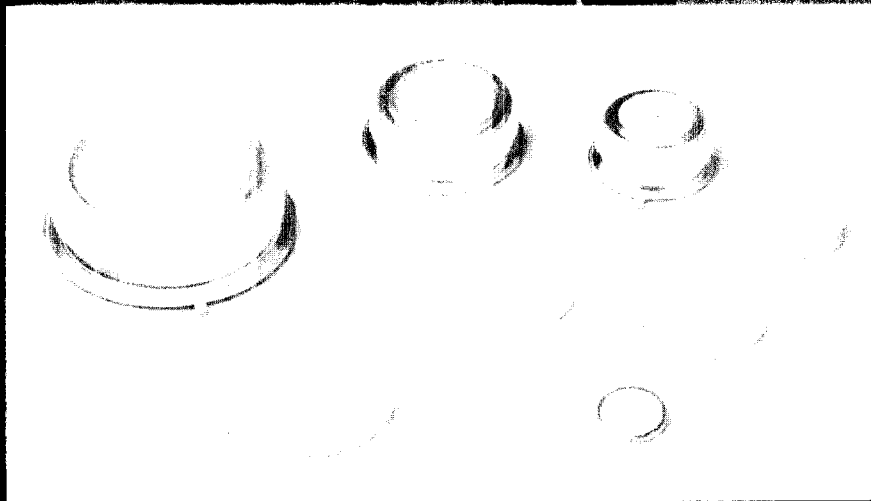


# SEMICONDUCTORS

## Distributed Gate Thyristors



## Shortform Design Guide



Westcode "D" and "R" series of fast switching thyristors have a regenerative interdigitated gate structure to ensure low switching losses and high di/dt performance. Low reverse recovery charge values, combined with the low forward switching losses, make these devices particularly attractive in applications such as Induction Heating Inverters, D.C. Chopper Drives, Uninterruptable Power Supplies, etc.

### Ordering

The full type number identifies voltage rating, dv/dt and turn-off time. An example would be an R216 series device with 1200 Volt repetitive forward and reverse rating and a turn-off time of 25µs with 200V/µsec commutating dv/dt.

<b>R216CH</b>	<b>12</b>	<b>F</b>	<b>J</b>	<b>O</b>
1.)	2.)	3.)	4.)	5.)

- 1.) Type number selected from table opposite
- 2.) Voltage grade code from Table 1
- 3.) dv/dt code from Table 2
- 4.) Turn-off time code from Table 3
- 5.)  $V_{RRM}$  (see below)

All types available with  $V_{RRM}$  ratings less than  $V_{DRM}$  ratings, for example where an anti-parallel diode is used. To identify these types a figure is inserted in space 5.) of the thyristor code — see above.

A single digit represents  $V_{RRM}$  in 10% increments of the  $V_{DRM}$  selected.

Example:

R305CH18FW4 has a  $V_{DRM}$  of 1800 volts and  $V_{RRM}$  of 720 volts.

The lower limit of the  $V_{RRM}$  is 200 volts.

An 'O' in position 5.) indicates  $V_{RRM} = V_{DRM}$ .

**Table 1. Voltage Code**

Code Number	$V_{DRM}$ and $V_{RRM}$	$V_{RSM}$
02	200	300
04	400	500
06	600	700
08	800	900
10	1000	1100
12	1200	1300
14	1400	1500
16	1600	1700
18	1800	1900
20	2000	2100
21	2100	2200
22	2200	2300
24	2400	2500
26	2600	2700
28	2800	2900
30	3000	3100
32	3200	3300
34	3400	3500
36	3600	3700

**Table 2. dv/dt Code**

dv/dt (V/µsec)	Code
20	C
50	D
100	E
200	F

**Table 3. Turn-off Time Code**

T <sub>q</sub> (µsec)	Code
10	N
12	M
15	L
20	K
25	J
30	H
35	G
40	2K
50	F
55	Y
60	2H
65	W
70	2G
75	E
100	D
120	4H
140	4G
160	8K
180	6H
200	2D.

Turn-off times shown in the table are measured at 125°C with re-applied dv/dt of 200V/µsec linear to 80%  $V_{DRM}$ , and 50 volts reverse. Current pulse and di/dt are shown for recovered charge measurements.

Other combinations of dv/dt and turn-off time giving shorter or longer turn-off times can be supplied subject to discussion with Westcode Sales Department.

**Note 1.**

$$I_{TSM} (8.3\text{msec}) = I_{TSM} (10\text{msec}) \times 1.066$$

$$I^2t (8.3\text{msec}) = I^2t (10\text{msec}) \times 0.943$$

**Note 2.**

$V_o$  Threshold voltage } for conduction loss and  
 $r_o$  Slope resistance } heatsink calculations.

