

Gate Turn-Off Thyristors

May 2013 Issue. 1

IXYS UK offers a broad range of high specification devices with voltage ratings to 4.5kV (2.8kV DC link) and controllable current ratings of up to 4kA are available to meet the toughest demands in applications such as traction propulsion and auxiliaries, AC industrial drives, FACT's and active VAr controllers. Offering both symmetrical devices for applications with a reverse blocking requirement e.g. current sourced inverters and asymmetric blocking devices for applications where no reverse blocking requirement exists e.g. voltage sourced inverters.

A new addition to the range is the 2500V, 500A, S0500YC GTO thyristor, available in a hermetically sealed capsule with a 25mm pole

Gate Turn-off Thyristors are still the component of choice when it comes to very high power converters and we remain totally committed to this technology for the foreseeable future.

Features and benefits

- Advanced technologies and lifetime control
- Controllable current ratings up to 4000A
- Fully hermetic pressure contact construction
- Available in 5 package sizes to industry standards

IXYS UK can also offer a range of complimentary products to its GTO thyristor range including:

- anti-parallel diodes
- snubber diodes
- snubber capacitors
- clamps



Applications

- Transportation propulsion
- Transportation auxiliaries
- Industrial drives
- Medium voltage AC drives
- Energy and renewables
- High power converters



Asymmetric GTO's

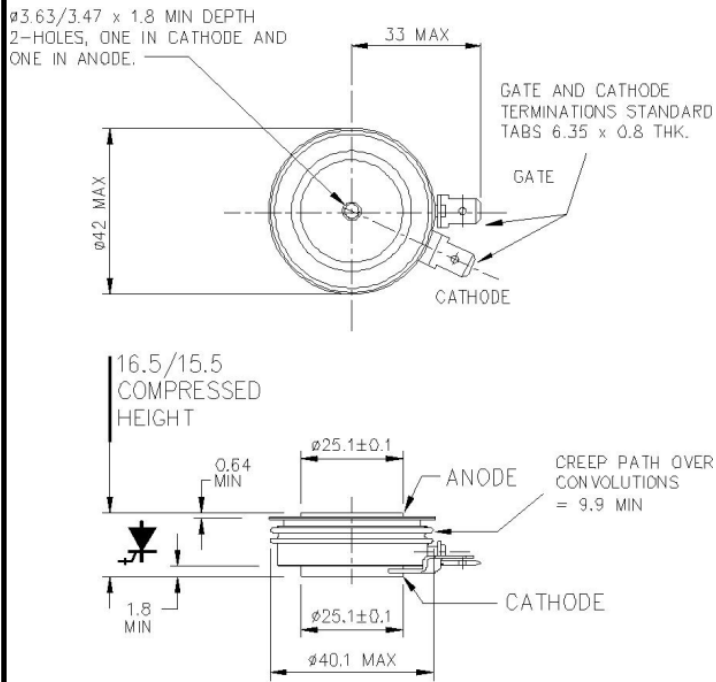
Type	V_{DRM} $V_{GK} = -2V$	V_{RRM}	$I_{TGM} @ C_S$		I_{TAV} $T_K = 55^\circ C$	I_{TSM}	P_t 10ms 1/2 sine $V_R \leq 60\% V_{RRM}$	Typ. Switching Times		V_T $I_T = I_{TGM}$	T_{JM}	R_{thJK} 180° Sine	Fig. No.
Part No.	V	V	A	μC	A	kA	kA^2s	t_{gt} μs	t_{gq} μs	V	°C	K/W	
G1000NC450	4500	18	1000	2.0	545	8.0	320×10^3	4.5	14	4.0	125	0.0270	W30
G1000QC250	2500	18	1000	1.0	443	6.5	211.25×10^3	3	13	4	125	0.0380	W35
G1000QC450	4500	18	1000	1.0	443	6.5	211.25×10^3	3	13	4	125	0.0380	W35
G2000HF250	2500	18	2000	4.0	1090	16.0	1.28×10^6	3.0	25	2.8	125	0.0220	W85
G2000HF450	4500	18	2000	4.0	940	13.7	938×10^3	4.0	25	3.5	125	0.0220	W85
G2500HF250	2500	18	2500	6.0	1085	16.0	1.28×10^6	3.0	25	3.1	125	0.0220	W85
G3000TF250	2500	18	3000	5.0	1600	30.0	4.5×10^6	3.0	25	2.5	125	0.0150	W86
G3000TF450	4500	18	3000	6.0	1381	24.0	2.88×10^6	4.0	25	4.0	125	0.0150	W86

