


Three Phase AC Switch (Power Modules), 50 A to 100 A



MT-K

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 
- Designed and qualified for industrial level
- Material categorization: For definitions of compliance please see www.vishay.com/doc299912


RoHS
COMPLIANT

PRODUCT SUMMARY

I _O	50 A to 100 A
V _{RRM}	800 V to 1600 V
Package	MT-K
Circuit	Three phase AC switch

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

SYMBOL	CHARACTERISTICS	VALUES 54MT..K	VALUES 94MT..K	VALUES 104MT..K	UNITS
I _O		50	90	100	A
	T _C	80	80	80	°C
I _{FSM}	50 Hz	390	950	1130	A
	60 Hz	410	1000	1180	
I ² _t	50 Hz	770	4525	6380	A ² s
	60 Hz	700	4130	5830	
I ² √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

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} , MAXIMUM REPETITIVE PEAK OFF-STATE VOLTAGE, GATE OPEN CIRCUIT V	I _{RRM} /I _{DRM} , MAXIMUM AT T _J = 125 °C mA
VS-54MT..K	80	800	900	800	20 (1)
	100	1000	1100	1000	
	120	1200	1300	1200	
	140	1400	1500	1400	
	160	1600	1700	1600	
VS-94/104MT..K	80	800	900	800	40 (1)
	100	1000	1100	1000	
	120	1200	1300	1200	
	140	1400	1500	1400	
	160	1600	1700	1600	

Note

(1) For single AC switch

**FORWARD CONDUCTION**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES 54MT.K	VALUES 94MT.K	VALUES 104MT.K	UNITS
Maximum I_{RMS} output current at case temperature	I_O	For all conduction angle	50	90	100	A
			80	80	80	°C
Maximum peak, one-cycle forward, non-repetitive on state surge current	I_{TSM}	<div> <div> $t = 10\text{ ms}$ $t = 8.3\text{ ms}$ </div> <div> No voltage reappplied 100 % V_{RRM} reappplied </div> </div>	390	950	1130	A
		Initial $T_J = T_J$ maximum	410	1000	1180	
			330	800	950	
			345	840	1000	
Maximum I^2t for fusing	I^2t	<div> $t = 10\text{ ms}$ $t = 8.3\text{ ms}$ </div> <div> No voltage reappplied 100 % V_{RRM} reappplied </div>	770	4525	6380	A ² s
			700	4130	5830	
			540	3200	4510	
			500	2920	4120	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	$t = 0.1\text{ ms to } 10\text{ ms}$, no voltage reappplied	7700	45 250	63 800	A ² √s
Low level value of threshold voltage	$V_{T(TO)1}$	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, T_J maximum	1.16	0.99	0.99	V
High level value of threshold voltage	$V_{T(TO)2}$	$(I > \pi \times I_{T(AV)})$, T_J maximum	1.44	1.19	1.15	
Low level value on-state slope resistance	r_{t1}	$16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$, T_J maximum	12.54	4.16	3.90	mΩ
High level value on-state slope resistance	r_{t2}	$(I > \pi \times I_{T(AV)})$, T_J maximum	11.00	3.56	3.48	
Maximum on-state voltage drop	V_{TM}	$I_{pk} = 150\text{ A}$, $T_J = 25\text{ °C}$ $t_p = 400\text{ μs}$ single junction	2.68	1.55	1.53	V
Maximum non-repetitive rate of rise of turned on current	di/dt	$T_J = 25\text{ °C}$, from $0.67 V_{DRM}$, $I_{TM} = \pi \times I_{T(AV)}$, $I_g = 500\text{ mA}$, $t_r < 0.5\text{ μs}$, $t_p > 6\text{ μs}$	150			A/μs
Maximum holding current	I_H	$T_J = 25\text{ °C}$, anode supply = 6 V, resistive load, grate open circuit	200			mA
Maximum latching current	I_L	$T_J = 25\text{ °C}$, anode supply = 6 V, resistive load	400			

