

DK13..FQ/W

FAST SWITCHING THYRISTOR

APPLICATIONS

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

KEY PARAMETERS

V_{DRM}	800V
$I_{T(RMS)}$	130A
I_{TSM}	1600A
dV/dt	200V/ μ s
di/dt	500A/ μ s
t_q	7-10 μ s

FEATURES

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

VOLTAGE RATINGS

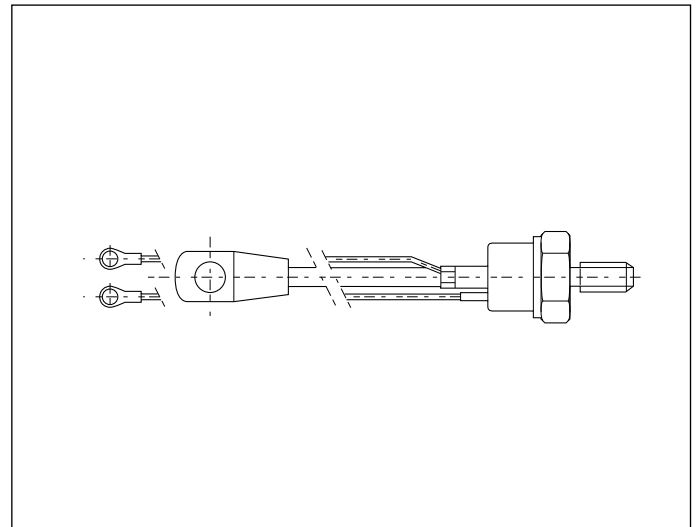
Type Number	Repetitive Peak Voltages V_{DRM} V_{RRM}	Conditions
DK13 08FQ K or M DK13 06FQ K or M	800 600	$V_{RSM} = V_{RRM} + 100V$ $I_{DRM} = I_{RRM} = 15mA$ at V_{RRM} or V_{DRM} & T_{vj}

$Q = t_q 7\mu s$. e.g. DK13 08FQK.

$W = t_q 10\mu s$. e.g. DK13 08FWK.

For 1/2" 20 UNF thread add K to type number, e.g. DK13 06FWK.

For M12 thread add M to type number, e.g. DK13 06FQM.



Outline type code: TO94 See package outlines for further information.

CURRENT RATINGS

Symbol	Parameter	Conditions	Max.	Units
$I_{T(AV)}$	Mean on-state current	Half wave resistive load, $T_{case} = 80^\circ C$	83	A
$I_{T(RMS)}$	RMS value	$T_{case} = 80^\circ C$	130	A

SURGE RATINGS

Symbol	Parameter	Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	$t_p = 10\text{ms}$ half sine; $T_{case} = 125^\circ\text{C}$ $V_R = 0\% V_{RRM} - 1/4$ sine	1.6	kA
I^2t	I^2t for fusing		12.8×10^3	A ² s

THERMAL AND MECHANICAL DATA

Symbol	Parameter	Conditions	Min.	Max.	Units
$R_{th(j-c)}$	Thermal resistance - junction to case	dc	-	0.25	°C/W
$R_{th(c-h)}$	Thermal resistance - case to heatsink	Mounting torque 15.0Nm with mounting compound	-	0.08	°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		12.0	15.0	Nm

DYNAMIC CHARACTERISTICS

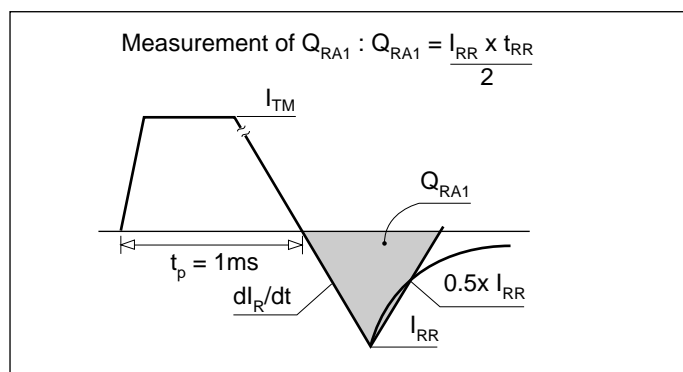
Symbol	Parameter	Conditions		Min.	Max.	Units
V_{TM}	Maximum on-state voltage	At 300A peak, $T_{case} = 25^\circ\text{C}$		-	2.35	V
I_{RRM}/I_{DRM}	Peak reverse and off-state current	At V_{RRM}/V_{DRM} , $T_{case} = 125^\circ\text{C}$		-	15	mA
dV/dt	Maximum linear rate of rise of off-state voltage	Linear to 60% V_{DRM} , $T_j = 125^\circ\text{C}$, Gate open circuit		-	200	V/μs
dI/dt	Rate of rise of on-state current	Gate source 20V, 20Ω	Repetitive 50Hz	-	500	A/μs
		$t_r < 0.5\mu\text{s}$, $T_j = 125^\circ\text{C}$	Non-repetitive	-	800	A/μs
$V_{T(TO)}$	Threshold voltage	At $T_{vj} = 125^\circ\text{C}$		-	1.5	V
r_T	On-state slope resistance	At $T_{vj} = 125^\circ\text{C}$		-	2.83	mΩ
t_{gd}	Delay time	$T_j = 25^\circ\text{C}$, $I_T = 50\text{A}$, $V_D = 300\text{V}$, $I_G = 1\text{A}$, $dI/dt = 50\text{A}/\mu\text{s}$, $dI_G/dt = 1\text{A}/\mu\text{s}$		1.5	-	μs
$t_{(ON)TOT}$	Total turn-on time			3	-	μs
I_H	Holding current	$T_j = 25^\circ\text{C}$, $I_{TM} = 1\text{A}$, $V_D = 12\text{V}$		60*	-	mA
t_q	Turn-off time	$T_j = 125^\circ\text{C}$, $I_T = 100\text{A}$, $V_R = 50\text{V}$, $dV/dt = 200\text{V}/\mu\text{s}$ (Linear to 60% V_{DRM}), $dI_R/dt = 30\text{A}/\mu\text{s}$, Gate open circuit	t_q code: Q	-	7	μs
			t_q code: W	-	10	μs

