

# DK24..FC

## FAST SWITCHING THYRISTOR

### 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
$dV/dt$	200V/ $\mu$ s
$dI/dt$	500A/ $\mu$ s
$t_q$	50 $\mu$ s

### FEATURES

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

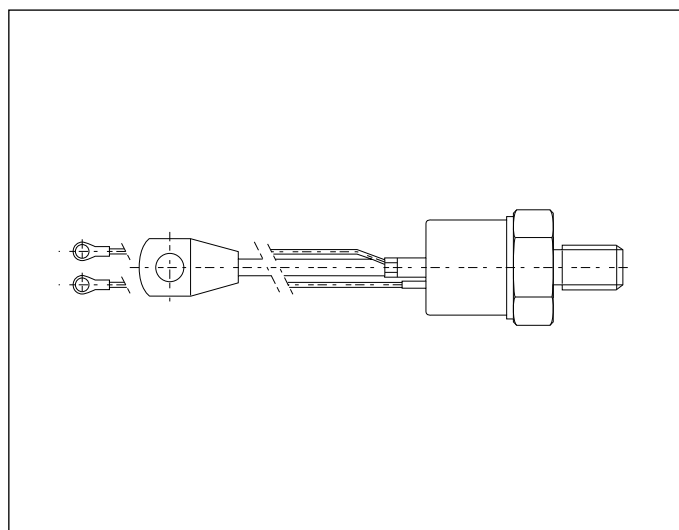
### VOLTAGE RATINGS

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

$C = t_g \text{ code} = 50\mu s.$

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.



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

### CURRENT RATINGS

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

## SURGE RATINGS

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

## 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

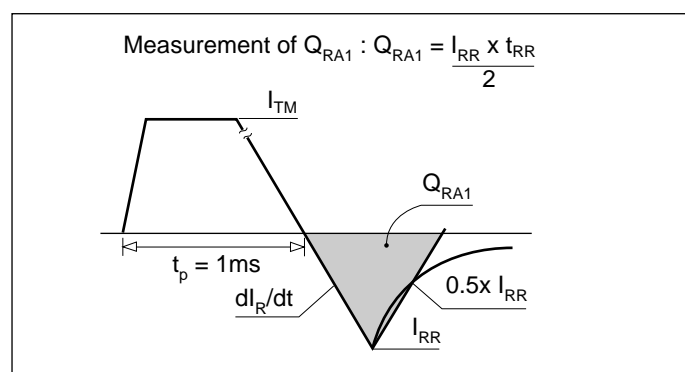
Symbol	Parameter	Conditions		Min.	Max.	Units
$V_{TM}$	Maximum on-state voltage	At 450A peak, $T_{case} = 25^\circ\text{C}$		-	2.0	V
$I_{RRM}/I_{DRM}$	Peak reverse and off-state current	At $V_{RRM}/V_{DRM}$ , $T_{case} = 125^\circ\text{C}$		-	25	mA
$dV/dt$	Maximum linear rate of rise of off-state voltage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

\*Typical value.

