MITEL
SEMICONDUCTOR

DK24..FC

Fast Switching Thyristor

Supersedes October 1995 version, DS4268 - 2.2

DS4268 - 2.3 March 1998

APPLICATIONS

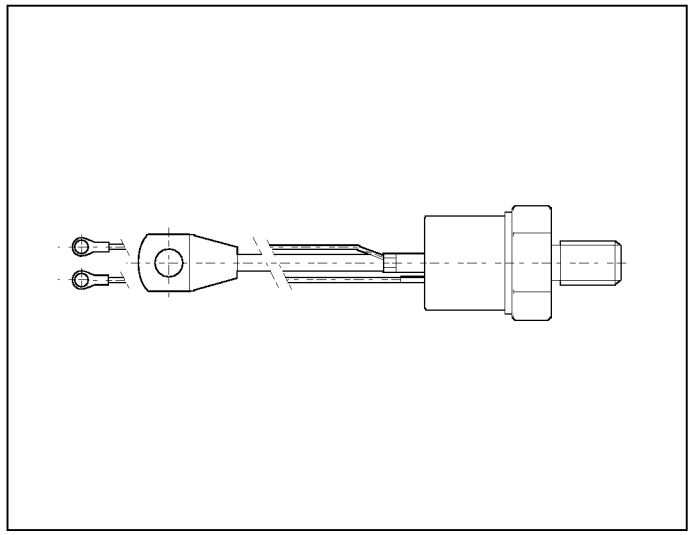
- High Power Inverters And Choppers.
- UPS.
- AC Motor Drives.
- Induction Heating.
- Cycloconverters.

KEY PARAMETERS

V_{DRM}	2000V
$I_{T(RMS)}$	260A
I_{TSM}	4000A
dVdt	200V/µs
dI/dt	500A/µs
t_q	50µs

FEATURES

- Low Switching Losses At High Frequency.
- Fully Characterised For Operation Up To 20kHz.



Outline type code: TO93 Turn to page 12 for further information.

VOLTAGE RATINGS

Type Number	Repetitive Peak Voltages V_{DRM} V_{RRM} V	Conditions
DK24 20FC K or M DK24 18FC K or M DK24 16FC K or M DK24 14FC K or M	2000 1800 1600 1400	$V_{RSM} = V_{RRM} + 100V$ $I_{DRM} = I_{RRM} = 25mA$ at V_{RRM} or V_{DRM} & T_{vj}

C = t_q code = 50µs.
For 3/4" 16 UNF thread add K to type number, e.g. DK24 20FCK.
For M16 thread add M to type number, e.g. DK24 14FCM.

CURRENT RATINGS

Symbol	Parameter	Conditions	Max.	Units
$I_{T(AV)}$	Mean on-state current	Half wave resistive load, T_{case} = 80°C	165	A
$I_{T(RMS)}$	RMS value	T_{case} = 80°C	260	A

SURGE RATINGS

Symbol	Parameter	Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	$t_p \geq 10ms$ half sine; $T_{case} = 125°C$	4.0	kA
I^2t	I^2t for fusing	$V_R = 0\%\ V_{RRM}$ - 1/4 sine	80.0×10^3	A^2s

THERMAL AND MECHANICAL DATA

Symbol	Parameter	Conditions	Min.	Max.	Units
$R_{th(j-c)}$	Thermal resistance - junction to case	dc	-	0.13	°C/W
$R_{th(c-h)}$	Thermal resistance - case to heatsink	Mounting torque 35.0Nm with mounting compound	-	0.06	°C/W
T_{vj}	Virtual junction temperature	On-state (conducting)	-	125	°C
		Reverse (blocking)	-	125	°C
T_{stg}	Storage temperature range		-40	150	°C
-	Mounting torque		30.0	35.0	Nm

DYNAMIC CHARACTERISTICS

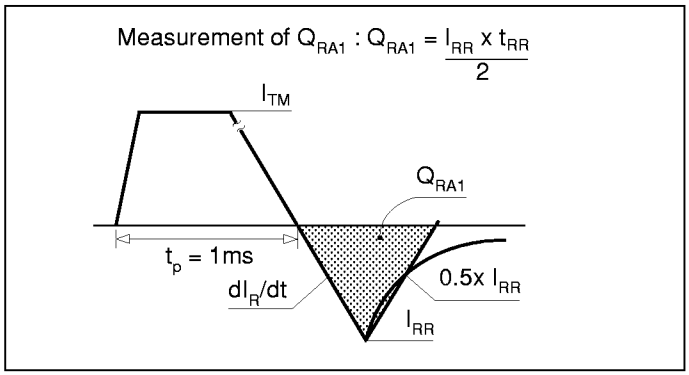
Symbol	Parameter	Conditions		Min.	Max.	Units
V_{TM}	Maximum on-state voltage	At 450A peak, $T_{case} = 25°C$		-	2.0	V
I_{RRM}/I_{DRM}	Peak reverse and off-state current	At V_{RRM}/V_{DRM}, $T_{case} = 125°C$		-	25	mA
dV/dt	Maximum linear rate of rise of off-state voltage	Linear to 60% V_{DRM} $T_j = 125°C$, Gate open circuit		-	200	V/µs
dI/dt	Rate of rise of on-state current	Gate source 20V, 20Ω	Repetitive 50Hz	-	500	A/µs
		$t_r < 0.5µs$, $T_j = 125°C$	Non-repetitive	-	800	A/µs
$V_{T(TO)}$	Threshold voltage	At $T_{vj} = 125°C$		-	1.25	V
r_T	On-state slope resistance	At $T_{vj} = 125°C$		-	1.66	mΩ
t_{gd}	Delay time	$T_j = 25°C$, $I_T = 50A$, $V_D = 300V$, $I_G = 1A$, $dI/dt = 30A/µs$, $dI_G/dt = 1A/µs$		3*	-	µs
$t_{(ON)TOT}$	Total turn-on time			1.5*	-	µs
I_H	Holding current	$T_j = 25°C$, $I_{TM} = 1A$, $V_D = 12V$		-	70	mA
t_q	Turn-off time	$T_j = 125°C$, $I_T = 200A$, $V_R = 50V$, $dV/dt = 200V/µs$ (Linear to 60% V_{DRM}), $dI_R/dt = 30A/µs$, Gate open circuit	t_q code: C	-	50	µs

