Three Phase AC Switch (Power Modules), 100 A

MTK

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/doc?99912

RoHS COMPLIANT

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.

PRIMARY CHARACTERISTICS	
I_O	100 A
V_{RRM}	800 V to 1600 V
Package	MTK
Circuit configuration	Three phase AC switch

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
I_O		100	A
	T_C	80	°C
I_{FSM}	50 Hz	1130	A
	60 Hz	1180	
I^2t	50 Hz	6380	A^2s
	60 Hz	5830	
$I^2\sqrt{t}$		63 800	$A^2\sqrt{s}$
V_{RRM}	Range	800 to 1600	V
T_{Stg}	Range	-40 to +125	°C
T_J	Range	-40 to +125	

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-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

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FORWARD CONDUCTION						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**			**VALUES**	**UNITS**
Maximum I_{RMS} output current at case temperature	I_O	For all conduction angle			100	A
					80	°C
Maximum peak, one-cycle forward, non-repetitive on state surge current	I_{TSM}	t = 10 ms	No voltage reapplied	Initial $T_J = T_J$ maximum	1130	A
		t = 8.3 ms			1180	
		t = 10 ms	100 % V_{RRM} reapplied		950	
		t = 8.3 ms			1000	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		6380	A^2s
		t = 8.3 ms			5830	
		t = 10 ms	100 % V_{RRM} reapplied		4510	
		t = 8.3 ms			4120	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied			63 800	$A^2\sqrt{s}$
Low level value of threshold voltage	$V_{T(TO)1}$	(16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), T_J maximum			0.99	V
High level value of threshold voltage	$V_{T(TO)2}$	(I > π x $I_{T(AV)}$), T_J maximum			1.15	
Low level value on-state slope resistance	r_{t1}	16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), T_J maximum			3.90	mΩ
High level value on-state slope resistance	r_{t2}	(I > π x $I_{T(AV)}$), T_J maximum			3.48	
Maximum on-state voltage drop	V_{TM}	I_{pk} = 150 A, T_J = 25 °C, t_p = 400 µs single junction			1.53	V
Maximum non-repetitive rate of rise of turned on current	dI/dt	T_J = 25 °C, from 0.67 V_{DRM}, I_{TM} = π x $I_{T(AV)}$, I_g = 500 mA, t_r < 0.5 µs, t_p > 6 µs			150	A/µs
Maximum holding current	I_H	T_J = 25 °C, anode supply = 6 V, resistive load, grate open circuit			200	mA
Maximum latching current	I_L	T_J = 25 °C, anode supply = 6 V, resistive load			400	

BLOCKING				
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**VALUES**	**UNITS**
RMS isolation voltage	V_{INS}	T_J = 25 °C all terminal shorted f = 50 Hz, t = 1 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}, gate open circuit	500	V/µs

Note

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

TRIGGERING						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**			**VALUES**	**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	V
Maximum required DC gate voltage to trigger	V_{GT}	T_J = 40 °C	Anode supply = 6 V, resistive load		4.0	
		T_J = 25 °C			2.5	
		T_J = 125 °C			1.7	
Maximum required DC gate current to trigger	I_{GT}	T_J = -40 °C			270	mA
		T_J = 25 °C			150	
		T_J = 125 °C			80	
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

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THERMAL AND MECHANICAL SPECIFICATIONS					
PARAMETER		**SYMBOL**	**TEST CONDITIONS**	**VALUES**	**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	0.34	K/W
			DC operation per junction	0.69	
			180 °C sine conduction angle per single AC switch	0.36	
			180 °C sine conduction angle per junction	0.72	
Maximum thermal resistance, case to heat sink		R_{thCS}	Per module Mounting surface smooth, flat and greased	0.03	
Mounting torque ± 100 %	to heat sink		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
	to terminal			3 to 4	
Approximate weight				225	g

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°	
104MT.K	0.027	0.033	0.042	0.057	0.081	0.023	0.037	0.046	0.059	0.082	K/W