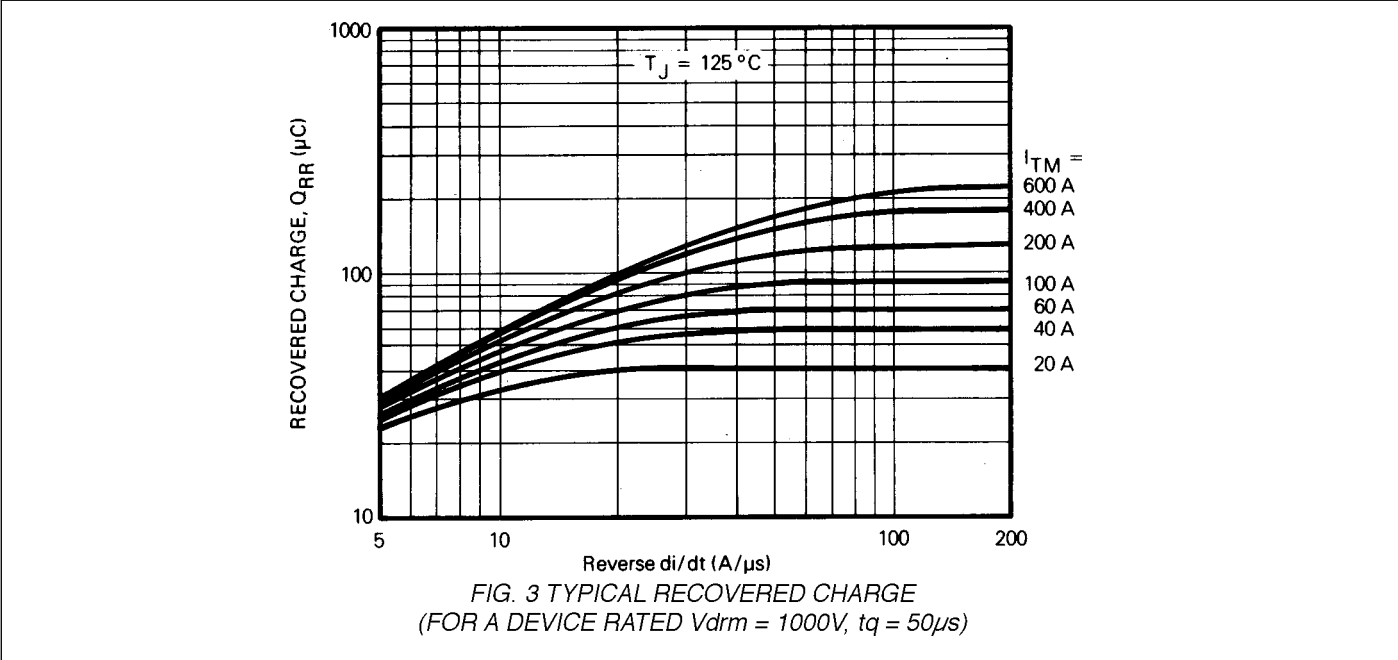
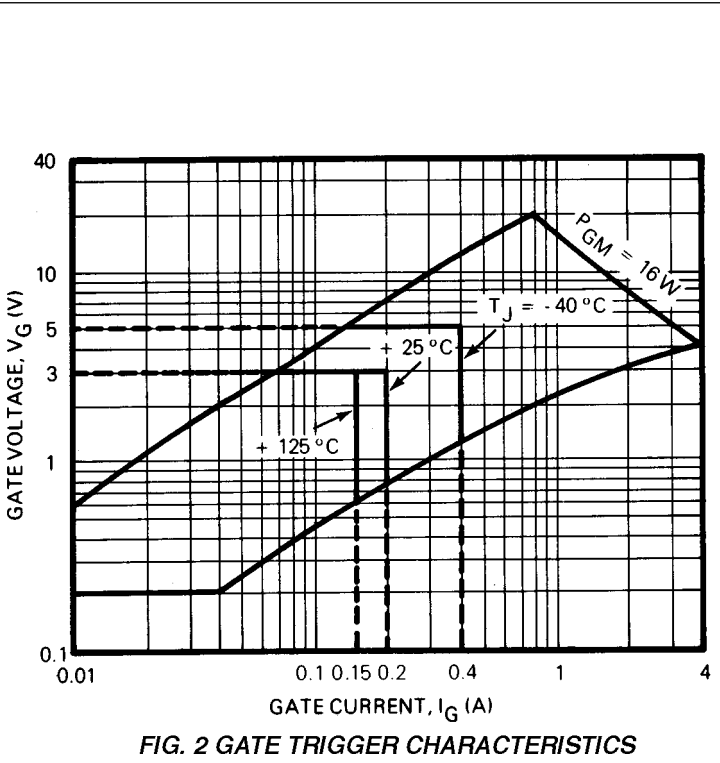
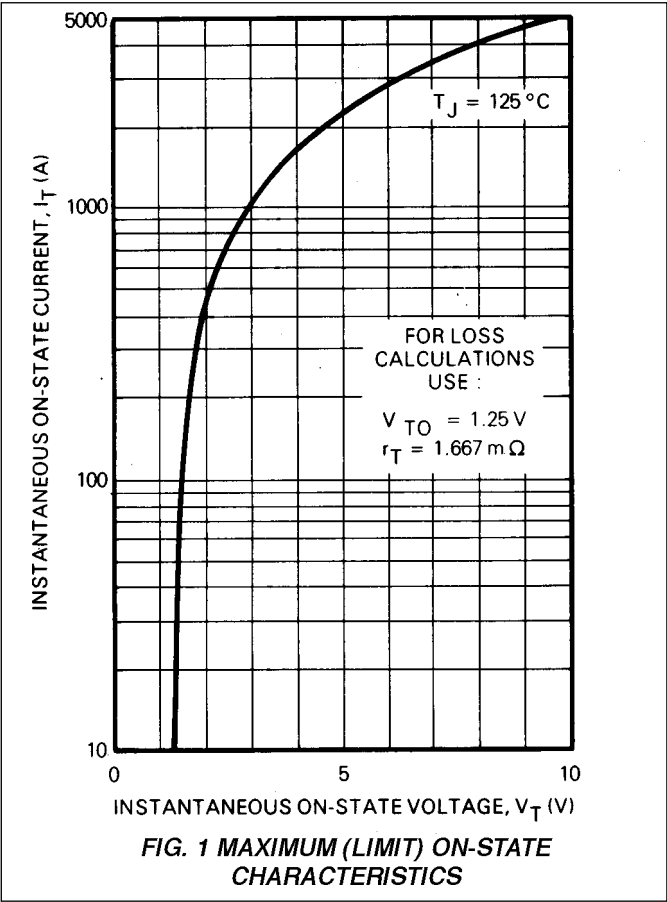
## GATE TRIGGER CHARACTERISTICS AND RATINGS