**Typical value.*

GATE TRIGGER CHARACTERISTICS AND RATINGS

Symbol	Parameter	Conditions	Typ.	Max.	Units
V_{GT}	Gate trigger voltage	V_{DRM} = 12V, T_{case} = 25°C, R_L = 6Ω	-	3.0	V
I_{GT}	Gate trigger current	V_{DRM} = 12V, T_{case} = 25°C, R_L = 6Ω	-	200	mA
V_{GD}	Gate non-trigger voltage	At V_{DRM} T_{case} = 125°C, R_L = 1kΩ	-	0.2	V
V_{RGM}	Peak reverse gate voltage		-	5.0	V
I_{FGM}	Peak forward gate current	Anode positive with respect to cathode	-	4	A
P_{GM}	Peak gate power		-	16	W
$P_{G(AV)}$	Mean gate power		-	3.0	W

MEASUREMENT OF RECOVERED CHARGE - Q_{RA1}



CURVES

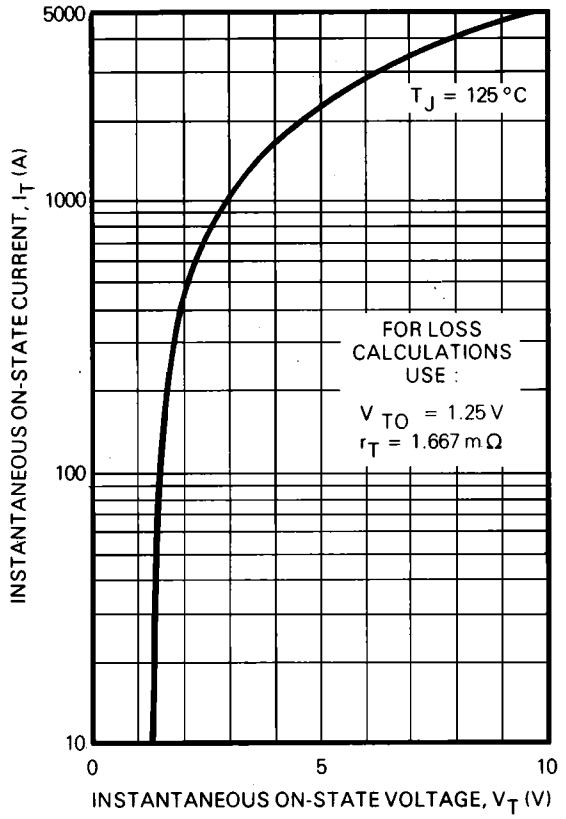


FIG. 1 MAXIMUM (LIMIT) ON-STATE CHARACTERISTICS

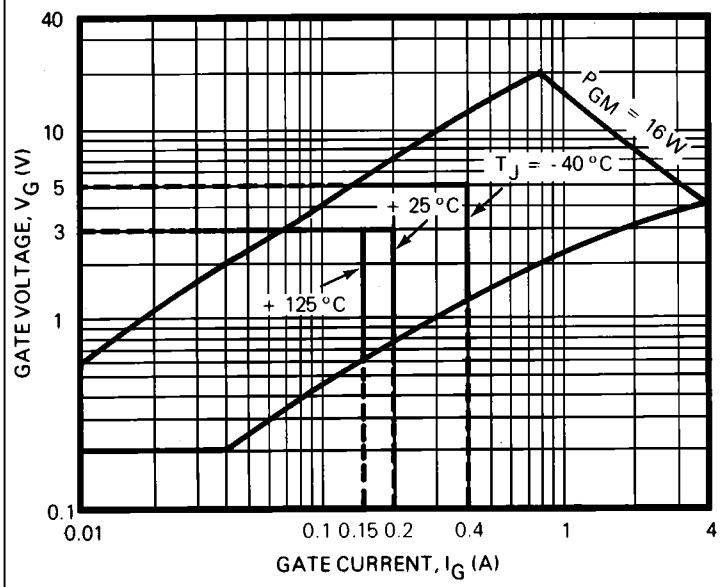


FIG. 2 GATE TRIGGER CHARACTERISTICS

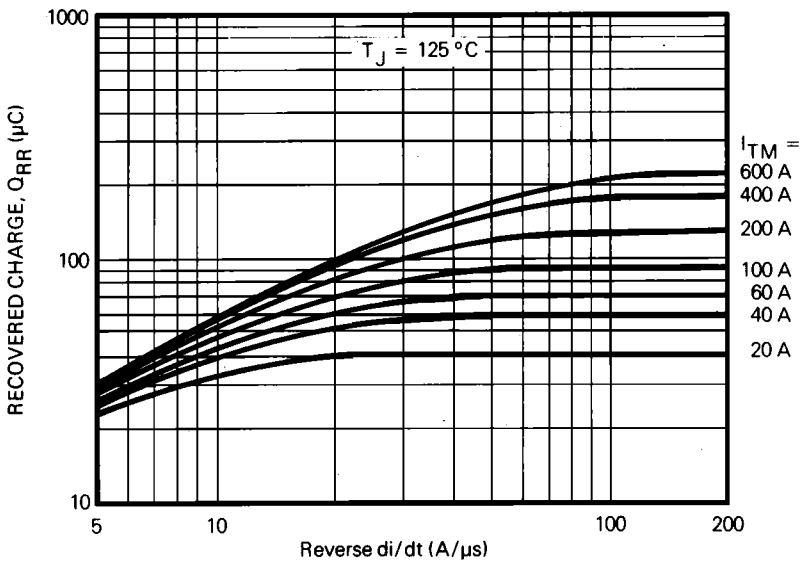


FIG. 3 TYPICAL RECOVERED CHARGE
(FOR A DEVICE RATED Vdrm = 1000V, tq = 50µs)

