Thyristors (SCRs), triacs, and AC switches portfolio

Discrete and Filter Division

Automotive and Discrete Group

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Environmentally friendly thyristors (SCR), triacs, and AC switches

HF HALOGEN FREE

No fluorine

No chlorine

No bromine

No iodine

No astatine

RoHS 2011/65/EU

(REACh compliant)

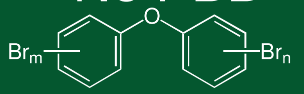
No lead plating

No mercury

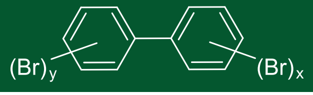
No cadmium

No hexavalent chromium

No PBB



No PBDE



UL

UL94-V0 flammability

SUSTAINABLE TECHNOLOGY by ST

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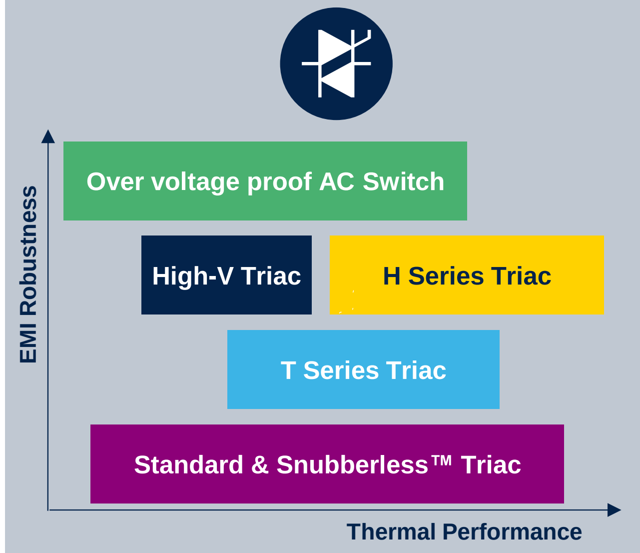
High-voltage, high-temperature thyristor portfolio

STPOWER

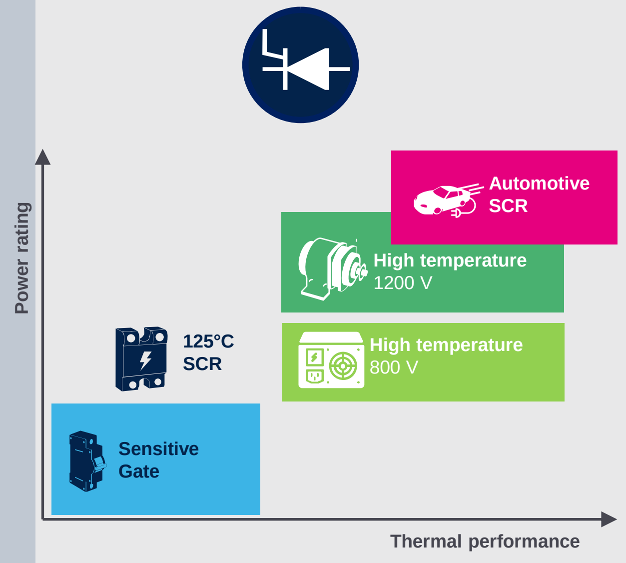
Enable higher system density with efficiency, robustness & digital control

Up to 1200 V and 150°C

Triacs & AC switches

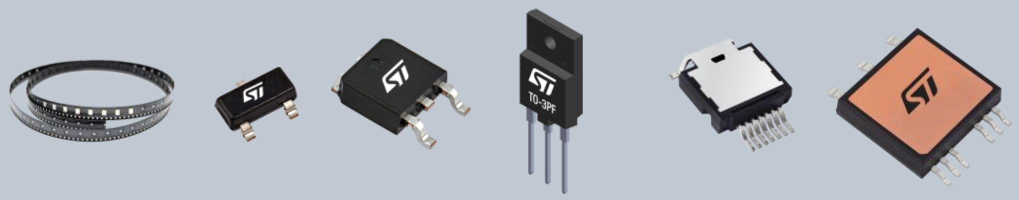


SCRs



Broad range, reliable supplier	Legacy home appliance devices
1200 V automotive SCR	TN3050H-12Y, TN4050HP-12Y, TN6050H-12Y
150°C H series thyristor	T4015H-6T/T1635H-8G
Top-side cooling	STTN6050H-12M1Y

Advanced packaging



BARE DIE | SOT-23 | DPAK | TO3-PF | HU3PAK | ACEPACK SMIT

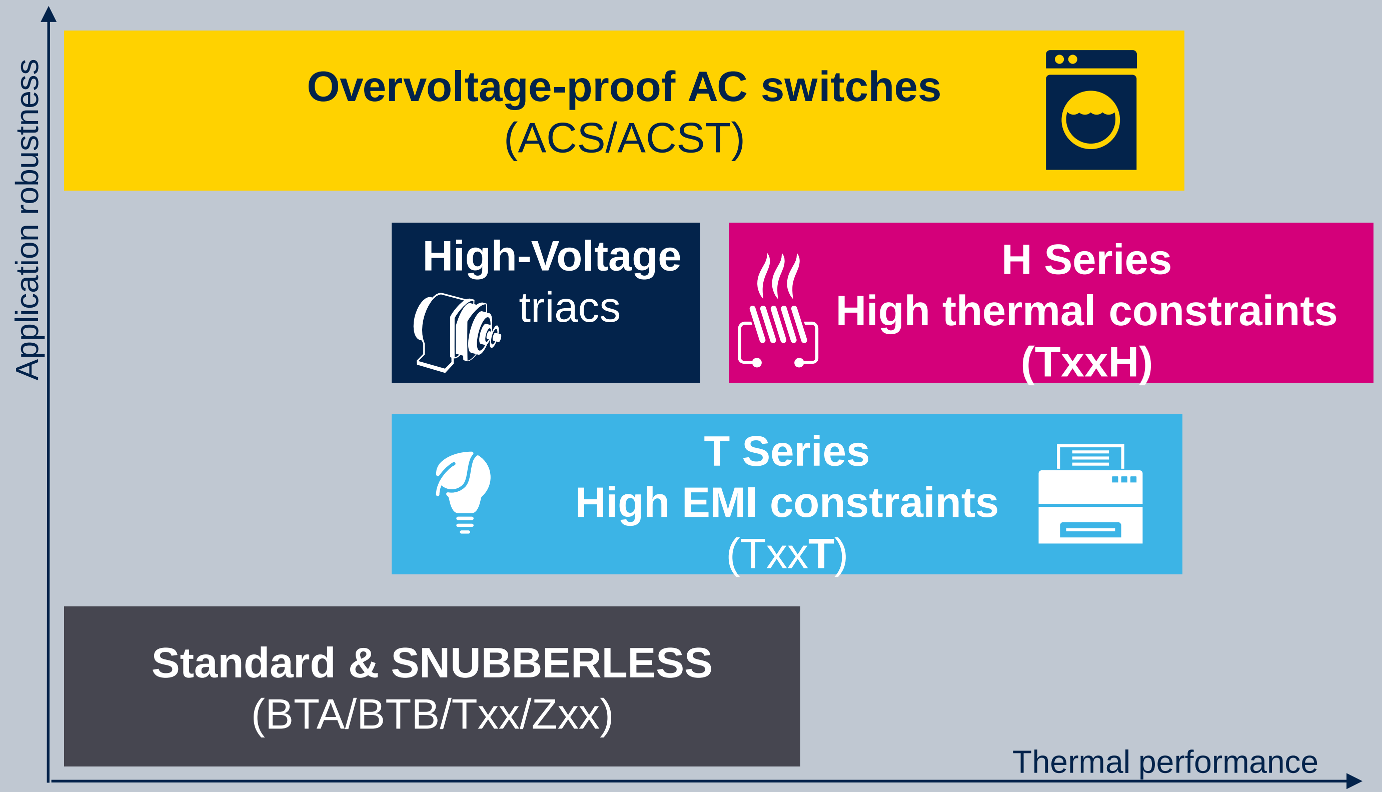
Thyristor innovation for emerging applications

Reliable solutions for vehicle electrification, renewable energies, smart industry, and digital appliances

- Industrial, automotive, and medical grade technology
- Robust and immune dedicated products
- Roadmap to 1800 V, 200 A, discrete & power modules
- Dedicated local application & engineering teams
- Complete portfolio of solutions, wide design tool set
- Long-term supply commitment

Complete range of triacs and AC switches

Bidirectional conduction



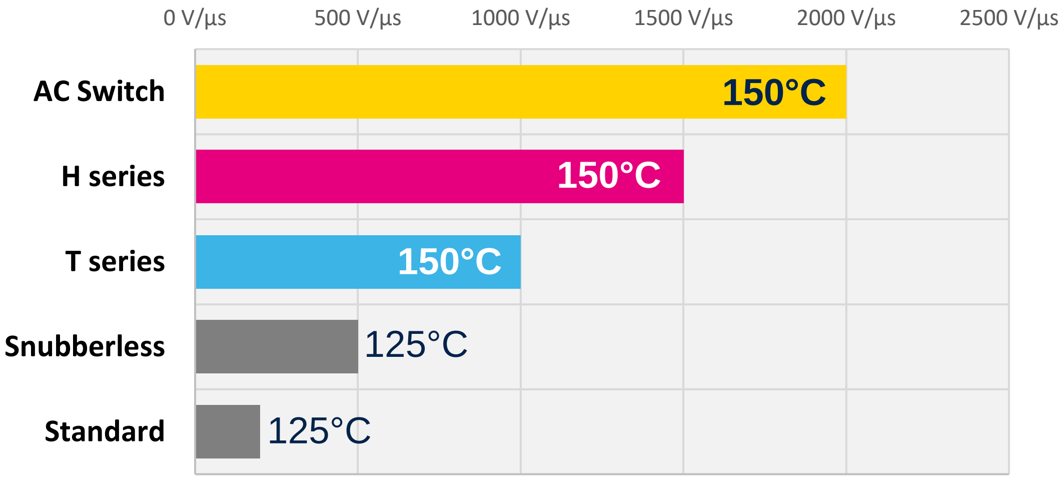
Electrical specifications:

- V_{DRM}: 600 to 1200 V
- $I_{T(RMS)}$: 0.2 to 50 A
- I_{GT}: 3 to 50 mA
- T_{Jmax}: 125 to 150°C

Triac and AC switch series

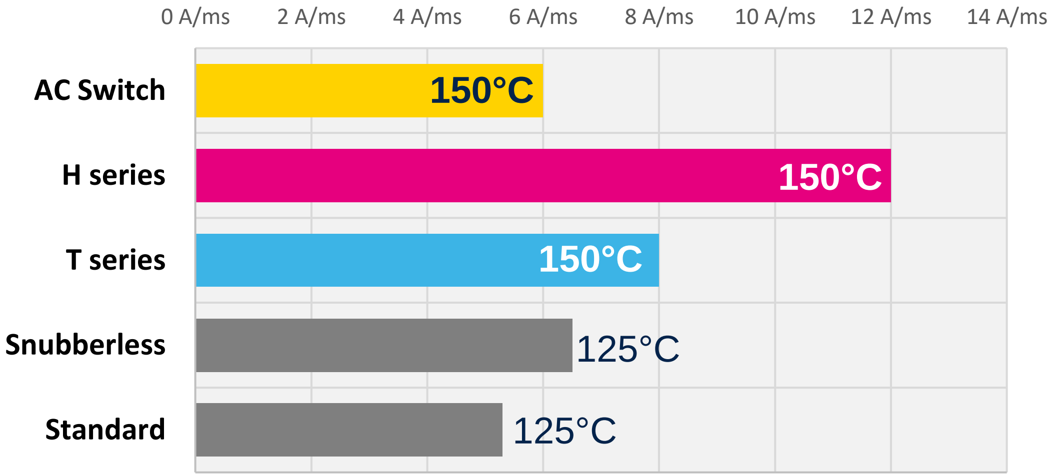
Performance comparison for 12 A triac, 800 V, I_{GT} = 35 mA

(dV/dt) improvement



Sensitive triac is designed to withstand higher dV/dt without false triggering

(dI/dt)c improvement



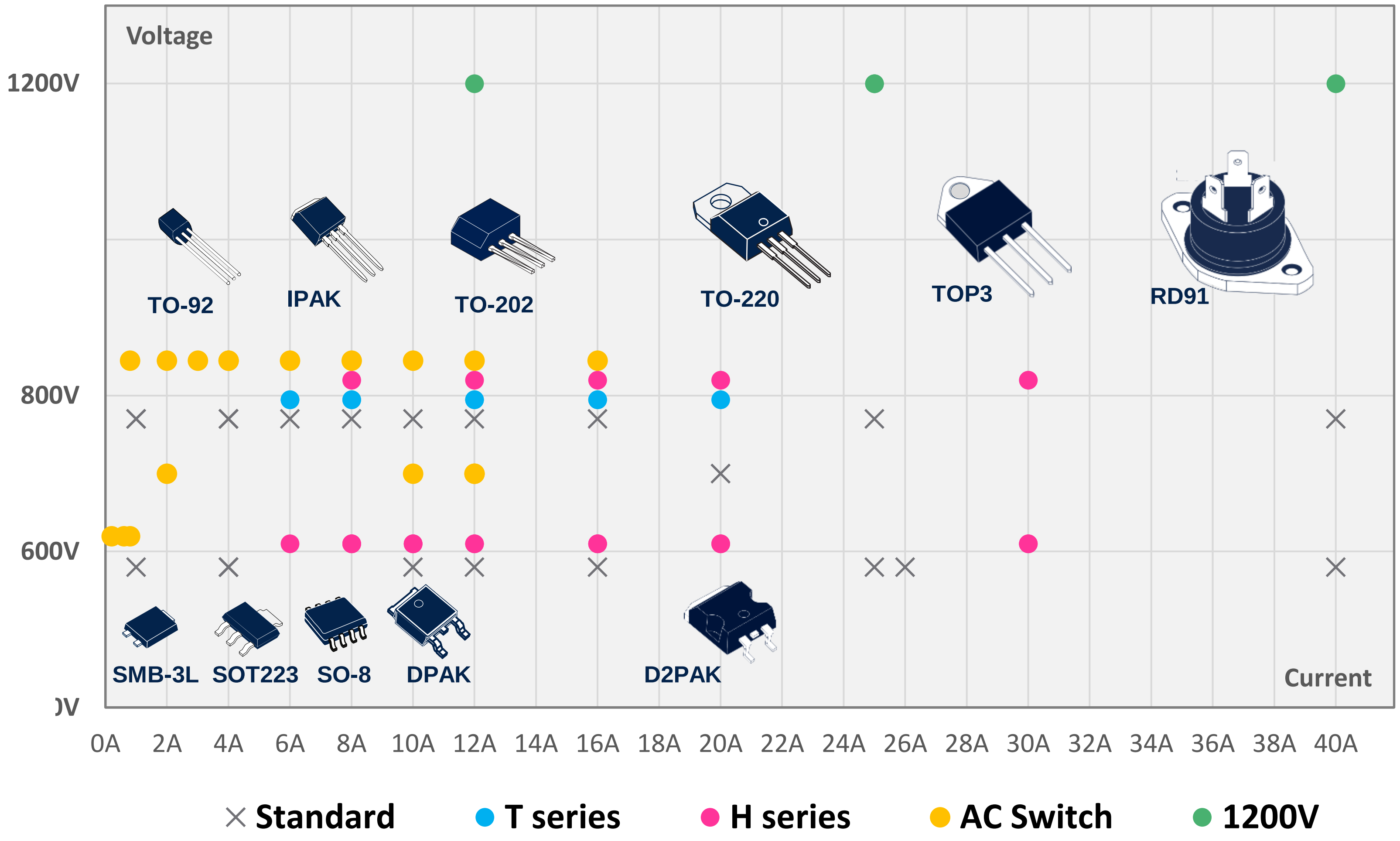
Triac turn–off allows handling stronger load current