Symmetric GTO's

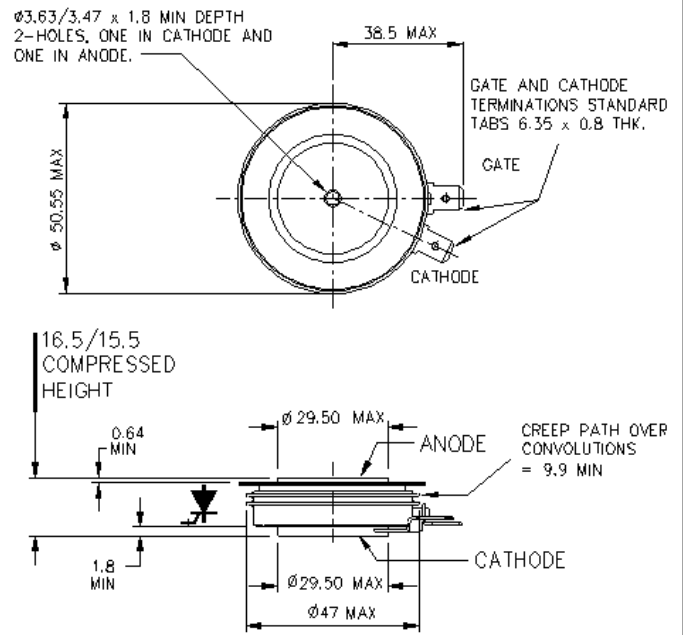
Type	V_{DRM} $V_{GK} = -2V$	V_{RRM}	$I_{TGM} @ C_S$		I_{TAV} $T_K = 55^\circ C$	I_{TSM}	P_t 10ms 1/2 sine $V_R \leq 60\% V_{RRM}$	Typ. Switching Times		V_T $I_T = I_{TGM}$	T_{JM}	R_{thJK} 180° Sine	Fig. No.
Part No.	V	V	A	μC	A	kA	kA^2s	t_{gt} μs	t_{gq} μs	V	°C	K/W	
S0300SR12D	1200	960	480	1.0	215	3.5	61.2×10^3	3.5	9	2.4	125	0.1300	W87
S0300SR12Y	1200	100	480	1.0	215	3.5	61.2×10^3	3.5	9	2.4	125	0.1300	W87
S0500YC20Y	2000	100	500	1.0	330	4.0	80×10^3	3.5	10	2.5	125	0.0870	W93
S0500YC25Y	2500	100	500	1.0	330	4.0	80×10^3	3.5	10	2.5	125	0.0870	W93
S0500KC200	2000	2000	500	1.0	330	4.0	80×10^3	3.5	10	2.5	125	0.0650	W34
S0500KC20Y	2000	100	500	1.0	330	4.0	80×10^3	3.5	10	2.5	125	0.0650	W34
S0500KC25D	2500	2000	500	1.0	330	4.0	80×10^3	3.5	10	2.5	125	0.0650	W34
S0500KC25Y	2500	100	500	1.0	330	4.0	80×10^3	3.5	10	2.5	125	0.0650	W34
S0700KC140	1400	1400	700	1.5	430	5.0	125×10^3	3.0	10	2.2	125	0.0630	W34
S0700KC14Y	1400	100	700	1.5	430	5.0	125×10^3	3.0	10	2.2	125	0.0630	W34
S0700KC17D	1700	1360	700	1.5	430	5.0	125×10^3	3.0	10	2.2	125	0.0630	W34
S0700KC17Y	1700	100	700	1.5	430	5.0	125×10^3	3.0	10	2.2	125	0.0630	W34
S1000NC300	3000	3000	1000	2.0	600	10.0	500×10^3	5.0	19	3.5	125	0.0270	W36
S1000NC30Y	3000	100	1000	2.0	600	10.0	500×10^3	5.0	19	3.5	125	0.0270	W36
S1000NC36D	3600	2880	1000	2.0	600	10.0	500×10^3	5.0	19	3.5	125	0.0270	W36
S1000NC36Y	3600	100	1000	2.0	600	10.0	500×10^3	5.0	19	3.5	125	0.0270	W36
S1200NC200	2000	2000	1200	3.0	790	13.0	840×10^3	4.5	19	2.7	125	0.0270	W36
S1200NC20Y	2000	100	1200	3.0	790	13.0	840×10^3	4.5	19	2.7	125	0.0270	W36
S1200NC25D	2500	2000	1200	3.0	790	13.0	840×10^3	4.5	19	2.7	125	0.0270	W36
S1200NC25Y	2500	100	1200	3.0	790	13.0	840×10^3	4.5	19	2.7	125	0.0270	W36

Fast Switching GTO's

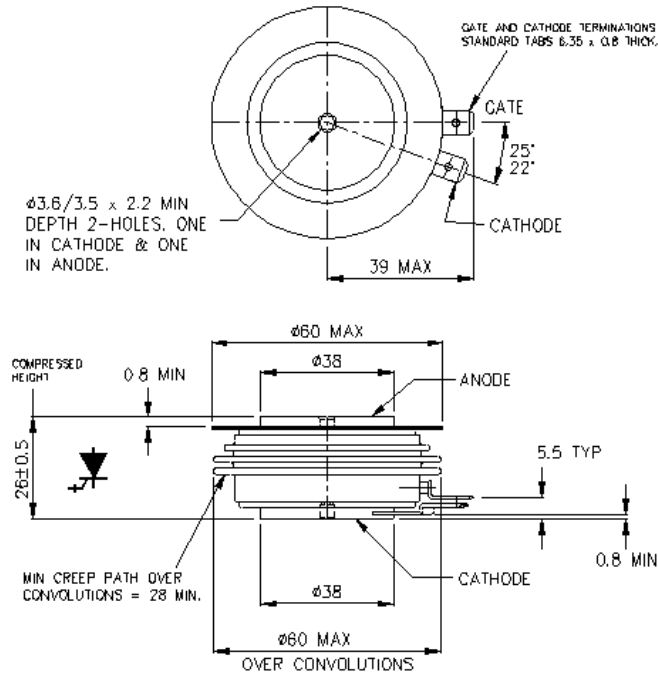
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Part No.	V	V	A	μC	A	kA	kA^2s	t_{gt} μs	t_{gq} μs	V	°C	K/W	
H0500KC200	2000	2000	500	1.0	280	3.0	45×10^3	2.0	5	3.2	125	0.0650	W34
H0500KC20Y	2000	100	500	1.0	280	3.0	45×10^3	2.0	5	3.2	125	0.0650	W34
H0500KC25D	2500	2000	500	1.0	280	3.0	45×10^3	2.0	5	3.2	125	0.0650	W34
H0500KC25Y	2500	100	500	1.0	280	3.0	45×10^3	2.0	5	3.2	125	0.0650	W34
H0700KC140	1400	1360	700	1.5	360	4.0	80×10^3	3.0	5	2.75	125	0.0630	W34
H0700KC14Y	1400	100	700	1.5	360	4.0	80×10^3	3.0	5	2.75	125	0.0630	W34
H0700KC17D	1700	1360	700	1.5	360	4.0	80×10^3	3.0	5	2.75	125	0.0630	W34
H0700KC17Y	1700	100	700	1.5	360	4.0	80×10^3	3.0	5	2.75	125	0.0630	W34
H1200NC200	2000	2000	1200	3.0	670	10.5	550×10^3	3.0	12	3.3	125	0.0270	W36
H1200NC20Y	2000	100	1200	3.0	670	10.5	550×10^3	3.0	12	3.3	125	0.0270	W36
H1200NC25D	2500	2000	1200	3.0	670	10.5	550×10^3	3.0	12	3.3	125	0.0270	W36
H1200NC25Y	2500	100	1200	3.0	670	10.5	550×10^3	3.0	12	3.3	125	0.0270	W36