*Typical value.

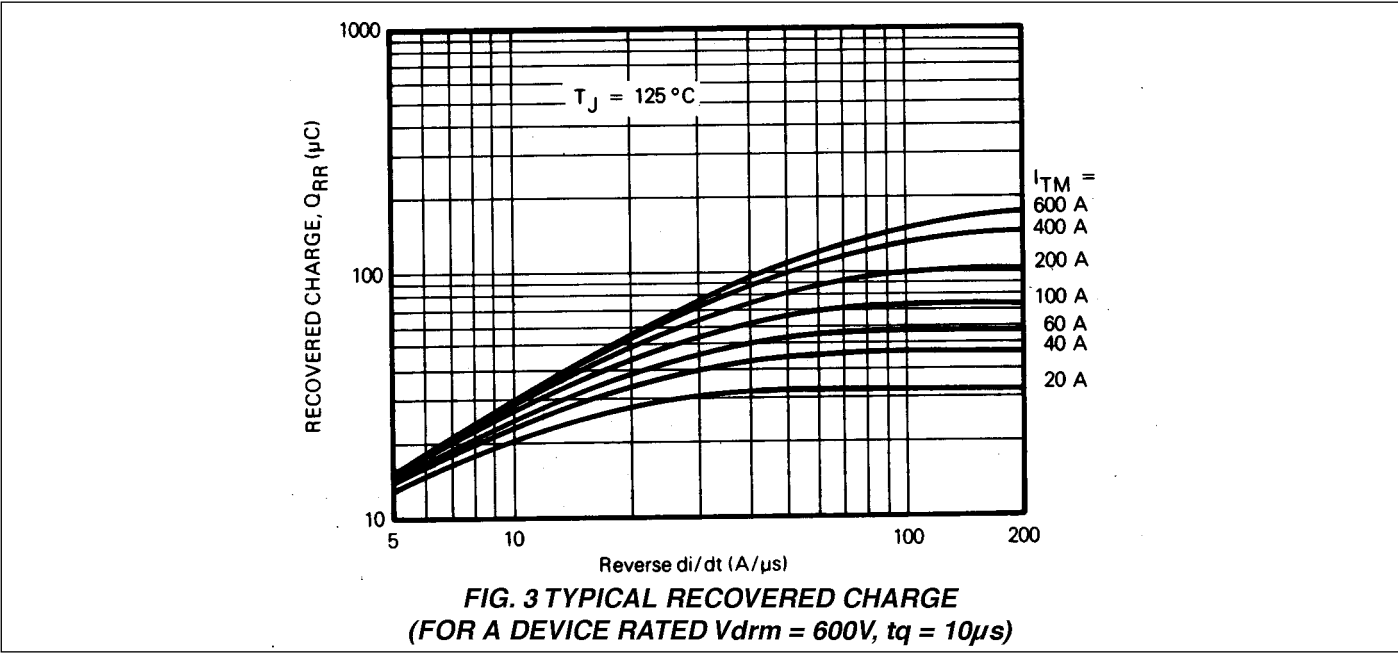
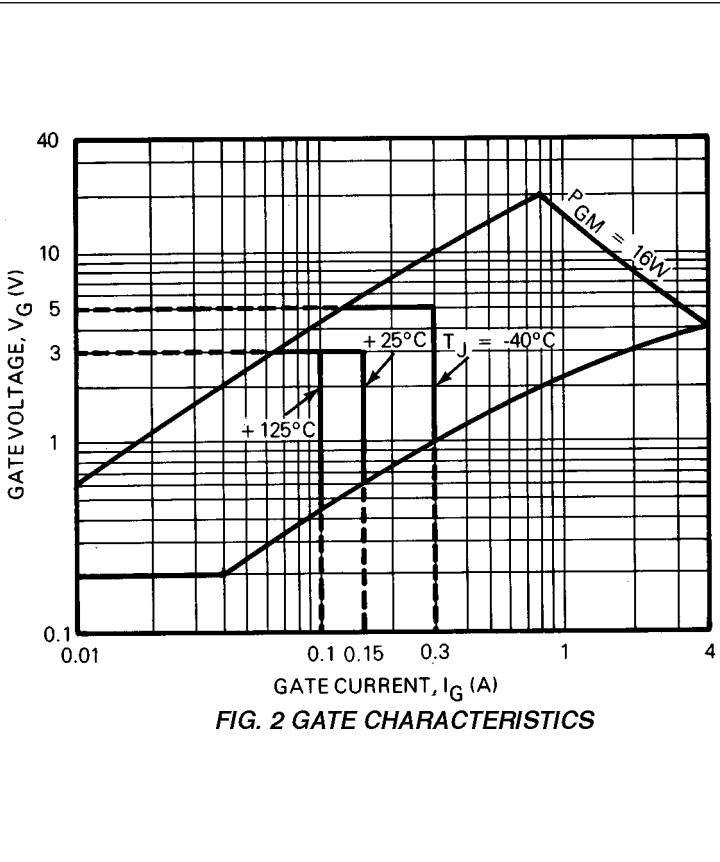
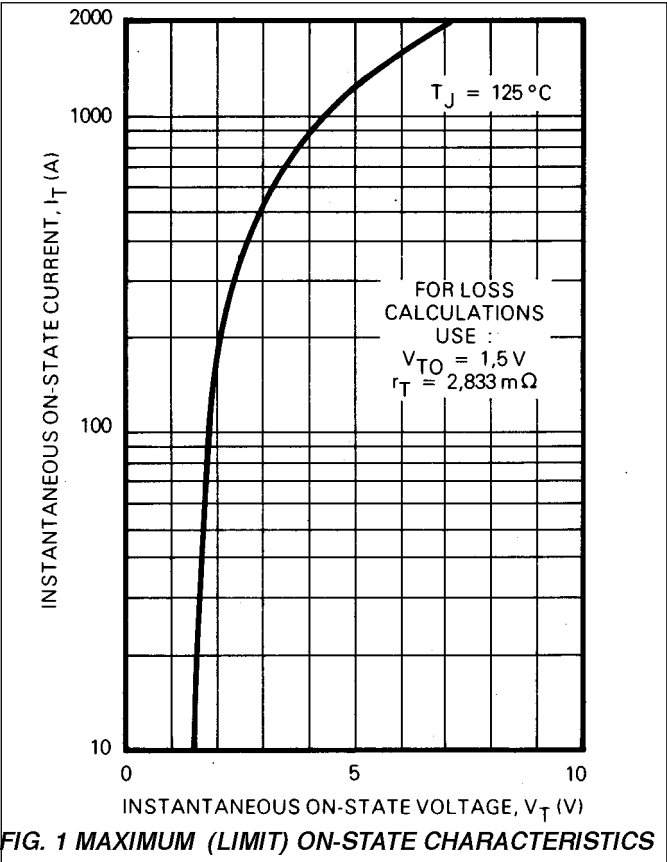
GATE TRIGGER CHARACTERISTICS AND RATINGS