AC switch = ACST1235-8 **H series** = T1235H-8 **T series** = T1235T-8 **SNUBBERLESS** = BTA12-800CW **standard** = BTA12-800B

Triac product range

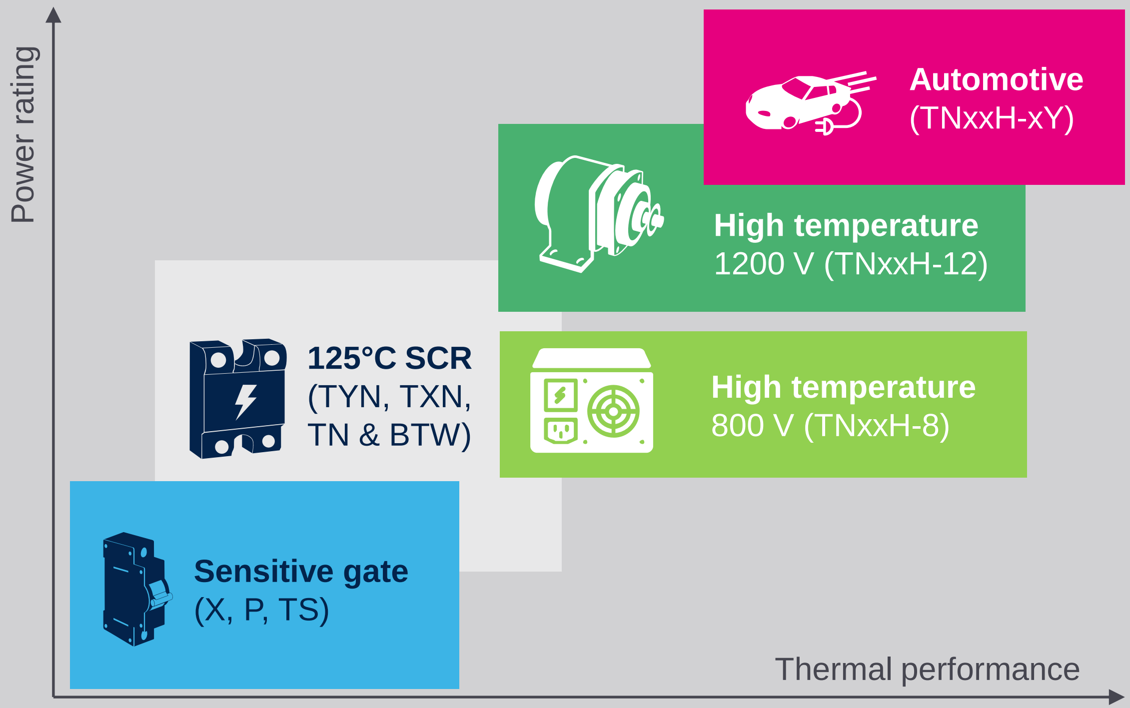
2500 V

Insulated package



Complete range of triacs and AC switches

Unidirectional conduction



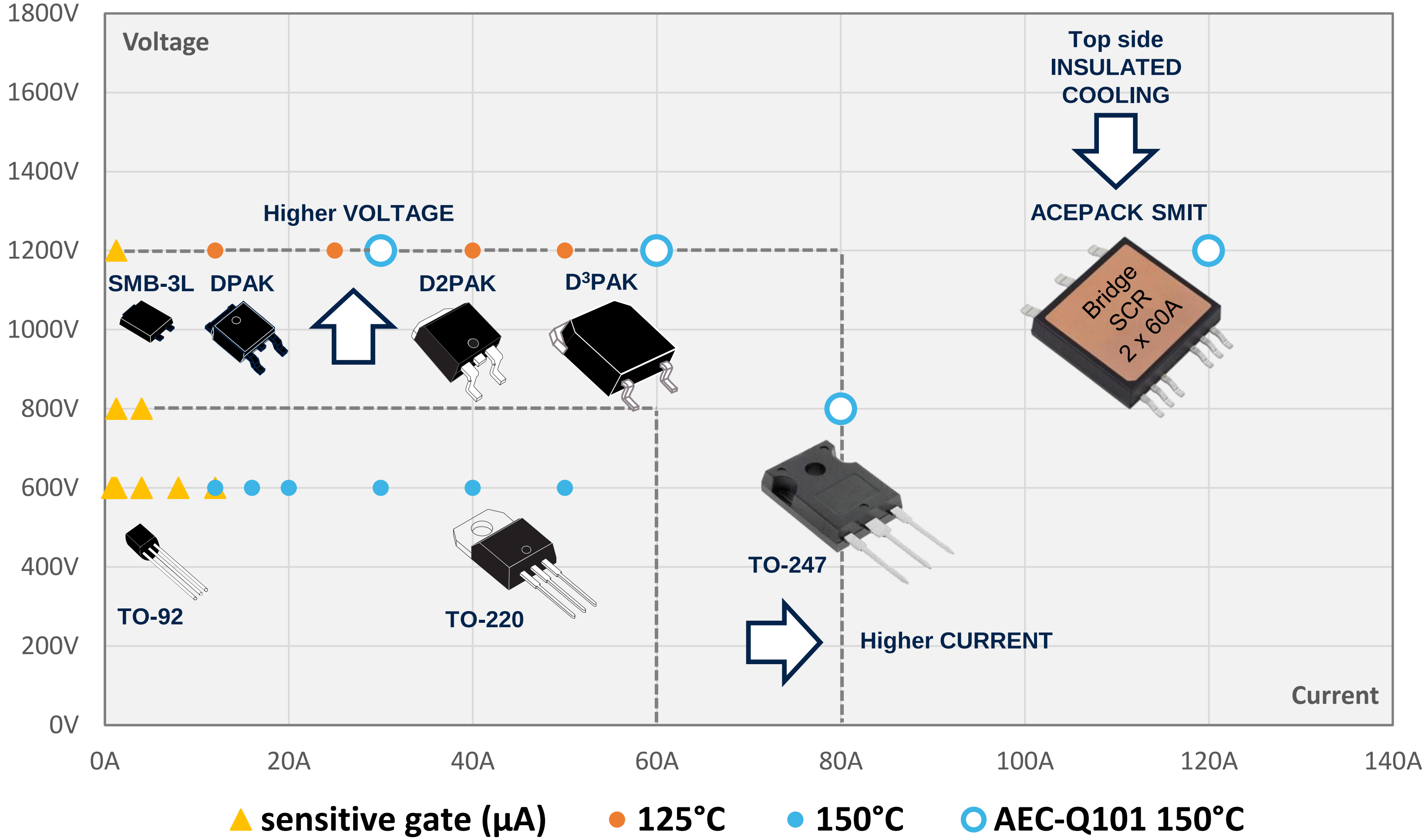
Electrical specifications:

- V_{DRM}: 400 to 1200 V
- $I_{T(RMS)}$: 0.25 to 130 A
- I_{GT}: 5 µA to 50 mA
- $T_{J\,MAX}$: 125 to 150°C

SCR product range

2500 V

Insulated package



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Low-power triacs and sensitive-gate SCRs

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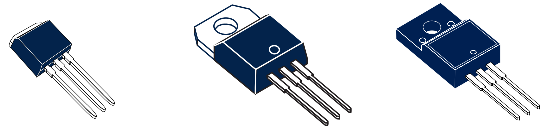
Low-power triacs (loads <200 W)

	I_T	V		Sensitivity				Packages							
	Amp	600 V	800 V	3 mA	5 mA	10 mA	25 mA 35 mA	TO-92	SO-8	SMBflat-3L	SOT-223	IPAK	DPAK	TO-220	TO-220FP
Standard triacs (4 quadrants)															
Z006	0.8	●			●			●			●				
Z01	1	●	●	●	●	●	●	●	●	●	●				
Z04	4	●	●	●	●	●	●					●	●		
T4_Q	4	●			●							●	●		
SNUBBERLESS triacs (3 quadrants)															
T4	4	●	●		●	●	●					●	●	●	●
ACS* and ACST															
ACS102	0.2	●			●				●						
ACS108	0.8	●	●		●	●		●		●	●				
ACST2	2		●			●							●		●
ACST3	3		●			●							●		
ACST4	4		●			●	●						●		

Washing machines **Irrigation** **Inrush limiter for LEDs** **Coffee machines**

SMBflat-3L **SO-8** **SOT-223** **DPAK**

IPAK **TO-220AB** **TO-220FPAB**



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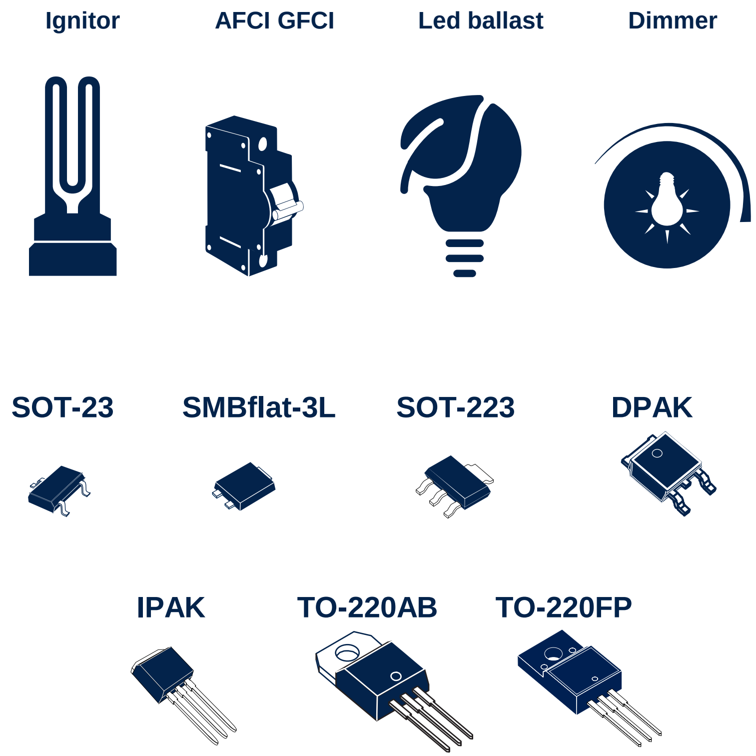
Sensitive-gate SCRs

	I_T	V			Sensitivity					Packages							
	Amp	600 V	800 V	1250 V	5 µA	50 µA	100 µA	150 µA	200 µA	TO-92	SMBflat-3L	SOT-223	SOT23	IPAK	DPAK	TO-220	TO-220FP
X and P01 families																	
X006/P01	0.8	●			●	●			●	●		●					
X01	1	●						●			●		●				
X02	1.25	●	●			●			●	●	●	●					
X04	4	●	●			●			●					●	●		
TS family																	
TS420	4	●							●					●	●	●	
TS820	8	●							●					●	●		●
TS1220	12	●							●					●	●		●
TS family overvoltage protected																	
TS110	1.25			●			●			●	●						



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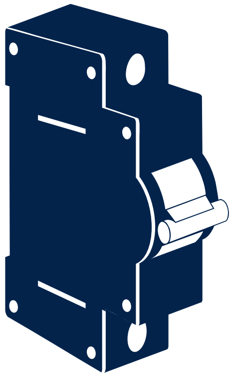
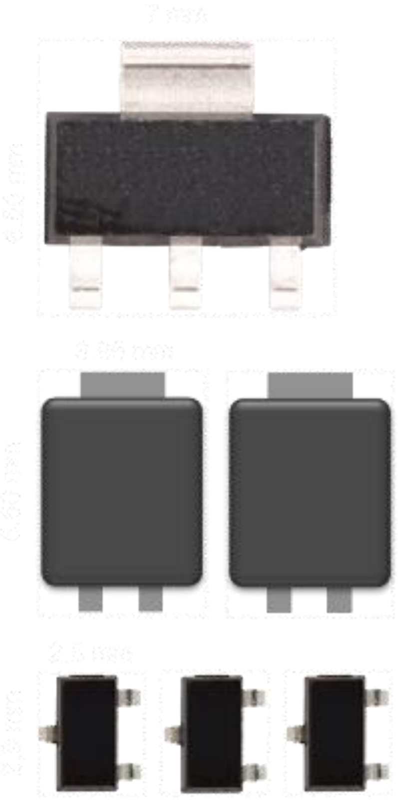
Sensitive SCR for e-breakers

Large product range, tailored by market, smallest package



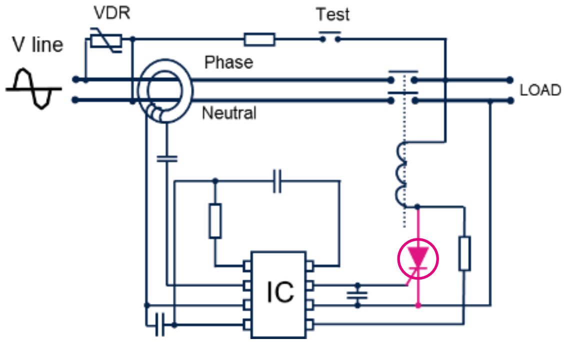


x1
SOT223

x2
SMBFlat-3L

x3
SOT23

		Legacy	220 V market	110 V market	Legacy
PARAMETER		X0202	TS110	X0115	P0102
I_{GT}		N/A	N/A	30 µA	N/A
I_{GT}		200 µA	100 µA	150 µA	200 µA
Tq (typ)			30 µs	20 µs	20 µs
$I_{T(RMS)}$		1.25 A	1.25 A	0.8 A	0.25 A
I_{TSM}		25 A	20 A	7.6 A	7 A
V_{DRM}		800 V	800 V	600 V	200 V
V_{DSM}		N/A	1250 V	750 V	N/A
dI/dt		50 A/µs	100 A/µs	50 A/µs	50 A/µs
dV/dt		10 V/µs	100 V/µs	80 V/µs	200 V/µs
Packages	TO-92	X0202NA	TS110-8A1		
Packages	SOT-223	X0202NN			P0102DN
Packages	SMBF-3L	X0202NUF	TS110-8UF	X0115MUF	
Packages	SOT23			X0115ML	P0102BL



