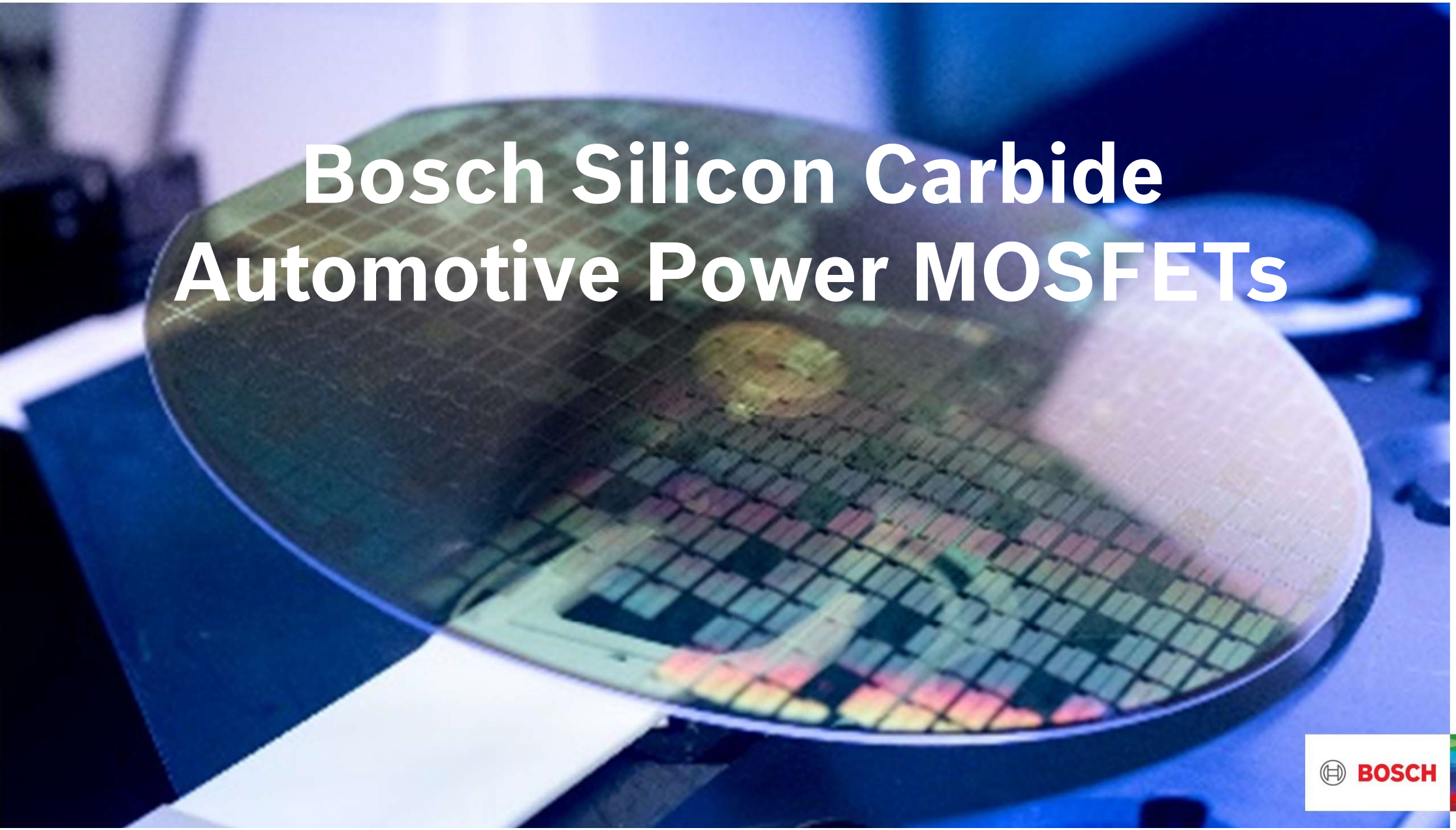
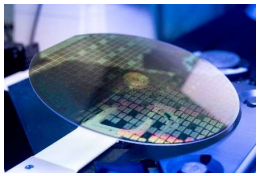

Bosch Silicon Carbide
Automotive Power MOSFETs
BOSCH

Bosch SiC Power MOSFETs
Bosch products, history and production



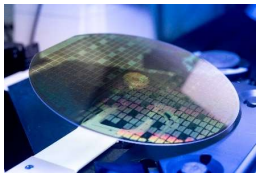
Bosch SiC history & production

- Own SiC technology development, design, fab process and wafer test, together in one campus for optimized and direct feedback
- Dedicated SiC-line in automotive qualified 150mm fab at semiconductor HQ Reutlingen Germany. 200mm readiness of production lines
- Automotive qualified products and supplier
- More than 10 years experience in SiC MOSFET development and more than 20 years in trench process (“Bosch process”)