Symbol	Parameter	Conditions	Typ.	Max.	Units
V_{GT}	Gate trigger voltage	$V_{DRM} = 12V, T_{case} = 25^{\circ}C, R_L = 6\Omega$	-	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



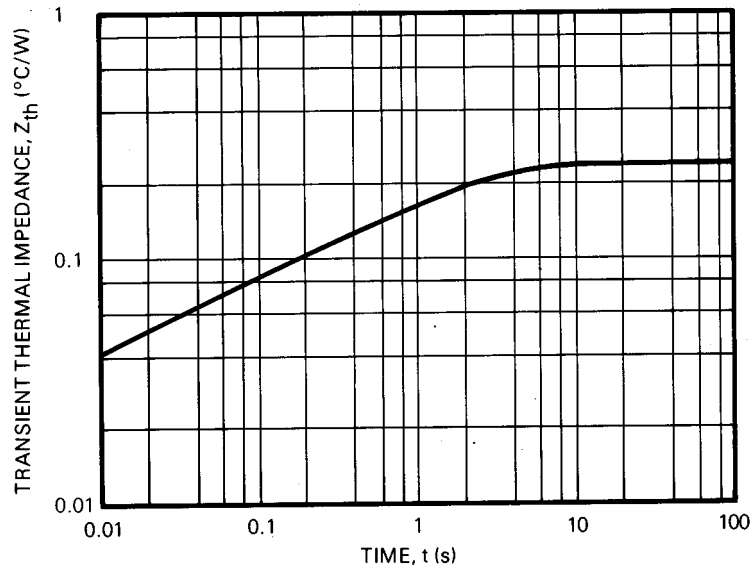
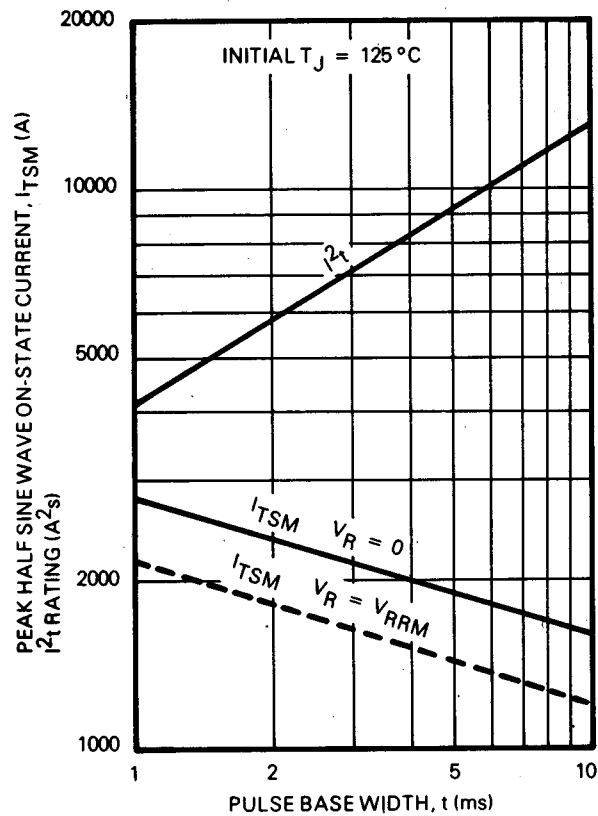