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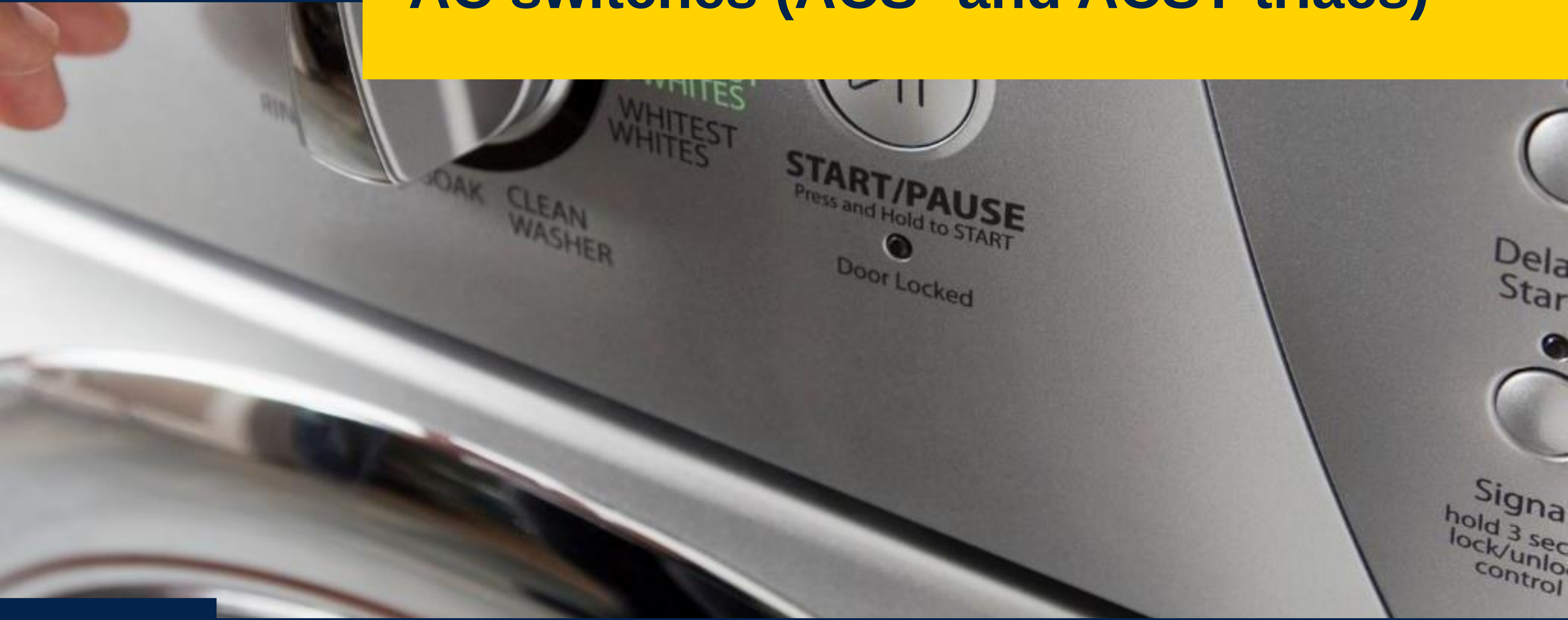
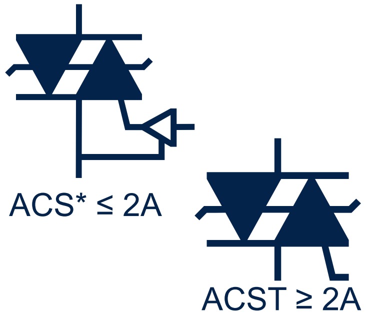
AC switches (ACS* and ACST triacs)



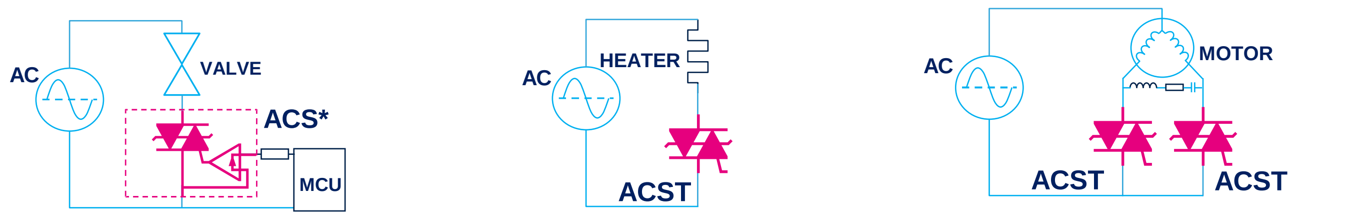
Overvoltage-protected AC switches and triacs

- Overvoltage protection
- High junction temp. options
- Best-in-class application robustness
- 5 to 10 mA gate current
- Surface mount options

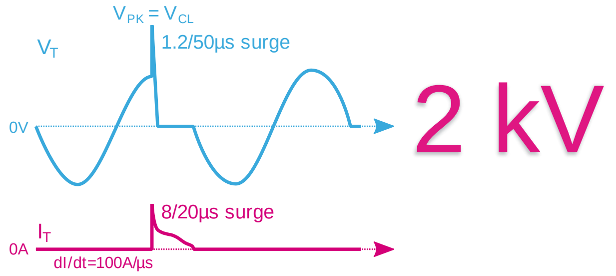


- EOS 2 kV without MOV
- Improved reliability
- EFT up to 6 kV
- Direct MCU drive
- Reduced PCB footprint

Actuator drive | **Heating** | **Motor drive**



IEC 61000-4-5

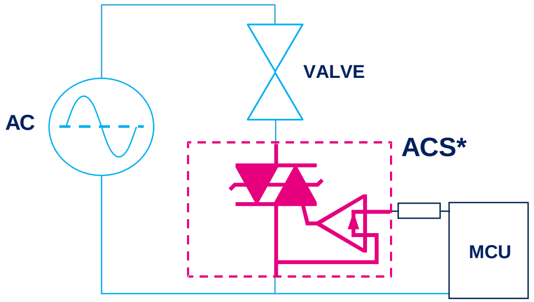


* is a registered and/or unregistered trademark of STMicroelectronics International NV or its affiliates in the EU and/or elsewhere.

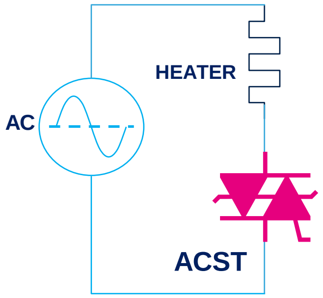
Overvoltage-protected ACS* switches and triacs
Applications and topologies

ACS **switches**	**AC loads < 2A** • Solenoids • Valves • Actuators	**Door lock**	**Washing machine**	**Valve**	**Garden irrigation**
ACST **triacs**	**AC load ≥ 2A** • Pumps • Inductive motors • Compressors	**Refrigeration compressor**	**AC motor control**	**Rolling shutter**	**HVAC**

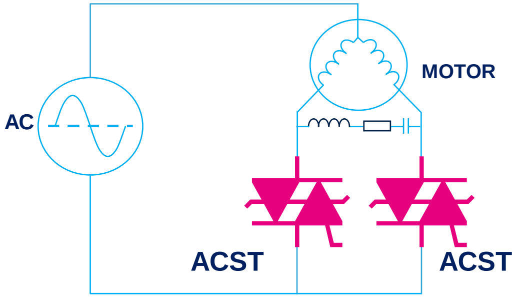
Actuator drive



Heating

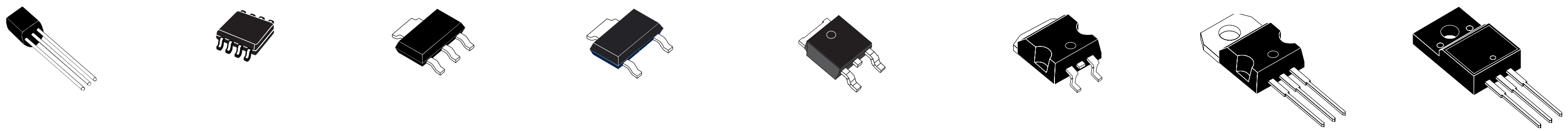


Motor drive



ACS/ACST switches for highly robust applications

I_{TRMS} (A)	TO-92	SO-8	SOT-223	SOT-223 2L	DPAK	D^2PAK	TO-220AB	TO-220FPAB
20							ACST2035H-8T	
16								ACST1635-8FP
12					ACST1220H-8B	ACST1210-7G ACST1235-7G	ACST1210-7T ACST1235-7T	ACST1235-8FP
10							ACST1010-7G ACST1035-7T	
8						ACST830-8G	ACST830-8T	ACST830-8FP
6						ACST610-8G	ACST610-8T	ACST610-8FP
4					ACST435-8B ACST410-8B			ACST410-8FP
3					ACST310-8B			
2					ACST210-8B ACS120-7SB			ACST210-8FP
1					ACS110-7SN			
0.8	ACS108-8SA		ACS108-8SN ACS108-8TN	ACS108-8SP				
0.2	ACS102-6TA	ACS102-6T1						



New release

30 & 35 mA ACST series

10 mA ACST series

5 & 10 mA ACS series

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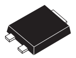
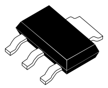
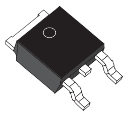
Overvoltage-protected AC switches (<2A)

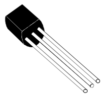
Part number	Package	$I_{T(RMS)}$ (A) RMS on-state current Max. (A)	V_{DRM} / V_{RRM} (V) Repetitive peak off-state voltage Max. (V)	I_{GT} (mA) Triggering gate current Max. (mA)	I_{TSM} (A) Nonrepetitive surge peak on-state current Max. (A)	dV/dt (1) (V/µs) Rising ratio of off voltage Min. (V/µs)	$(dI/dt)_c$ (A/ms) Rate of decrease of on-state current Min. (A/ms)	Max. T_J (°C) Junction temperature Max. (°C)
Logic-level ACS*								
ACS102-6T1	SO-8	**0.2**	600	5	7	300	0.15	125
ACS302-6T1	SO-20			5 (x3)				
ACS108-8TN	SOT-223	**0.8**	800	5	13	600	0.8	
ACS108-8SA	TO-92			10	13	2000	2	
ACS108-8SN	SOT-223 3L							
ACS108-8SP	SOT-223 2L							
ACS120-7SB	DPAK	**2**	700	10	20	500	1	
ACS120-7ST	TO-220AB							

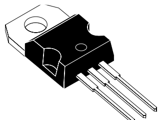

SMBflat-3L


SOT-223


DPAK

Surface mount


TO-92


TO-220AB

Noninsulated

RoHS 2011/65/EU

HF HALOGEN FREE

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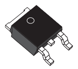
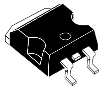
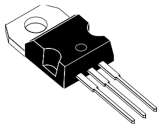
(1) Measured at 400 V

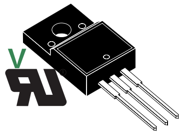
Overvoltage-protected AC switches (>2A)

Part number	Package				$I_{T(RMS)}$	V_{DRM} / V_{RRM}	I_{GT}	I_{TSM}	dV/dt	(dI/dt)c	Max. T_J
					Max (A)	Max (V)	Max (mA)	Max (A)	Min (V/µs)	Min (A/ms)	Max (°C)
	DPAK	D2PAK	TO-220AB	TO-220AB full Pack	RMS on-state current	Repetitive peak off-state voltage	Triggering gate current	Nonrepetitive surge peak on-state current	Rising ratio of off voltage	Rate of decrease of on-state current	Junction temperature
Logic level (direct MCU drive)											
ACST210-8	B			FP	**2**	800	10	8	500	0.5	125
ACST310-8	B				**3**			20	500	1	
ACST410-8	B			FP	**4**			30	500	2	
ACST610-8		G	T	FP	**6**			45	500	3.5	
ACST1010-7			T		**10**	700		100	200	4	
ACST1210-7		G			**12**			120	200	5	
SNUBBERLESS* (I_{GT}>20 mA)											
ACST435-8	B				**4**	800	35	30	1000	5	125
ACST830-8		G	T	FP	**8**		30	80	2000	8	
ACST1035-7		G			**10**	700	35	100	2000	12	
ACST1220		G			**12**						
ACST1235-7		G			**12**			120	2000	14	
High-temperature SNUBBERLESS*											
ACST1235-8				FP	**12**	800	35	120	2000	6	150
ACST1635-8				FP	**16**			140	300	4	
ACST2035H-8			T			800	35	160	1000	30	


DPAK
Surface Mount


D²PAK


TO-220AB
Noninsulated

2000 V

TO-220FPAB
Insulated (UL)

RoHS 2011/65/EU

HF HALOGEN FREE

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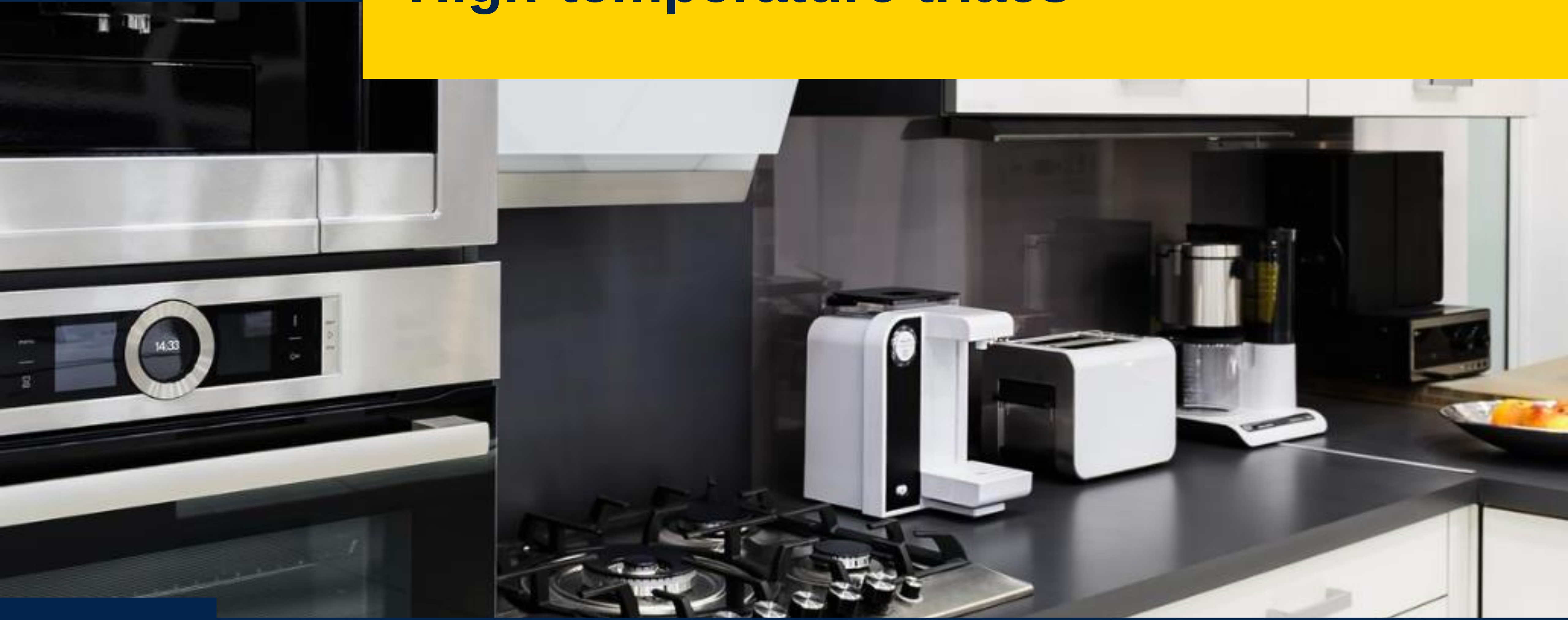
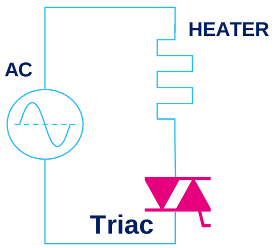
High-temperature triacs