Note

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

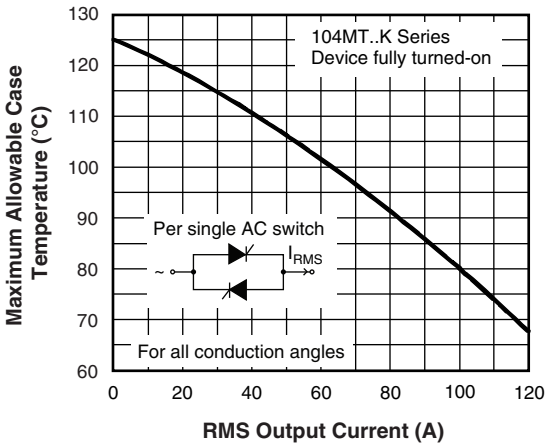

Fig. 1 - Current Ratings Characteristic

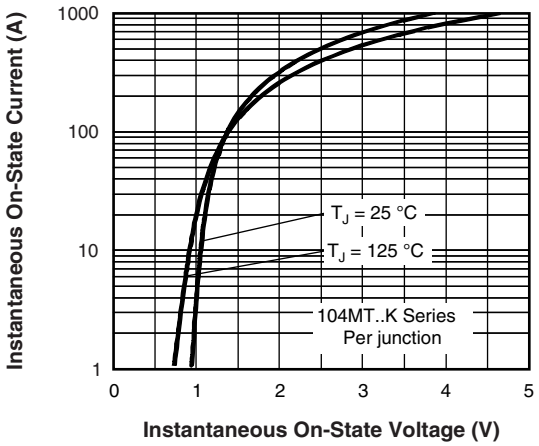

Fig. 2 - Forward Voltage Drop Characteristics

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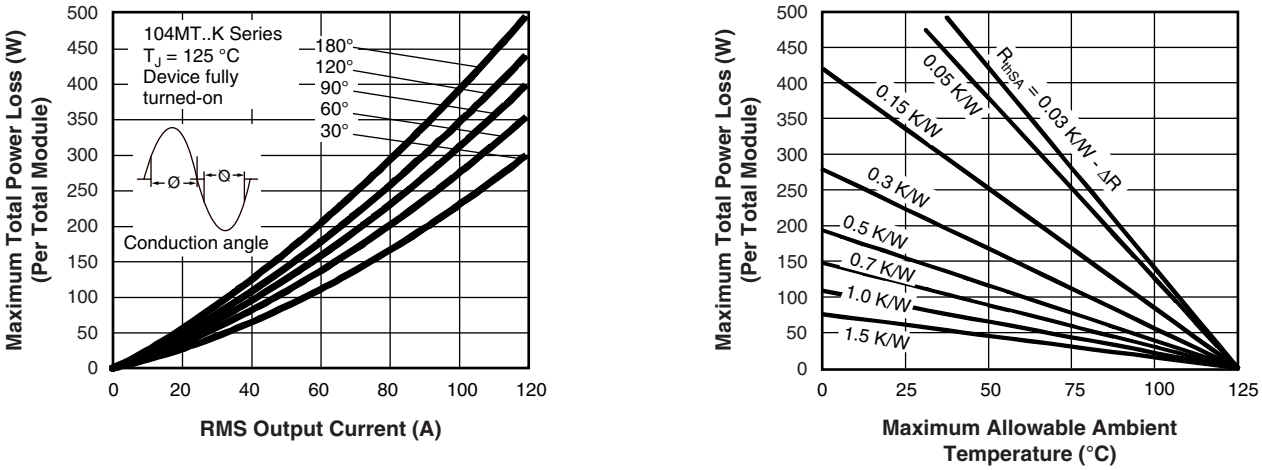