Symbol	Parameter	Conditions	Typ.	Max.	Units
$V_{GT}$	Gate trigger voltage	$V_{DRM} = 12V, T_{case} = 25^{\circ}C, R_L = 6\Omega$	-	3.0	V
$I_{GT}$	Gate trigger current	$V_{DRM} = 12V, T_{case} = 25^{\circ}C, R_L = 6\Omega$	-	200	mA
$V_{GD}$	Gate non-trigger voltage	At $V_{DRM} T_{case} = 125^{\circ}C, R_L = 1k\Omega$	-	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



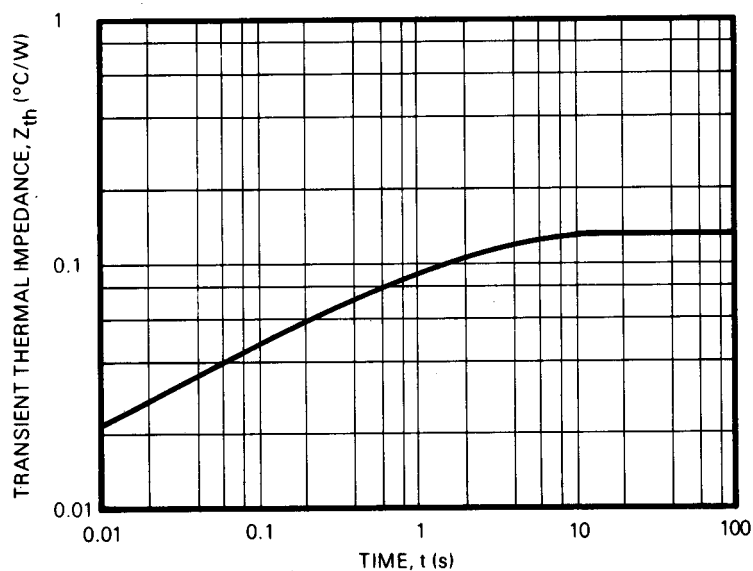
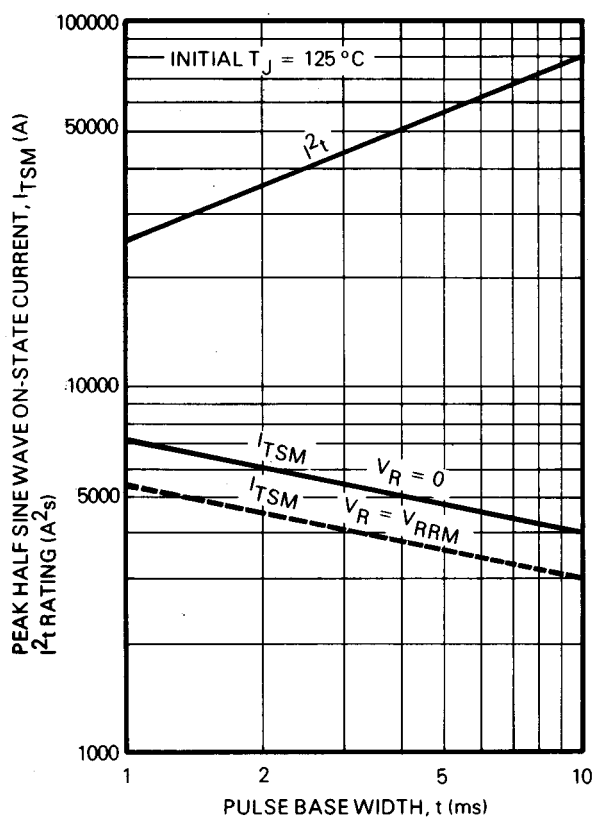