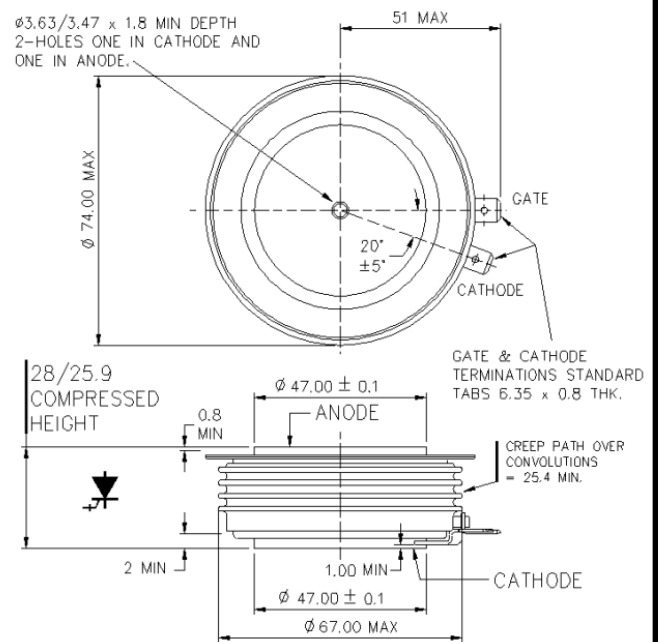
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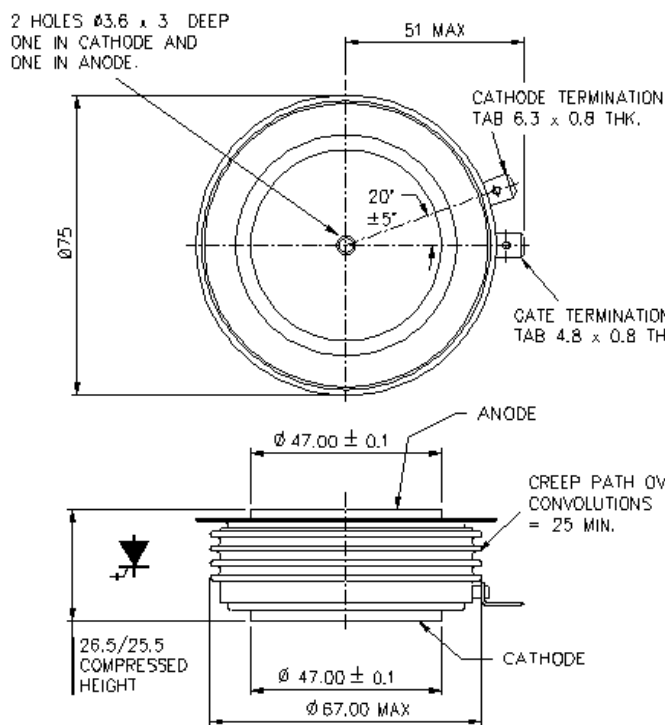
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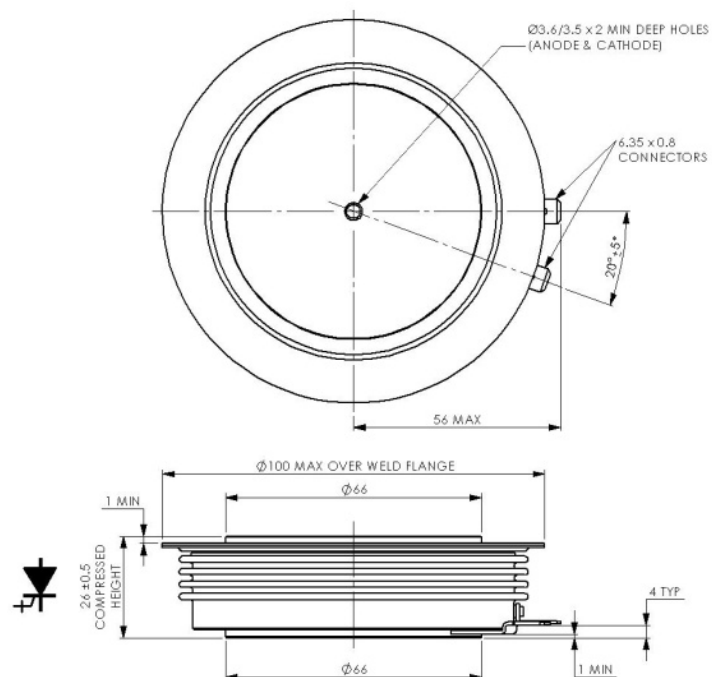
W35 – 101A358