Fig. 3 - Total Power Loss Characteristics

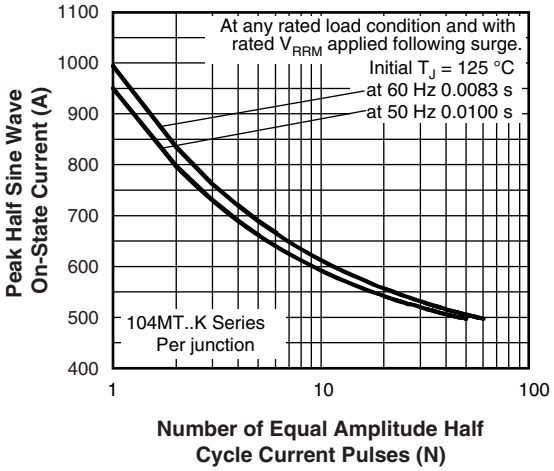

Fig. 4 - Maximum Non-Repetitive Surge Current

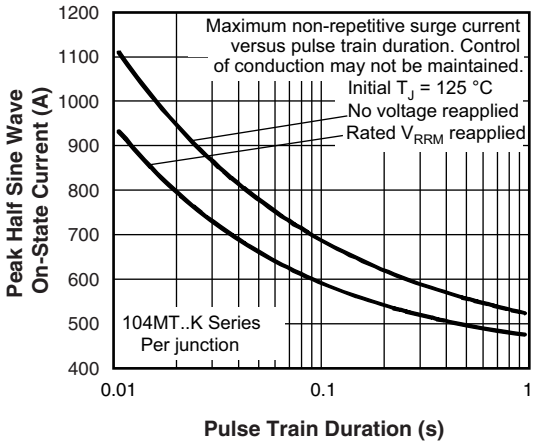

Fig. 5 - Maximum Non-Repetitive Surge Current

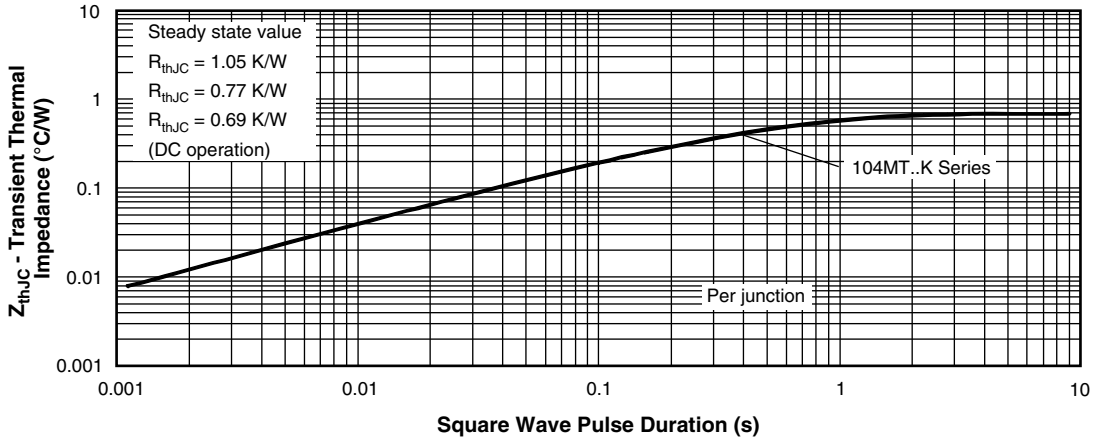

Fig. 6 - Thermal Impedance Z_{thJC} Characteristics

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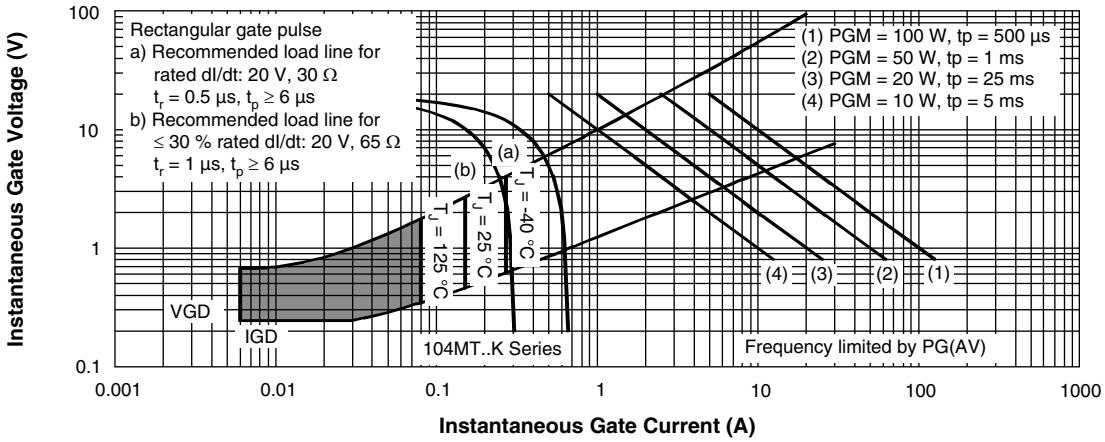