FIG. 4 TRANSIENT THERMAL IMPEDANCE - JUNCTION TO CASE

FIG. 5 NON-REPETITIVE SUB-CYCLE SURGE  
ON-STATE CURRENT AND  $I^2t$  RATING

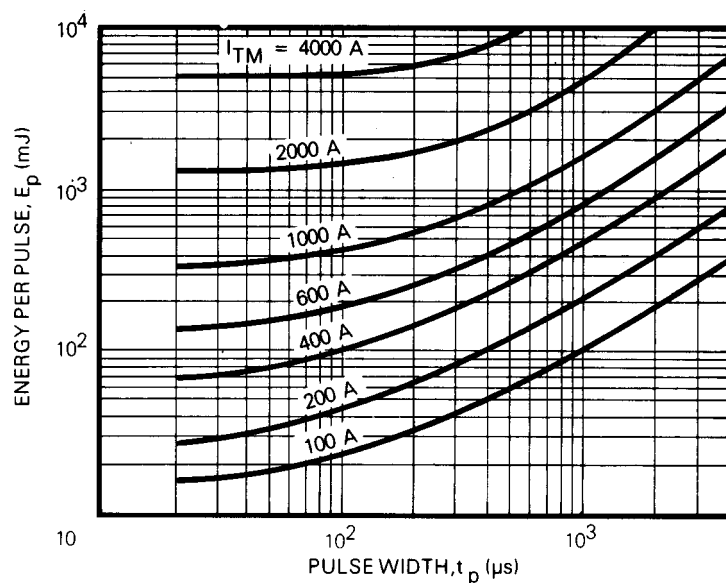
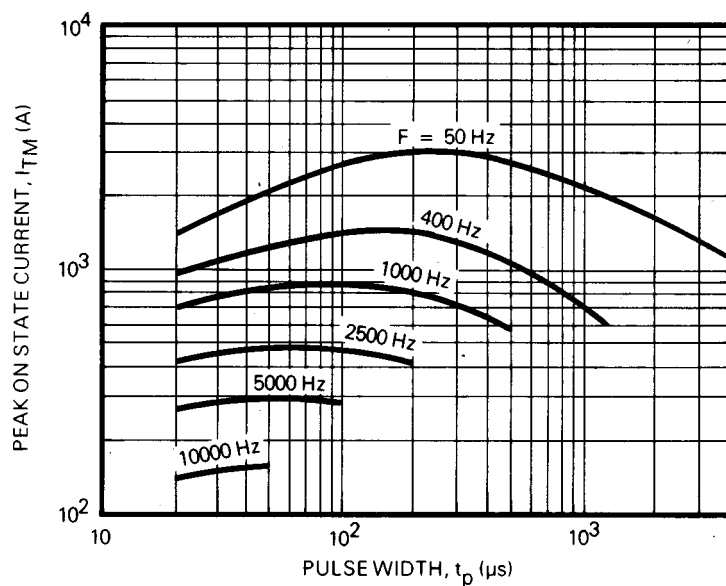
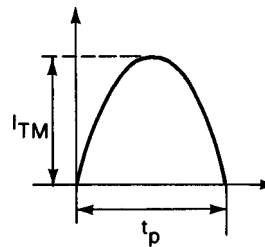


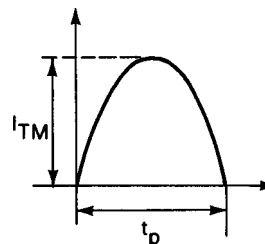
FIG. 6 ENERGY PER PULSE FOR SINUSOIDAL PULSES

**NOTES:**

1.  $V_D \leq 600V$ .
2.  $V_R \leq 10V$ .
3. R.C Snubber,  $C = 0.22\mu F$ ,  $R = 4.7\Omega$

FIG. 7 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR  $T_c = 65^\circ C$ **NOTES:**

1.  $V_D \leq 600V$ .
2.  $V_R \leq 10V$ .
3. R.C Snubber,  $C = 0.22\mu F$ ,  $R = 4.7\Omega$



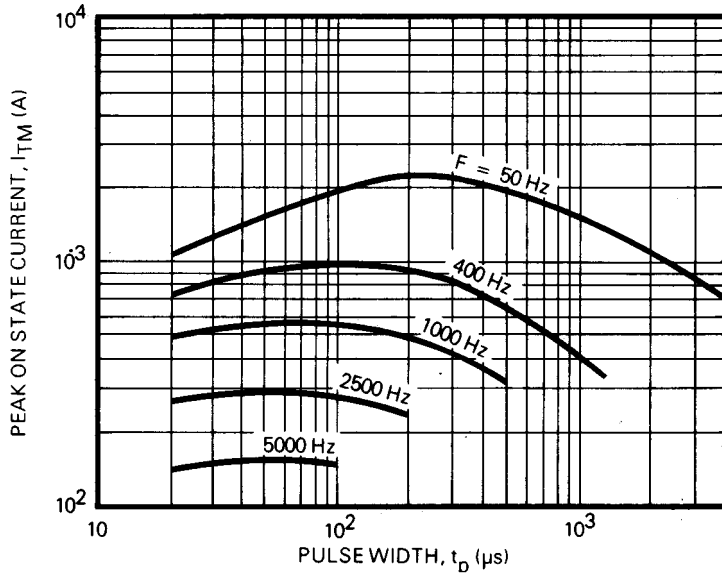


FIG. 8 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR  $T_c = 90^\circ\text{C}$

**NOTES:**

1.  $V_D \leq 600\text{V}$ .
2.  $V_R \leq 10\text{V}$ .
3. R.C Snubber,  $C = 0.22\mu\text{F}$ ,  $R = 4.7\Omega$

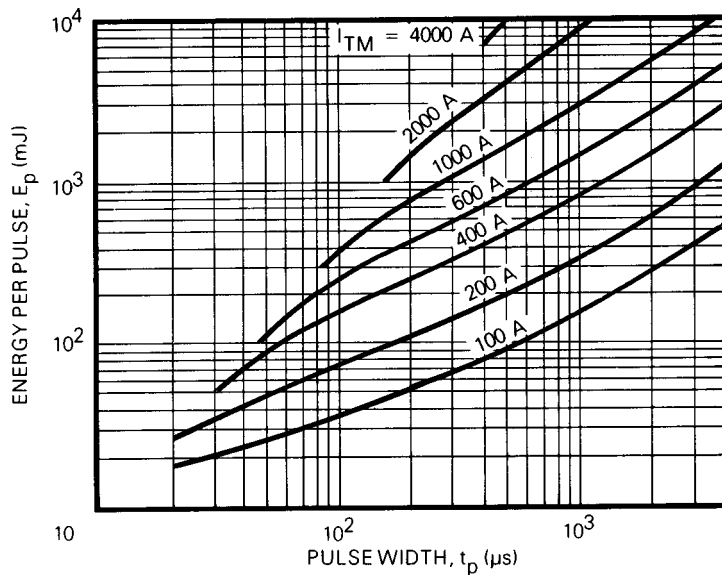
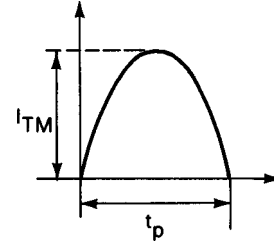
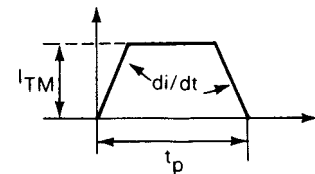