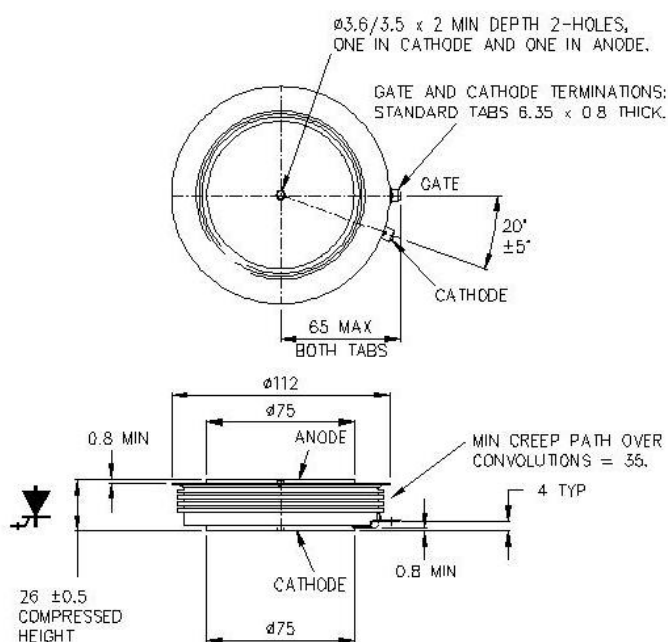
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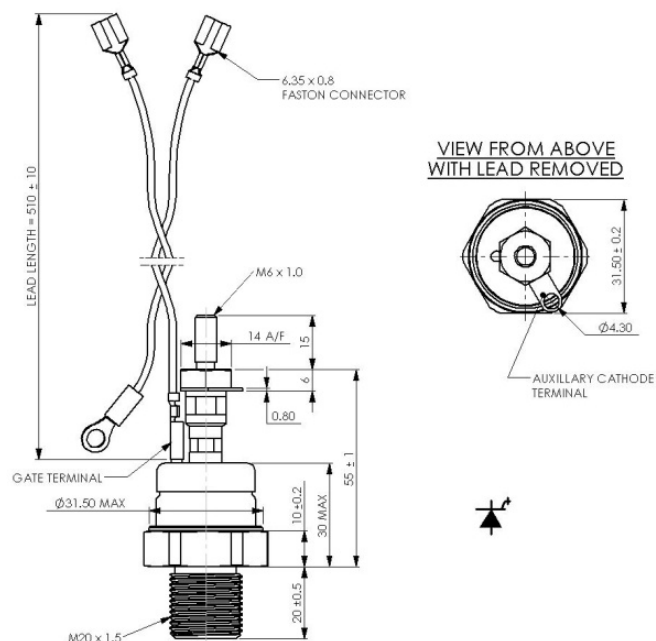
W30 – 101A343



W85 – 101A388



W86 – 101A316



W87 – 101A376

Cross reference of diodes[#] and capacitors suitable for most GTO applications

GTO	Anti-parallel Diode	Snubber Diode	Snubber Capacitor
Part No.	Part No.	Part No.	Part No.
G1000NC450	M0588LC450	M0371YH450	E53.R11-202T2W
G1000QC250	M0955LC250	M0347WC250	E53.H59-102T1W
G1000QC450	M0955LC250	M0371YH450	E53.H59-102T1W
G2000HF250	M1494NC250	M0955LC250	E53.R11-402T2W
G2000HF450	M1163NC450	M0659LC450	E53.R11-402T2W
G2500HF250	M1494NC250	M0955LC250	E53.Q59-602T2W
G3000TF250	M1565VF450	M0955LC250	E53.Q59-502T2W
G3000TF450	M1565VC450	M1104NC500	E53.Q59-602T2W
H0500KC200	M0347WC200	M0130RM200	E53.H59-102T1W
H0500KC20Y	M0347WC200	M0130RM200	E53.H59-102T1W
H0500KC25D	M0347WC250	M0130RM250	E53.H59-102T1W
H0500KC25Y	M0347WC250	M0130RM250	E53.H59-102T1W
H0700KC140	M0367WC220	M0139RM180	E53.H59-152T1W
H0700KC14Y	M0367WC220	M0139RM180	E53.H59-152T1W
H0700KC17D	M0367WC220	M0139RM180	E53.H59-152T1W
H0700KC17Y	M0367WC220	M0139RM180	E53.H59-152T1W
H1200NC200	M0955LC250	M0367WC220	E53.R11-302T2W
H1200NC20Y	M0955LC250	M0367WC220	E53.R11-302T2W
H1200NC25D	M0955LC250	M0367WC280	E53.R11-302T2W
H1200NC25Y	M0955LC250	M0367WC280	E53.R11-302T2W
S0300SR12D	M0367WC220	M0367WC220	E53.H59-102T1W
S0300SR12Y	M0367WC220	M0367WC220	E53.H59-102T1W
S0500YC20Y	M0347WC200	M0347WC200	E53.H59-102T1W
S0500YC25Y	M0347WC200	M0347WC200	E53.H59-102T1W
S0500KC200	M0347WC200	M0130RM200	E53.H59-102T1W
S0500KC20Y	M0347WC200	M0130RM200	E53.H59-102T1W
S0500KC25D	M0347WC250	M0130RM250	E53.H59-102T1W
S0500KC25Y	M0347WC250	M0130RM250	E53.H59-102T1W
S0700KC140	M0367WC220	M0139RM180	E53.H59-152T1W
S0700KC14Y	M0367WC220	M0139RM180	E53.H59-152T1W
S0700KC17D	M0367WC220	M0139RM180	E53.H59-152T1W
S0700KC17Y	M0367WC220	M0139RM180	E53.H59-152T1W
S1000NC300	M0659LC400	M0371YH350	E53.R11-202T2W
S1000NC30Y	M0659LC400	M0371YH350	E53.R11-202T2W
S1000NC36D	M0659LC400	M0371YH450	E53.R11-202T2W
S1000NC36Y	M0659LC400	M0371YH450	E53.R11-202T2W
S1200NC200	M0955LC200	M0367WC220	E53.R11-302T2W
S1200NC20Y	M0955LC200	M0367WC220	E53.R11-302T2W
S1200NC25D	M0955LC250	M0367WC250	E53.R11-302T2W
S1200NC25Y	M0955LC250	M0367WC250	E53.R11-302T2W

- Diode selection is influenced by the application. Consult factory for specific requirements

Anti-parallel and Snubber Diodes

Fast Recovery Diodes are an essential complement to any switching device and are more often than not the limiting factor in the design and performance of modern power converters. To address the needs of our customers, we have developed an unparalleled range of Fast Recovery Diodes. These diodes are available with blocking voltages up to 4.5kV and average current ratings to 2.4kA. The devices utilise compression bonding and fully hermetic packaging to deliver robust devices that you can rely on in demanding applications.