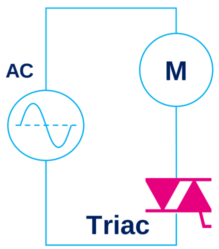
High-temperature (150°C), high-performance triacs

150°C junction operation	Improved reliability
High turn-off and noise immunity	Application robustness against EMI
Up to 800 V blocking voltage	Functional reliability
Logic Level gates available	Direct MCU drive
Wide package selection	Compact / innovative designs

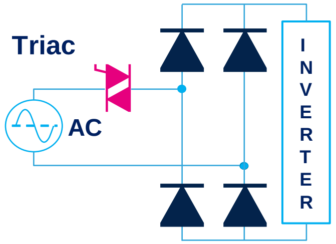
Heater/thermostat

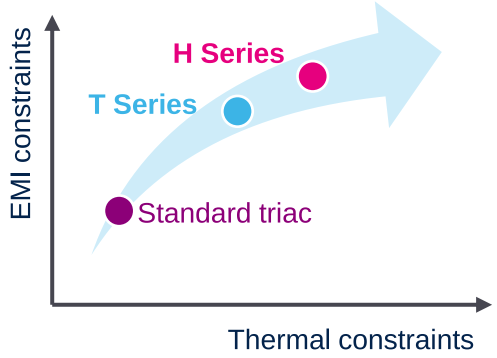


Speed drive



Inrush current limiter





High-temperature (150°C), high-performance triacs Applications and topologies

T Series

High EMI constraints

- Inductive AC loads
- Universal motors
- Phase control

Washing machines

Laser printers

Vacuum cleaners

Light dimmers

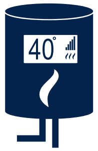
H Series

High thermal constraints

- Inrush limiters
- High ambient temp
- Heating

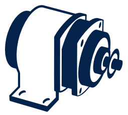
Smart plugs

Water heaters

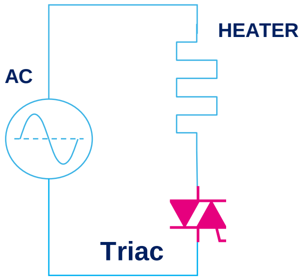


Coffee machines

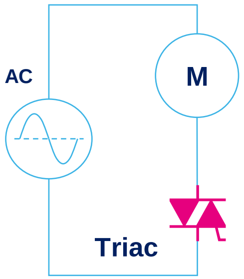
AC motors



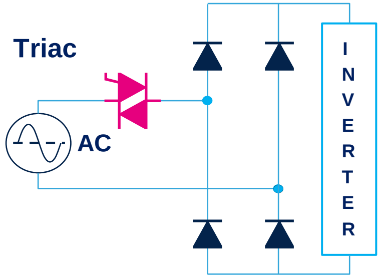
Heater/thermostat



Speed drive



Inverter inrush limiter



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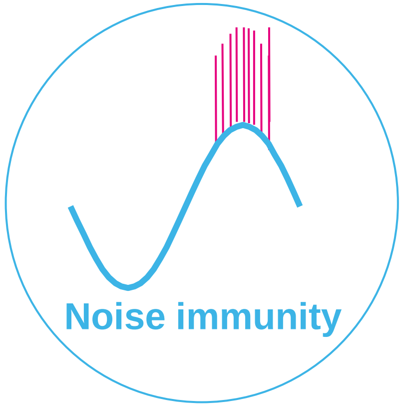
T-series triacs for applications with high EMI constraints

For robust appliances

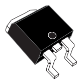


6 kV

Easy IEC 61000-4-4 design

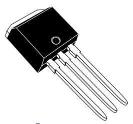
Part number	Package				$I_{T\ (RMS)}$	T_j	V_{DRM}, V_{RRM}	I_{GT}	I_{TSM}	dV/dt	(dI/dt)c
	TO-220AB	TO-220AB Ins	I2PAK	D2PAK	RMS on-state current	Junction Temp.	Repetitive peak off-state voltage	Triggering gate current	Nonrepetitive surge peak on-state current	Rising ratio of off voltage	Rate of decrease of on-state current
					Max. (A)	Max. (°C)	Max. (V)	Max. (mA)	Max. (A)	@Tj 150°C Min. (V/µs)	@Tj 150°C Min. (A/ms)
Logic Level (direct drive by MCU)											
T610T-8	T				6	150	800	10	45	170	3.7(1)
T810T-8	T			G	8				60		4(1)
T1210T-8	T			G	12				90		8(1)
T1610T-8	T	I		G	16				120		15(1)
SNUBBERLESS											
T635T-8	T				6	150	800	35	45	1000	3(2)
T835T-8	T	I		G	8				60		4(2)
T1235T-8	T	I	R	G	12				90		8(2)
T1635T-8	T	I		G	16				120		12(2)
T2035T-8				G	20				160		21(2)

(1) (dI/dt)c @ 0.1 V/µs (2) $(dI/dt)_C$ w/o RC snubber

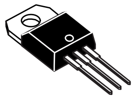


D²PAK

Surface Mount

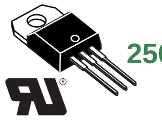


I²PAK



TO-220AB

Noninsulated



2500 V

TO-220AB Ins.

Insulated (UL)

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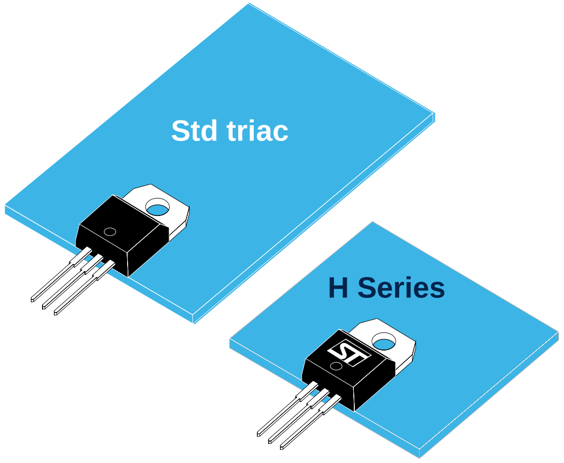
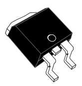
H-series triacs
for applications with high thermal constraints

Compact solution for heavy loads

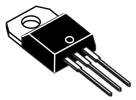


-50%

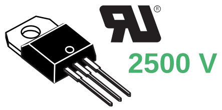
Heatsink size



D²PAK



TO-220AB



TO-220AB Ins.

	Part number	Package			$I_{T(RMS)}$	T_J	V_{DRM}, V_{RRM}	I_{GT}	I_{TSM}	dV/dt	$(dI/dt)_c$
		TO-220AB	TO-220AB insulated	D²PAK	A	°C	V	mA	A	V/µs @150°C	A/ms @10V/µs, @150°C
					Max	Max	Max	Max	Max	Min	Min
6H-Series	**600 V, 10 mA gate, Logic-Level triacs**										
	T610H-6	T			6	150	600	10	60	75	2.3
	T810H-6	T		G	8				80	75	3
	T1010H-6	T		G	10				100	75	3.8
	T1610H-6	T			16				160	100	3
	600 V, 35 mA gate, SNUBBERLESS triacs										
	T835H-6	T	I	G	8	150	600	35	80	1000	11
	T1035H-6	T	I	G	10				100		13
	T1235H-6	T	I	G	12				120		16
	T1635H-6	T	I	G	16				160		21
	T2035H-6	T	I	G	20				200		27
	T3035H-6	T	I	G	30				270		33
	600 V, 50 mA gate, SNUBBERLESS triacs										
	T850H-6	T	I	G	8	150	600	50	80	1500	14
	T1050H-6	T	I	G	10				100		18
	T1250H-6	T	I	G	12				120		21
	T1650H-6	T	I	G	16				160		28
	T2050H-6	T		G	20				200		36
	T3050H-6	T	I	G	30				270		44
8H-Series	**800 V, 35 mA gate, SNUBBERLESS triacs**										
	T835H-8	T	I	G	8	150	800	35	80	1500	8
	T1235H-8	T	I	G	12				120		12
	T1635H-8	T	I	G	16				160		16
	T2035H-8	T	I	G	20				200		20
	T3035H-8	T	I	G	30				270		25

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High-voltage triacs and thyristors (SCR)

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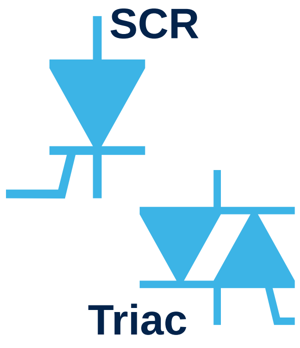
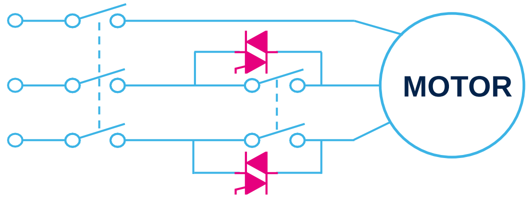
High-voltage triacs and thyristors (SCR)
High application robustness for 3-phase AC loads

- 1200 V AC blocking voltage
- Low trigger current options
- Outstanding dynamic perf.
- High thermal performance
- Surface mount options

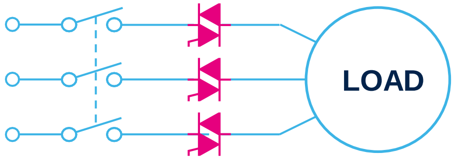


- 500 V_{RMS} 3-phase AC load compatible
- Compact gate drive
- Improved application robustness
- Enhanced thermal reliability
- Compact / innovative designs

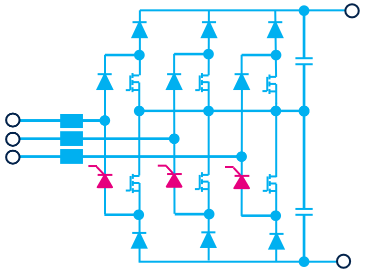
Hybrid motor starter



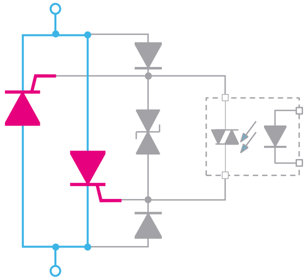
Motor soft starter



3-Phase Vienna



Isolated static switch

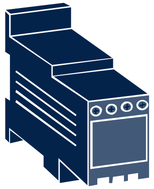


High-voltage triacs and thyristors (SCR) for power conversion

Triac

- Controlled bridges
- AC switching
- Motor starters

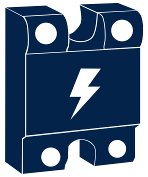
IE3 motor starter



Heating

HVAC

Solid state relay

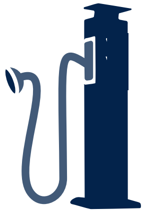


SCR

- Controlled bridges
- AC switching
- Motor starters

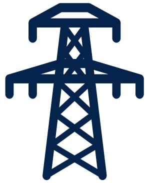
Critical power UPS

Charging Station

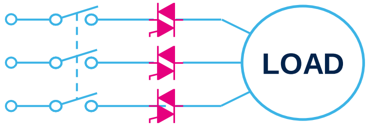


Renewable

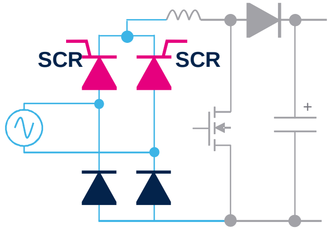
Energy management



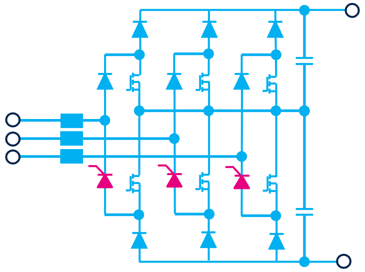
Motor soft starter



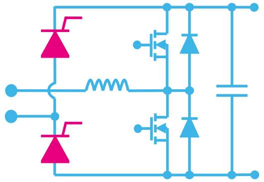
Controlled bridge



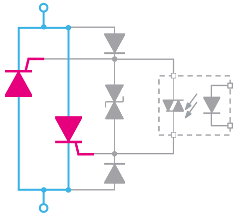
3-Phase Vienna



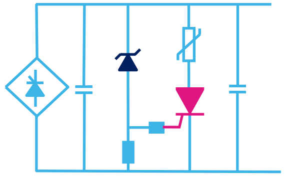
Totem pole PFC boost



Solid static relays



10 kV surge protection



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High-voltage triacs
High application robustness for 3-phase AC loads

<table>
<tr><th>Part number</th><th>Package</th><th>$I_{T(RMS)}$</th><th>V_{DRM}, V_{RRM}</th><th>I_{TSM}</th><th>I_{GT}</th><th>dV/dt</th><th>$(dI/dt)_c$</th><th>T_J</th></tr>
<tr><th></th><th></th><th>A</th><th>V</th><th>A</th><th>mA</th><th>V/µs</th><th>A/ms</th><th>°C</th></tr>
<tr><th></th><th></th><th>Max</th><th>Max</th><th>max</th><th>Max</th><th>Min</th><th>Min</th><th>Max</th></tr>
<tr><td colspan="9">12A, 1200 V, 125°C triac</td></tr>
<tr><td>TXDV1212</td><td>TO-220AB Ins.</td><td>12</td><td>1200</td><td>120</td><td>100</td><td>2000</td><td>30</td><td>125</td></tr>
<tr><td colspan="9">25A, 1200 V, 125°C triac</td></tr>
<tr><td>T2550-12T</td><td>TO-220AB</td><td rowspan="4">25</td><td rowspan="4">1200</td><td rowspan="3">240</td><td rowspan="3">50</td><td rowspan="3">2500</td><td rowspan="3">20</td><td rowspan="4">125</td></tr>
<tr><td>T2550-12I</td><td>TO-220AB Ins.</td></tr>
<tr><td>T2550-12G</td><td>D2PAK</td></tr>
<tr><td>TPDV1225</td><td>TOP3 Ins.</td><td>230</td><td>150</td><td>2000</td><td>88</td></tr>
<tr><td colspan="9">40A, 1200 V, 125°C triac</td></tr>
<tr><td>TPDV1240</td><td>TOP3 Ins.</td><td>40</td><td>1200</td><td>350</td><td>200</td><td>500</td><td>142</td><td>125</td></tr>
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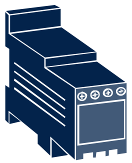
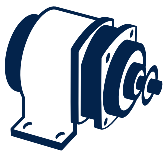
Motor starter