FIG. 9 ENERGY PER PULSE FOR TRAPEZOIDAL PULSES

**NOTES:**

1.  $di/dt = 25\text{A}/\mu\text{s}$
2.  $V_D \leq 600\text{V}$ .
3.  $V_R \leq 10\text{V}$ .
4. R.C Snubber,  $C = 0.22\mu\text{F}$ ,  $R = 4.7\Omega$



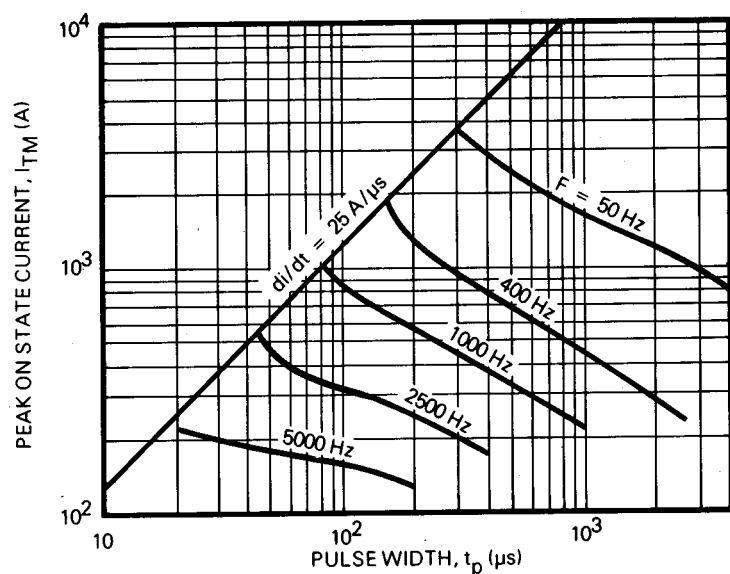
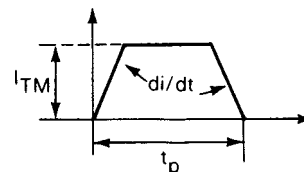


FIG. 10 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT  
vs PULSE WIDTH FOR  $T_c = 65^\circ\text{C}$

**NOTES:**

1.  $di/dt = 25 \text{ A}/\mu\text{s}$
2.  $V_D \leq 600 \text{ V}$ .
3.  $V_R \leq 10 \text{ V}$ .
4. R.C Snubber,  $C = 0.22 \mu\text{F}$ ,  $R = 4.7 \Omega$



**NOTES:**

1.  $di/dt = 25 \text{ A}/\mu\text{s}$
2.  $V_D \leq 600 \text{ V}$ .
3.  $V_R \leq 10 \text{ V}$ .
4. R.C Snubber,  $C = 0.22 \mu\text{F}$ ,  $R = 4.7 \Omega$

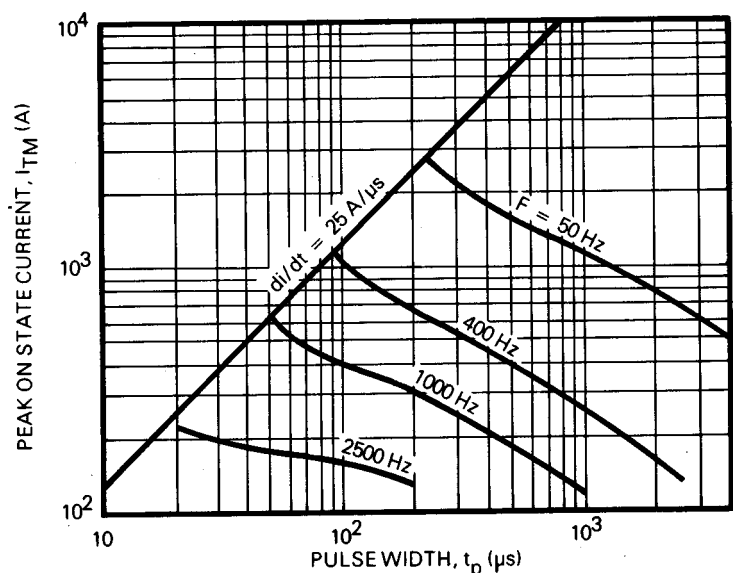
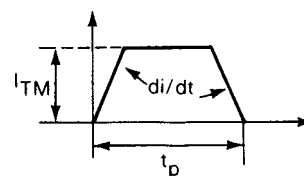