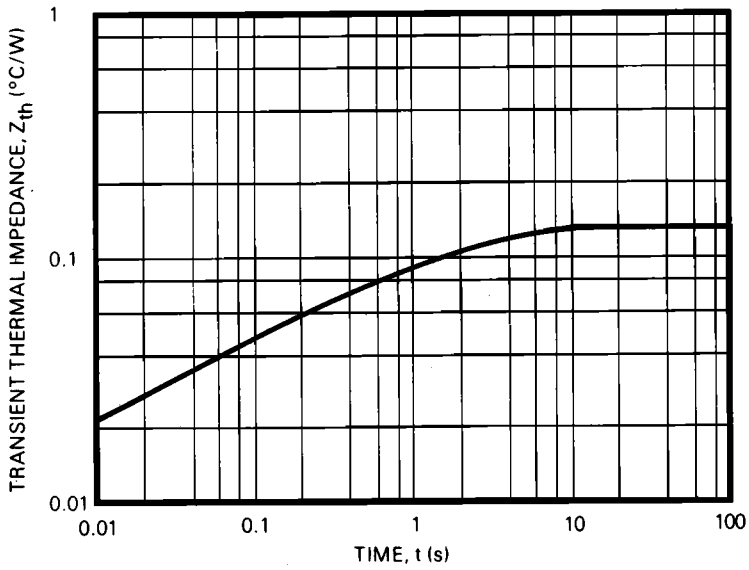


FIG. 4 TRANSIENT THERMAL IMPEDANCE - JUNCTION TO CASE

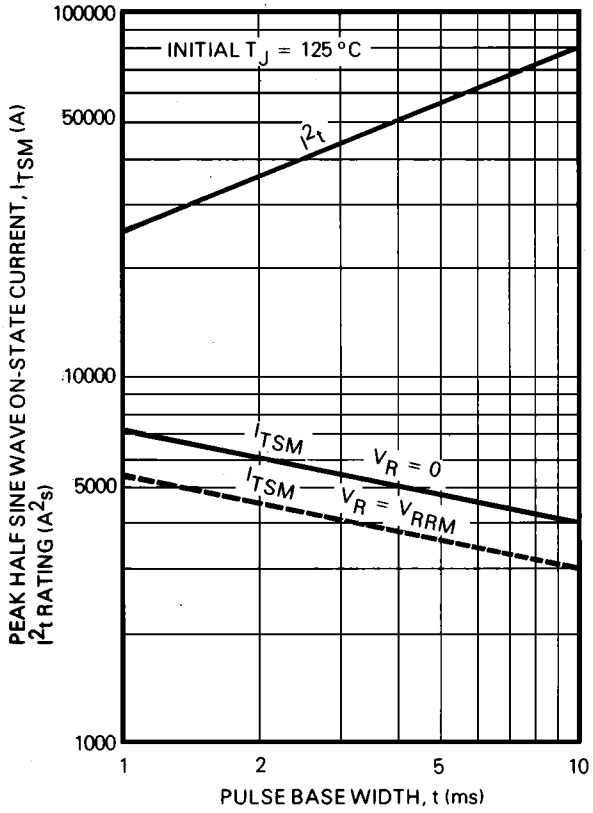


FIG. 5 NON-REPETITIVE SUB-CYCLE SURGE ON-STATE CURRENT AND I2t RATING

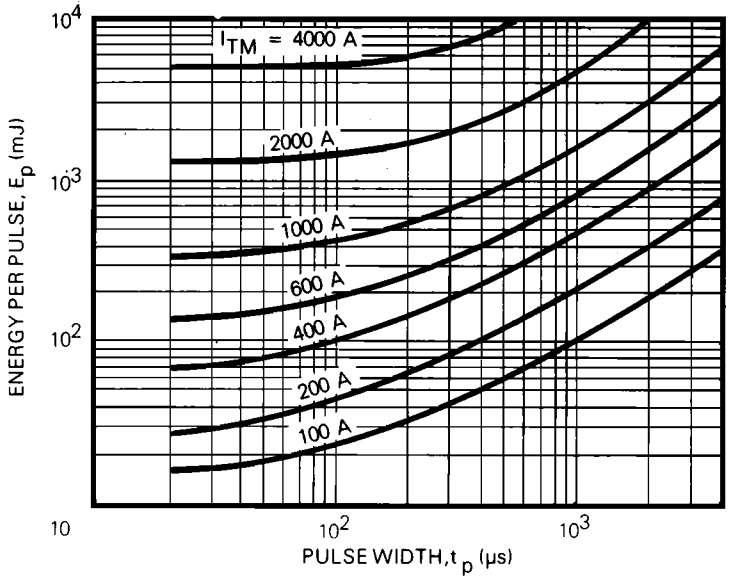
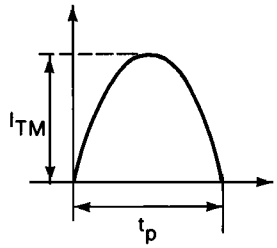


FIG. 6 ENERGY PER PULSE FOR SINUSOIDAL PULSES

NOTES:
1. $V_D \leq 600V$.