FIG. 4 TRANSIENT THERMAL IMPEDANCE - JUNCTION TO CASE

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

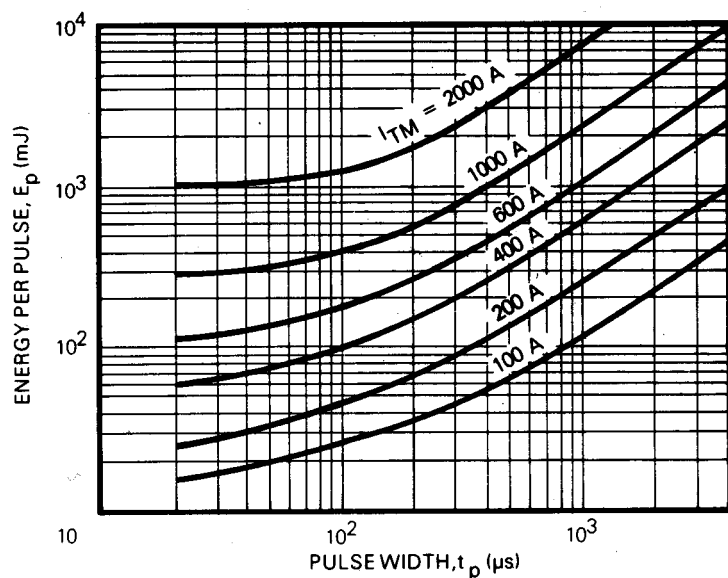
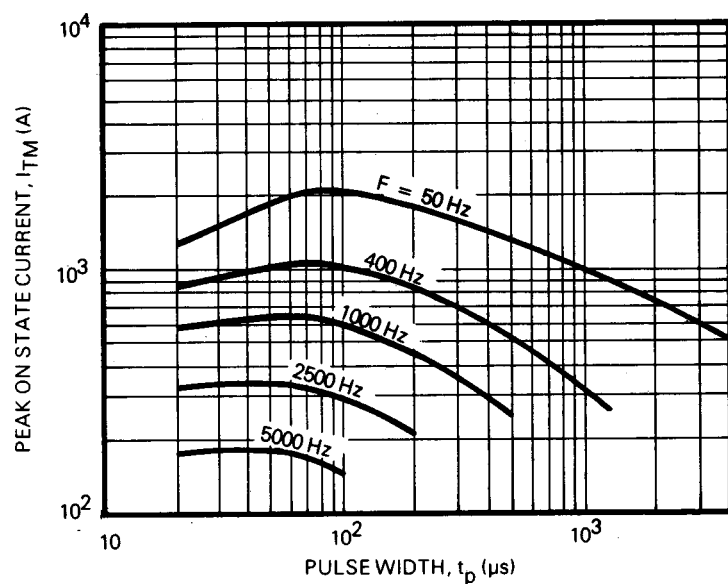
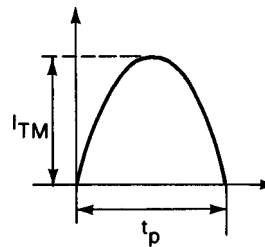


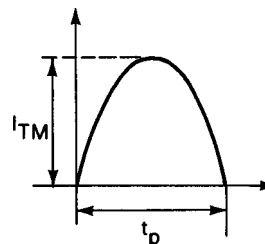
FIG. 6 ENERGY PER PULSE FOR SINUSOIDAL PULSES

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, $C = 0.22\mu F$, $R = 4.7\Omega$



