International
IOR Rectifier

SERIES MT-K

THREE PHASE AC SWITCH

Power Modules

50A
90A
100A

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

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 phase control motor starter.

Major Ratings and Characteristics

Parameters		54MT-K	94MT-K	104MT-K	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
V_{RRM} range		800 to 1600			V
T_J		-40 to 125			°C

ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number	Voltage code 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} 125°C mA
54MT..K	80	800	900	800	10
	100	1000	1100	1000	10
	120	1200	1300	1200	10
	140	1400	1500	1400	10
	160	1600	1700	1600	10
94MT..K 104MT..K	80	800	900	800	20
	100	1000	1100	1000	20
	120	1200	1300	1200	20
	140	1400	1500	1400	20
	160	1600	1700	1600	20

On-state Conduction

	Parameters	54MT	94MT	104MT	Units	Conditions	
I_O	Maximum RMS output current	50	90	100	A		
		80	80	80	°C		
I_{TSM}	Maximum peak one half cycle non-repetitive surge current Initial $T_J = T_J$ max.	390	950	1130	A	t=10ms	No voltage reapplied
		410	1000	1180	A	t=8.3ms	T_J=125°C
		330	800	950	A	t=10ms	100% V_{RRM} reapplied
		345	840	1000	A	t=8.3ms	T_J=125°C
I^2t	Maximum I^2t for fusing Initial $T_J = T_J$ max.	770	4525	6380	A^2s	t=10ms	No voltage reapplied
		700	4130	5830	A^2s	t=8.3ms	T_J=125°C
		540	3200	4510	A^2s	t=10ms	100% V_{RRM} reapplied
		500	2920	4120	A^2s	t=8.3ms	T_J=125°C
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	7700	45250	63800	$A^2\sqrt{s}$	I^2t for time $t_x = I^2\sqrt{t} \times \sqrt{t_x}$; $0.1 \le t_x \le 10$ms, V_{RRM} = 0V	
$V_{F(TO)1}$	Low-level of threshold voltage	1.16	0.99	0.99	V	T_J=125°C, $(16.7\% \times \pi \times I_{(AV)} < I < \pi \times I_{(AV)})$	
$V_{F(TO)2}$	High-level of threshold voltage	1.44	1.19	1.15	V	T_J=125°C, $(\pi \times I_{(AV)} < I < 20 \times \pi \times I_{(AV)})$	
r_{t1}	Low-level on-state slope resist.	12.54	4.16	3.90	mΩ	T_J=125°C, $(16.7\% \times \pi \times I_{(AV)} < I < \pi \times I_{(AV)})$	
r_{t2}	High-level on-state slope resist.	11.00	3.56	3.48	mΩ	T_J=125°C, $(\pi \times I_{(AV)} < I < 20 \times \pi \times I_{(AV)})$	
V_{TM}	Max. on-state voltage drop	2.68	1.55	1.53	V	T_J=25°C, I_{TM}=150A_{pk} Per single Junction tp=400µs	
dI/dt	Max. non-repetitive rate of rise of turned on current	150			A/µs	T_J=25°C, from 0.67 V_{DRM} $I_{TM} = \pi \times I_{(AV)}$, I_g=500mA, t_r < 0.5 µs, t_p > 6 µs	
I_H	Max. holding current	100	200	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	

Blocking

I_{RRM} I_{DRM}	Max. peak leakage current	100	µA	T_J=25°C, per junction at rated V_{RRM}
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 rated V_{DRM} gate open circuit *

* Available with dv/dt = 1000 V/µs

Triggering

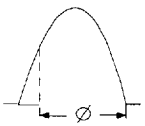
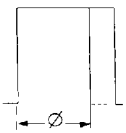
	Parameters	54MT	94MT	104MT	Units	Conditions	
P_{GM}	Maximum peak gate power	8	10	10	W	$T_J = T_J$ max.	
$P_{G(AV)}$	Maximum average gate power	2	2.5	2.5	W	$T_J = T_J$ max.	
$+I_{GM}$	Maximum peak gate current	1.5	2.5	2.5	A	$T_J = T_J$ max.	
$-V_{GT}$	Max. peak negative gate volt.	10	10	10	V	$T_J = T_J$ max.	
V_{GT}	Maximum required DC gate voltage to trigger	3	4	4	V	T_J = - 40°C	Anode supply = 6V, resistive load
		2	2.5	2.5	V	T_J = 25°C	
		1	1.5	1.5	V	$T_J = T_J$ max.	
I_{GT}	Maximum required DC gate current to trigger	90	250	250	mA	T_J = - 40°C	Anode supply = 12V, resistive load
		60	100	100	mA	T_J = 25°C	
		35	50	50	mA	$T_J = T_J$ max.	
V_{GD}	Maximum gate voltage that will not trigger	0.2	0.25	0.25	V	@ $T_J = T_J$ max., rated V_{DRM} applied	
I_{GD}	Maximum gate current that will not trigger	2	6	6	mA	@ $T_J = T_J$ max., rated V_{DRM} applied	