BLOCKING

PARAMETER	SYMBOL	TEST CONDITIONS	54MT.K	94MT.K	104MT.K	UNITS
RMS isolation voltage	V_{INS}	$T_J = 25\text{ °C}$ all terminal shorted $f = 50\text{ Hz}$, $t = 1\text{ s}$	4000			V
Maximum critical rate of rise of off-state voltage	dV/dt (1)	$T_J = T_J$ maximum, linear to $0.67 V_{DRM}$, grate open circuit	500			V/μs

Note

(1) Available with $dV/dt = 1000\text{ V/μs}$, to complete code add S90 i. e. 104MT160KBS90

TRIGGERING

PARAMETER	SYMBOL	TEST CONDITIONS	54MT.K	94MT.K	104MT.K	UNITS
Maximum peak gate power	P_{GM}	$T_J = T_J$ maximum	10			W
Maximum average gate power	$P_{G(AV)}$		2.5			
Maximum peak gate current	I_{GM}		2.5			A
Maximum peak negative gate voltage	$-V_{GT}$		10			
Maximum required DC gate voltage to trigger	V_{GT}	<div> $T_J = 40\text{ °C}$ $T_J = 25\text{ °C}$ $T_J = 125\text{ °C}$ </div>	4.0	2.5	1.7	V
		Anode supply = 6 V, resistive load	270	150	80	mA
Maximum required DC gate current to trigger	I_{GT}	<div> $T_J = -40\text{ °C}$ $T_J = 25\text{ °C}$ $T_J = 125\text{ °C}$ </div>				
Maximum gate voltage that will not trigger	V_{GD}	$T_J = T_J$ maximum, rated V_{DRM} applied	0.25			V
Maximum gate current that will not trigger	I_{GD}		6			mA

**THERMAL AND MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	54MT.K	94MT.K	104MT.K	UNITS
Maximum junction operating and storage temperature range	T _J , T _{Stg}		-40 to 125			°C
Maximum thermal resistance, junction to case	R _{thJC}	DC operation per single AC switch	0.52	0.39	0.34	K/W
		DC operation per junction	1.05	0.77	0.69	
		180 °C sine cond. angle per single AC switch	0.56	0.40	0.36	
		180 °C sine cond. angle per junction	1.12	0.80	0.72	
Maximum thermal resistance, case to heatsink	R _{thCS}	Per module Mounting surface smooth, flat and grased	0.03			
Mounting torque ± 100 % to heatsink to terminal		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.	4 to 6			Nm
			3 to 4			
Approximate weight				225		

ΔR CONDUCTION PER JUNCTION

DEVICES	SINUSOIDAL CONDUCTION AT T_J MAXIMUM					RECTANGULAR CONDUCTION AT T_J MAXIMUM					UNITS
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
54MT.K	0.072	0.085	0.108	0.152	0.233	0.055	0.091	0.117	0.157	0.236	K/W
94MT.K	0.033	0.039	0.051	0.069	0.099	0.027	0.044	0.055	0.071	0.100	
104MT.K	0.027	0.033	0.042	0.057	0.081	0.023	0.037	0.046	0.059	0.082	