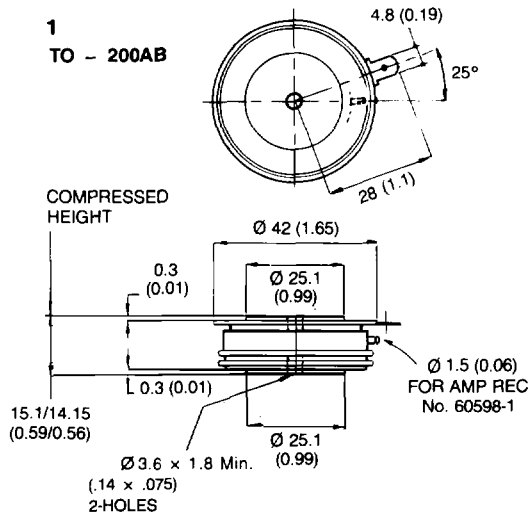
**Note 3.**

A blocking voltage derating factor of 0.13% per deg. C. is applicable for  $T_j$  below 25 deg. C.

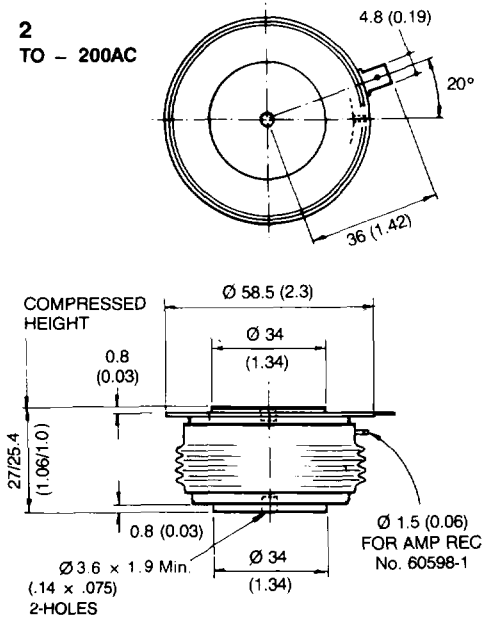
Type	$V_{DRM}/V_{RRM}$ Range Note 3 (V)	$T_q$ (200 V/1s) ( $\mu$ sec)	$I_{Tav}$ $T_{hs}$ 55 °C (A)	$I_{TRM}$ (A) 50% Duty Cycle Sine wave 1 KHz 5 KHz 10 KHz	$T_{sink}$ 55 °C Square wave 100 A/ $\mu$ sec 5 KHz 10 KHz	di/dt Rep./Non Rep. (A/ $\mu$ sec)	$I_{TRMS}$ 25 °C (A)	$I_T$ 25 °C (A)	$I_{TRM(1)}$ $V_A \leq 60\%$ $T_J$ 125 °C (A)	$I_{TRM(2)}$ $V_A \leq 10V$ $T_J$ 125 °C (A)	$I^2 t$ (2) Note 1 $T_J$ 125 °C (A <sup>2</sup> s)	Typical Recovered Charge at 125 °C, 50% Chord at $I_T$ & di/dt ( $\mu$ C) (A) (A/ $\mu$ sec)	$I_{DRM}$ $I_{RRM}$ (mA)	$I_{GT}/V_{GT}$ (mA/V)	$V_{TM}$ at $I_{TRM}$ at 125 °C (V)	$V_O$ at 125 °C Note 2 (V)	$r$ at 125 °C (m $\Omega$ )	Rth j - sink (K/W) d.c. & 180 ° 120 ° sine Rect.	Weight (gm)	Mounting Force (Kgf)	Fig. No.	Type								
R210CHx	200 - 1400	20 - 30	425	1200	1060	890	800	685	670	500/1000	870	690	4300	4700	110 x 10 <sup>3</sup>	41	550	40	60	200/3	2.70	1000	1.82	0.880	0.060	0.070	90	530/1000	1	R210C
R185CHx	200 - 1200	20 - 25	500	1500	1350	1200	1000	850	820	500/1000	1030	820	6000	6600	218 x 10 <sup>3</sup>	85	550	40	60	200/3	2.15	1000	1.51	0.640	0.060	0.070	90	530/1000	1	R185C
R216CHx	200 - 1200	20 - 30	560	1750	1550	1300	1180	1000	975	500/1000	1125	925	6300	6900	240 x 10 <sup>3</sup>	85	550	40	60	200/3	1.85	1000	1.23	0.620	0.060	0.070	90	530/1000	1	R216C
R180CHx	200 - 1000	12 - 20	810	2200	1700	1400	1500	1200	1050	1000/1500	1690	1260	8000	8800	387 x 10 <sup>3</sup>	45	1000	60	70	300/3	2.52	1400	2.10	0.300	0.032	0.041	340	1000/2000	2	R180C
R190CHx	200 - 1400	25 - 35	830	2600	2050	1650	1650	1450	1350	1000/1500	1715	1320	8500	9350	437 x 10 <sup>3</sup>	110	1000	60	70	300/3	2.40	1400	1.90	0.357	0.032	0.041	340	1000/2000	2	R190C
R200CHx	1200 - 2100*	60 - 75	880	2600	1900	1500	1700	1400	1200	1000/1500	1765	1455	7500	8250	340 x 10 <sup>3</sup>	355	1000	60	70	300/3	2.12	1400	1.45	0.480	0.032	0.041	340	1000/2000	2	R200C
R219CHx	200 - 1200	15 - 25	930	2700	2100	1650	1800	1500	1350	1000/1500	1895	1505	9000	9900	490 x 10 <sup>3</sup>	85	1000	60	70	300/3	2.04	1400	1.55	0.350	0.032	0.041	340	1000/2000	2	R219C
R220CHx	200 - 1200	20 - 30	959	3000	2300	1800	1950	1700	1500	1000/1500	1950	1550	9400	10800	580 x 10 <sup>3</sup>	115	1000	60	70	300/3	1.96	1400	1.50	0.330	0.032	0.041	340	1000/2000	2	R220C
R270CHx	200 - 800	10 - 20	990	3000	2500	2150	2000	1950	1900	1000/1500	2000	1628	11000	12000	720 x 10 <sup>3</sup>	40	1000	60	70	300/3	1.84	1400	1.35	0.350	0.032	0.041	340	1000/2000	2	R270C