2. $V_R \leq 10V$.
3. R.C Snubber, C = 0.22µF, R = 4.7Ω



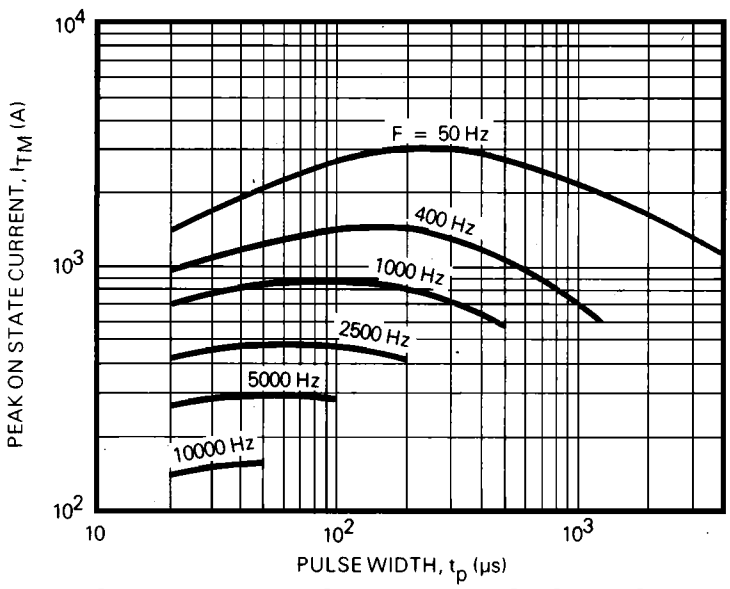
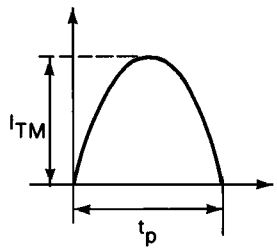


FIG. 7 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR Tc = 65°C

NOTES:
1. $V_D \leq 600V$.
2. $V_R \leq 10V$.
3. R.C Snubber, C = 0.22µF, R = 4.7Ω



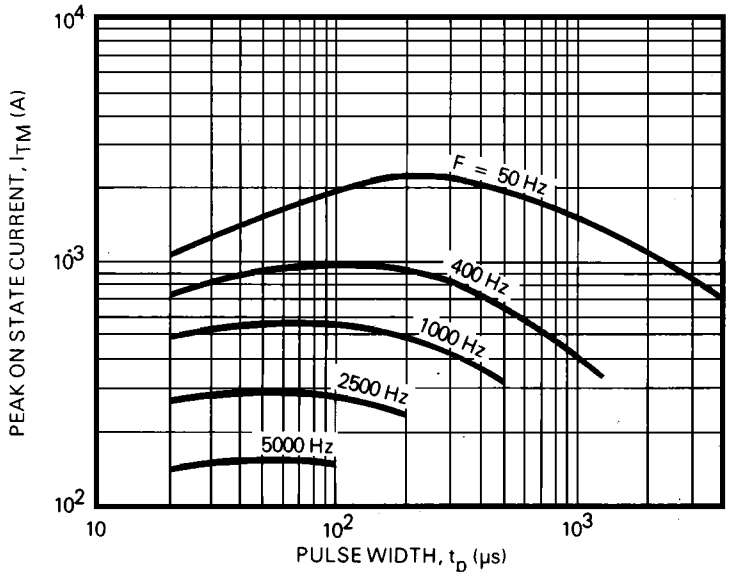
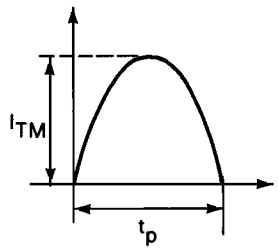