Note

- Table shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC

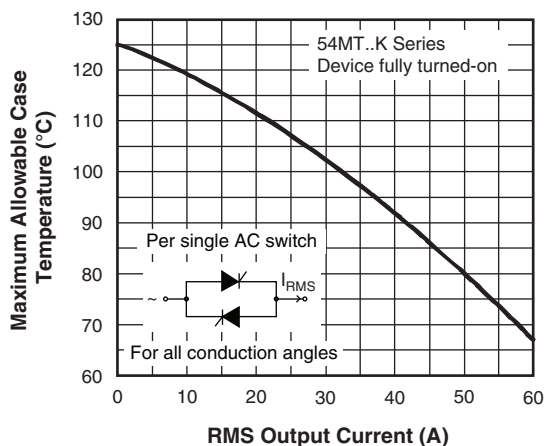


Fig. 1 - Current Ratings Characteristic

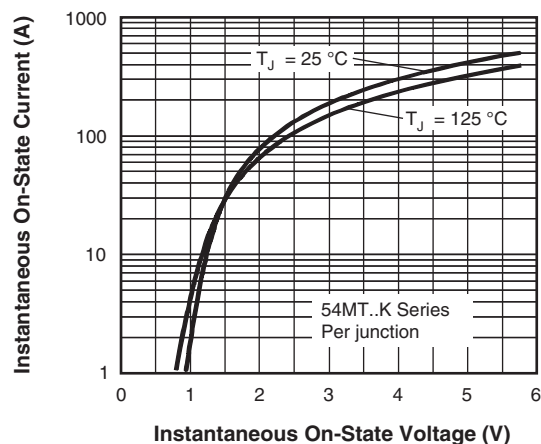


Fig. 2 - Forward Voltage Drop Characteristics

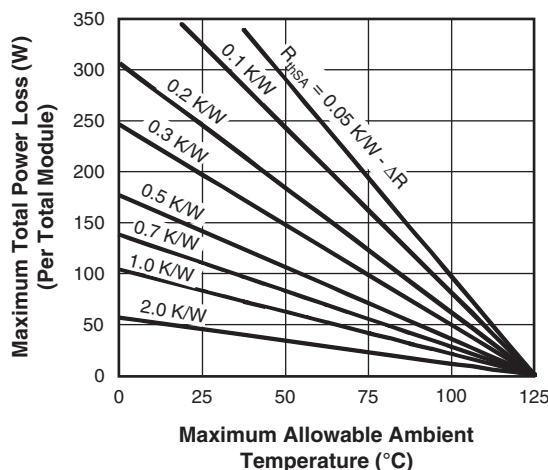
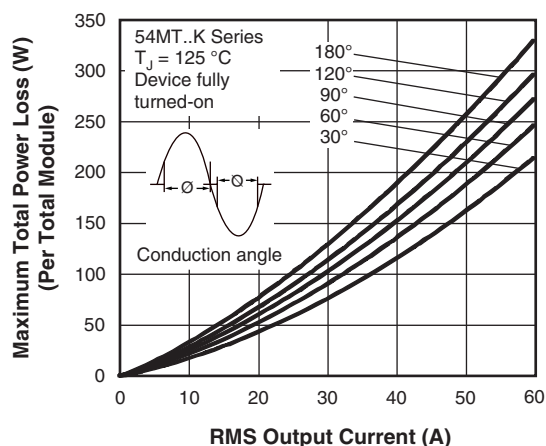