IXYS UK's range of fast recovery diodes include characteristics tailored to meet the requirements of snubber applications.

IXYS UK can also provide capacitors to suit our range of GTO thyristors.

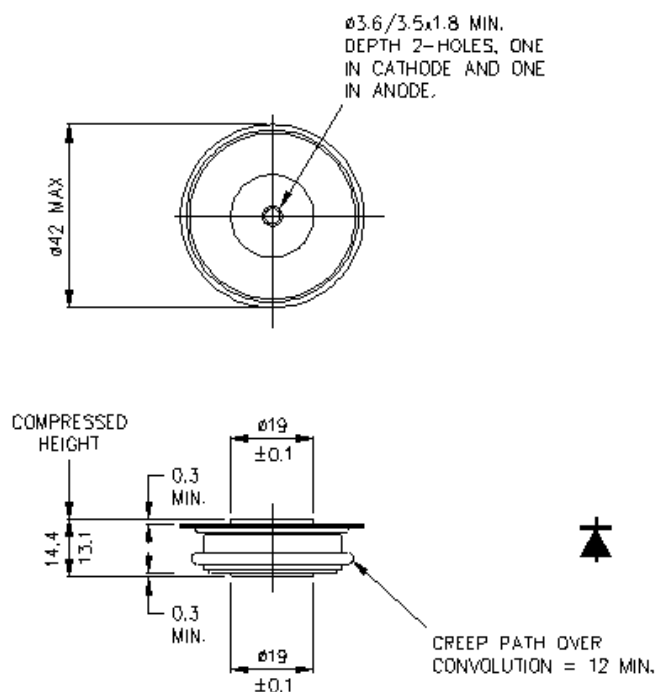
Snubber circuits are essential for reducing or eliminating voltage transients in inductive circuits where the sudden interruption of current flow can lead to a sharp rise in voltage across the device creating the interruption. The sharp rise in voltage is a transient, and can damage and lead to failure of the controlling device. The snubber attempts to prevent this undesired voltage by conducting transient current around the device. Snubber circuits usually consist of a network resistor, capacitor and diode, specially selected to cope with the demands of the circuit.

Features and benefits

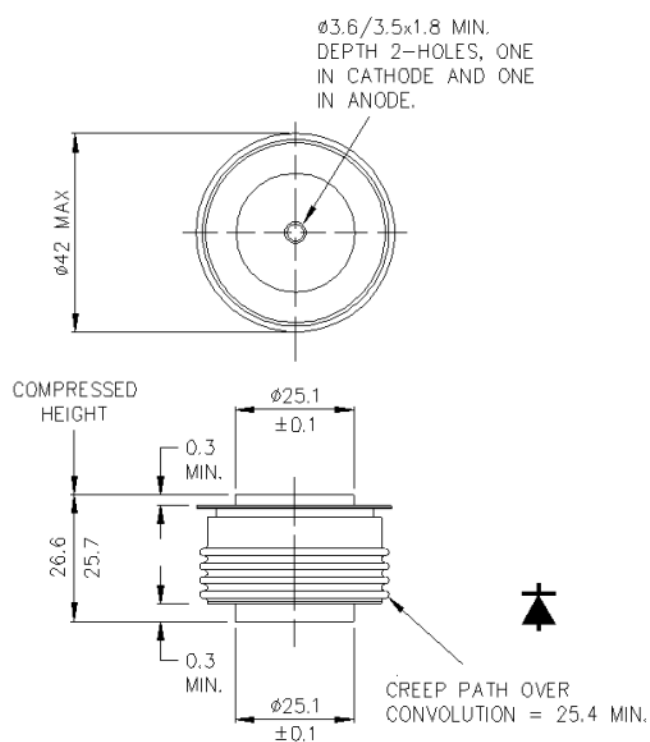
- Stud and capsule housing options available to suit your application
- Capsule package sizes from 25mm to 73mm poleface
- V_{RRM} from 200V to 4500V available
- Current rating up to 2413A I_{FAV}
- Minimum recovery times down to 1 μ s (50% chord)



