


THREE PHASE AC SWITCH

Power Modules

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
- ULE78996 approved 

50 A
90 A
100 A

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 ² s
@ 60Hz	700	4130	5830	A ² s
$I^2\sqrt{t}$	7700	45250	63800	A ² √s
V_{RRM} range	800 to 1600			V
T_{STG} range	- 40 to 125			°C
T_J range	- 40 to 125			°C

54-94-104MT..KB Series

Bulletin I27504 08/97

International
IR Rectifier

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 _{RFM} /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 @ Case temperature	50 80	90 80	100 80	A °C	For all conduction angle
I _{TSM} Maximum peak, one-cycle forward, non-repetitive on state surge current	390 410 330 345	950 1000 800 840	1130 1180 950 1000	A	t = 10ms No voltage reappplied t = 8.3ms reappplied t = 10ms 100% V _{RRM} reappplied t = 8.3ms reappplied
I ² t Maximum I ² t for fusing	770 700 540 500	4525 4130 3200 2920	6380 5830 4510 4120	A ² s	t = 10ms No voltage reappplied t = 8.3ms reappplied t = 10ms 100% V _{RRM} reappplied t = 8.3ms reappplied
I ² t Maximum I ² t for fusing	7700	45250	63800	A ² /s	t = 0.1 to 10ms, no voltage reappplied
V _{TR(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 _{TR(TO)2} High level value of threshold voltage	1.44	1.19	1.15	V	(I > π x I _{T(AV)}), @ T _J max.
r ₁₁ 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 ₁₂ High level value on-state slope resistance	11.00	3.56	3.48	mΩ	(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 0.87 V _{DFM} , I _{TM} = π x I _{T(AV)} I _Q = 500mA, t _r < 0.5 μs, t _p > 6 μs
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		mA	T _J = 25°C, anode supply = 6V, resistive load

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Blocking

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

(*) Available with $dv/dt = 1000\text{V}/\mu\text{s}$, 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	$T_J = T_J \text{ max.}$
$P_{G(AV)}$ 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	$T_J = -40^\circ\text{C}$ Anode supply = 6V, resistive load
	2.5				$T_J = 25^\circ\text{C}$
	1.7				$T_J = 125^\circ\text{C}$
I_{GT} Max. required DC gate current to trigger	270			mA	$T_J = -40^\circ\text{C}$ Anode supply = 6V, resistive load
	150				$T_J = 25^\circ\text{C}$
	80				$T_J = 125^\circ\text{C}$
V_{GD} Max. gate voltage that will not trigger	0.25			V	@ $T_J = T_J \text{ max.}$, 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			$^\circ\text{C}$	
T_{stg} Max. storage temperature range	-40 to 125			$^\circ\text{C}$	
$R_{\theta JC}$ 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
$R_{\theta CS}$ Max. thermal resistance, case to heatsink	0.03			K/W	Per module Mounting surface smooth, flat and greased
T Mounting torque $\pm 10\%$	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	

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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	0.238	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

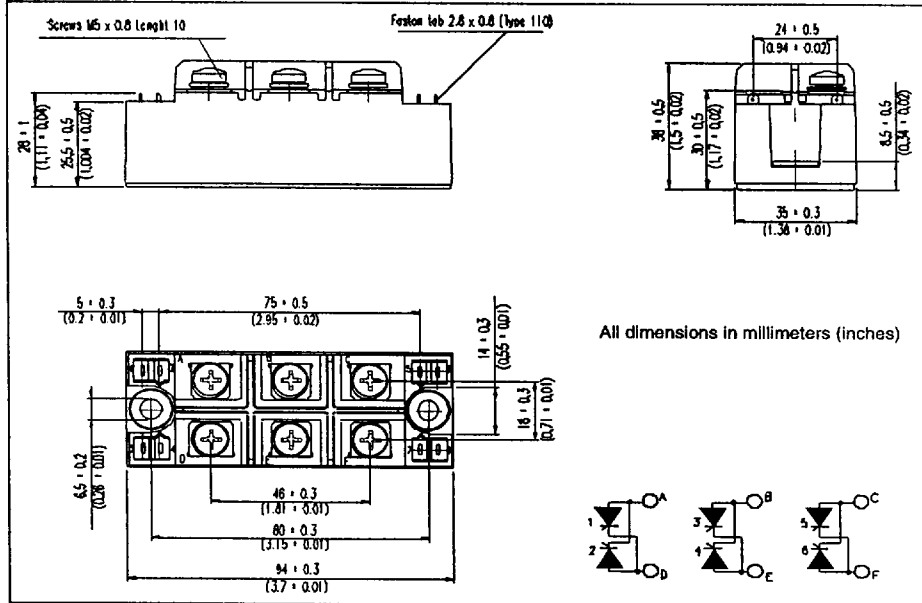
10	4	MT	160	K	B	S90
①	②	③	④		⑤	⑥

- 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)