Fig. 3 - Total Power Loss Characteristics

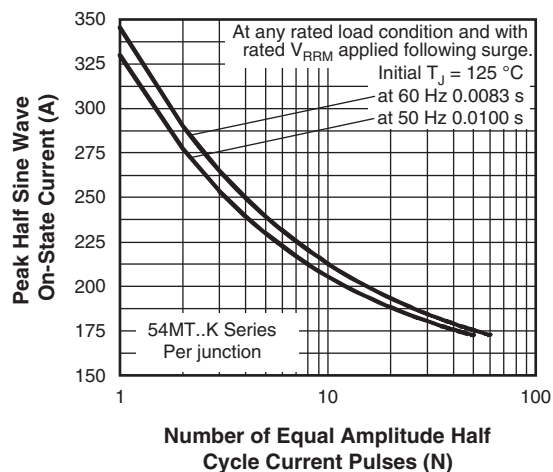


Fig. 4 - Maximum Non-Repetitive Surge Current

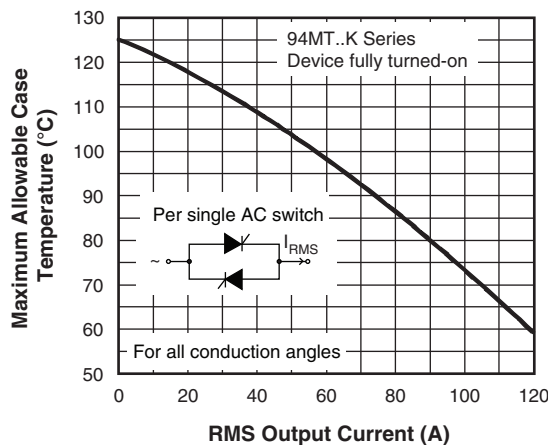


Fig. 6 - Current Ratings Characteristic

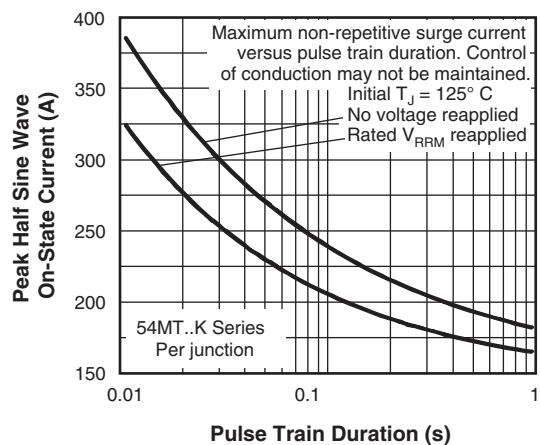


Fig. 5 - Maximum Non-Repetitive Surge Current

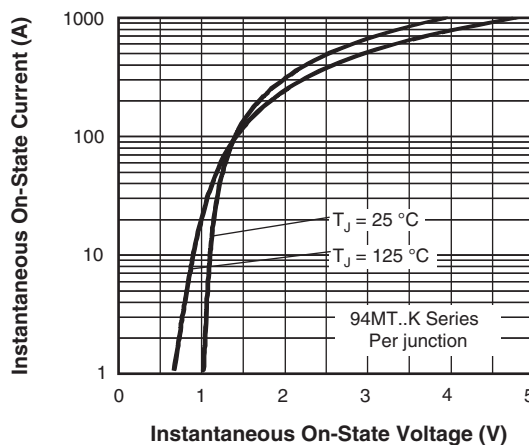


Fig. 7 - Forward Voltage Drop Characteristics

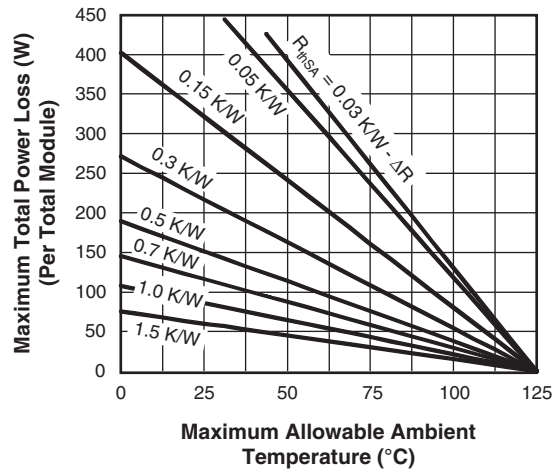
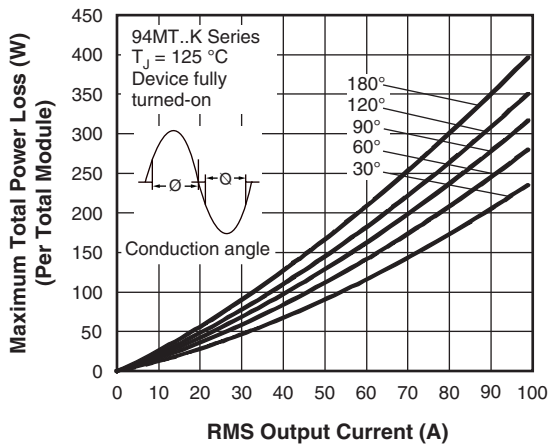