SiC products

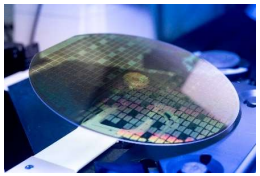
- Bare die products with variable layout & discrete packaged products in two voltage classes
- **Bare die products**
  - 1200V: 10mΩ, 13mΩ, 23mΩ, 31mΩ & 50mΩ
  - 750V: 7mΩ, 10mΩ, 16mΩ, 22mΩ & 35mΩ
- **SMD TO-263-7 and THT TO-247-3L/4L** discrete packaged products for e.g. on-board chargers and dc-dc applications
  - 1200V: 23mΩ, 31mΩ, 50mΩ
  - 750V: 16mΩ, 22mΩ, 36mΩ

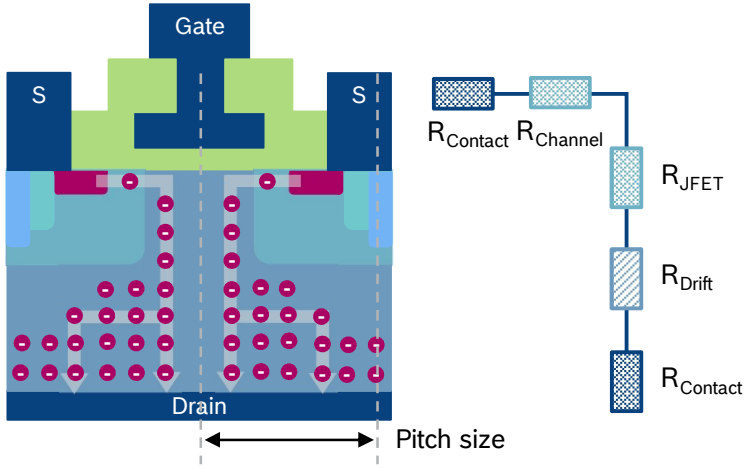
Bosch SiC Power MOSFETs
Main features and benefits of Bosch SiC



Benchmark low on-resistance	**High partial load efficiency (static losses)** Typical T_j: 70° - 100°C and also at low temperature ➢ Low chip temperature → low $R_{DS(on)}$ → high efficiency
Optimized switching behaviour	**High partial load efficiency (dynamic losses)** ➢ Fast switching slopes → low losses → high efficiency
Flexible and simple to drive	**Lowest internal gate resistance & flexible performance using gate voltage of 15V or 18V with minimal impact of $R_{DS(on)}$** Switching speed adjustable by gate resistors
High oxide reliability	**Low failure rate for automotive grade reliability and low gate and drain leakage currents**
Reliability & robustness	**High short circuit robustness & avalanche robustness**
Highest temperature rating up to 200°C for bare dies	**Improved thermal design** Smaller components can be used for the same power rating → space saving → reduced module form factor

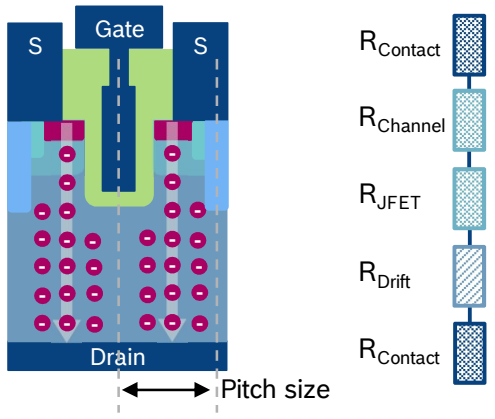
Bosch SiC Power MOSFETs
Advantages of Bosch dual channel trench technology





Planar gate technology

- Used in first and current generations of SiC-MOSFETs
- Larger pitch size → higher $R_{DS(on)}$ x A compared to trench technology



Dual channel trench gate technology

- Bosch own SiC process in-house development
- Very small pitch size, potential to future further scaling
- Lower $R_{DS(on)}$ x A compared to planar SiC MOSFET
- Bosch device concept optimized for reliability
- High short circuit robustness
- 25 years BOSCH experience in trench technology