FIG. 8 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR Tc = 90°C

NOTES:
1. $V_D \leq 600V$.
2. $V_R \leq 10V$.
3. R.C Snubber, C = 0.22µF, R = 4.7Ω



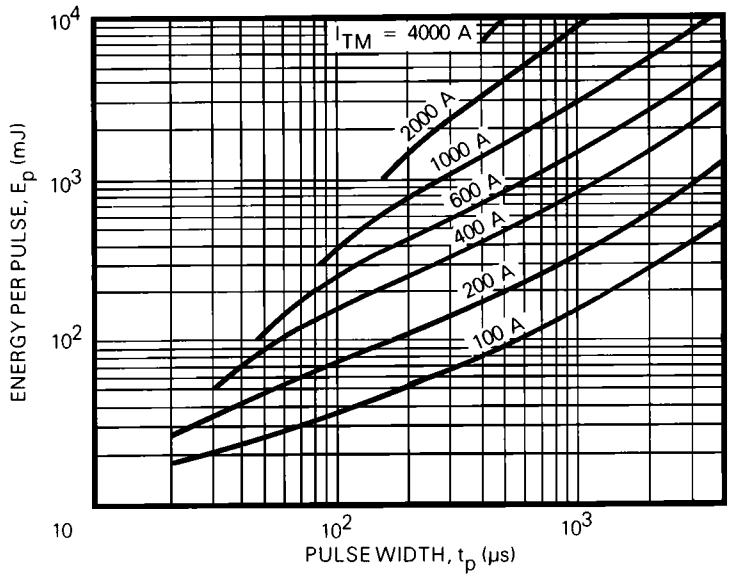
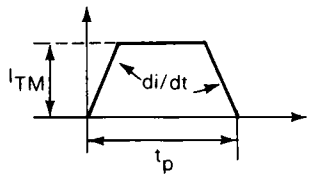


FIG. 9 ENERGY PER PULSE FOR TRAPEZOIDAL PULSES

NOTES:
1. dI/dt = 25A/µs
2. $V_D \leq 600V$.
3. $V_R \leq 10V$.
4. R.C Snubber, C = 0.22µF, R = 4.7Ω



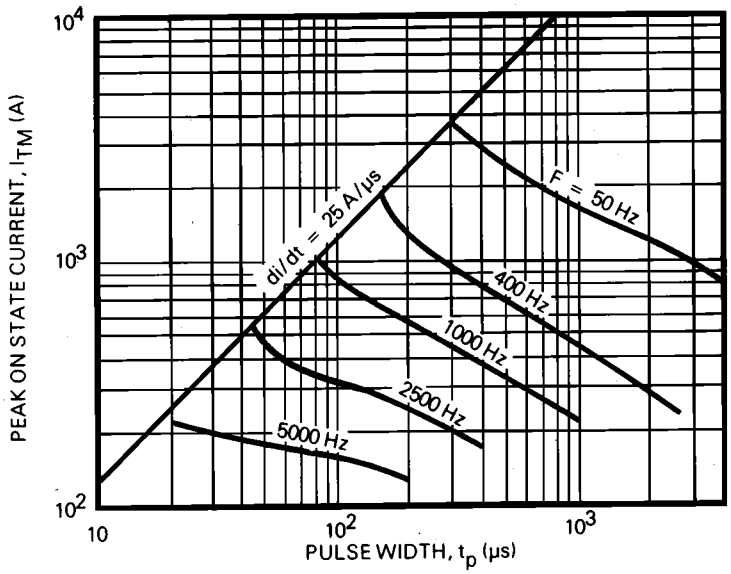
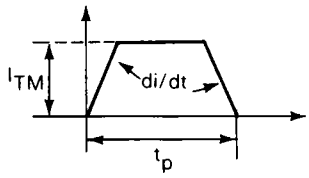


FIG. 10 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR Tc = 65°C

NOTES:
1. dI/dt = 25A/µs
2. $V_D \leq 600V$.
3. $V_R \leq 10V$.
4. R.C Snubber, C = 0.22µF, R = 4.7Ω