Fig. 8 - Total Power Loss Characteristics

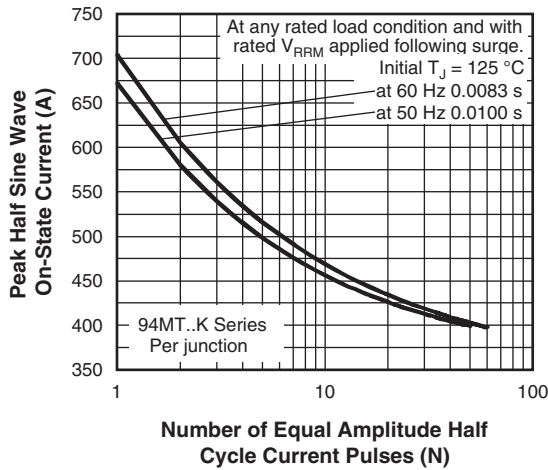


Fig. 9 - Maximum Non-Repetitive Surge Current

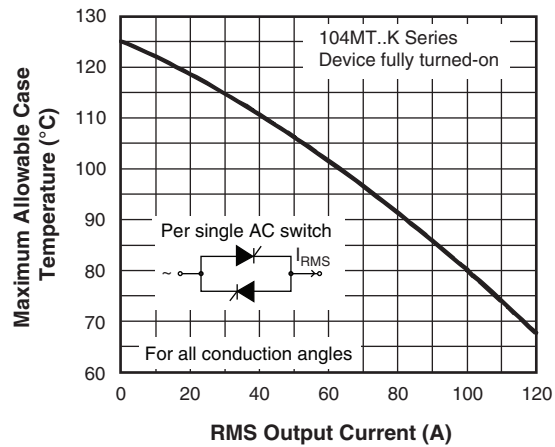


Fig. 11 - Current Ratings Characteristic

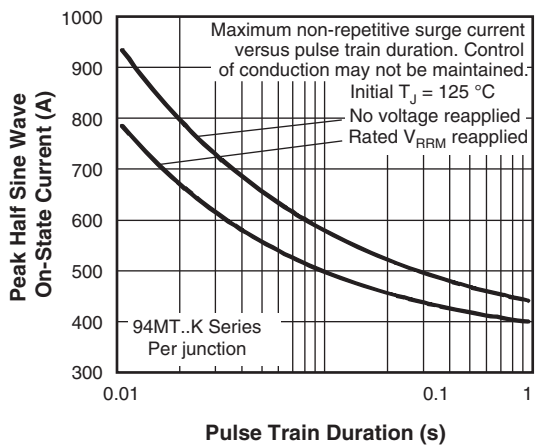


Fig. 10 - Maximum Non-Repetitive Surge Current

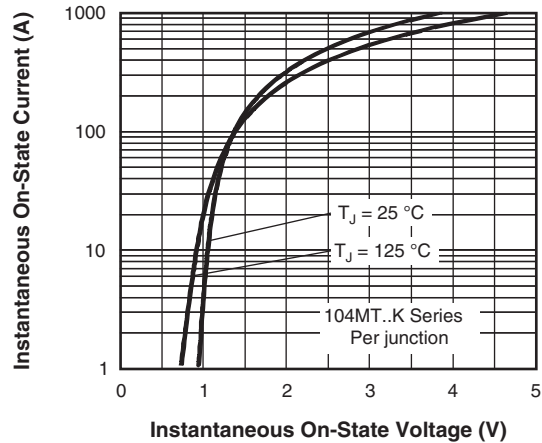