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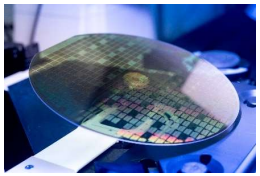
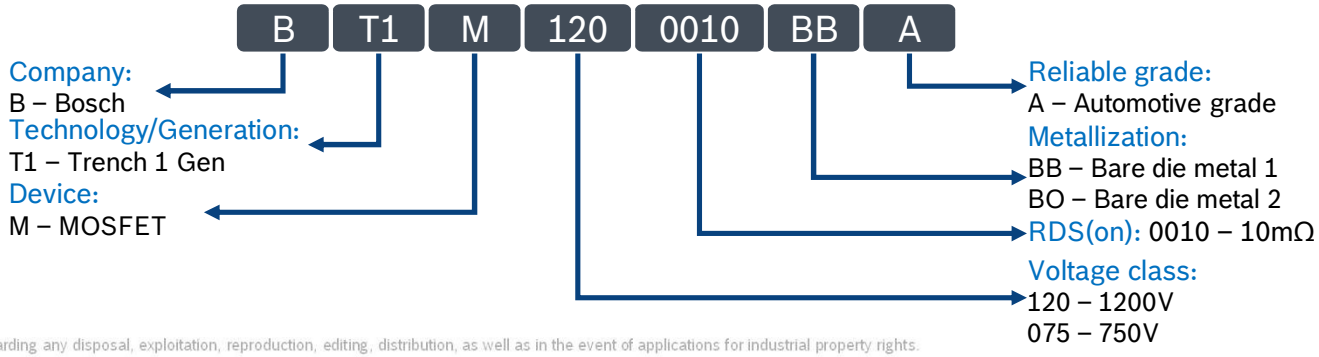
Bosch SiC Power MOSFETs
Portfolio bare die*

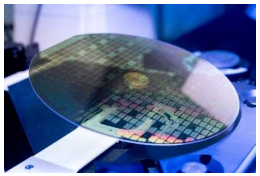


Type	V_{DSS} Voltage [V]	I_D Current [A]	$R_{DS(on)}$ [mΩ]	Qualification	Metallization
BT1M1200010*A	1200	175	10	AEC-Q101	* = BB: AlCu or * = BO: metallization for sintering/soldering
BT1M1200013*A		130	13		
BT1M1200023*A		75	23		
BT1M1200031*A		55	31		
BT1M1200050*A		35	50		
BT1M0750007*A	750	225	7	AEC-Q101	* = BB: AlCu or * = BO: metallization for sintering/soldering
BT1M0750010*A		165	10		
BT1M0750016*A		100	16		
BT1M0750022*A		70	22		
BT1M0750035*A		45	35		

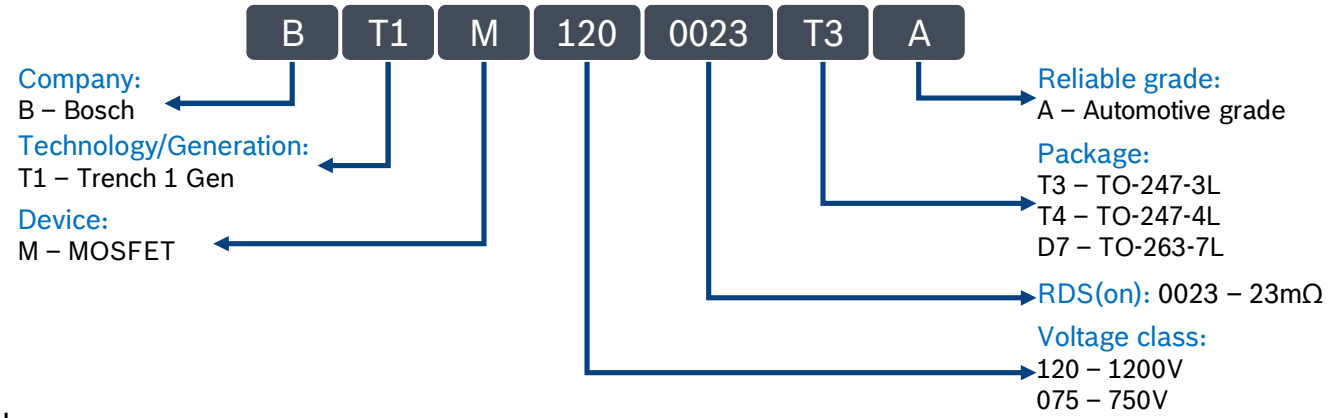


* will be extended constantly

Bosch SiC Power MOSFETs
Portfolio line discrete*



Type	V_{DSS} Voltage [V]	I_D Current [A]	$R_{DS(on)}$ [mΩ]	Qualification	Package
BT1M1200023*A	1200	63	23	AEC-Q101	* = T3: TO-247-3L * = T4: TO-247-4L * = D7: TO-263-7L
BT1M1200031*A		44	31		
BT1M1200050*A		29	50		
BT1M0750016*A	750	82	16	AEC-Q101	* = T3: TO-247-3L * = T4: TO-247-4L * = D7: TO-263-7L
BT1M0750022*A		59	22		
BT1M0750035*A		39	36		



* will be extended constantly