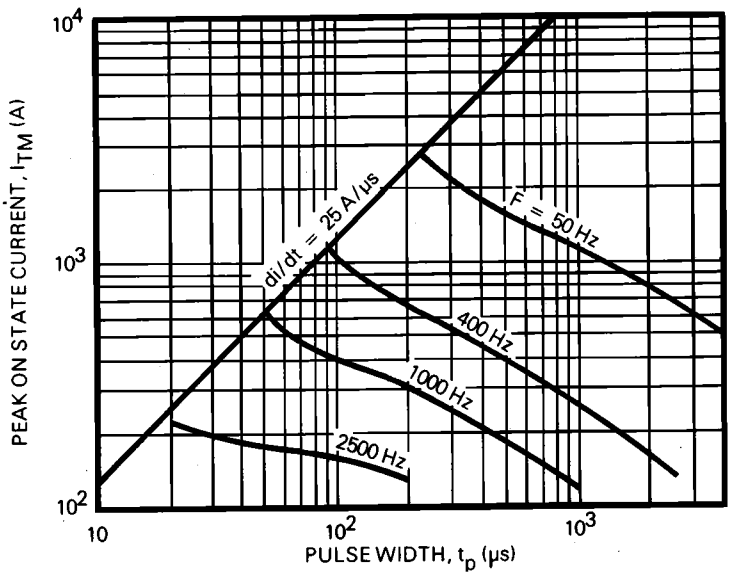
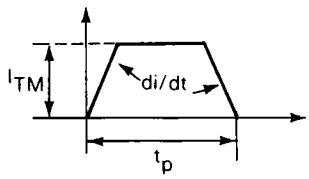


FIG. 11 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR Tc = 90°C

NOTES:
1. dI/dt = 25A/µs
2. $V_D \leq 600V$.
3. $V_R \leq 10V$.
4. R.C Snubber, C = 0.22µF, R = 4.7Ω



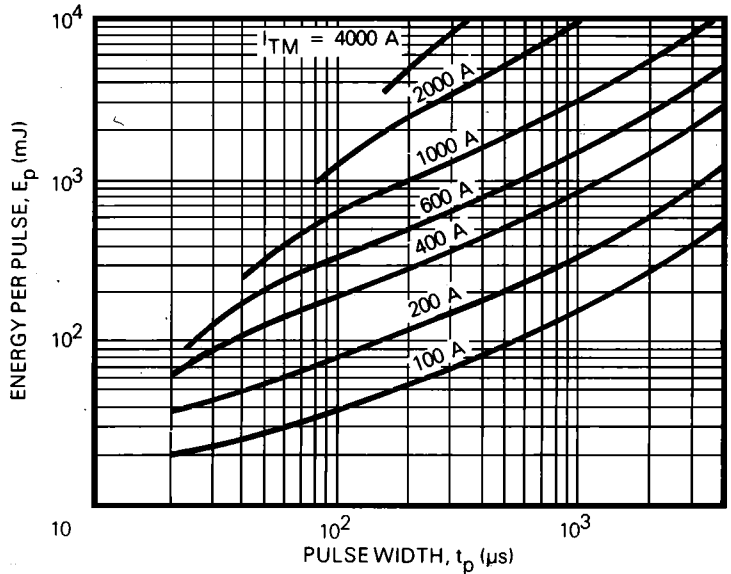
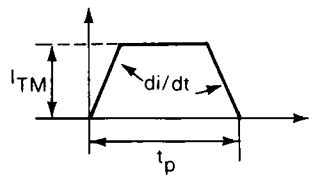


FIG. 12 ENERGY PER PULSE FOR TRAPEZOIDAL PULSES

NOTES:
1. dI/dt = 50A/µs
2. $V_D \leq 600V$.
3. $V_R \leq 10V$.
4. R.C Snubber, C = 0.22µF, R = 4.7Ω



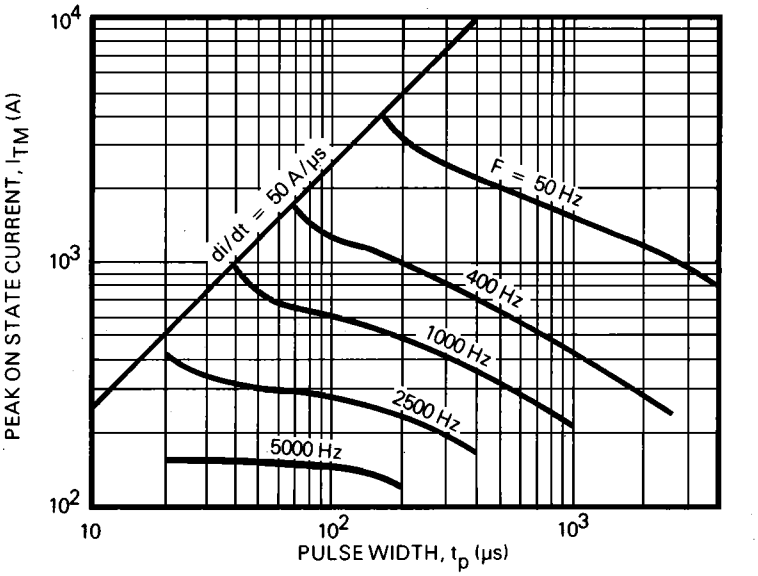
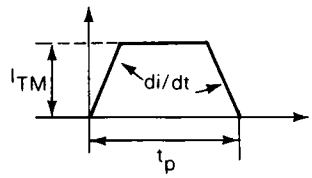


FIG. 13 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR Tc = 65°C

NOTES:
1. dI/dt = 50A/µs
2. $V_D \leq 600V$.
3. $V_R \leq 10V$.
4. R.C Snubber, C = 0.22µF, R = 4.7Ω