R305CHx	1200 - 1800	60 - 70	1126	3400	2200	1600	2100	1500	1300	1000/1500	2268	1855	13500	15000	1.13 x 10 <sup>6</sup>	400	1000	60	150	300/3	2.30	2000	1.55	0.375	0.024	0.029	510	1900/2600	3	R305C
R325CHx	200 - 1400	25 - 40	1180	3600	2700	2000	2500	2000	1800	1000/1500	2398	1915	17000	18700	1.75 x 10 <sup>6</sup>	170	1000	60	150	300/3	2.20	2000	1.60	0.300	0.024	0.029	510	1900/2600	3	R325C
R350CHx	200 - 1200	20 - 25	1212	3800	2300	1800	2300	1700	1500	1000/1500	2496	1926	17600	19400	1.88 x 10 <sup>6</sup>	100	1000	60	150	300/3	2.18	2000	1.72	0.230	0.024	0.029	510	1900/2600	3	R350C
R355CHx	200 - 1200	20 - 30	1273	4900	2700	2100	2600	2000	1800	1000/1500	2600	2050	18000	19800	1.96 x 10 <sup>6</sup>	135	1000	60	150	300/3	2.02	2000	1.55	0.236	0.024	0.029	510	1900/2600	3	R355C
R395CHx	1200 - 2100*	65 - 75	1293	3900	2500	1900	2500	1900	1600	1000/1500	2594	2144	15500	17000	1.45 x 10 <sup>6</sup>	420	1000	60	150	300/3	1.90	2000	1.30	0.300	0.024	0.029	510	1900/2600	3	R395C
R400CHx	200 - 1200	25 - 35	1448	4600	3100	2300	2900	2300	2100	1000/1500	2943	2353	19500	21500	2.30 x 10 <sup>6</sup>	130	1000	60	150	300/3	1.70	2000	1.30	0.200	0.024	0.029	510	1900/2600	3	R400C
R600CHx	1600 - 2100†	50 - 70	2550	6400	4000	3000	4400	3300	3000	1000/1500	5087	4390	33800	37200	6.92 x 10 <sup>6</sup>	1100	4000	60	300	300/3	2.00	4000	1.30	0.175	0.011	0.012	1700	2700/4700	4	R600C
R800CHx	1200 - 1800	40 - 60	2700	7000	4100	3100	4700	3500	3000	1000/1500	5260	4560	35600	39000	7.61 x 10 <sup>6</sup>	700	4000	60	300	300/3	1.90	4000	1.25	0.163	0.011	0.012	1700	2700/4700	4	R800C
R1200CHx	200 - 1200	20 - 30	3375	9900	6600	4700	6800	7500	8000	1000/1500	6960	5480	43900	48300	11.7 x 10 <sup>6</sup>	225	4000	60	300	300/3	1.54	4000	1.22	0.08	0.011	0.012	1700	2700/4700	4	R1200C
D315CHx	2100 - 3600	140 - 200	1065	3200	2350	1750	2100	1550	1300	1000/1500	2110	1800	12800	14100	994 x 10 <sup>3</sup>	1350	1000	60	100	300/3	2.42	2000	1.39	0.514	0.024	0.029	510	1900/2600	3	D315C
D350CHx	2000 - 2600	80 - 120	1090	3250	2200	1650	2000	1400	1160	1000/1500	2177	1840	19760	24740	3.06 x 10 <sup>6</sup>	700	1000	60	100	300/3	2.40	2000	1.75	0.375	0.024	0.029	510	1900/2600	3	D350C
D390CHx	1800 - 2100†	45 - 70	1205	3800	2800	2100	2400	1900	1800	1000/1500	2426	1988	14800	16300	1.33 x 10 <sup>6</sup>	540	1000	60	100	300/3	2.10	2000	1.44	0.330	0.024	0.029	510	1900/2600	3	D390C
D405CHx	200 - 1800	40 - 65	1363	4900	3100	2500	2800	2300	2000	1000/1500	2749	2240	15500	17000	1.45 x 10 <sup>6</sup>	500	1000	60	100	300/3	1.80	2000	1.30	0.250	0.024	0.029	510	1900/2600	3	D405C
D450CHx	200 - 1200	20 - 30	1540	5000	4400	3500	3500	3200	3000	1000/1500	3140	2480	21500	23650	2.80 x 10 <sup>6</sup>	160	1000	60	100	300/3	1.60	2000	1.27	0.165	0.024	0.029	510	1900/2600	3	D450C