Thermal and Mechanical Specifications

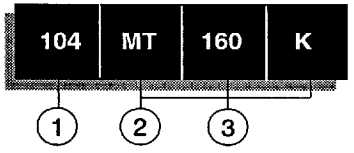
	Parameters		54MT	94MT	104MT	Units	Conditions
T_J	Max. junction temp. range		-40 to 125			°C	
T_{stg}	Max. storage temp. range		-40 to 125			°C	
R_{thJC}	Max. thermal resistance junction to case		0.524	0.385	0.344	K/W	DC operation per single AC switch
			1.048	0.770	0.688	K/W	DC operation per single junction
			0.560	0.401	0.357	K/W	180° Sine cond. angle per single AC switch
			1.120	0.802	0.715	K/W	180° Sine cond. angle per single junction
R_{thCS}	Max. thermal resistance, case to heatsink		0.033			K/W	Per module. Mounting surface smooth, flat and greased.
wt	Approximate weight		225			g	A mounting compound is recommended and the tourque should be rechecked after a period of about 3 hours to allow for the spread of the compound. Lubricated threads.
T	Mounting	heatsink	4 to 6			Nm	
	Torque ± 10%	terminal	3 to 4			Nm	

ΔR Conduction (per Junction)

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

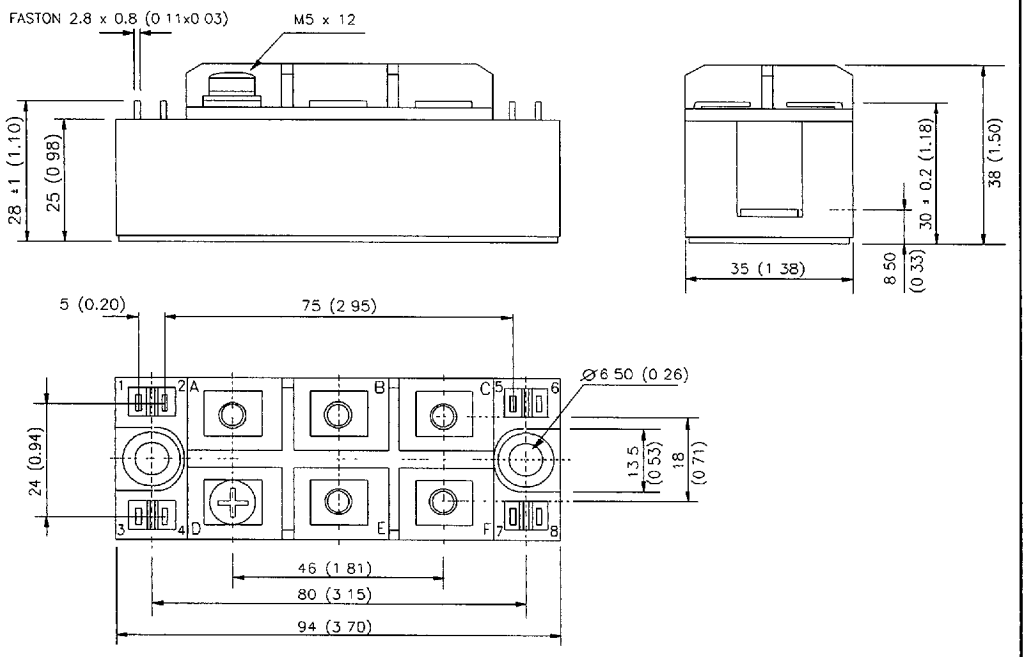
Conduction angle		54MT..K	94MT..K	104MT..K	Units	Conditions
	180°	0.072	0.033	0.027	K/W	$T_J = T_J$ max.
	120°	0.085	0.039	0.033	K/W	
	90°	0.108	0.051	0.042	K/W	
	60°	0.152	0.069	0.057	K/W	
	30°	0.233	0.099	0.081	K/W	
	180°	0.055	0.027	0.023	K/W	$T_J = T_J$ max.
	120°	0.091	0.044	0.037	K/W	
	90°	0.117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