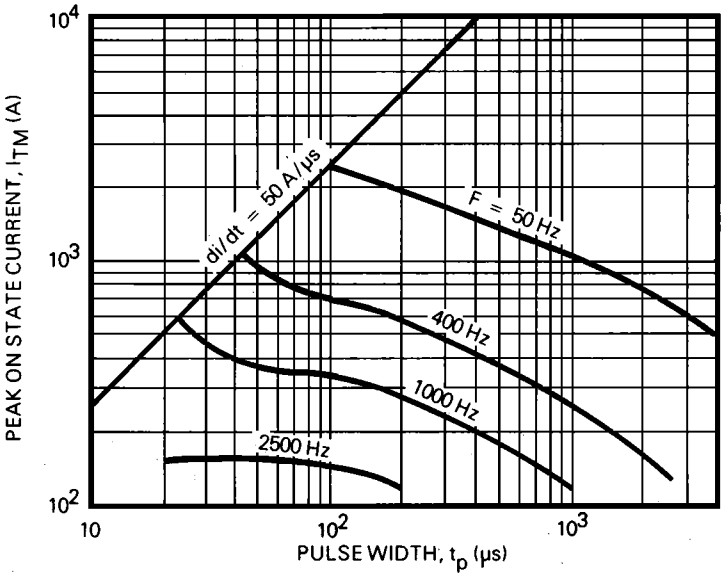
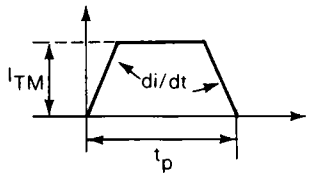


FIG. 14 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR Tc = 90°C

NOTES:
1. dI/dt = 50A/µs
2. $V_D \leq 600V$.
3. $V_R \leq 10V$.
4. R.C Snubber, C = 0.22µF, R = 4.7Ω



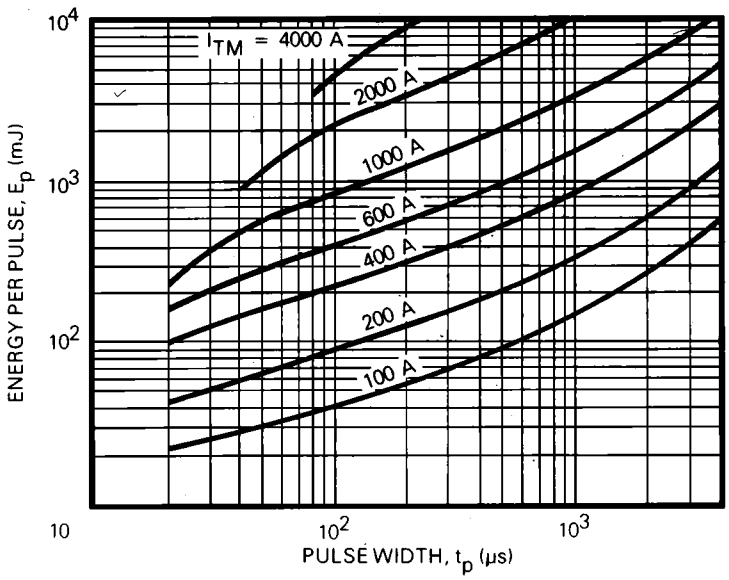
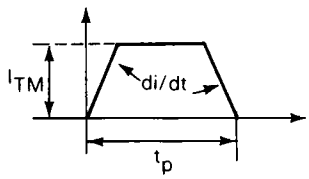


FIG. 15 ENERGY PER PULSE FOR TRAPEZOIDAL PULSES

NOTES:
1. dI/dt = 100A/µs
2. $V_D \leq 600V$.
3. $V_R \leq 10V$.
4. R.C Snubber, C = 0.22µF, R = 4.7Ω



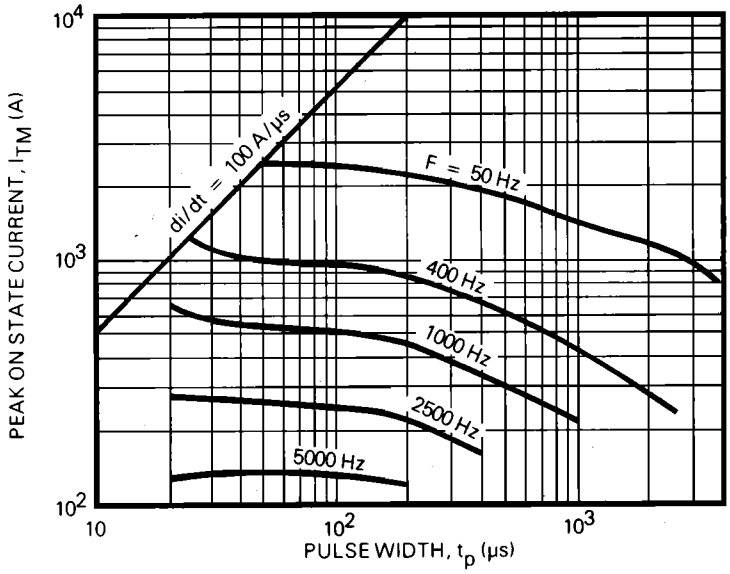
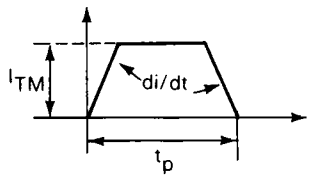