Fig. 12 - Forward Voltage Drop Characteristics

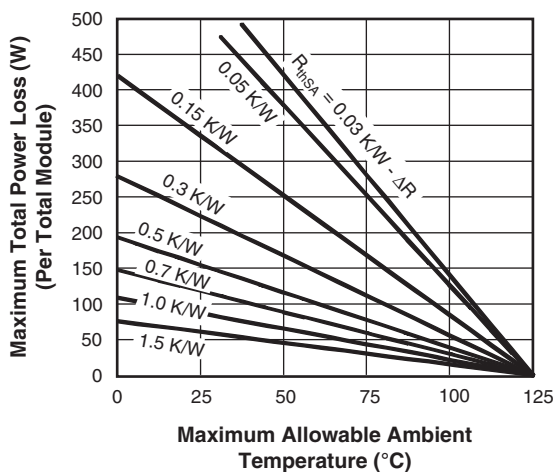
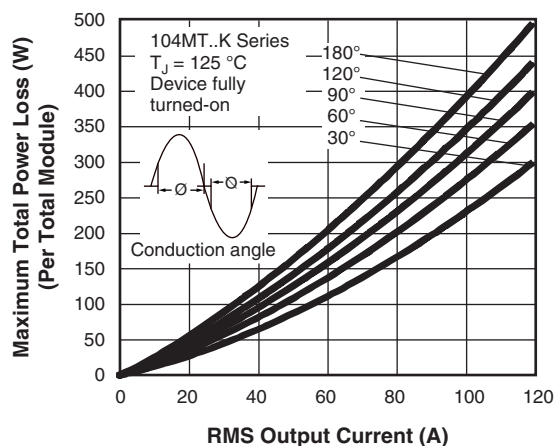


Fig. 13 - Total Power Loss Characteristics

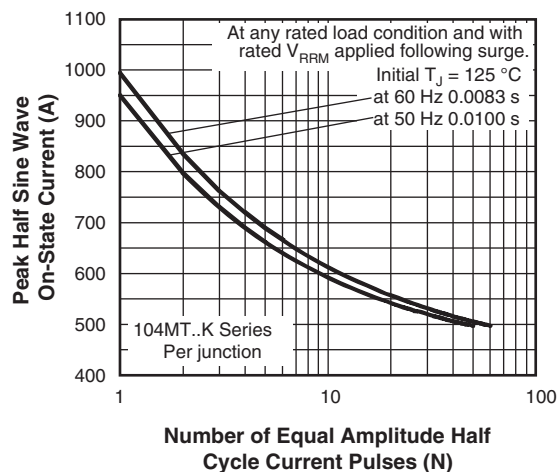


Fig. 14 - Maximum Non-Repetitive Surge Current

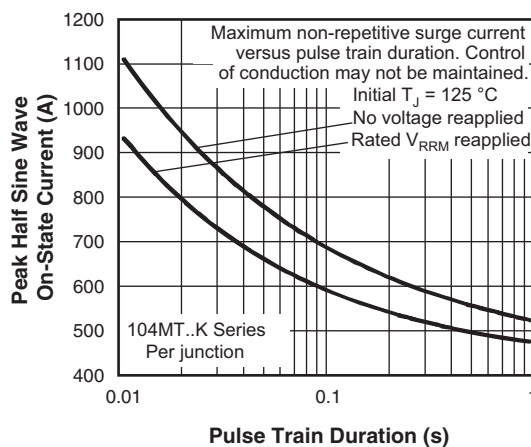
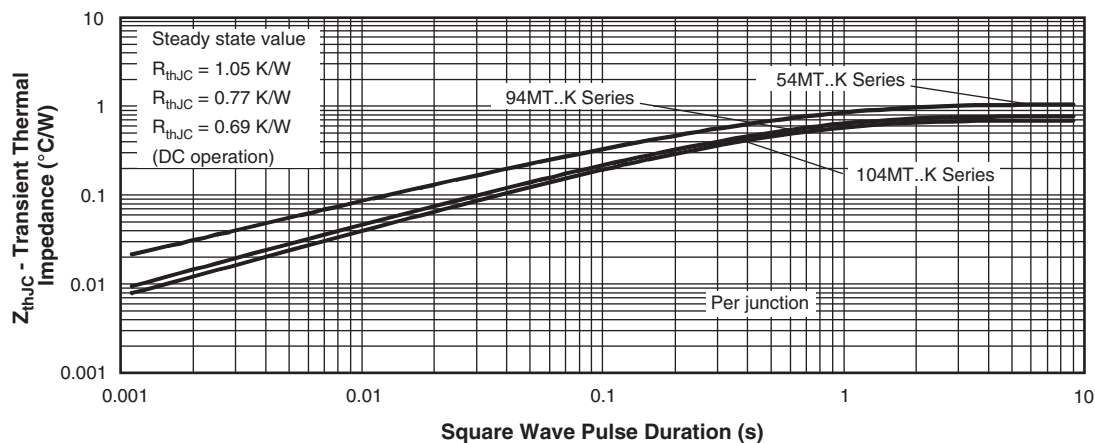