Ordering Information Table



1	-	Current rating code:	54 = 50 A (Avg) 94 = 90 A (Avg) 104 = 100 A (Avg)
2	-	Basic part number	
3	-	Voltage code (code x 10 = V_{RRM})	

Outline Table



All dimensions in millimeters (inches)

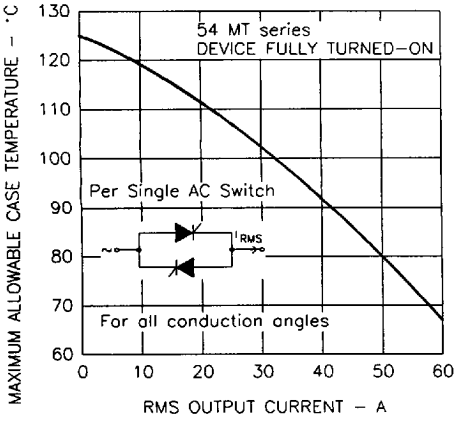


Fig. 1 - Current Ratings Characteristics

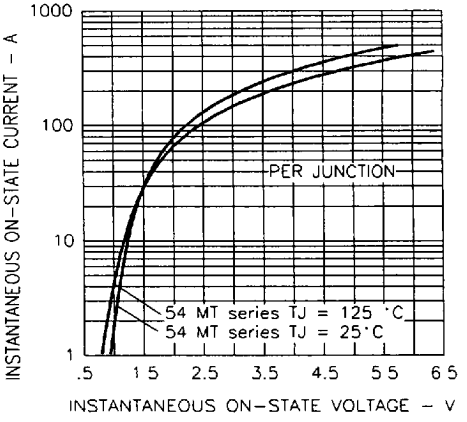


Fig. 2 - Forward Voltage Drop Characteristics

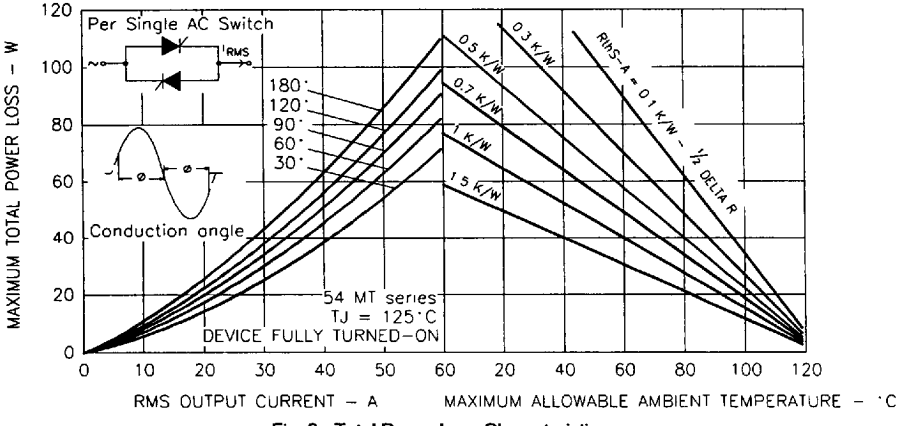