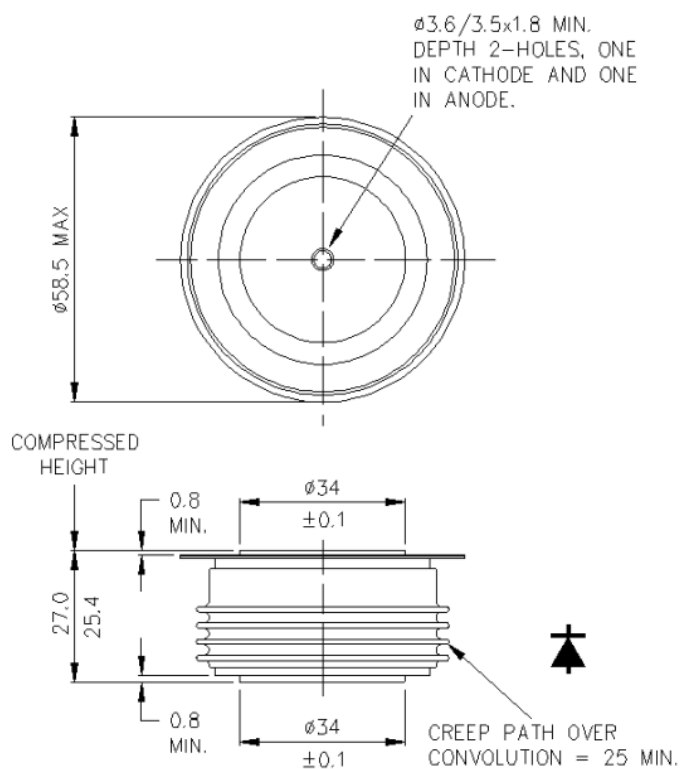
Part No.	V _{RRM} V	I _{FAV} T _K =55 ^o C A	I _{FSM} 10ms 1/2 sine V _R - ≤ 60% V _{RRM} A	I ² t A ² s	Typ. Reverse Recovery Parameters				V _{TO} r _T @ T _{JM}		T _{JM} °C	R _{thJK} d.c. 180° sine K/W	Fig. No.
					T _{JM}				V mΩ				
					t _{rr} μs	Q _{rr} μC	@ I _{FM} A	@ -di _F /dt A/μs					
M0130RM200	2000	130	2240	25.0 x 10 ³	2.60	430	1000	150	1.290	1.540	125	0.3000	W21
M0130RM250	2500	130	2240	25.0 x 10 ³	2.60	430	1000	150	1.290	1.540	125	0.3000	W21
M0139RM120	1200	139	2450	30.0 x 10 ³	1.00	125	1000	100	1.240	1.280	125	0.3000	W21
M0139RM180	1800	139	2450	30.0 x 10 ³	1.00	125	1000	100	1.240	1.280	125	0.3000	W21
M0347WC200	2000	347	4250	90.3 x 10 ³	2.80	210	550	40	1.210	1.200	125	0.0900	W1
M0347WC250	2500	347	4250	90.3 x 10 ³	2.80	210	550	40	1.210	1.200	125	0.0900	W1
M0367WC220	2200	367	4500	101 x 10 ³	3.30	300	550	40	1.280	0.920	125	0.0900	W1
M0371YH350	3500	371	4900	120 x 10 ³	3.20	1260	1000	200	1.050	1.650	150	0.1000	W3
M0371YH450	4500	371	4900	120 x 10 ³	3.20	1260	1000	200	1.050	1.650	150	0.1000	W3
M0588LC450	4500	588	3955	78.2 x 10 ³	3.50	450	1000	60	2.320	1.770	150	0.0330	W4
M0659LC450	4500	659	7620	290 x 10 ³	4.20	800	1000	60	1.710	0.925	125	0.0330	W4
M0863LC300	3000	863	10000	500 x 10 ³	4.80	950	1000	60	1.308	0.538	125	0.0330	W4
M0863LC360	3600	863	10000	500 x 10 ³	4.80	950	1000	60	1.308	0.538	125	0.0330	W4
M0955LC200	2000	955	11700	684 x 10 ³	3.40	500	1000	60	1.440	0.330	125	0.0330	W4
M0955LC250	2500	955	11700	684 x 10 ³	3.40	500	1000	60	1.440	0.330	125	0.0330	W4
M1104NC450	4500	1104	13000	845 x 10 ³	6.00	2100	1000	60	1.370	0.553	125	0.0220	W5
M1163NC450	4500	1163	10800	583 x 10 ³	6.40	1200	1000	60	1.500	0.770	150	0.0220	W5
M1494NC250	2500	1494	19600	1.92 x 10 ⁶	3.90	815	1000	60	1.150	0.265	125	0.0220	W5
M1565VF450	4500	1565	19700	1.94 x 10 ⁶	5.00	2800	1000	200	1.090	0.360	125	0.0180	W43
M2413VF250	2500	2413	32000	5.12 x 10 ⁶	5.00	2500	1000	200	1.090	0.121	125	0.0160	W43



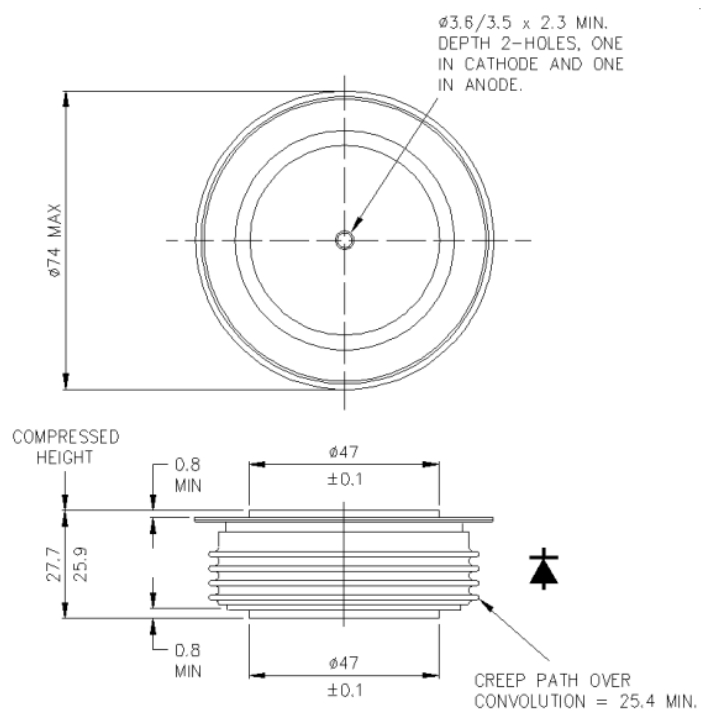
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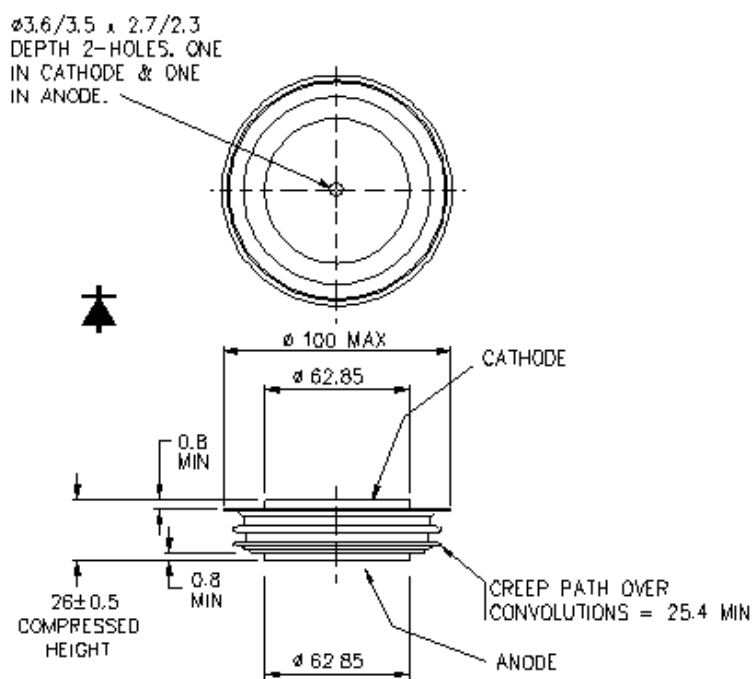
W3 – 100A317