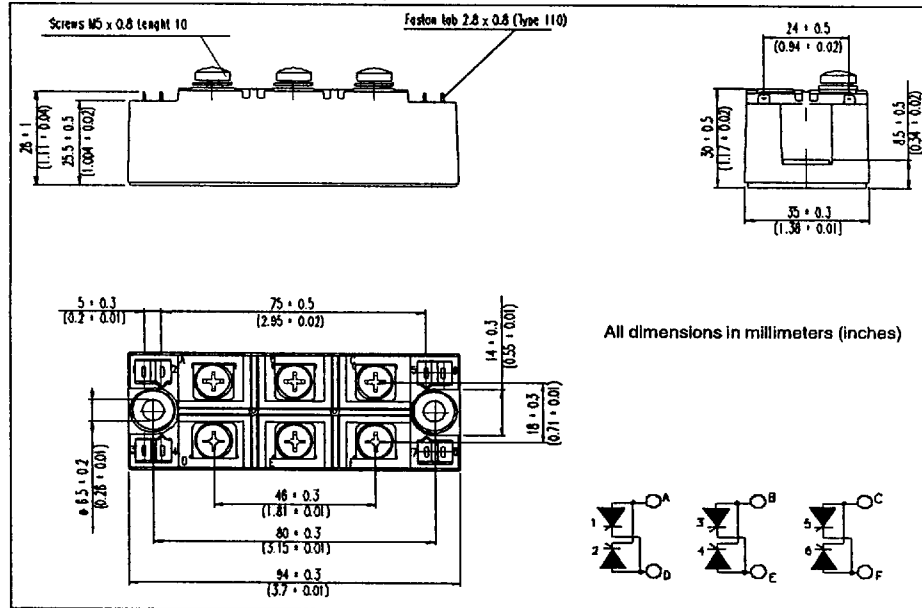
NOTE: To order the Optional Hardware see Bulletin I27900

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Outline Table (with optional barriers)



Outline Table (without optional barriers)



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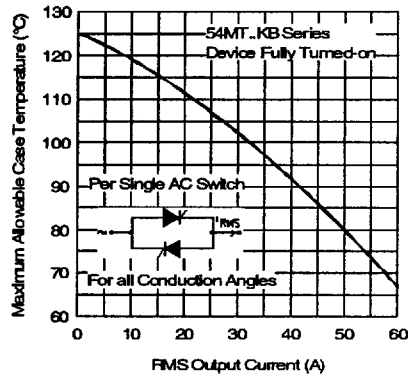