Fig. 3 - Total Power Loss Characteristics

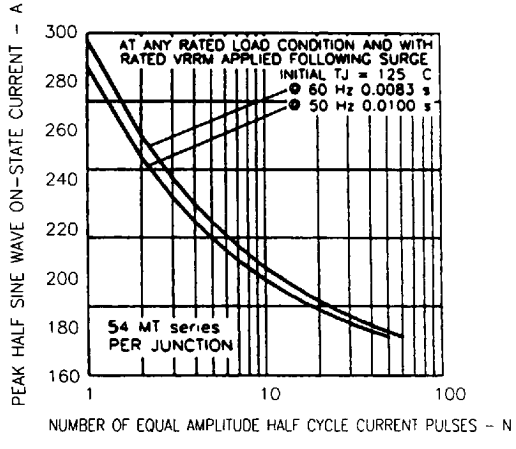


Fig. 4 - Maximum Non-Repetitive Surge Current

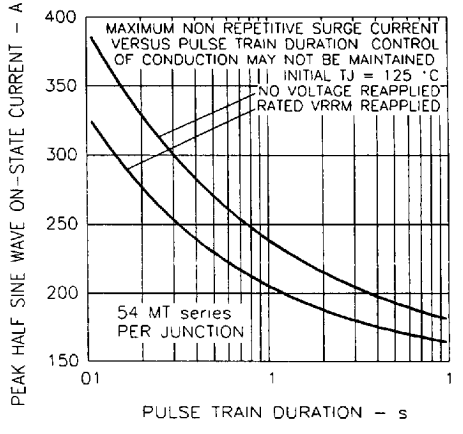


Fig. 5 - Maximum Non-Repetitive Surge Current

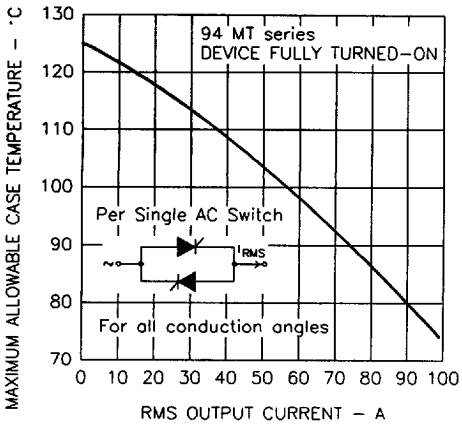


Fig. 6 - Current Ratings Characteristics

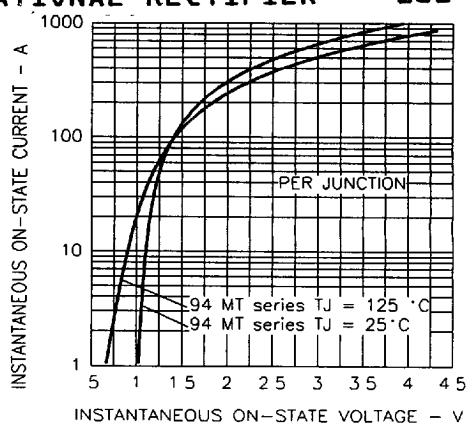


Fig. 7 - Forward Voltage Drop Characteristics

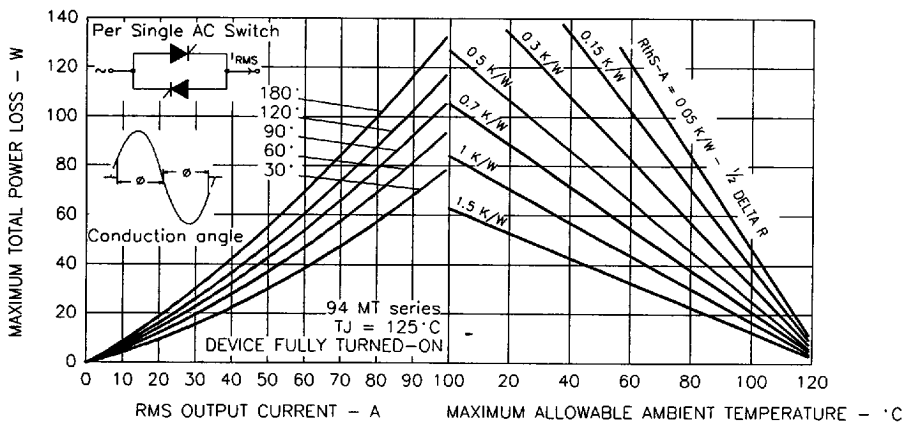