Fig. 15 - Maximum Non-Repetitive Surge Current


Fig. 16 - Thermal Impedance Z_{thJC} Characteristics

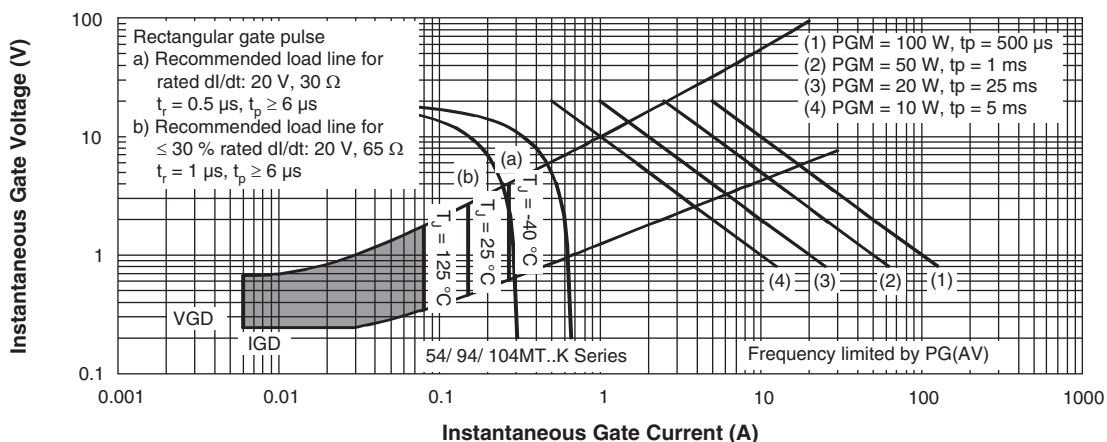


Fig. 17 - Gate Characteristics

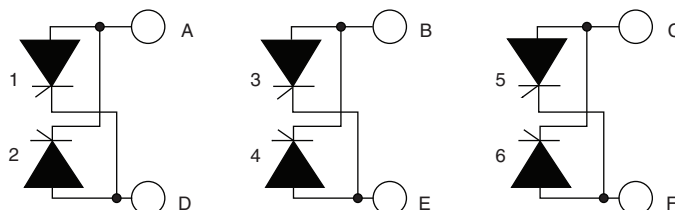
ORDERING INFORMATION TABLE

Device code	VS-	10	4	MT	160	K	PbF
	1	2	3	4	5		6
1	- Vishay Semiconductors product						
2	- Current rating code: 5 = 50 A (average) 9 = 90 A (average) 10 = 100 A (average)						
3	- AC switch						
4	- Essential part number						
5	- Voltage code $\times 10 = V_{RRM}$ (see Voltage Ratings table)						
6	- PbF = Lead (Pb)-free						

Note

- To order the optional hardware go to www.vishay.com/doc?95172

CIRCUIT CONFIGURATION



LINKS TO RELATED DOCUMENTS

Dimensions

www.vishay.com/doc?95004

DIMENSIONS WITH OPTIONAL BARRIERS in millimeters (inches)