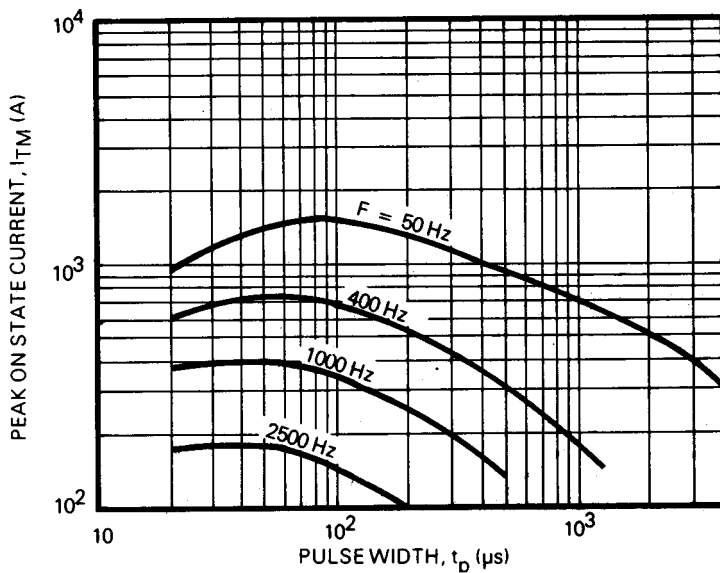


FIG. 8 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR $T_c = 90^\circ\text{C}$

NOTES:

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

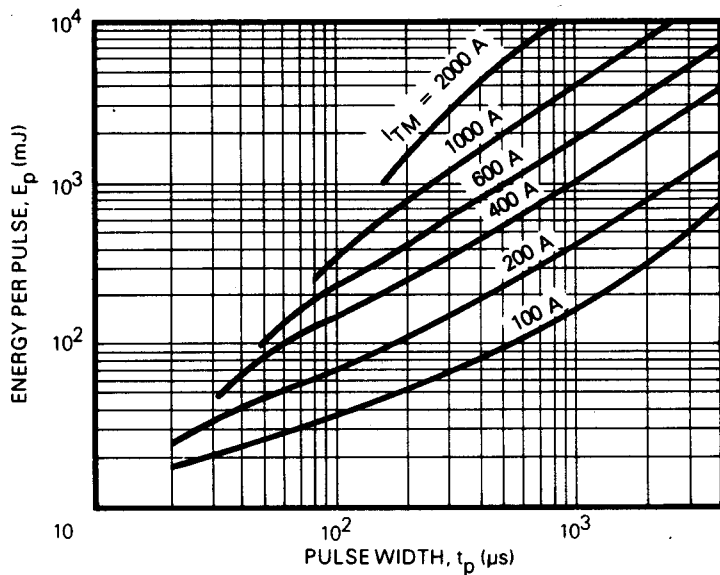
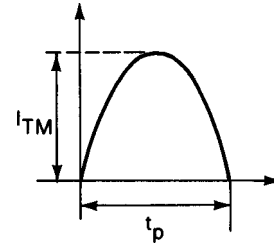
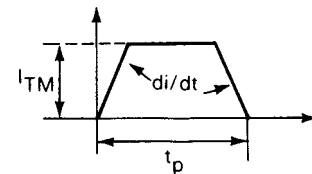


FIG. 9 ENERGY PER PULSE FOR TRAPEZOIDAL PULSES

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, $C = 0.22\mu\text{F}$, $R = 4.7\Omega$



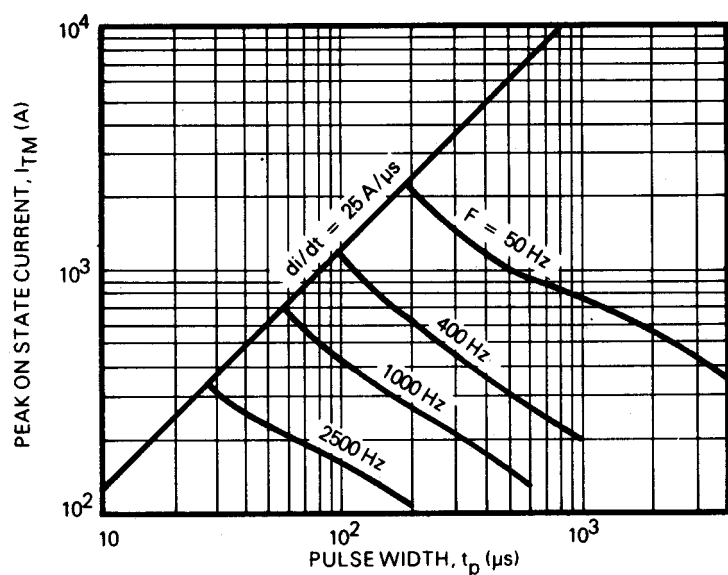


FIG. 10 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT
vs PULSE WIDTH FOR $T_c = 65^\circ\text{C}$

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, $C = 0.22 \mu\text{F}$, $R = 4.7 \Omega$