Fig. 8 - Total Power Loss Characteristics

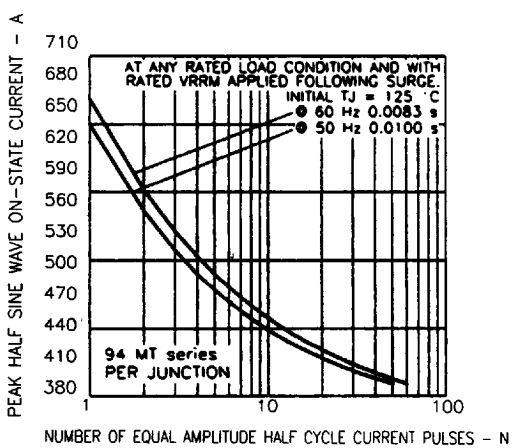


Fig. 9 - Maximum Non-Repetitive Surge Current

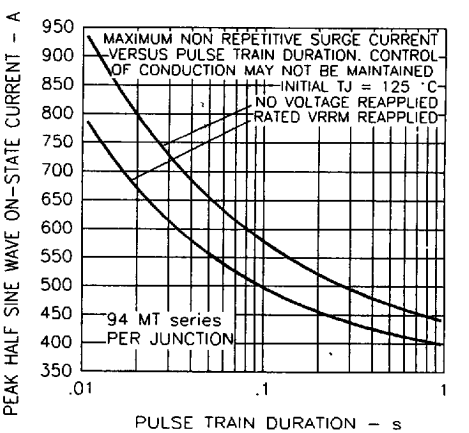


Fig. 10 - Maximum Non-Repetitive Surge Current

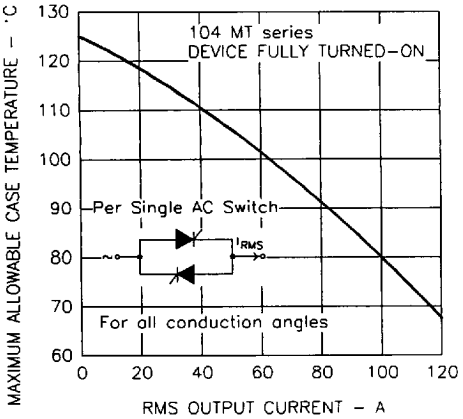


Fig. 11 - Current Ratings Characteristics

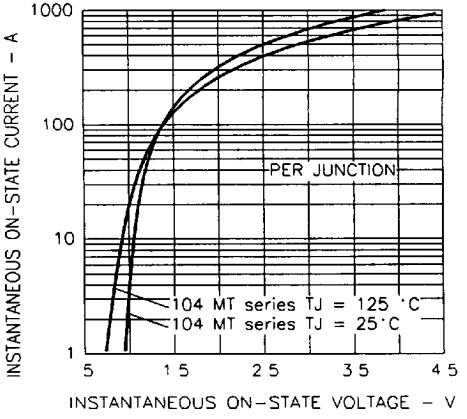


Fig. 12 - Forward Voltage Drop Characteristics

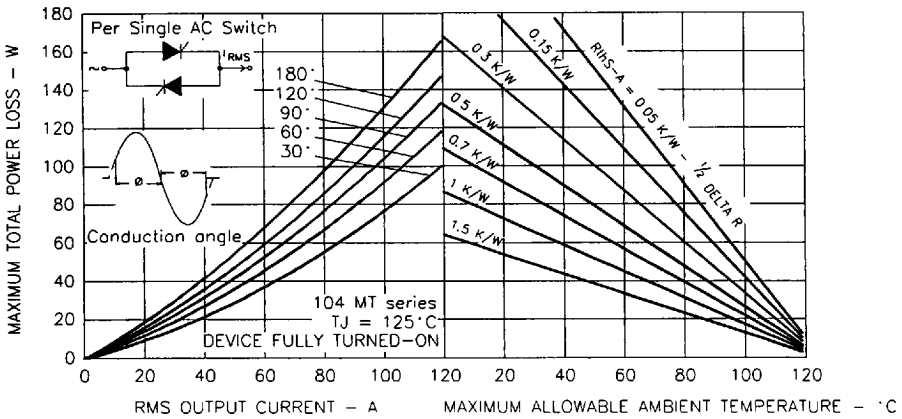