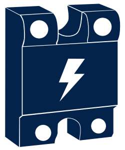


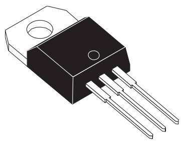
Heating

3-phase motor drive

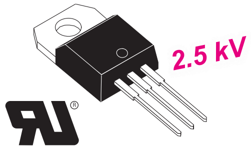


Solid-state relay

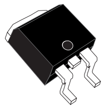




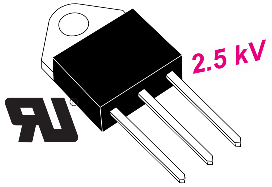
TO-220AB



TO-220AB insulated



D2PAK



TOP3 insulated

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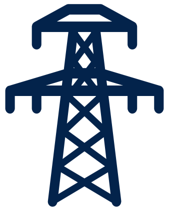
1200 V thyristors (SCR)
Reliable, compact designs for new AC-DC applications

	Part number	Package	RMS current (A)	Triggering (mA)	Surge current (A)	dV/dt (V/µs)
	1200 V, 125°C					
Industrial-grade	**TYN1212RG**	TO-220AB	12	15	120	200
	TN2540-12G	D^2PAK	25	40	300	1500
	TYN1225RG	TO-220AB	25	40	300	1500
	BTW68-1200RG	TOP3-I	30	80	400	250
	TN4050-12PI	TOP3-I	40	50	400	500
	TN4050-12WL	TO-247 LL	40	50	400	500
	BTW69-1200N	TOP3	50	50	700	1000
	BTW69-1200RG	TOP3-I	50	80	580	1000
	TN6050-12PI	TOP3-I	60	50	700	2000
	TN6050-12WL	TO-247 LL	60	50	700	2000
	TN5050H-12PI	TOP3-I	50	50	450	1500
	TN8050H-12PI	TOP3-I	80	50	680	1500
	1200 V, 150°C					
Automotive-grade	**TN3050H-12GY**	D^2PAK	30	50	300	1000
	TN3050H-12WY	TO-247	30	50	300	1000
	TN6050HP-12WY	TO-247	60	50	600	1000

Critical power UPS

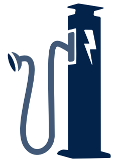
HVAC

Energy management

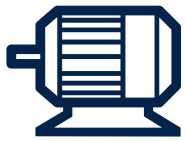


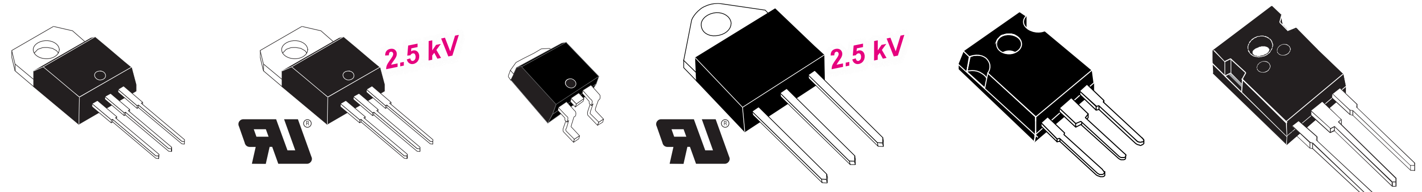
Renewable

Charging stations



IE3 motor starters





TO-220AB **TO-220AB Ins.** **D2PAK** **TOP3 insulated** **TO-247** **TO-247 long lead**

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25-80 A thyristors for industrial applications

	RMS	Part number SCR	Part number Triac	3Q	4Q	Voltage 600 V	Voltage 800 V	Voltage 1200 V	I_{GT} (mA)	dV/dt @ T°j (V/µs)	T°j (°C)	I_{TSM} (A)	TOP3 Ins	TO3PF	D3PACK	RD91
600 V 800 V	25A		BTA26	●	●	●	●		35	1000	125	250	●			
			T2650	●		●			50	1000	125	260		●		
	30A	BTW68					●		50	500	125	400	●			
	40A		TPDV840	●			●		200	500	125	350	●			
			BTA41	●	●	●	●		50	500	125	400	●			●
			T4050	●		●			50	1000	125	400		●		
	50A	BTW69				●	●		80	1000	125	580	●			
			T5035H	●			●		35	2000	150	500	●			
	80A	TM8050H					●		50	1000	150	670			●	
1200 V	25A		TPDV1225	●				●	150	2000	125	230	●			
	30A	BTW68						●	50	250	125	400	●			
	40A		TPDV1240	●				●	200	500	125	350	●			
		TN4050						●	50	2000	125	400	●			
	50A	BTW69						●	80	1000	125	580	●			●
		TN5050H						●	50	1000	150	580	●			
	60A	TN6050						●	50	2000	125	700	●			
	80A	TN8050H						●	50	1500	150	680	●			

Motor starter | Heating | HVAC | Solid State relay | UPS | Charging Station | Renewable | Energy management

TOP3 Ins 2.5 kV

D3PACK

RD91 2.5 kV

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Industrial SCR thyristors for in-rush current limitation

SCR portfolio to fit a wide range of industrial applications

600 V → 800 V | 1200 V

Application	< 1 kW	< 3.6 kW	< 7.2 kW up to 50 kW 1-Phase	< 7.2 kW up to 50 kW 3-Phase
SMPS	TN1205H-6 TN1605H-8 TN2010H-6	TN3015H-6 TN4015H-6 TN5015H-6	TN5015H-6	TN5050H-12 TN8050H-12
Air conditioning				
Solar microinverter	TN1605H-8	TN3015H-6	TM8050H-8	
EV charging station				TM8050H-8

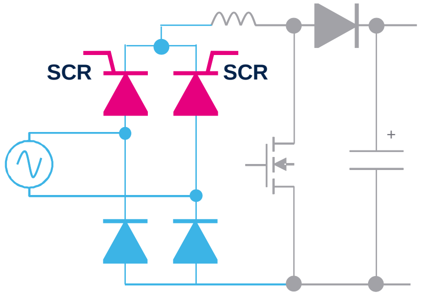
High-temperature thyristors (SCR)

High-temperature thyristors (SCR) for better reliability and more compact designs

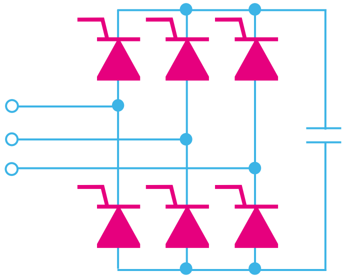
- **High junction temperature**
- Up to 1200 V
- Narrow triggering current
- High noise immunity
- Surface mount options

- **Heatsink reduction**
- Compatible with 3-phase AC chargers
- Accurate drive circuit
- Easier to design
- High application merit

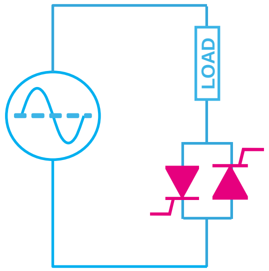
Controlled bridge



3-Phase R-Regulator



SSR



AEC-Q101 qualified

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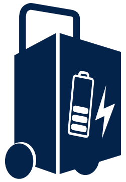
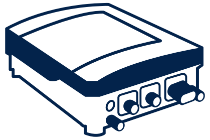
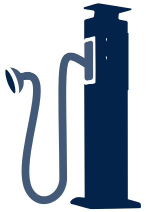
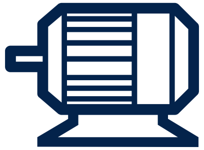
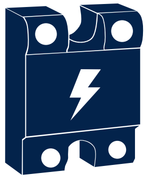
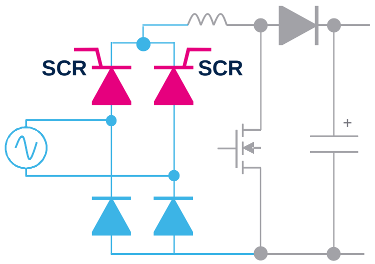
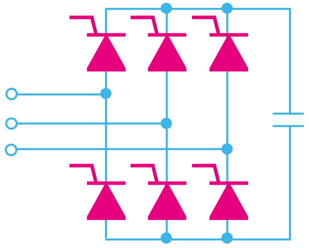
High-temperature thyristors (SCR) in industrial and automotive applications

600 V 800 V	Single-phase AC • Inrush limiters • Rectifier regulators • V surge protection	Motor bike 	SMPS 	Battery charger 	AC-DC conversion 
1200 V	3-phase AC • Controlled bridges • AC switching • Motor starters	OBC 	Charging station 	Motor control 	Solid state relay 

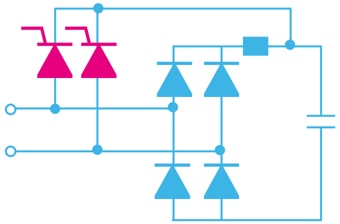
Controlled bridge



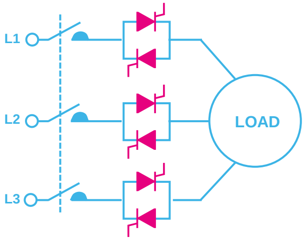
3-phase bridge



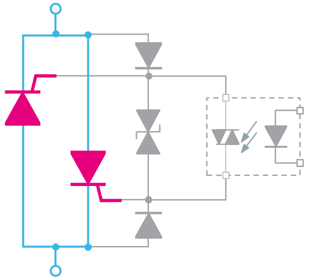
Bridge bypass



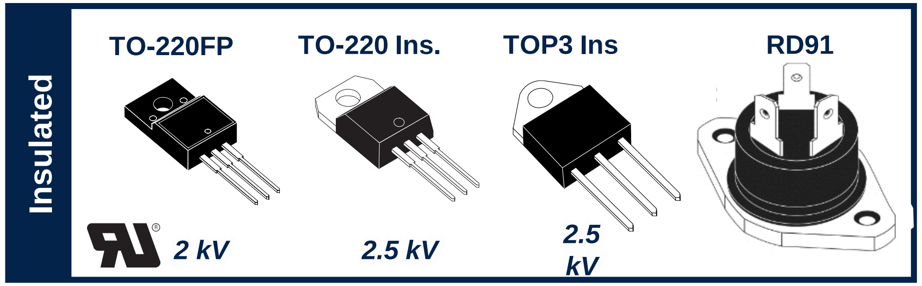
3-phase controller

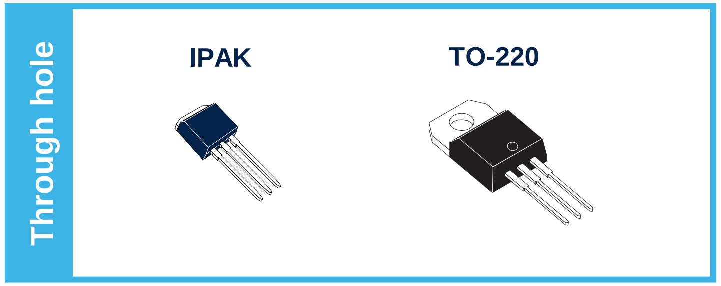


Isolated static switch



Standard thyristors (SCR)





	Part number	I_{TRMS} (A)	Voltage 600 V	Voltage 800 V	I_{GT} (mA)	dV/dt @ 150°C (V/µs)	T°j (°C)	I_{TSM} (A)	IPAK	TO-220	TO-220FP	TO-220 ins	TOP3 Ins	DPAK	D2PAK	RD91
600 V 800 V	TYN606	6	●		15	200	125			●						
	TN805	8	●		5 to 15	5	125							●		
	TN815	8		●	15	150	125		●					●		
	TS820	8	●		0.2	5	125				●					
	TYN608	8	●		15	15	125			●						
	TYN610	10	●		15	200	125			●						
	TYN810	10		●	15	200	125			●						
	TN1205T	12	●		5	100	125							●		
	TN1215	12	●	●	15	200	125		●					●	●	
	TYN612M	12	●		5	50	125			●	●					
	TYN612	12	●		15	200	125			●		●				
	TYN812	12		●	5 to 15	200	125			●						
	TN1515	15	●		15	200	125							●		
	TN1625	16	●		25	500	125								●	
	TYN616	16	●		25	500	125			●						
	TYN816	16		●	25	500	125			●						
	TN2540	25	●	●	40	1500	125								●	
	TYN615	25	●		40	1500	125			●		●				
	TYN825	25		●	40	1500	125			●		●				
	BTW68	30		●	50	500	125	400					●			
	TYN640	40	●		35	1000	125			●						
	TYN840	40		●	35	1000	125			●						
	BTW69	50	●	●	80	1000	125						●			
1200 V	TYN1212	12	1200		15	200	125			●						
	TN2540-12	25	1200		40	1500	125								●	
	TYN1225	25	1200		40	1500	125			●						
	BTW68	30	1200		50	250	125						●			
	TYN4050	40	1200		50	2000	125						●			
	BTW67 - BTW69	50	1000 - 1200		80	1000	125	580					●			●
	TN4050	40	1200		50		125						●			
	TN6050	60	1200		50	2000	125						●			

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High-temperature thyristors (SCR)

	Part number	I_{TRMS} (A)	I_{GT} (mA)	dV/dt @ 150°C (V/µs)	T°j (°C)	I_{TSM} (A)	TO-220	TO-220 ins	TOP3 Ins	T0-247 HC	DPAK	D2PAK	D3PAK	H2PAK	HU3PAK	ACEPAK	Grade
600 V	TN1205H-6	12	2 to 5	100	150	120	●					●					
	TN1605H-6	16	6	200	150	140	●					●					
	TN1610H-6	16	10	1000	150	140	●	●									
	TN2010H-6	20	10	400	150	180	●	●				●					
	TN2015H-6	20	15	750	150	180	●	●									
	TN3015H-6	30	15	1000	150	270	●	●				●					
	TN4015H-6	40	15	500	150	360	●	●				●					
	TN5015H-6	50	15	500	150	450	●	●				●					
800 V	TN1605H-8	16	5 to 8	500	150	160	●	●			●	●					
	TN4035HA-8	40	35	1500	150	300						●					AEC
	TN5015H-8	50	15	1000	150	500		●				●					
	TM8050H-8	80	50	1000	150	670				●			●				
1200 V	TN3050H-12	30	50	1000	150	300				●		●					AEC
	TN3050HP-12	30	50	1000	150	300									●		AEC
	TN4050-12	40	50		125				●	●							
	TN4050HP-12	40	50	1500	150	400								●	●		AEC
	TN4050HA-12	40	50	1500	150	400						●					AEC
	TN5050H-12	50	50		150				●	●							
	TN6050-12	60	50		125				●	●							
	TN6050HP-12	60	50	1000	150	600				●							AEC
	STTN6050H-12	2x60	50		150											●	AEC
	TN8050H-12	80	50		150				●	●							
	TN13050H-12	130	50		150	1100				●							
	TN13050HA-12	130	50		150	1100				●							AEC