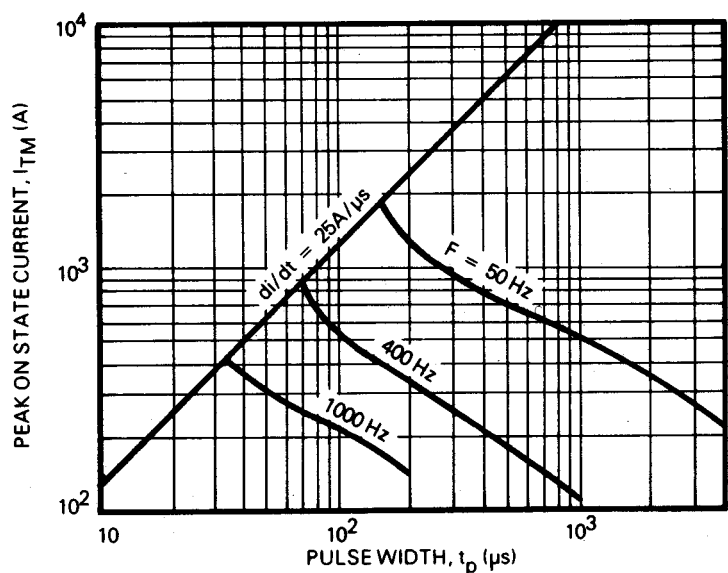
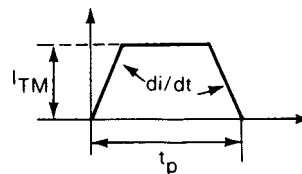
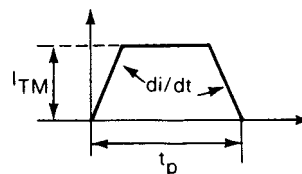


FIG. 11 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT
vs PULSE WIDTH FOR $T_c = 90^\circ\text{C}$

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, $C = 0.22 \mu\text{F}$, $R = 4.7 \Omega$



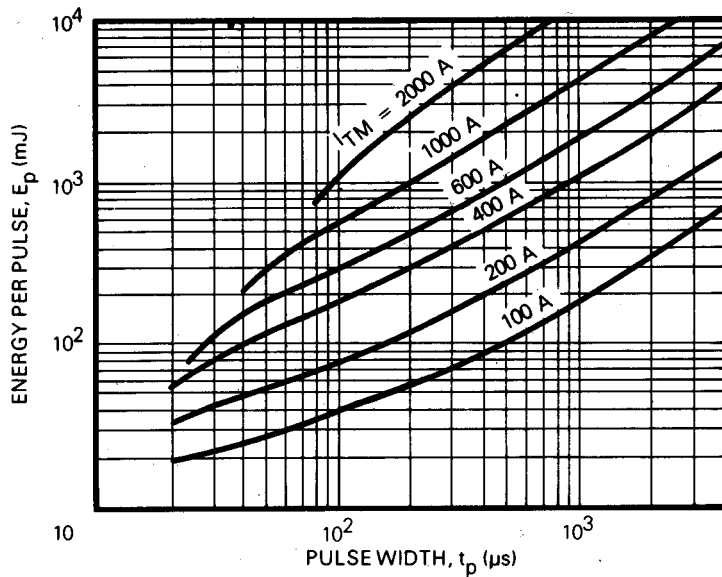
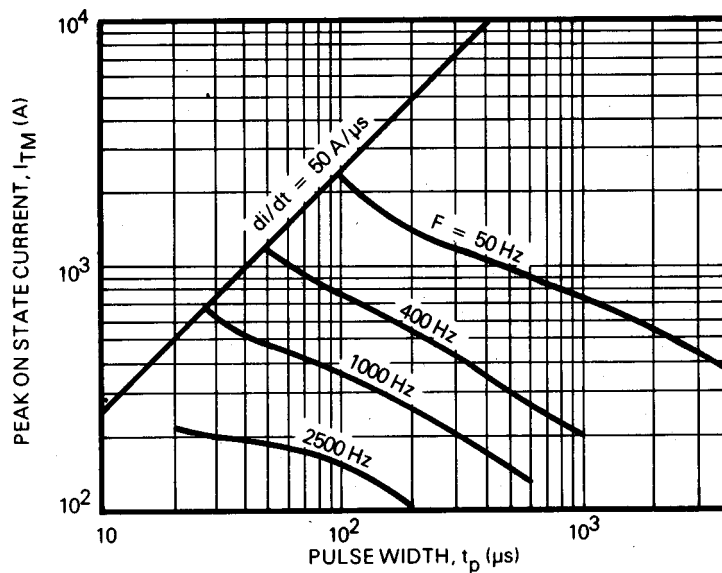
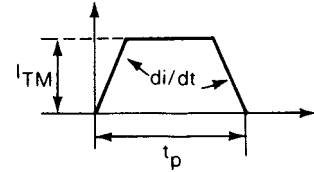


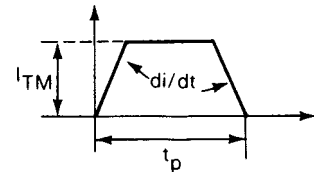
FIG. 12 ENERGY PER PULSE FOR TRAPEZOIDAL PULSES