FIG. 11 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT  
vs PULSE WIDTH FOR  $T_c = 90^\circ\text{C}$





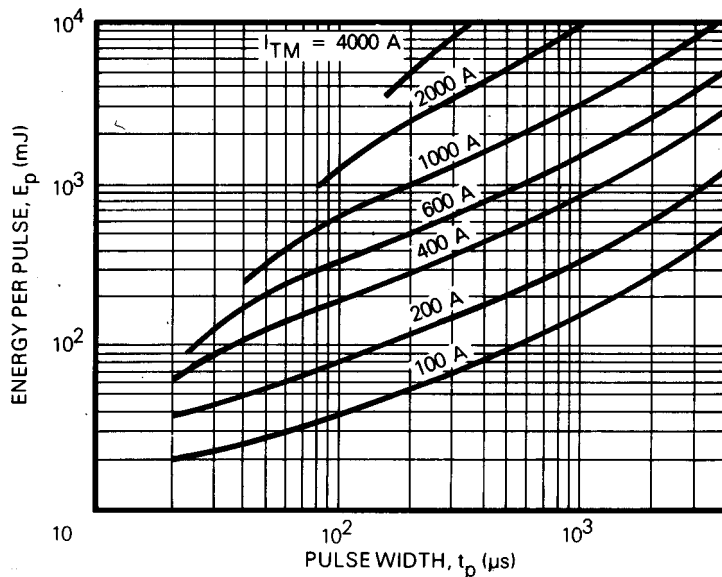


FIG. 12 ENERGY PER PULSE FOR TRAPEZOIDAL PULSES

**NOTES:**

1.  $di/dt = 50 A/\mu s$
2.  $V_D \leq 600V$ .
3.  $V_R \leq 10V$ .
4. R.C Snubber,  $C = 0.22\mu F$ ,  $R = 4.7\Omega$

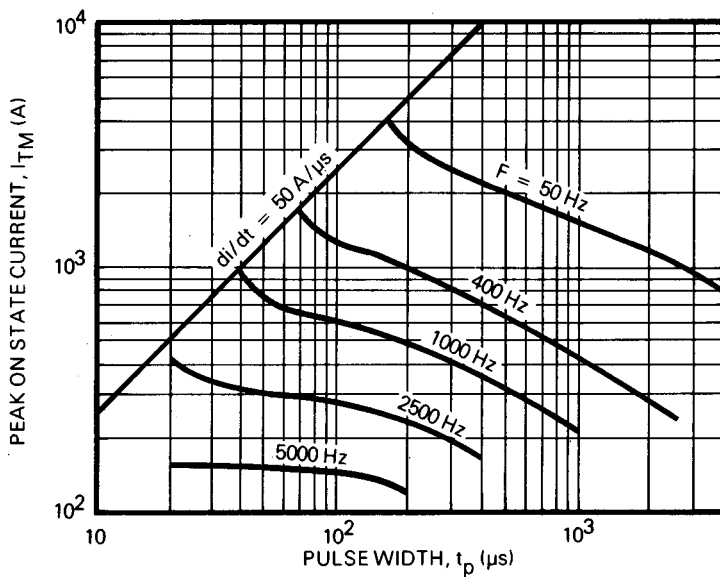
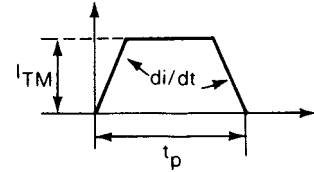
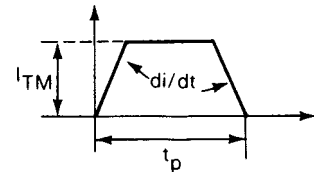


FIG. 13 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR  $T_c = 65^\circ C$

**NOTES:**

1.  $di/dt = 50 A/\mu s$
2.  $V_D \leq 600V$ .
3.  $V_R \leq 10V$ .
4. R.C Snubber,  $C = 0.22\mu F$ ,  $R = 4.7\Omega$



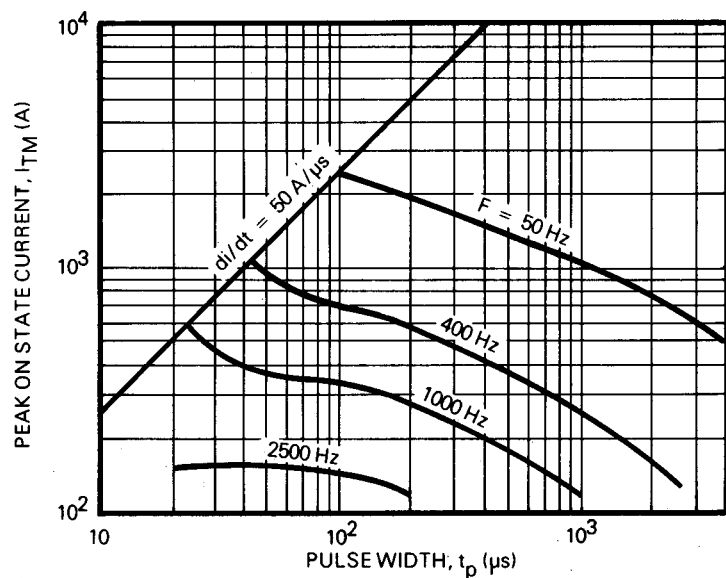


FIG. 14 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR  $T_c = 90^\circ\text{C}$

