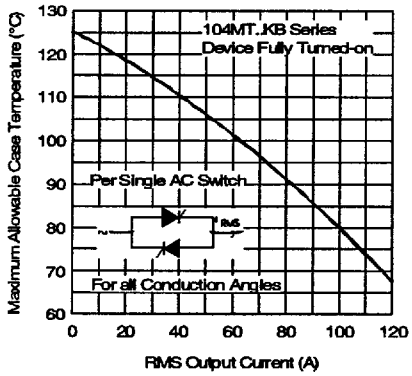


Fig. 11 - Current Ratings Characteristic

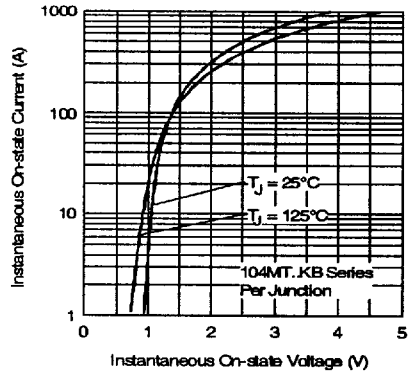


Fig. 12 - Forward Voltage Drop Characteristics

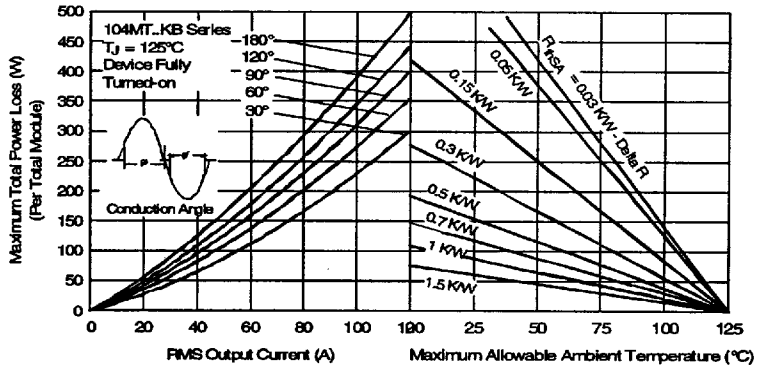


Fig. 13 - Total Power Loss Characteristics

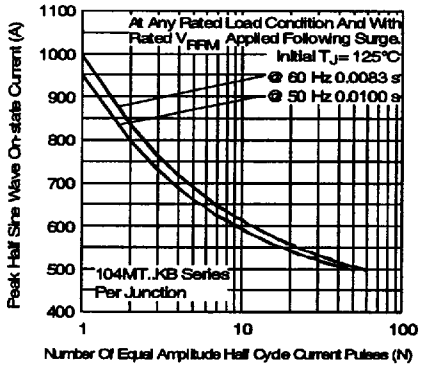


Fig. 14 - Maximum Non-Repetitive Surge Current

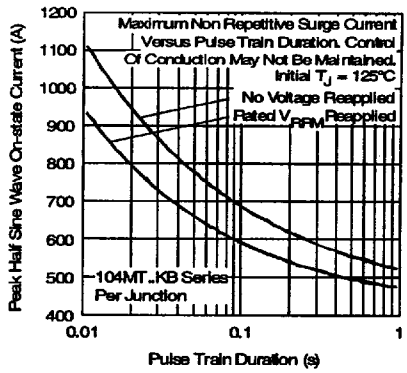


Fig. 15 - Maximum Non-Repetitive Surge Current

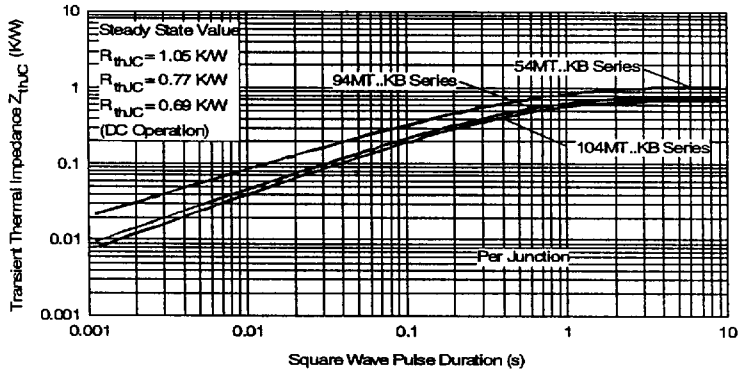


Fig. 16 - Thermal Impedance Z_{thJC} Characteristics

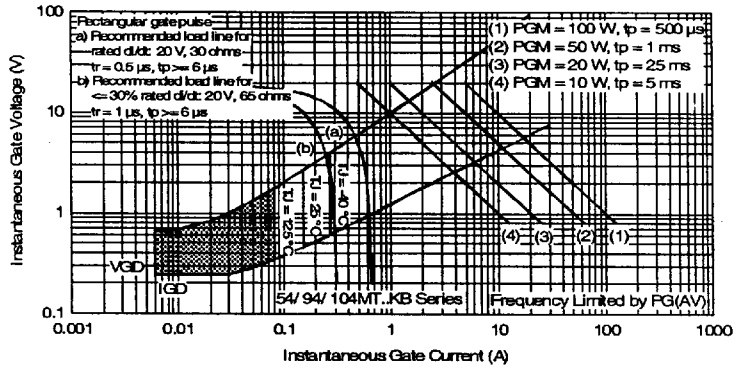


Fig. 17 - Gate Characteristics