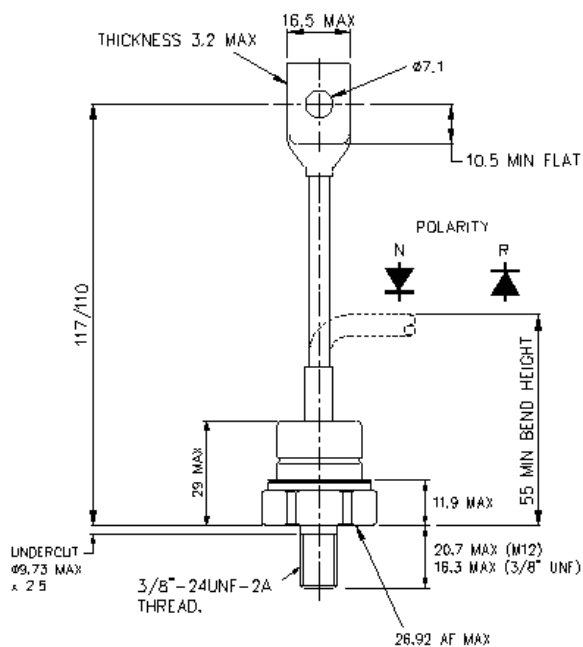
W4 – 100A243



W5 – 100A249



W43 – 100A320



W21 – 100A294

Snubber Capacitors

IXYS UK supply a broad range of capacitors suitable for GTO snubber circuits. These capacitors have a low series resistance and high pulse strength; they also have very good self-healing characteristics without loss of capacitance.

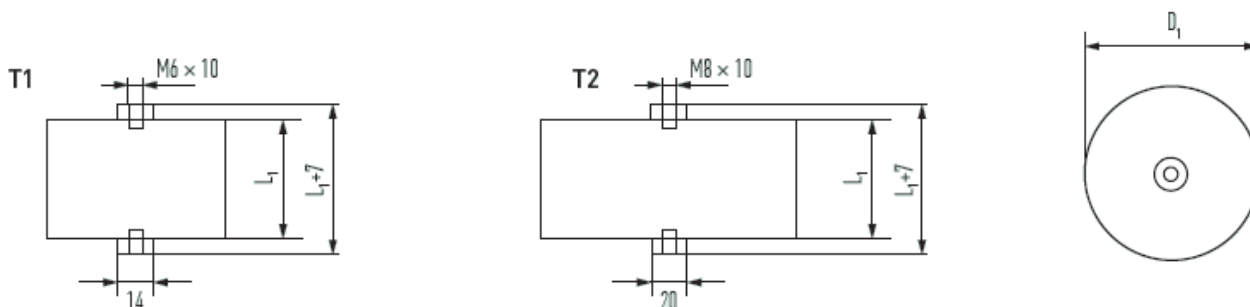
These capacitors consist of a flame retardant plastic can filled with solid resin to ensure reliable operation even under the most extreme environmental conditions.

Features and benefits

- Dry construction – can be mounted in any position
- Self-healing
- Low self-inductance
- Low series resistance
- High RMS current capability
- High surge current capability



Part Number	Rated Capacitance C_N μ F	Series Resistance R_s mW	Thermal Resistance R_{th} K/W	Maximum Current (RMS) I_{max} A	Maximum Current (Peak) $\hat{I}$ kA	Peak Surge Current I_s kA	Rated Energy Content W_N Ws	Self Inductance L_e nH	Rated Voltage DC U_N (V) DC	Rated Voltage AC U_N (V) AC	rms at sinusoidal voltage U_{rms} (V)	Non-repetitive Surge voltage U_s (V)	Rated Can Diameter D_1 mm	Rated Can Length L_1 mm
E53.H59-102T1W	1	1.6	8.1	40	0.35	1.8	5	15	3200	1050	750	4800	55	59
E53.H59-152T1W	1.5	2.4	8.1	32	0.27	1.35	6	15	2800	700	500	4200	55	59
E53.R11-202T2W	2	1.2	2.1	100	3	10	16	15		4000	2800	6000	115	110
E53.H59-252T1W	2.5	1.8	8.1	40	0.37	1.1	6	15	2250	700	500	3375	55	59
E53.M59-252T2W	2.5	0.65	5.9	75	0.9	4.5	13	15	3200	1050	750	4800	75	59
E53.R11-302T21W	3	1.2	2.1	125	2.1	6.3	38	15	5000	2100	1500	7500	115	110
E53.P59-402T2W	4	0.5	4.7	80	1.5	7.5	20	15	3200	1050	750	4800	95	59
E53.R11-402T21W	4	1	2.1	125	2.5	7.5	50	15	5000	2100	1500	7500	115	110
E53.Q59-502T2W	5	0.32	4.2	100	1.8	9.0	26	15	3200	1050	750	4800	105	59
E53.M59-602T2W	6	0.75	5.9	70	0.88	2.6	15	15	2250	700	500	3375	75	59
E53.Q59-602T2W	6	0.28	4.2	100	2.2	11	31	15	3200	1050	750	4800	105	59



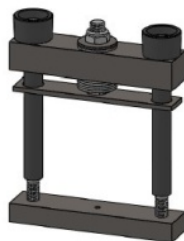
For larger capacitors suitable for energy efficient and asymmetric snubber configurations such as McMurray or Undeland, please consult factory