Fig. 7 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code

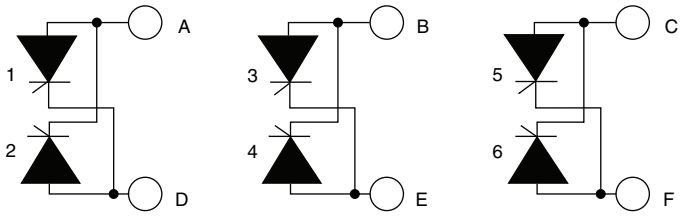
VS-	10	4	MT	160	K	PbF
1	2	3	4	5		6

1	-	Vishay Semiconductors product
2	-	Current rating code: 10 = 100 A (average)
3	-	AC switch
4	-	Essential part number
5	-	Voltage code x 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

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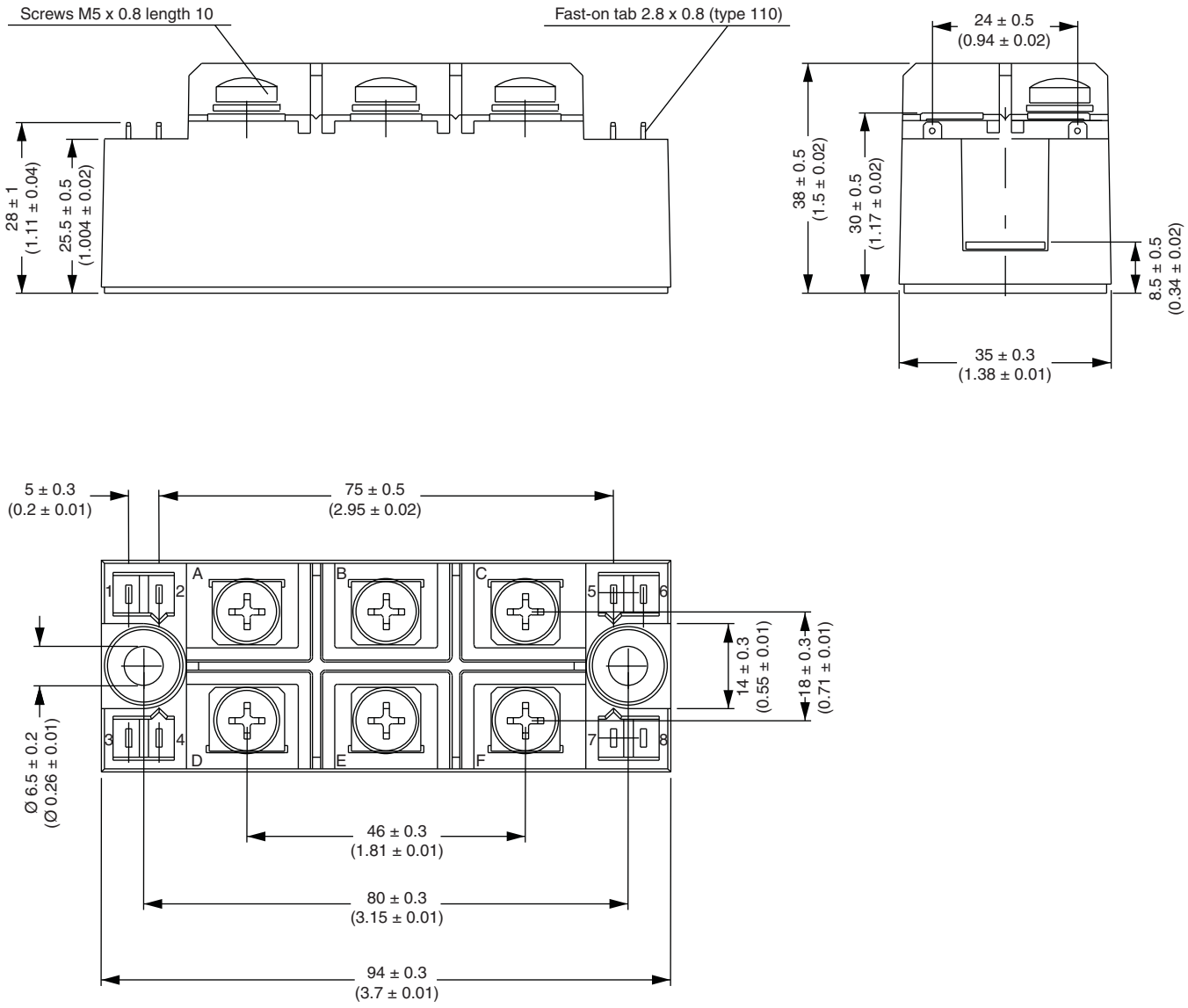
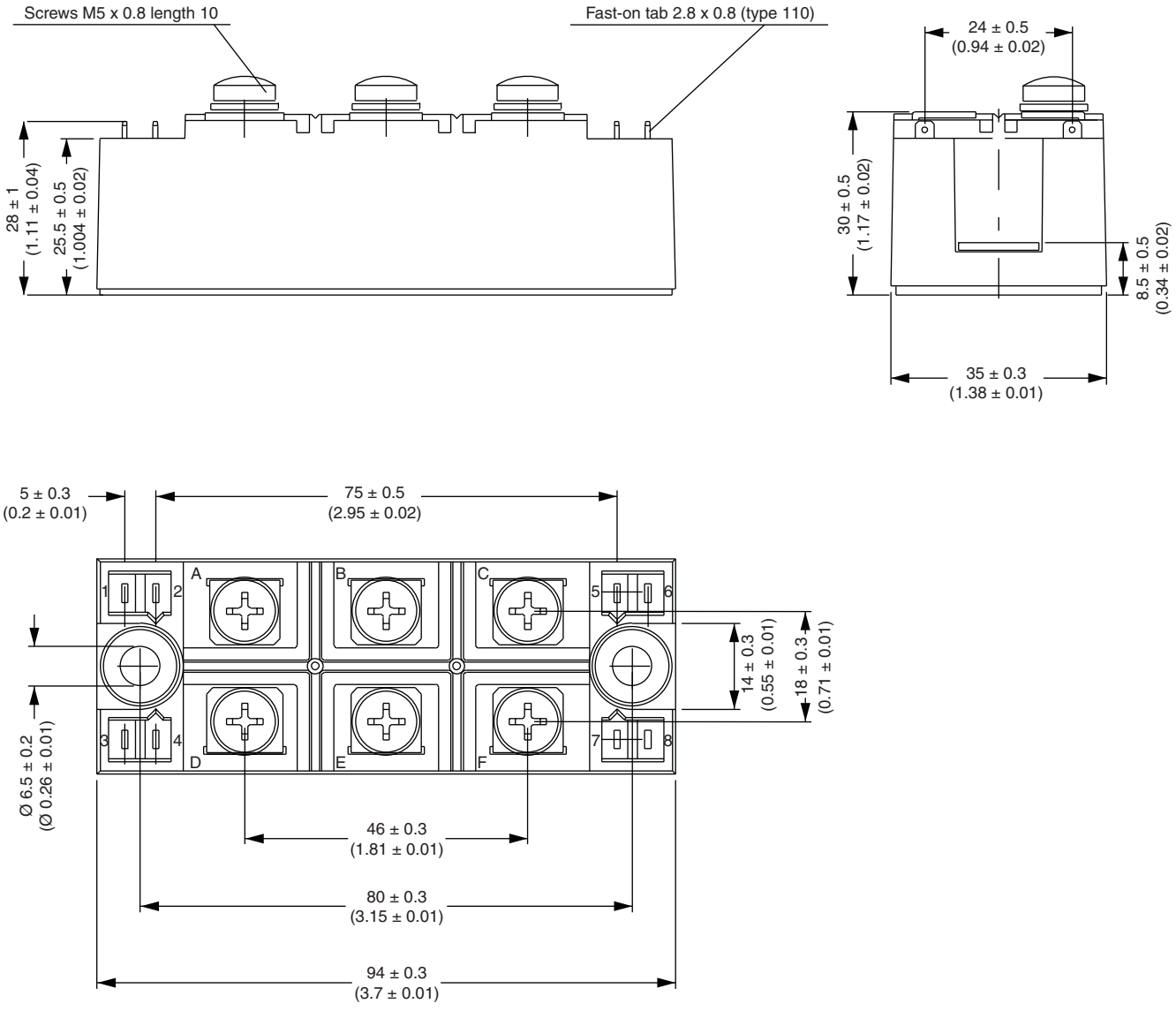
MTK (with and without optional barrier)

DIMENSIONS WITH OPTIONAL BARRIERS in millimeters (inches)



DIMENSIONS WITHOUT OPTIONAL BARRIERS in millimeters (inches)



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