Through hole

Surface mount

Top side cooling

STPOWER AEC-Q101

HF HALOGEN FREE

RoHS 2011/65/EU

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Automotive-grade SCR product range

HP Series

High power density

	D2PAK	H2PAK	HU3PAK	TO-247	ACEPACK SMIT
TN3050H-12xY	●			●	
TN3050HP-12L2Y			●		
TN4050HP-12x2Y		●	●		
TN6050HP-12WY				●	
STTN6050H-12M1Y					●
STTD6050H-12M2Y					●

- Low standby and ON-state losses
- Compact & top-cooled packages
- Discretes or modules

HA Series

High robustness

	D2PAK	TO-220AB	TO-247LL
TN4050HA-12xY	●	2023	2023
TN8050HA-12W2Y			2023

- High rate of current turn-on capability
- Strong EMI immunity in OFF-state
- Extra overvoltage blocking capability

Fast HV discharge

	D2PAK	TO-247LL
TN4035HA-8GY	●	
TN12550HA-12W2Y		2023

- Very high overcurrent capability
- FMEA compliant with automotive safety standards
- High creepage TO-247 or D2PAK compact SMD package

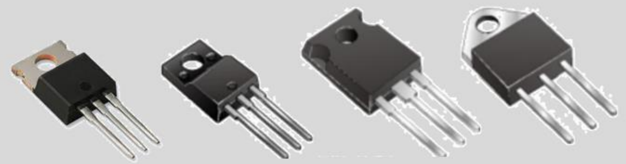
Package innovation

Thyristor package trends

Improved thermal dissipation
Higher power density
Automated assembly
Single heatsink

Surface-mount devices
Higher power density
Automated assembly
But compromise thermal dissipation

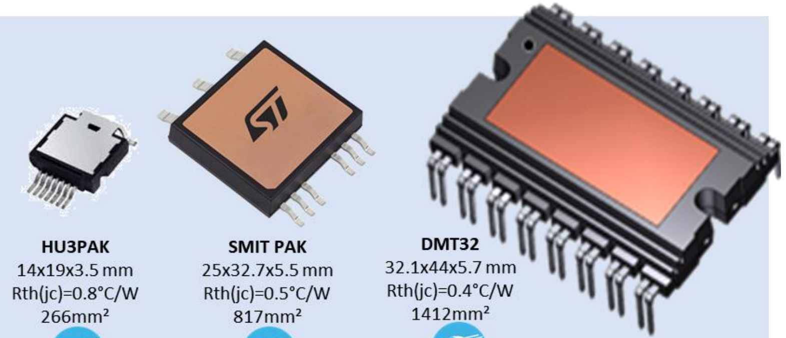
VERTICAL coolling



TO220	TO220FP	TO247	TOP3I
10.2x16.4x4.5 mm	10.2x19.5x4.5 mm	15.8x24.3x5 mm	15.3x24.3x4.5 mm
Rth(jc)=1.6°C/W	Rth(jc)=4°C/W	Rth(jc)=1.2°C/W	Rth(jc)=1.8°C/W
167mm²	199mm²	384mm²	372mm²
AEC-Q101		AEC-Q101	

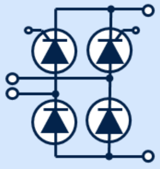
10A to 120A **R_{TH} < 5°C/W**

TOP SIDE coolling



HU3PAK	SMIT PAK	DMT32
14x19x3.5 mm	25x32.7x5.5 mm	32.1x44x5.7 mm
Rth(jc)=0.8°C/W	Rth(jc)=0.5°C/W	Rth(jc)=0.4°C/W
266mm²	817mm²	1412mm²
AEC-Q101	AEC-Q101	AEC-Q101

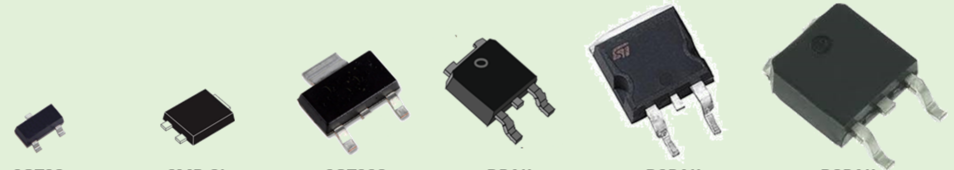
30A to 240A **R_{TH} < 1°C/W**



MODULE

Multiple dice in one
power module

PCB Coolling

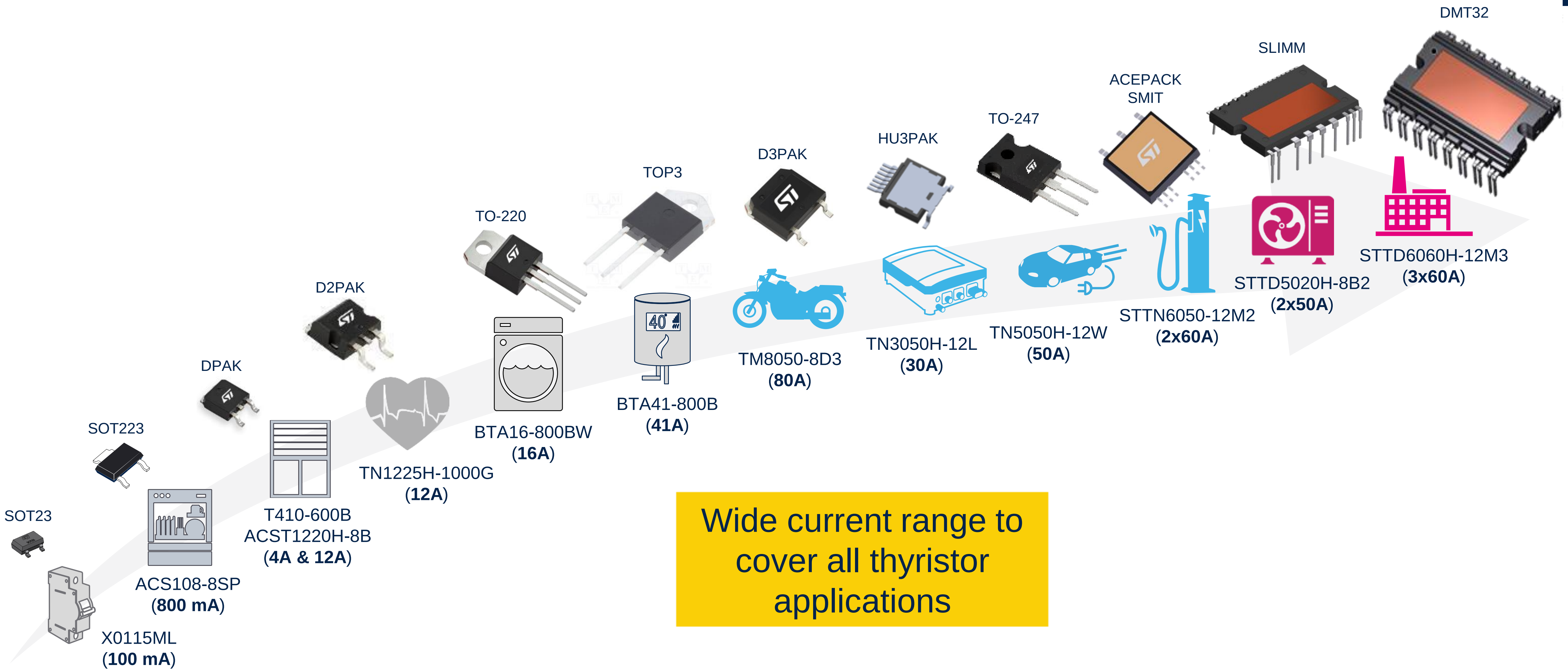


SOT23	SMB-3L	SOT223	DPAK	D2PAK	D3PAK
2.5x2.9x1 mm	3.6x5.4x1 mm	6.5x7x1.8 mm	6.5x9.7x2.3 mm	10.2x15.4x4.5 mm	16x19x5 mm
Rth(jc)=60°C/W	Rth(jc)=14°C/W	Rth(jc)=25°C/W	Rth(jc)=3.5°C/W	Rth(jc)=1.6°C/W	Rth(jc)=1°C/W
7mm²	19mm²	45mm²	63mm²	157mm²	304mm²
				AEC-Q101	

1A to 80A **R_{TH} < 5°C/W**

DISCRETE

Thyristor family higher power package roadmap



Wide current range to cover all thyristor applications

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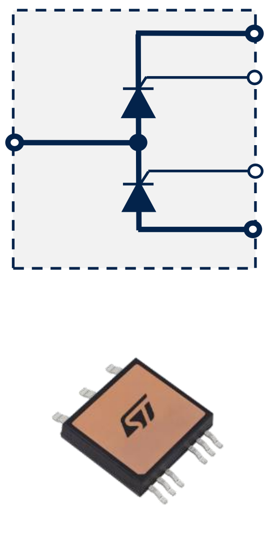
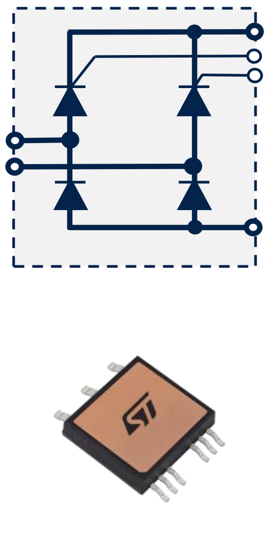
Thyristor power module

STTN6050H-12M2Y



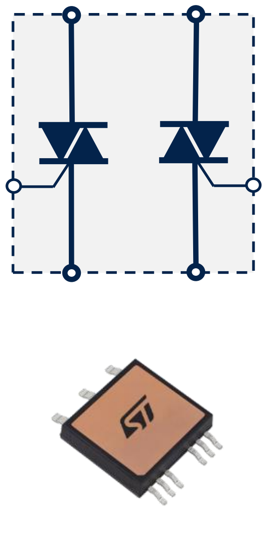
Released

STTD6050H-12M1Y



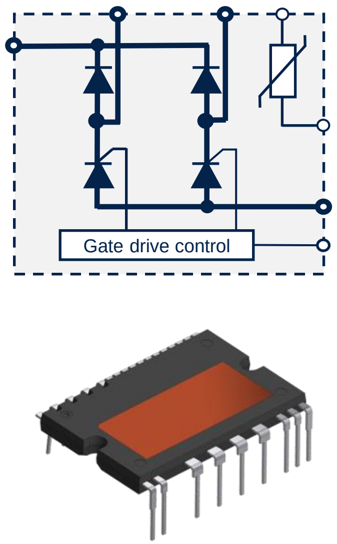
Released

STT6050H-12M2Y



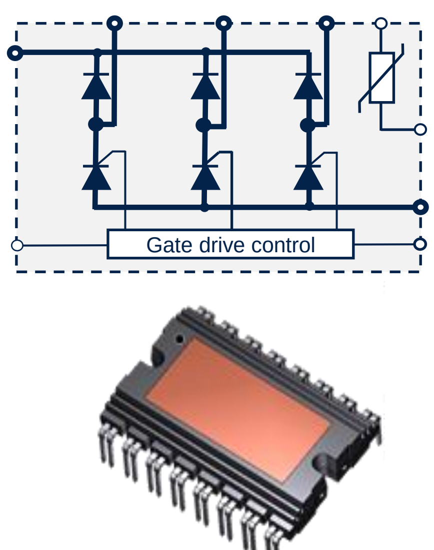
Development

STTD5060H-8M2



Development

STTD6060H-12M3



Investigation

Automotive

Industrial

ACEPACK SMIT: surface-mount isolated top-side cooling

SLLIMM: small low-loss intelligent molded module

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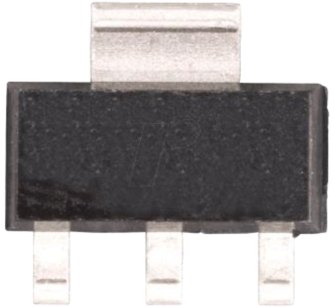
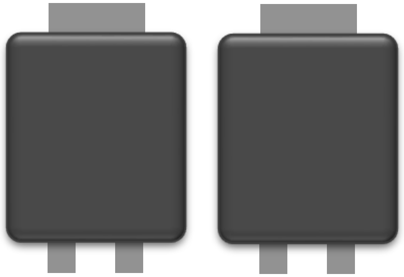
SOT23 package

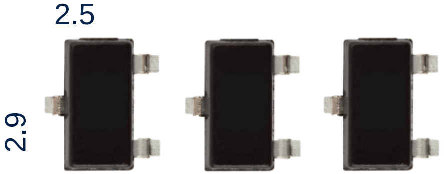
For more compactness, the smallest package is SOT23



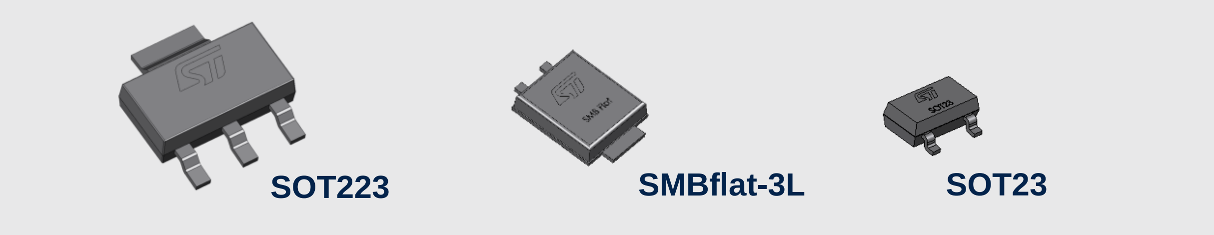
x1
SOT223



x2
SMBFlat-3L



x3
SOT23



Smallest thyristor package

9 mm² footprint for compact design

Creepage distance is of 1.1 mm

* for pollution degree 2 without insulated foil thickness, according to IEC60664

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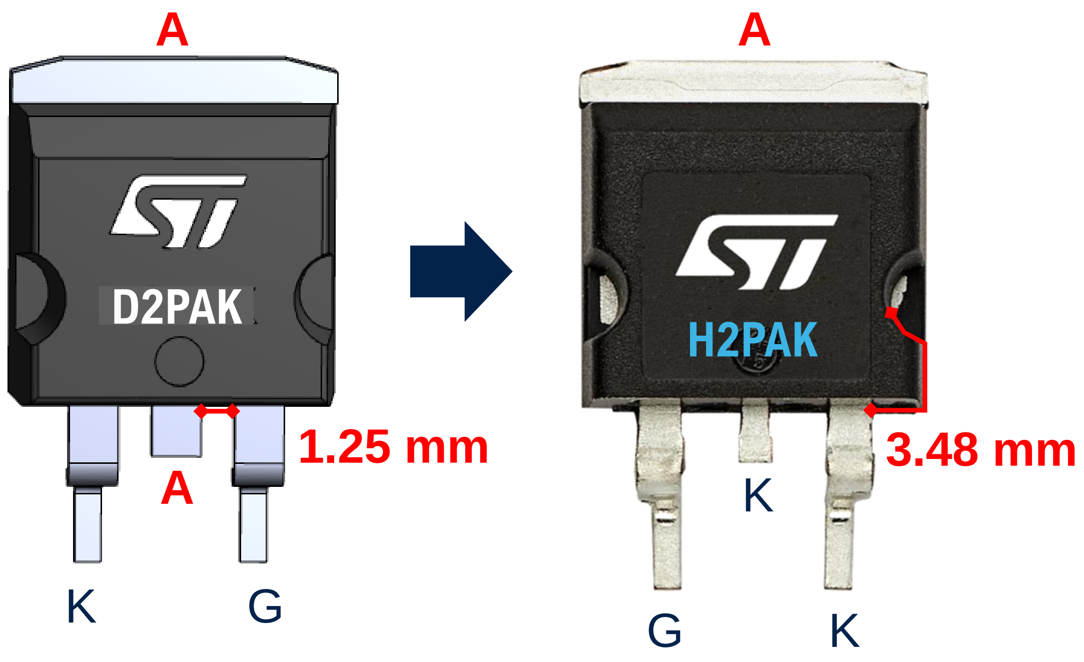
Introducing H2PAK package