Bar clamps for GTO Thyristors

Part Number	Rod Size & Length mm	Insulator Size & Length mm	Fixing centres	Pole Face	Clamp Forces	Fig No.
XSK1500DA076038	M8 x 90	M8 x 60	89	32	10kN to 20kN	WC51
XSK1500DA076076	M8 x 130	M8 x 95				
XSK1500DA076101	M8 x 160	M8 x 120				
XSK2000DA076038	M8 x 95	M8 x 60	89	38	13kN to 20kN	WC52
XSK2000DA076076	M8 x 130	M8 x 95				
XSK2000DA076101	M8 x 160	M8 x 120				
XSK3000DA076038	M8 x 100	M8 x 65	89	50	27kN to 34kN	WC53
XSK3000DA076076	M8 x 130	M8 x 100				
XSK3000DA076101	M8 x 160	M8 x 125				
XSK3400DA076038	M8 x 100	M8 x 65	89	50	25kN to 31kN	WC54
XSK3400DA076076	M8 x 140	M8 x 105				
XSK3400DA076101	M8 x 160	M8 x 130				
XSK3800DA116M076	M10 x 150	M12 x 100	132	66	32kN to 38kN	WC55
XSK3800DA116M101	M10 x 180	M12 x 125				
XSK4400DA116M076	M10 x 150	M12 x 105	132	68	36kN to 44kN	WC56
XSK4400DA116M101	M10 x 180	M12 x 130				
XSK6000DA116M076	M10 x 150	M12 x 105	132	75	50kN to 60kN	WC57
XSK6000DA116M101	M10 x 180	M12 x 130				



WC51



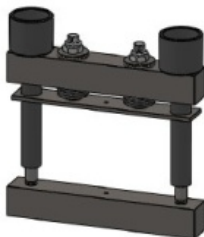
WC52



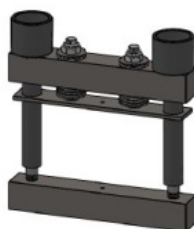
WC53



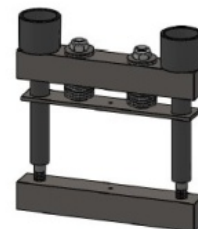
WC54



WC55



WC56



WC57

For complete outline drawings please consult factory

Pulse Power Assemblies

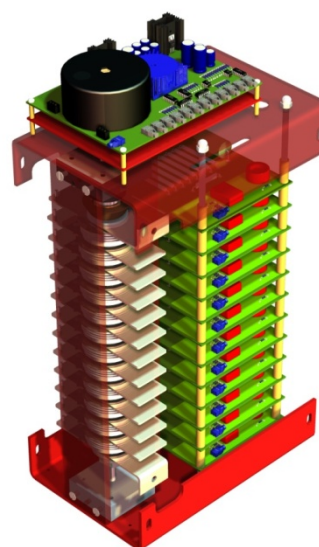
As a pioneer in the development of solid state pulsed power components and systems, we are able to deliver anything from discrete components to fully integrate energy transfer switches.

With systems successfully delivering voltage ratings of over 50kV and pulsed currents to 140kA, we have a wealth of experience to put at your disposal.

Our modular design solutions based on pulse thyristor technology and integrating control and protection functions provide you with a flexible 'black box' approach to energy transfer problems

We are involved with pulsed power on a global basis, working with prestigious research organisations such as CERN, Switzerland as well as medium volume manufacture for emerging commercial applications such as laser supplies, PUV and PEF sterilisation, magnetisation and metal forming.

We have a philosophy of working closely with our customers to ensure that we deliver the right solution in the right time and right price – First time and every time.



At IXYS UK, we have over 70 years of experience in power circuit design and manufacture, our dedicated team of design engineers can deliver custom solutions for a whole range of design problems ranging from simple crowbar applications to complicated multi-megawatt power converters. Utilising the latest 3D modelling techniques, we can reduce the cycle time from concept to manufacture and ensure successful system level integration into our customers' equipment.

IXYS UK Westcode Ltd are at the forefront of solid state pulsed power technology, offering custom solutions to complex pulsed power problems.

IXYS UK's range of pulse thyristors have voltage ratings of 2.5kV, pulsed currents to 50kA peak and di/dt capabilities to over 11kA/μs are available. Please consult factory for other requirements

Part No.	V_{DRM} $V_{GK} = 2V$	V_{RRM}	V_{DC} $V_{GK} = 2V$	I_{PULSE}	di/dt_{cr}	V_{TO}	r_T	T_{JM}	R_{thJC} 180° Sine K/W	Fig. No.
	V	V	V	kA	kA/μs	V	mΩ	°C		
Y200CKC250	2500	2000	1500	20	5	1.216	2.196	125	0.065	W34
Y500CNC250	2500	2000	1500	50	11	1.755	1.122	125	0.027	W36

GTO thyristor product matrix

The following table highlight the current and future range of GTO thyristors available from IXYS UK Westcode Ltd, arranged by voltage rating, technology and package size

Voltage											
1200V	S0300										
1800V		Future introduction	S0700	H0700							
2500V		S0500 (New)	S0500	H0500	G1000	S1200	H1200		G2000 & G2500	G3000	
3600V						S1000					
4500V					G1000			G1000	G2000	G3000	In development
Technology	Symmetrical	Symmetrical	Symmetrical	Fast Symmetrical	Asymmetric	Symmetrical	Fast Symmetrical	Asymmetric	Asymmetric	Asymmetric	Asymmetric
Package											
Stud	SR										
15mm		YC	KC	KC							
26mm					QL	NC	NC	NC	HF	TF	EF
Silicon											
Die size	25mm	30mm	32mm	32mm	43mm	50mm	50mm	53mm	68mm	87mm	91mm



GTO Chopper circuit



Certificate FM26085

IXYS UK Westcode Ltd's BS EN ISO9001 quality system is registered by BSI



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