**NOTES:**

1.  $di/dt = 50 \text{ A}/\mu\text{s}$
2.  $V_D \leq 600 \text{ V}$ .
3.  $V_R \leq 10 \text{ V}$ .
4. R.C Snubber,  $C = 0.22 \mu\text{F}$ ,  $R = 4.7 \Omega$

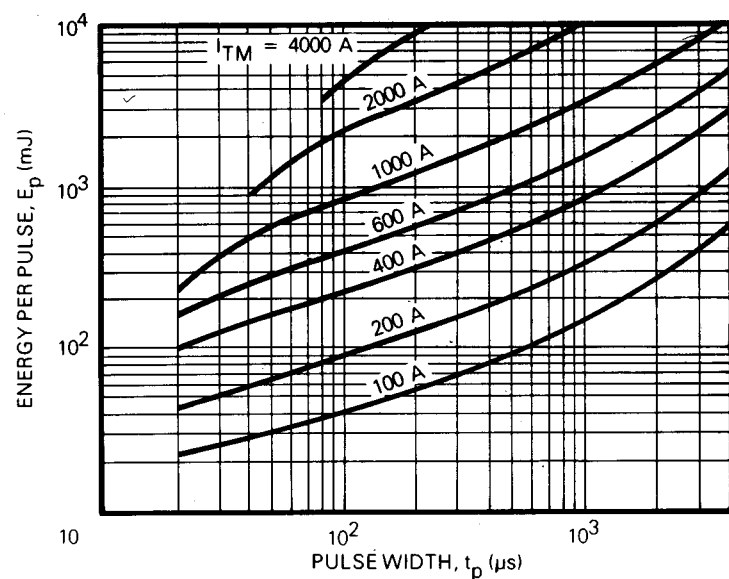
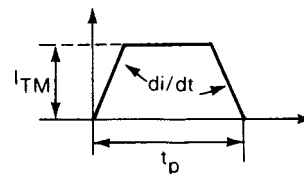
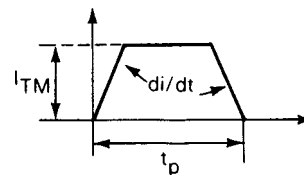


FIG. 15 ENERGY PER PULSE FOR TRAPEZOIDAL PULSES

**NOTES:**

1.  $di/dt = 100 \text{ A}/\mu\text{s}$
2.  $V_D \leq 600 \text{ V}$ .
3.  $V_R \leq 10 \text{ V}$ .
4. R.C Snubber,  $C = 0.22 \mu\text{F}$ ,  $R = 4.7 \Omega$



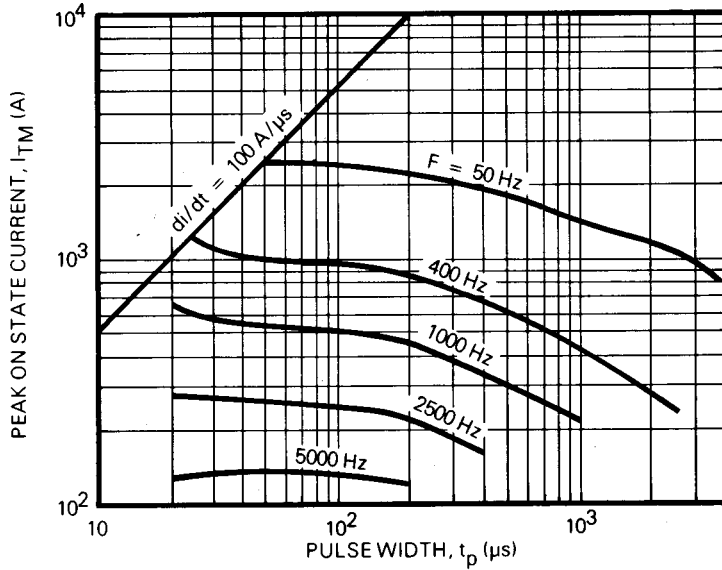


FIG. 16 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR  $T_c = 65^\circ\text{C}$

**NOTES:**

1.  $di/dt = 100 \text{ A}/\mu\text{s}$
2.  $V_D \leq 600 \text{ V}$ .
3.  $V_R \leq 10 \text{ V}$ .
4. R.C Snubber,  $C = 0.22 \mu\text{F}$ ,  $R = 4.7 \Omega$