H2PAK offers up to 3.48 mm creepage, compliant for 485 V_{AC} RMS



Only **1.25 mm** creepage on standard D2PAK

0.8°C / W thermal resistance

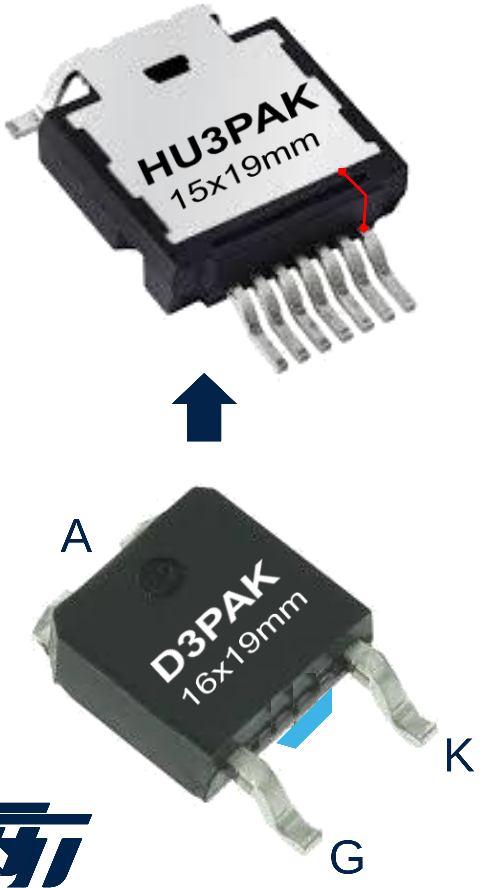
GKK pinout compared to **KAG** on standard D2PAK

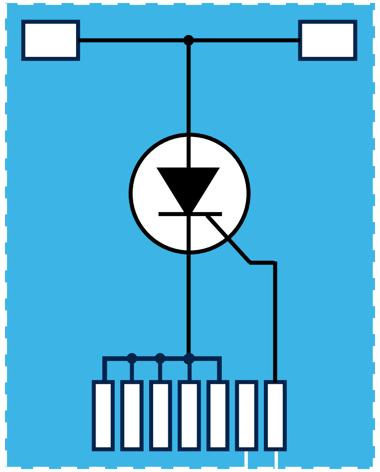
1.25 mm → **3.48 mm** creepage → 485 V_{AC} RMS
Extend creepage to 5.38 mm* → 765 V_{AC} RMS

* In development, for pollution degree 2, according to IEC60664

HU3PAK package

Low profile, surface mount and top-side cooling discrete package





Package height 3.5 mm

0.8°C/W thermal resistance

Creepage > 3.7 mm → 515 VAC RMS *

Package tab is not insulated

* for pollution degree 2 without insulated foil thickness, according to IEC60664

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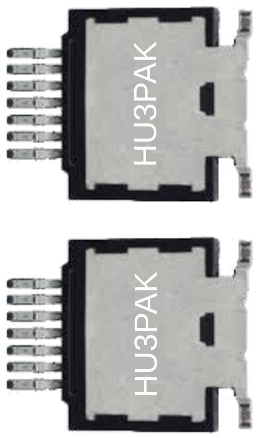
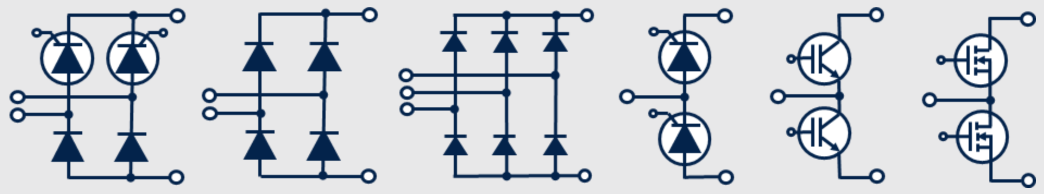
ACEPACK SMIT

The surface mount with isolated top-cooled package

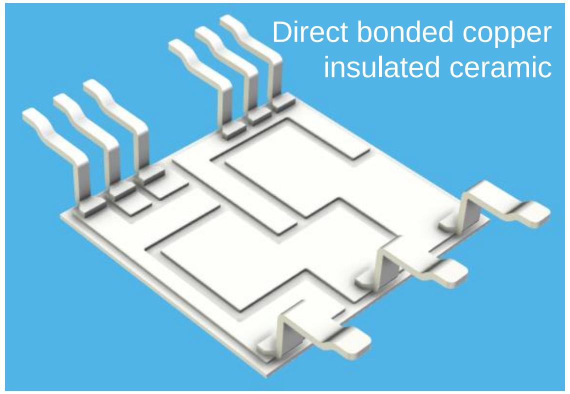


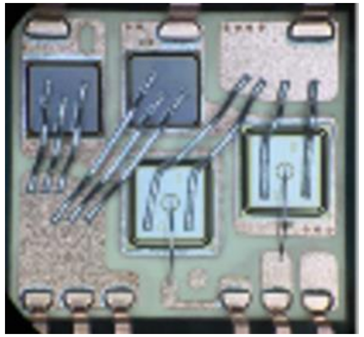


Top-side cooling → thermal resistance < 0.2°C / W

Creepage distance 7 mm 1000 V

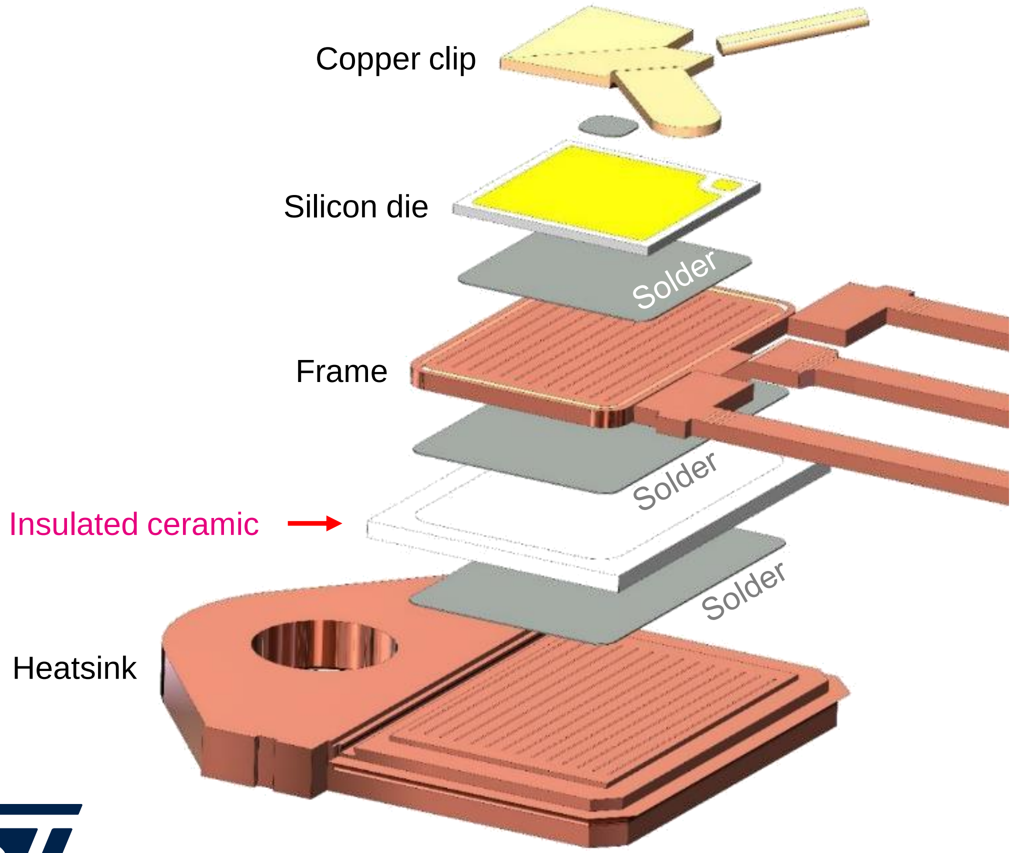
4 kV insulation, 4 mm lead-heatsink distance





TOP3 insulated package

To cover the needs of industrial and high-power applications



Copper clip package for high power

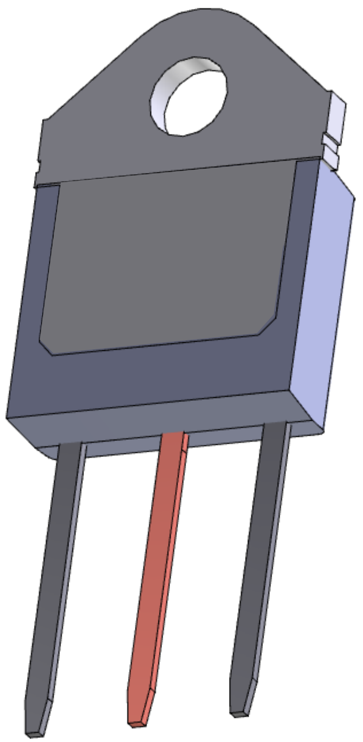
Thermal resistance junction to case < 1°C/W

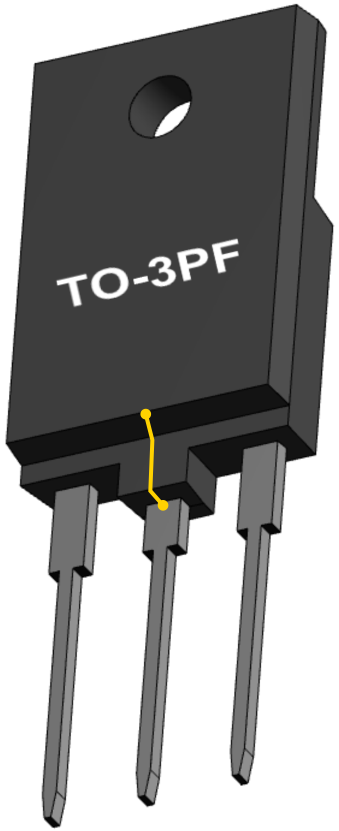
Ceramic insulation → 2500 V insulated

Creepage distance lead to heatsink 2.80 mm

TO-3PF package

To cover the needs of industrial and heating applications with polluted environments



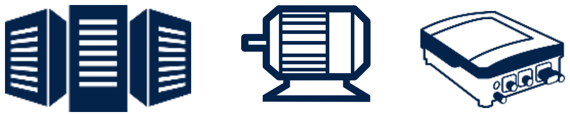


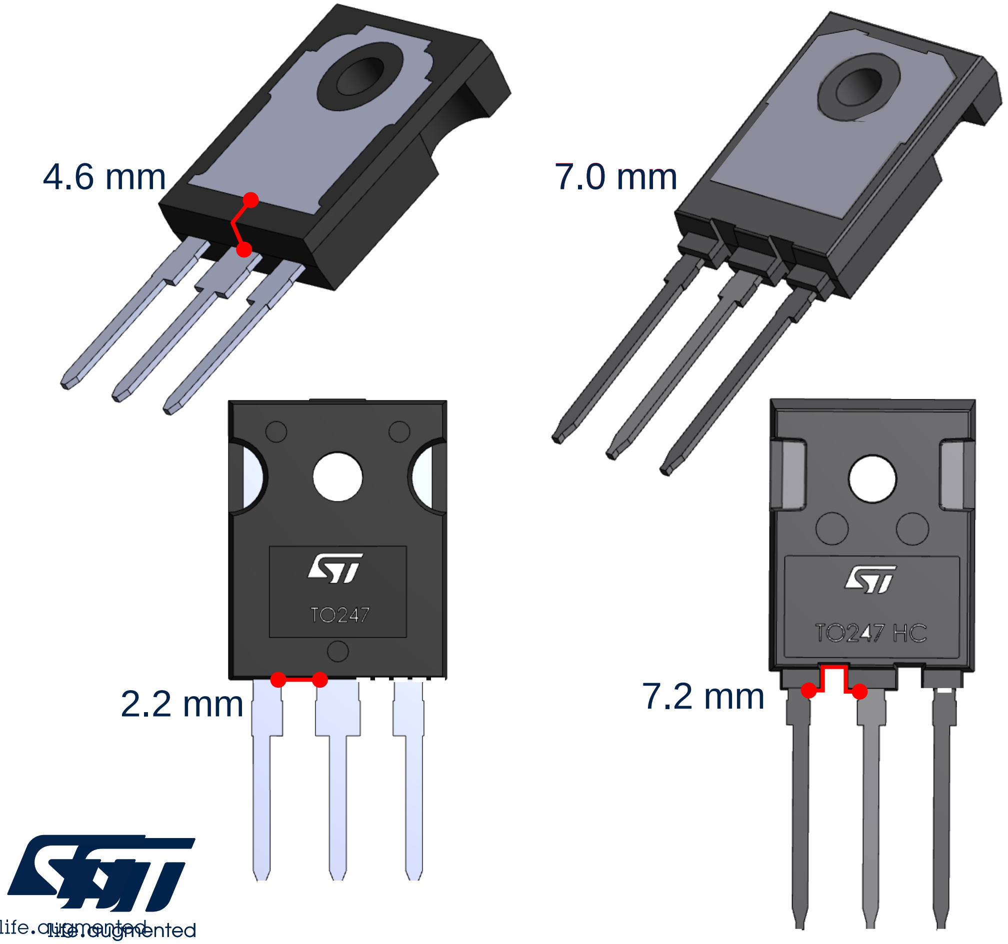
Pin to heatsink isolation
TOP3 vs TO-3PF