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, $C = 0.22\mu F$, $R = 4.7\Omega$



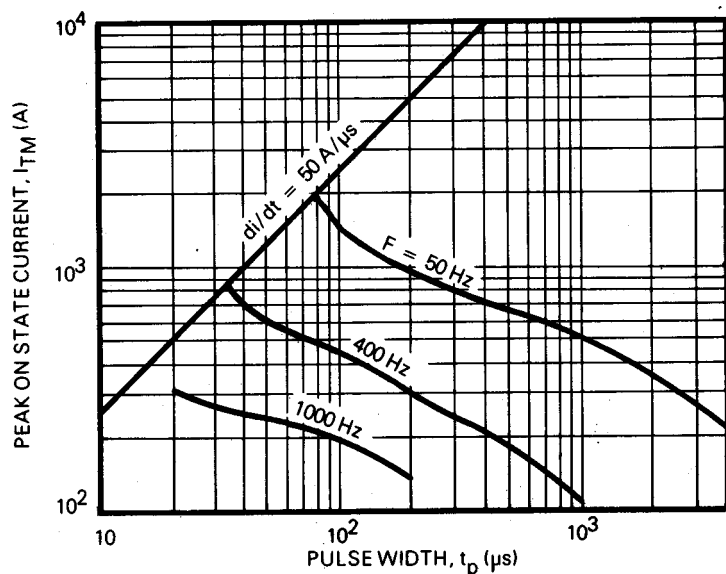


FIG. 14 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR $T_c = 65^\circ\text{C}$

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, $C = 0.22\mu\text{F}$, $R = 4.7\Omega$

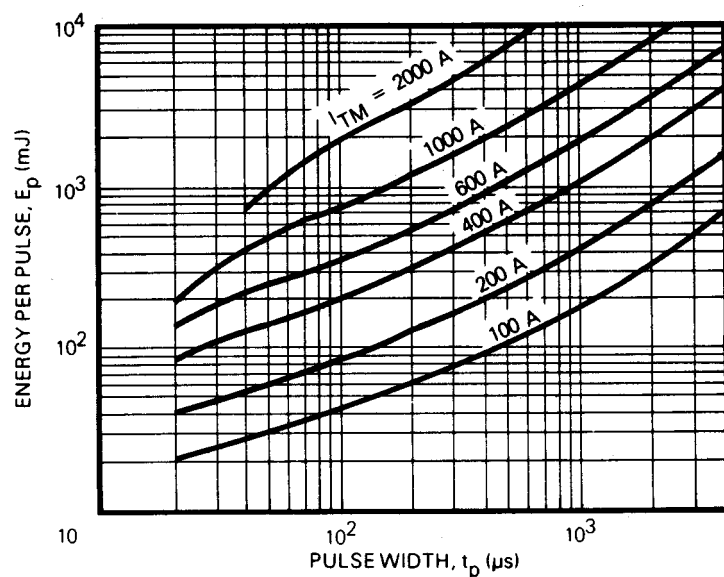
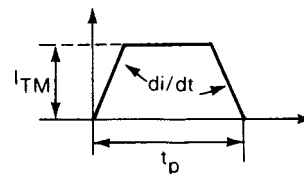
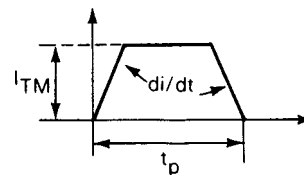


FIG. 15 ENERGY PER PULSE FOR TRAPEZOIDAL PULSES

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, $C = 0.22\mu\text{F}$, $R = 4.7\Omega$



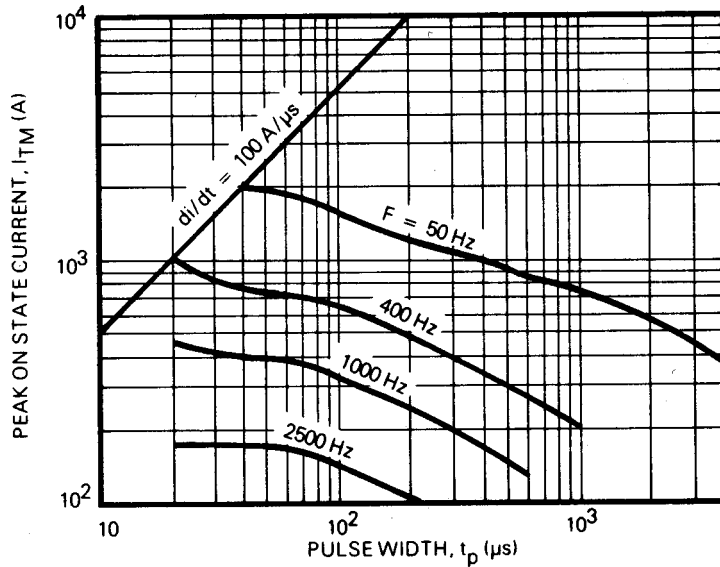


FIG. 16 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR $T_c = 65^\circ\text{C}$

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, $C = 0.22 \mu\text{F}$, $R = 4.7 \Omega$