Fig. 13 - Total Power Loss Characteristics

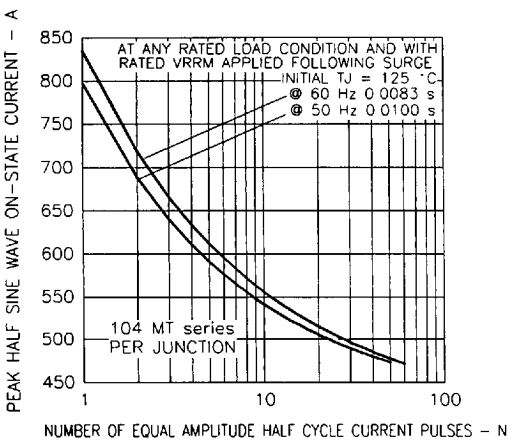


Fig. 14 - Maximum Non-Repetitive Surge Current

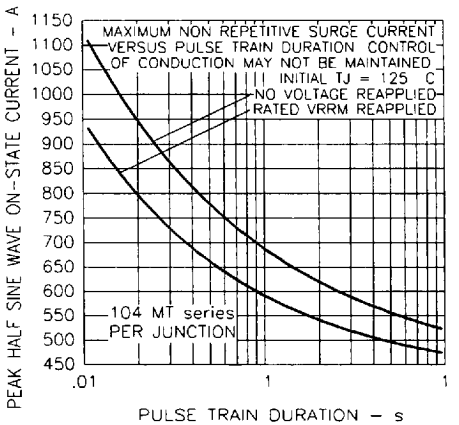


Fig. 15 - Maximum Non-Repetitive Surge Current

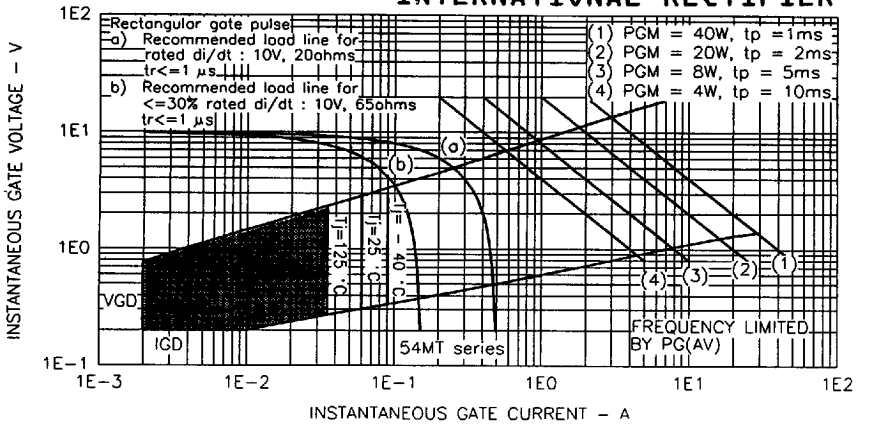


Fig. 17 - Gate Characteristics

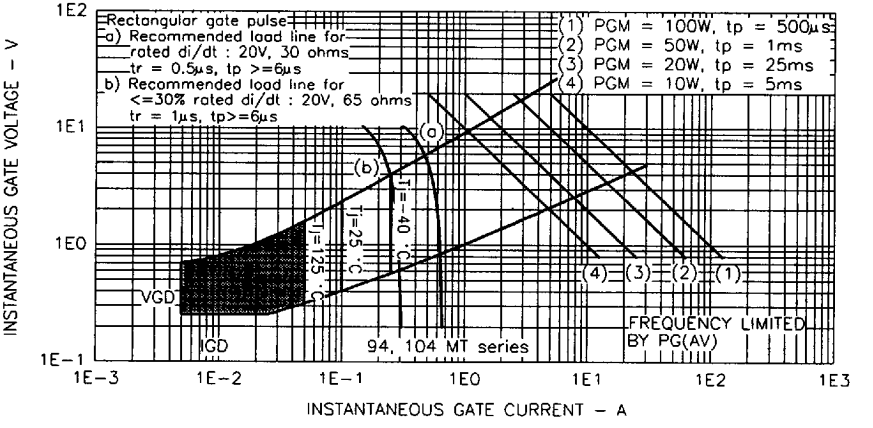


Fig. 17 - Gate Characteristics

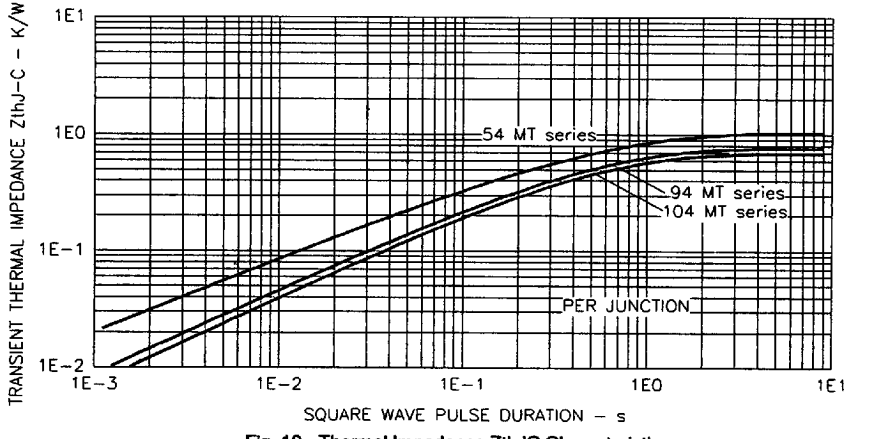


Fig. 19 - Thermal Impedance ZthJC Characteristics