- **Compatible with standard TOP3 package**
- **Extended creepage 4.40 mm vs 2.80 mm**
- **Fully molded → 2500 V insulated (UL1557)**
- **UL840 certified → compatible with pollution degree 3 up to 250 VAC & 2 up to 300 V**

High creepage TO-247

To cover the needs of industrial & automotive high-power applications



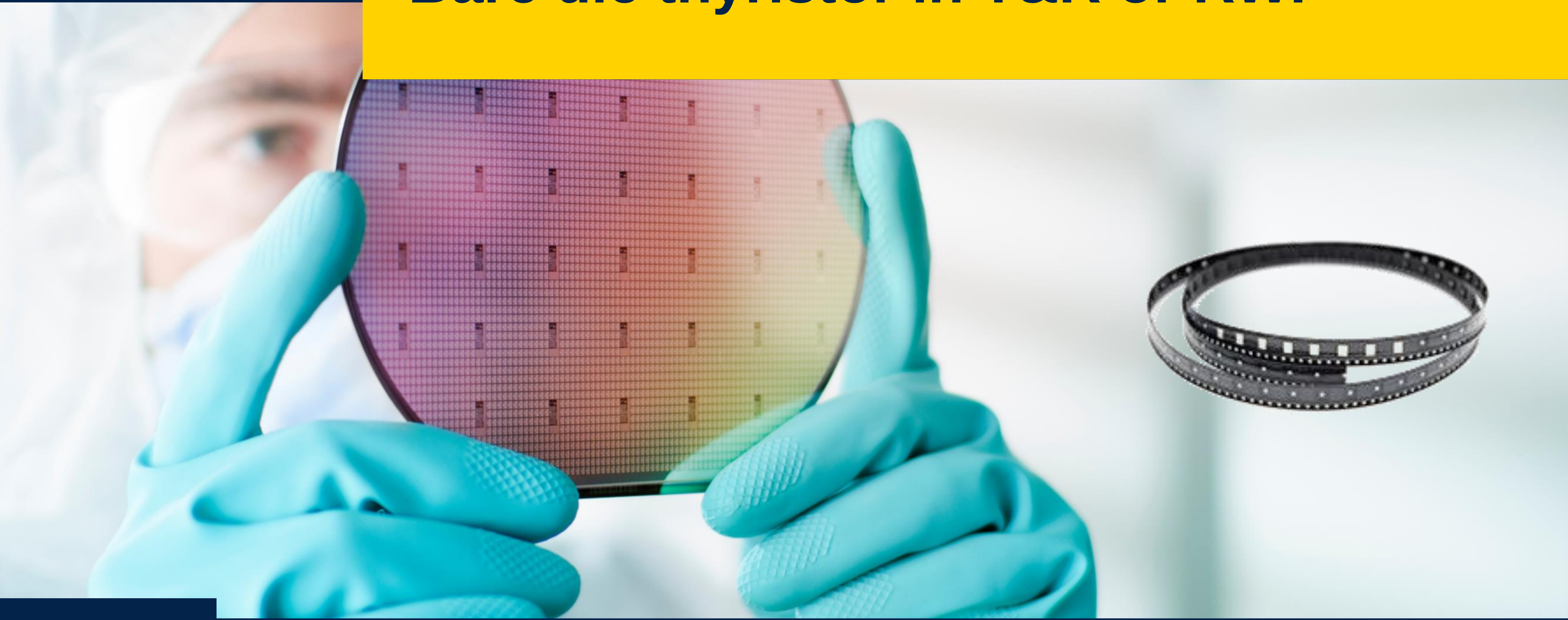


Longer leads → bending with horizontal heatsink

Extended creepage 7.0 mm min vs. 2.2 mm

For high power applications

Bare die thyristor in T&R or RWF



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Bare die thyristor part numbering

J	T	M	-	16		-	120	6		TR
Die	Device	Techno		Current	Temp°C		Voltage	Metal	Grade	Packing
J = Die	C = Triac T = SCR TA = AGT	T = TopGlass M = Mesa N = Planar		04 = 4A 16 = 25A 40 = 40A 45 = 50A 70 = 70A 130 = 130A	Blank = 125°C H = 150 °C		080 = 800V 120 = 1200V 160 = 1600V	2 = Clip 6 = Wire Bonding	Blank = Industrial Y = Automotive M = Medical	TR = Tape & Reel V = Waffle Pack RW = Sticky foil

SYMBOL	CURRENT FLOW	DEVICE NAME
	UNIDIRECTIONAL	**SCR** (Silicon Controlled Rectifier)
	UNIDIRECTIONAL	**AGT** (Anode Gated Thyristor)
	BIDIRECTIONAL	**TRIAC**

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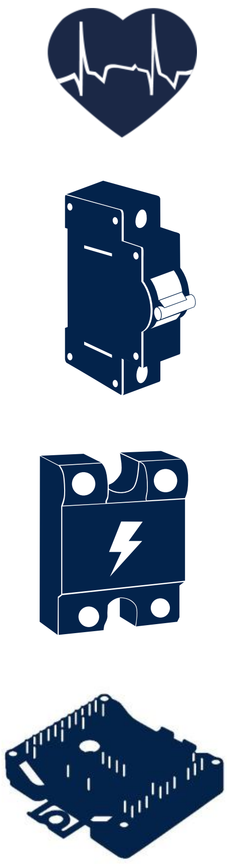
Thyristor
T&R or RWF (reconstructed wafer frame)

APPLICATIONS



PN	Product	Gate	Voltage (VDRM)	Top	X (mm)	Y (mm)	Area (mm²)	Tj (°C)	Vto (V)	Rd (mOhms)	Techno	Grade
JTT-04-060-9TR	SCR	Corner	600	Bonding	2.09	2.09	4	125			Top glass	
JTM-12-060-2VS	SCR	Corner	600	Clip	2.65	2.65	7	125			Mesa	
JTM-12-060-2V	SCR	Corner	600	Clip	3.5	3.5	12	125			Mesa	
JTM-20-060-2V	SCR	Corner	600	Clip	4.42	4.42	20	125	0.8	15	Mesa	
JTM-45-060-2V	SCR	Corner	600	Clip	6.35	6.35	40	125	1.2	10	Mesa	
JTM-50-080-2TR	SCR	Corner	800	Bonding	5.55	4.27	24	150			Mesa	
JTM-20-100-2V	SCR	Corner	1000	Clip	4.42	4.42	20	125	0.8	15	Mesa	
JCMW40-100-2E	Triac	Corner	1000	Clip	6.35	6.35	40	125	0.85	10	Mesa	
JTAN560-12-V	AGT	Corner	1200	Clip	2.59	2.97	8	125			Planar	Medical
JTN530-12-V	SCR	Corner	1200	Clip	2.59	2.97	8	125			Planar	Medical
JTN660-12-V	SCR	Corner	1200	Clip	2.49	3.68	9	125			Planar	
JTM-12-120-2TR	SCR	Corner	1200	Clip	3.5	3.5	12	125	0.77	23	Mesa	
JTM-16-120-2TR	SCR	Corner	1200	Clip	4	4	16	125	0.85	18	Mesa	
JTM-16-120-6TR	SCR	Corner	1200	Bonding	4	4	16	125	0.85	18	Mesa	
JTM-20-120-2TR	SCR	Corner	1200	Clip	4.42	4.42	20	125	0.85	14	Mesa	
JTM-40-120-2TR	SCR	Corner	1200	Clip	5.8	5.8	34	125	0.85	8	Mesa	
JTM-45-120-2TR	SCR	Corner	1200	Clip	6.35	6.35	40	125	0.93	7.1	Mesa	
JTN6050H-12-6TR	SCR	Central	1200	Bonding	6.48	6.28	41	150	0.83	6	Planar	Automotive
JTN5050H-12-6V	SCR	Central	1200	Bonding	7.73	5.53	43	150			Planar	Automotive
JTM-70-120-2TR	SCR	Corner	1200	Clip	8.5	8.5	72	125	0.9	6	Mesa	
JTM-77-120-2TR	SCR	Corner	1200	Clip	8.5	8.5	72	125	0.9	6	Mesa	

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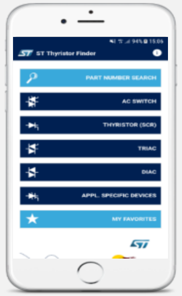
Applications and development tools

Your design support & tools

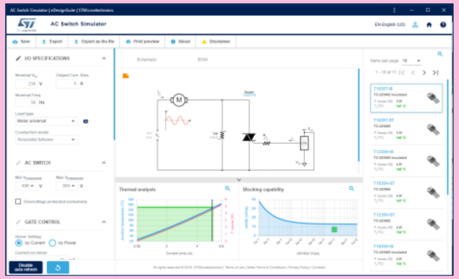
Portfolio & datasheets



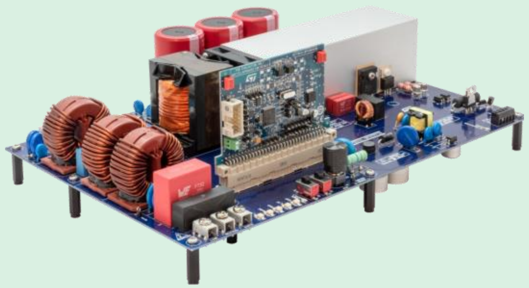
Selector Guide

eDesignSuite

Intelligent design tools



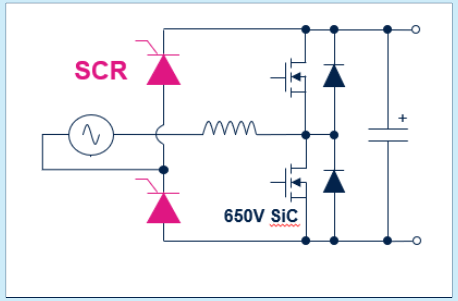
Reference designs



Evaluation boards

Application notes

Know-how & design tips



Thyristor-based evaluation boards

Board part number	Description	Thyristor (SCR)	Triac	ACST	ACS*
Starter kit					
STEVAL-IHT007V1	Extension board with ACS switches for STM8S-DISCOVERY kit		T1010H-6G		ACS108-8UN
STEVAL-IHT005V2	Full 3.3 V ACS/Triac control using the STM32		T1635H-6T	ACST1635-8FP	
STEVAL-GLA001V1	Insulated AC switch control (Nucleo compatible)		T1635T-8FP	ACST310-8B	ACS108-8TN
Motor control					
STEVAL-IHM029V2	Universal motor control based on the STM8S		T1235T-8T		
STEVAL-IHM041V1	Universal motor driver with speed control based on the STM8		T1635T-8I		
Home appliance					
STEVAL-IHT001V2	Cold thermostat kit based on the STM8S			ACST610-8FP	ACS110-7SN
STEVAL-IHT003V2	Low loss e-starter for compressor starter circuits			ACST610-8T	
Light dimmers					
STEVAL-ILD003V2	Analog wall dimmer for CFL/LED lamps	TS820-600FP			
STEVAL-ILD004V2	Digital wall dimmer for halogen and low-consumption lamps	TS820-600FP			
Active inrush current limiters					
STEVAL-IHT008V1	Low standby loss front-end with inrush current limitation and insulated AC switch control		T1635T-8FP	ACST210-8FP	ACS108-8SN
STEVAL-ISF003V1	Low standby losses power front-end with inrush current-limitation	TN5050H-12WY			
STEVAL-SCR001V1	Inrush current solution with high side bypass SCR	TN5015H-6G			
STEVAL-SCR002V1	Inrush current solution with Low side bypass SCR	TN1605H-6T	Z0110MN		
STEVAL-DPSTPFC1	Totem pole boost				
Other applications					
STDES-OVP001V1	± 6 kV surge protection (IEC61000-4-5)		T5015H-6T		
STDES-DIS001V1	BMS active discharge reference design	TN4035H-8GY			
STDES-SSR001V1	Solid State relay 6A full SMD	TN4035HA-8GY		ACS108-8SN	

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Selected application notes

AN	Title	Version	Latest update	Type
AN1966	Triac overvoltage protection using a Transil	4	27-avr-22	application
AN2777	New high-temperature, high-performance TRIACs for optimized vacuum cleaner designs	1.2	13-sept-18	application
AN2986	AC switch triggering with 3.3 V power supply	1.4	15-janv-19	application
AN2991	Single-phase induction motor drive for refrigerator compressor application (formerly AN1354)	2.2	13-sept-18	application
AN308	Triac analog control circuits for inductive loads	4.2	13-sept-18	application
AN3168	**Noninsulated SCR / triac control circuits**	1.2	13-sept-18	application
AN390	AVS kit guidelines	6	13-sept-18	application
AN392	Microcontrollers and TRIAC-based dimmers	2.3	13-sept-18	application
AN436	Triac CONTROL BY PULSE TRANSFORMER	2.3	13-sept-18	application
AN4363	**How to select the triac, ACS, or ACST that fits your application**	2.1	15-janv-19	application
AN437	**RC snubber circuit design for TRIACs**	2.6	16-janv-19	application
AN440	Triac control with a microcontroller powered from a positive supply	4.1	03-juin-20	application
AN441	Inductive load control with AC switches	3.2	13-sept-18	application
AN442	TRIACS AND MICROCONTROLLERS - THE EASY CONNECTION	2.1	13-sept-18	application
AN4564	Is a positive power supply mandatory for my application, or could a negative output work also?	1	13-sept-18	application
AN4606	**Inrush-current limiter circuits (ICL) with triacs and thyristors (SCR) and controlled bridge design tips**	2.2	19-mars-21	application
AN4608	**How to select the right thyristor (SCR) for your application**	1	13-sept-18	application
AN4993	How to implement a SCR or a triac in a hybride relay application	1.1	13-sept-18	application
AN5114	Controlling a triac with a phototriac	2	02-août-22	application
AN533	**SCRs, TRIACs, and AC switches, thermal management precautions for handling and mounting**	3.6	16-juil-20	application
AN5649	How to evaluate and improve triacs immunity to EFT bursts	1	15-juin-20	application
AN5384	**ACEPACK SMIT module package guidelines for mounting and thermal management**	1	04-nov-19	product
AN1172	THE NEW ACS SERIES: SERIES A BREAKTHROUGH IN RUGGEDNESS & DRIVE FOR HOME APPLIANCES	2.5	16-janv-19	product
AN1379	Z01 and ACS behavior compared under fast voltage transients	5.2	13-sept-18	product
AN2703	**Parameter list for SCRs, triacs, AC Switches, and Diacs**	3	25-mars-22	product
AN302	Thyristors and TRIACs: holding current - an important parameter	3.5	16-janv-19	product
AN303	Thyristors and TRIACs: latching current	3.4	16-janv-19	product
AN3169	Technology performance comparison of triacs subjected to fast transient voltages	1.1	13-sept-18	product
AN4030	Gate to cathode capacitor, impact on triac immunity and reliability	1	13-sept-18	product
AN439	**Snubberless™ and logic level triac behavior at turn-off**	3.4	13-sept-18	product
AN4607	**Basics on the thyristor (SCR) structure and its application**	2	13-sept-18	product

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