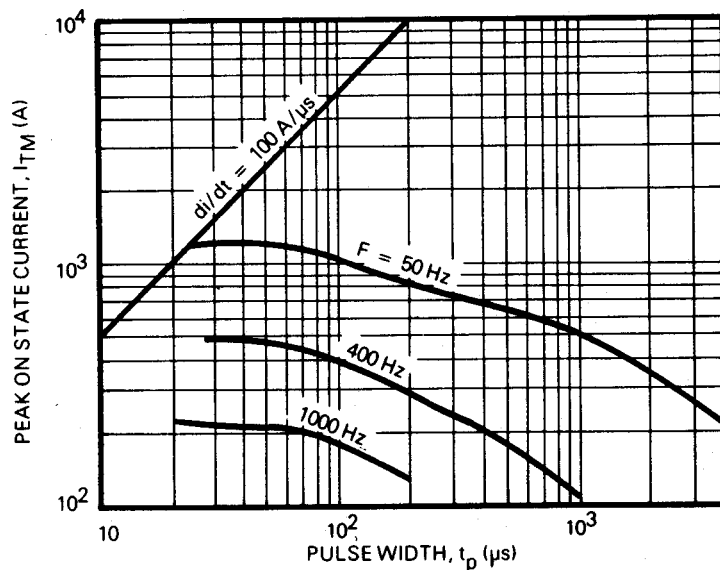
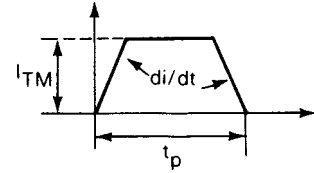
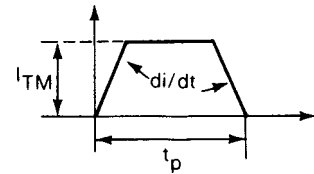


FIG. 17 MAXIMUM ALLOWABLE PEAK ON-STATE CURRENT vs PULSE WIDTH FOR $T_c = 90^\circ\text{C}$

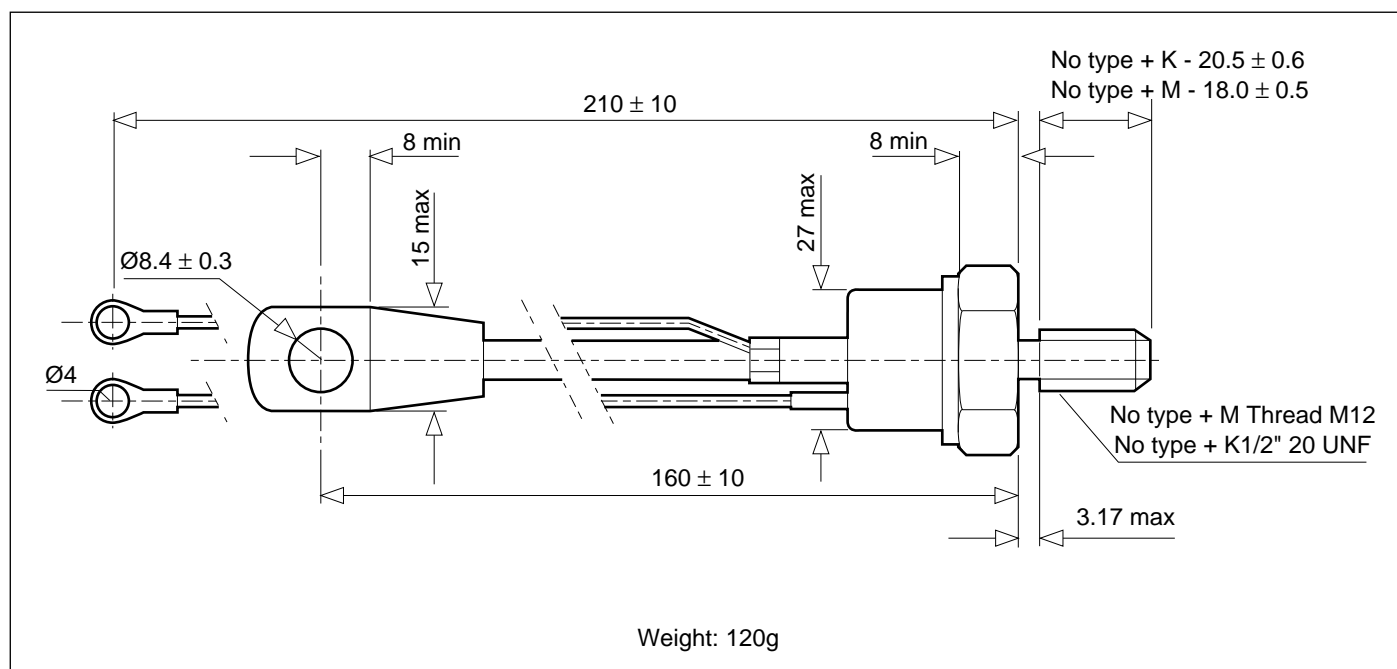
NOTES:

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 - TO94

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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