Fig. 1 - Current Ratings Characteristic

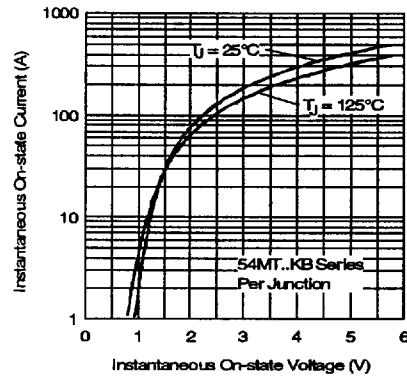


Fig. 2 - Forward Voltage Drop Characteristics

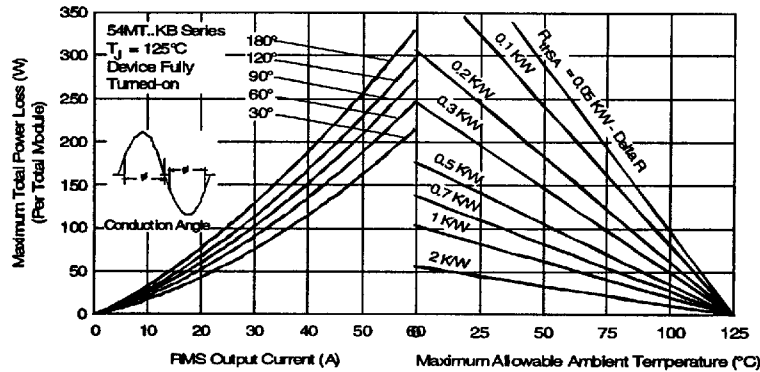


Fig. 3 - Total Power Loss Characteristics

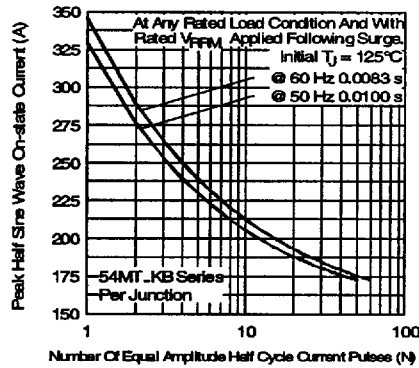


Fig. 4 - Maximum Non-Repetitive Surge Current

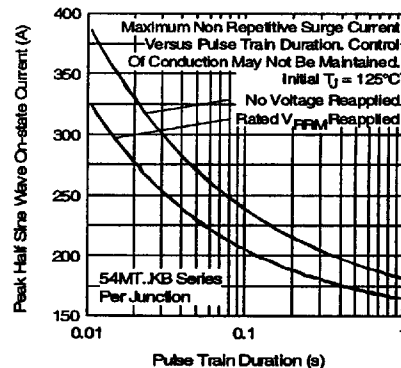


Fig. 5 - Maximum Non-Repetitive Surge Current

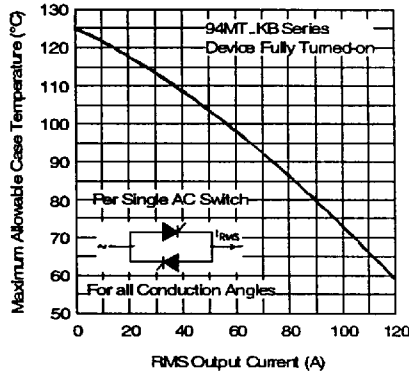


Fig. 6 - Current Ratings Characteristic

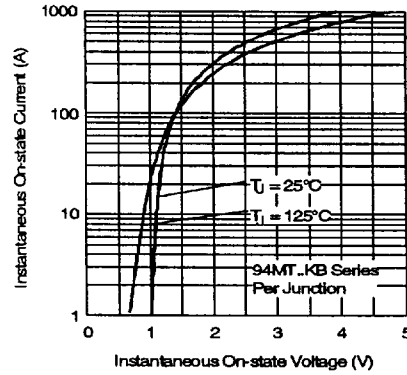


Fig. 7 - Forward Voltage Drop Characteristics

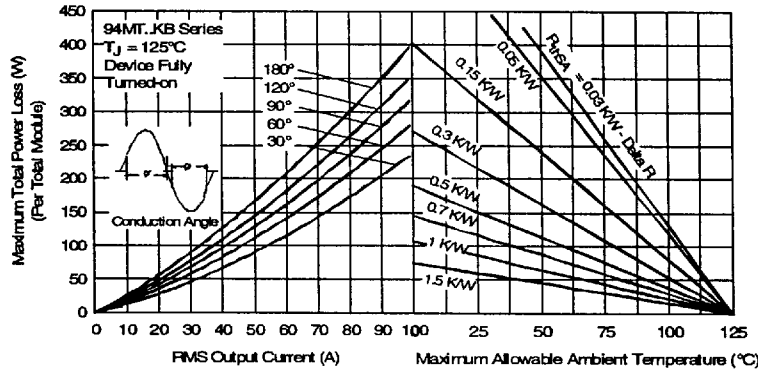


Fig. 8 - Total Power Loss Characteristics

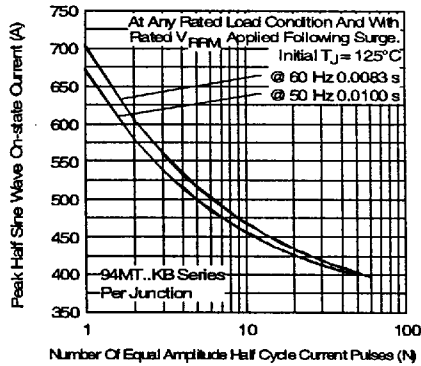


Fig. 9 - Maximum Non-Repetitive Surge Current