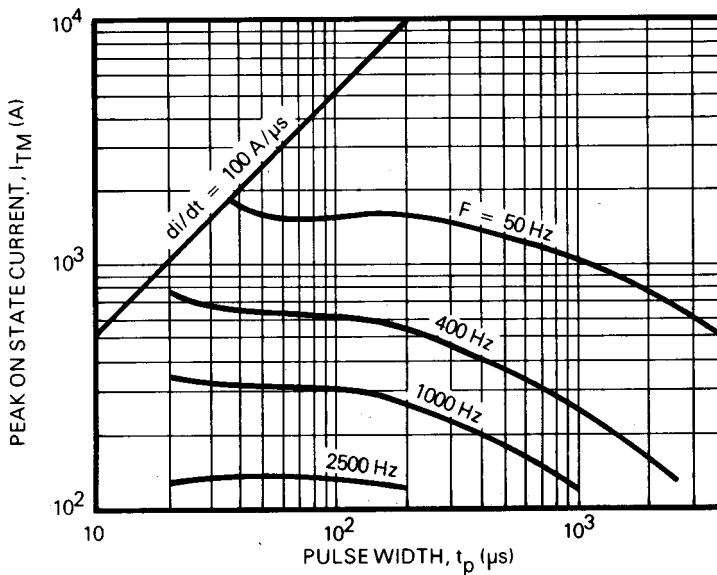
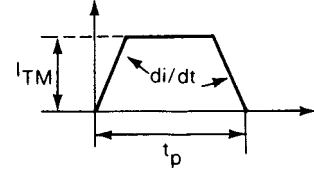
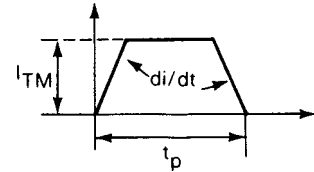


FIG. 17 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR  $T_c = 90^\circ\text{C}$

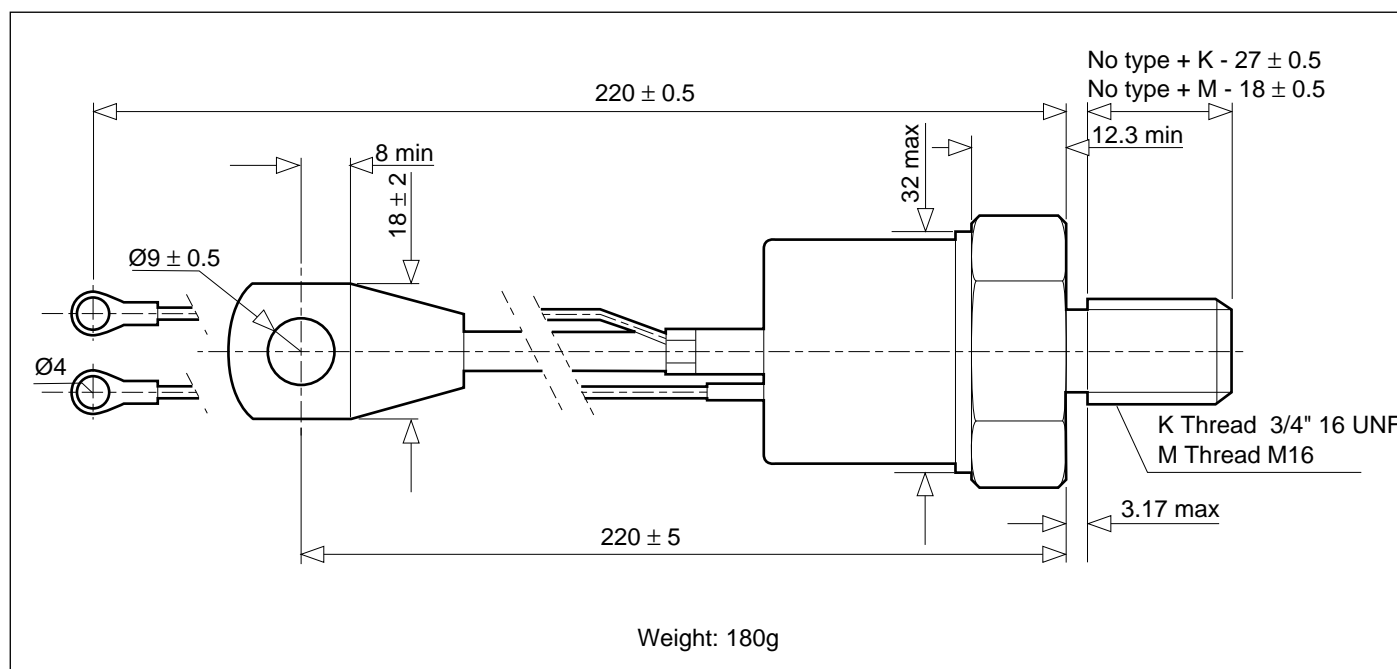
**NOTES:**

1.  $di/dt = 100 \text{ A}/\mu\text{s}$
2.  $V_D \leq 600 \text{ V}$ .
3.  $V_R \leq 10 \text{ V}$ .
4. R.C Snubber,  $C = 0.22 \mu\text{F}$ ,  $R = 4.7 \Omega$



## PACKAGE DETAILS - TO93

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



### HEADQUARTERS OPERATIONS

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