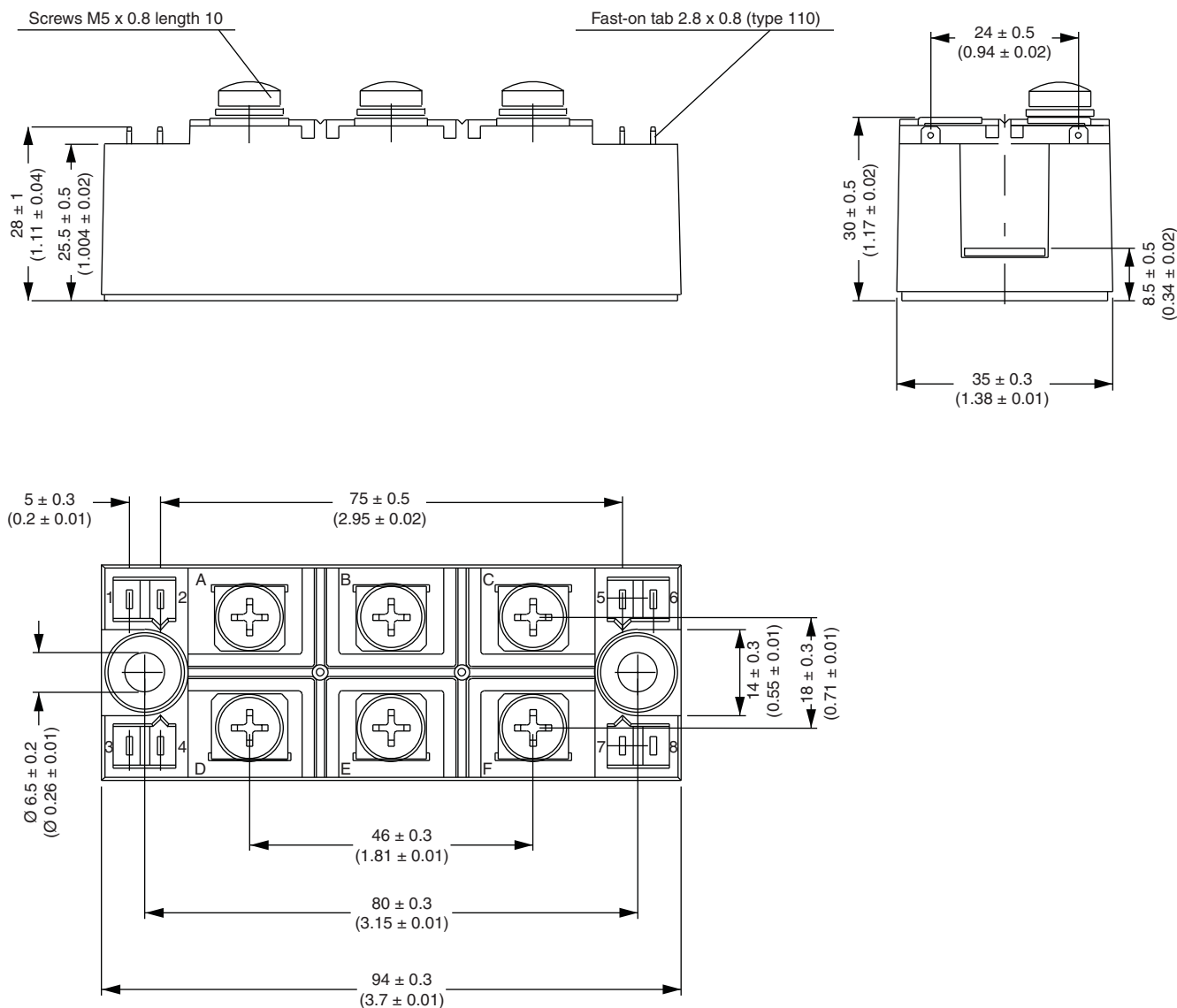


Outline Dimensions

Vishay Semiconductors MTK (with and without optional barrier)



DIMENSIONS WITHOUT OPTIONAL BARRIERS in millimeters (inches)





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