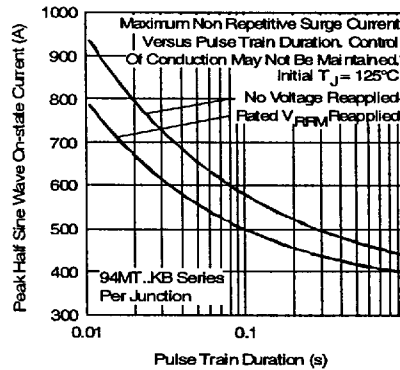


Fig. 10 - Maximum Non-Repetitive Surge Current

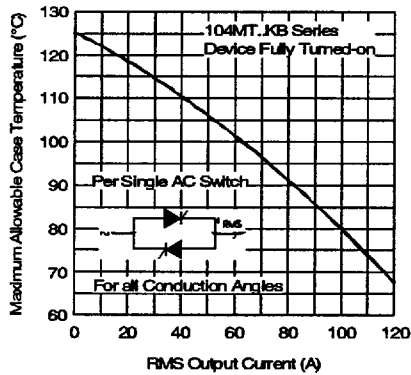


Fig. 11 - Current Ratings Characteristic

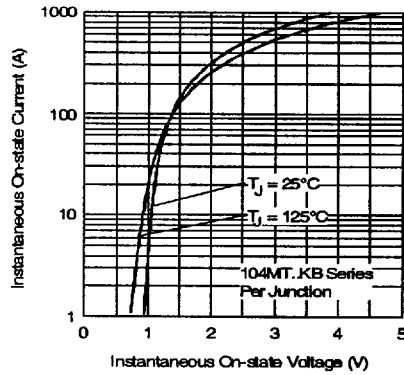


Fig. 12 - Forward Voltage Drop Characteristics

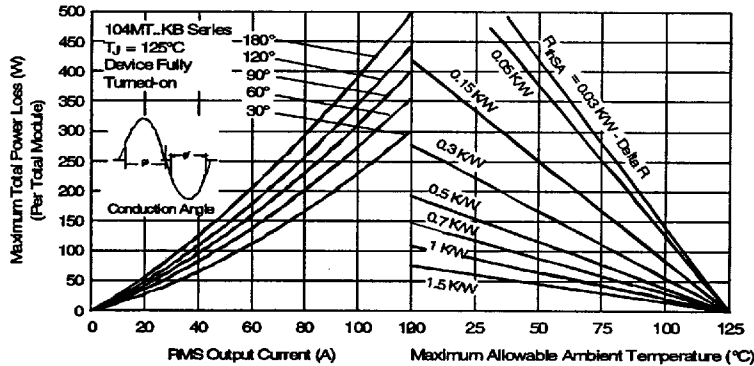


Fig. 13 - Total Power Loss Characteristics

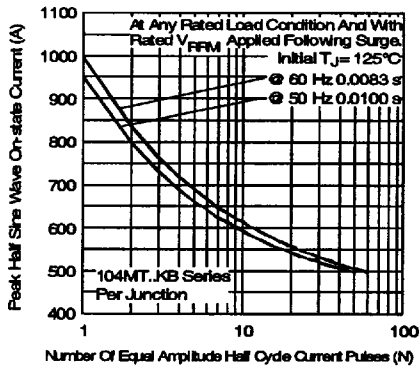


Fig. 14 - Maximum Non-Repetitive Surge Current

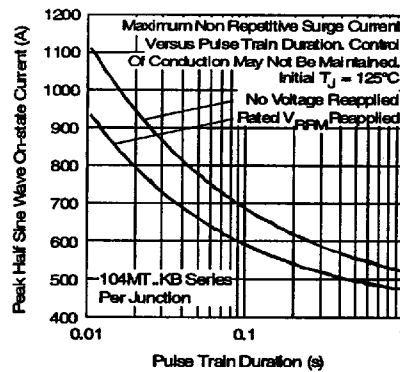


Fig. 15 - Maximum Non-Repetitive Surge Current

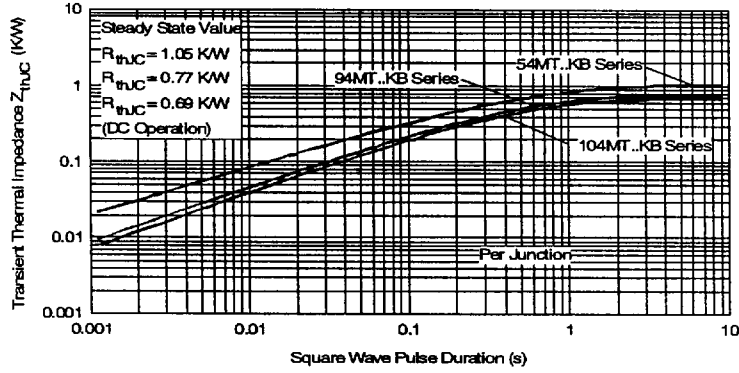


Fig. 16 - Thermal Impedance Z_{thJC} Characteristics

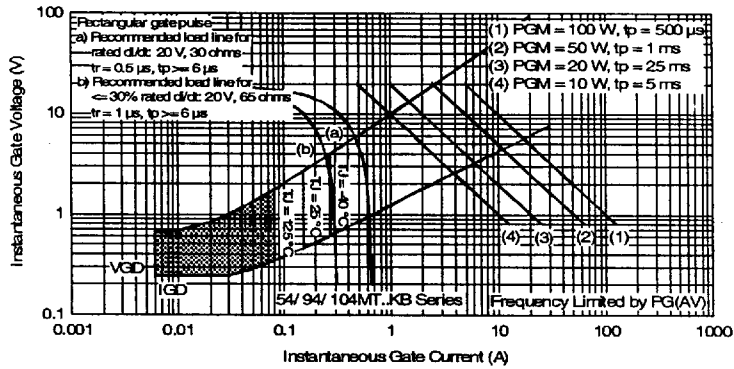


Fig. 17 - Gate Characteristics