†  $V_{DRM}$  2500V,  $V_{RRM}$  2100V available on request.  
\*  $V_{RRM}$  1800 Volts max.

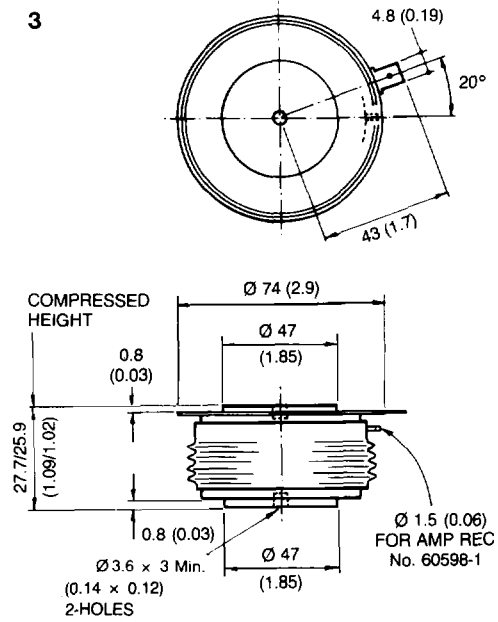
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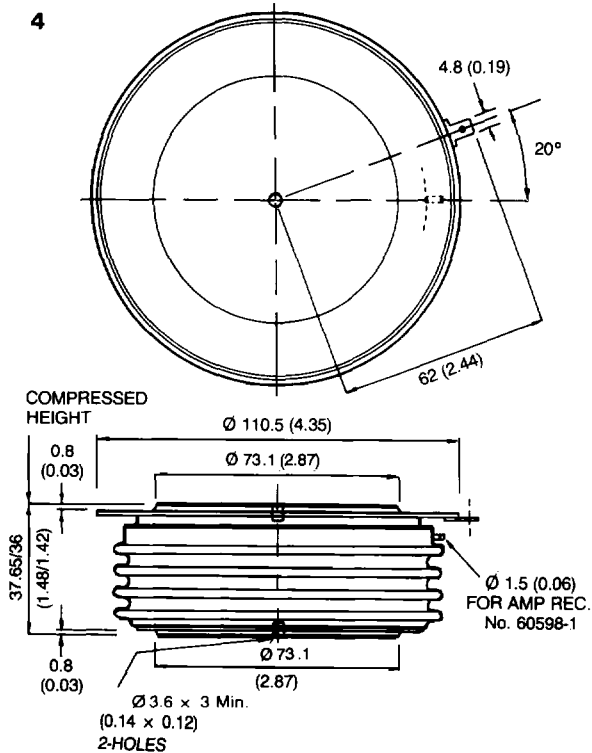
2  
TO - 200AC



3



4



**Note:**  
Standard gate leads  
300mm long  
available on request.

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