FIG. 16 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR Tc = 65°C

NOTES:
1. dI/dt = 100A/µs
2. $V_D \leq 600V$.
3. $V_R \leq 10V$.
4. R.C Snubber, C = 0.22µF, R = 4.7Ω



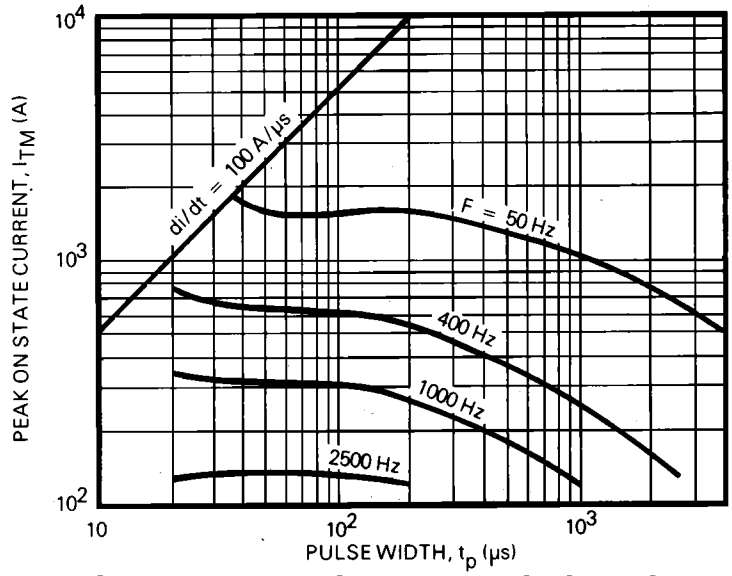
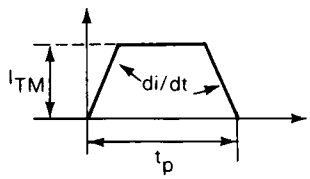


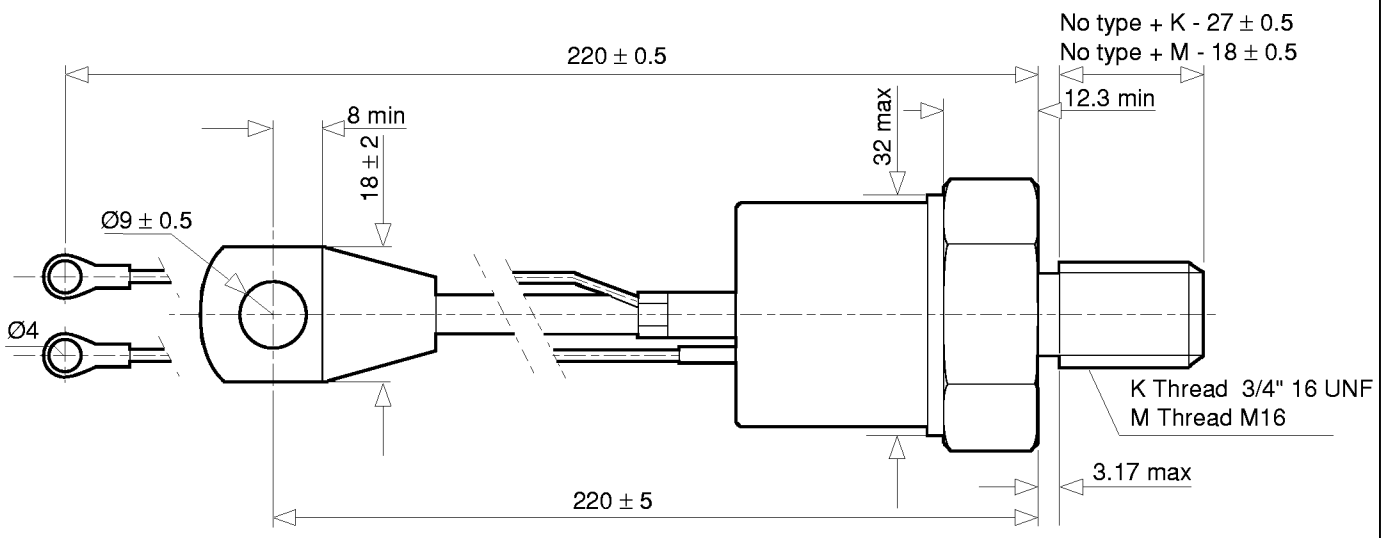
FIG. 17 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR Tc = 90°C

NOTES:
1. dI/dt = 100A/µs
2. $V_D \leq 600V$.
3. $V_R \leq 10V$.
4. R.C Snubber, C = 0.22µF, R = 4.7Ω



PACKAGE DETAILS - TO93

For further package information, please contact your local Customer Service Centre. All dimensions in mm, unless stated otherwise. DO NOT SCALE.



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