

Features

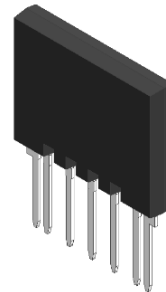
- DOT247 package with the 4th Generation SiC-MOSFET
- $V_{DSS} = 1200V$
- Low $R_{DS(on)}$
- High-speed switching possible
- Low switching losses
- $T_{vjmax} = 175^{\circ}C$
- Compact design
- High power density

Construction

The power module is a common source module which implements SiC-MOSFETs.

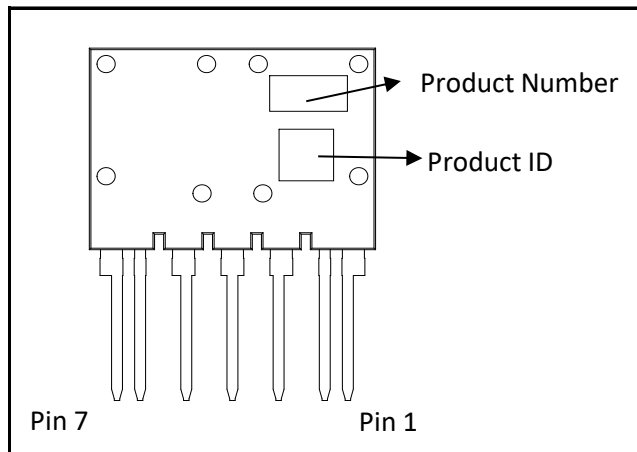
Application

- Inverter, Converter

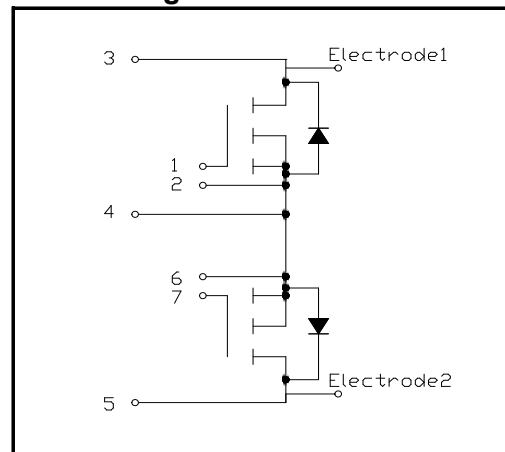


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Outline



Circuit diagram



Pin No.	Pin Name	Function
1	G1	MOSFET Gate
2	S1	MOSFET Source
3	P	Positive Power
4	N	Negative power
5	O	Output
6	S2	MOSFET Source
7	G2	MOSFET Gate

Absolute maximum ratings (Tvj = 25°C unless otherwise specified)

Parameter	Symbol	Conditions	Rating	Unit
Drain - source voltage	V_{DSS}	$V_{GS} = 0V$	1200	V
Gate - source voltage (DC)	V_{GSS}		-4 to +21	
Gate - source voltage ($t_{surge} < 300ns$)	$V_{GSSsurge}$		-4 to +23	
Continuous drain current (DC)	I_D	$T_c = 25^\circ C, V_{GS} = 18V$	106	A
		$T_c = 100^\circ C, V_{GS} = 18V$	75	
Pulsed drain current	$I_{D,pulse}$	Pulse 1ms, $T_c = 25^\circ C, V_{GS} = 18V$ ^{Note 2), 5)}	194	
		Pulse 1ms, $T_c = 100^\circ C, V_{GS} = 18V$ ^{Note 2), 5)}	137	
Continuous source current (DC)	I_S	$T_c = 25^\circ C, V_{GS} = 18V$	106	
Pulsed source current	$I_{S,pulse}$	Pulse 1.5μs, $T_c = 25^\circ C, V_{GS} = 18V$ ^{Note 2)}	194	
Body diode surge forward current	$I_{S,pulse}$	Pulse 1.5μs, $T_c = 25^\circ C, V_{GS} = 0V$ ^{Note 2), 4), 5)}	130	W
Total power dissipation ^{Note 3), 5)}	P_{tot}	$T_c = 25^\circ C$	361	
Virtual junction temperature	T_{vj}		-40 to +175	°C
Storage temperature	T_{stg}		-40 to +125	

Note 1) If the product is used beyond absolute maximum ratings defined in the specifications, as its internal structure may be damaged, please replace the product with a new one.

Note 2) Repetition rate should be kept within the range where temperature rise if die should not exceed T_{vjmax} .

Note 3) Case temperature (T_c) is defined on the cooper surface just under the chips.

Note 4) Repetitive pulse, $PW \leq 1.5\mu s$, Duty cycle $\leq 5\%$

Note 5) T_{vj} is less than 175°C.

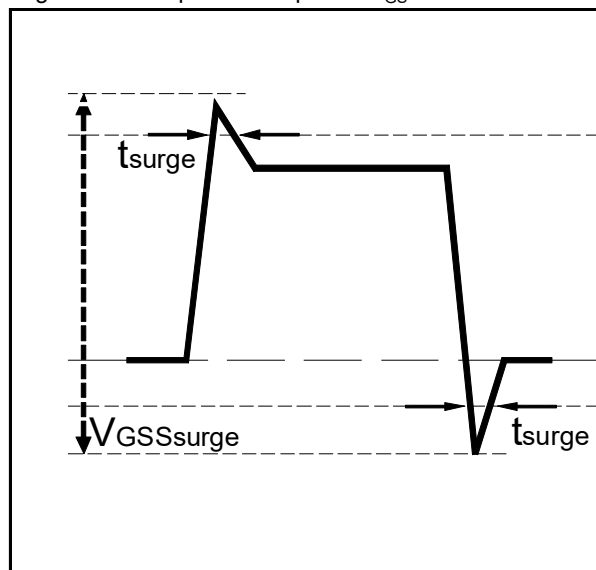
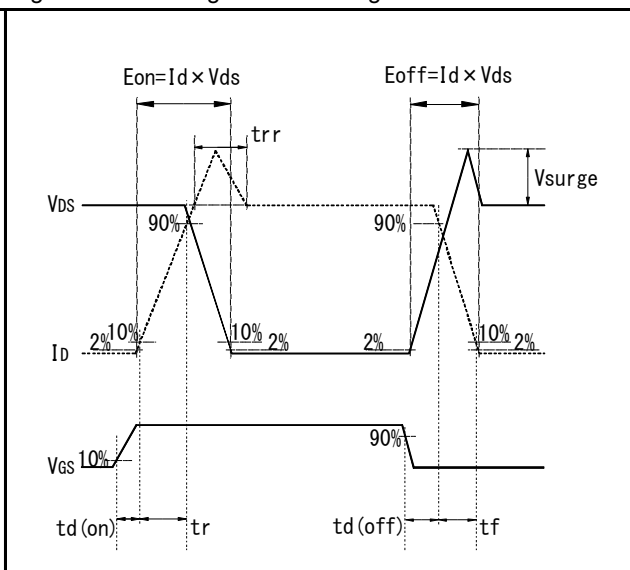
Figure 1. Example of acceptable V_{GS} waveform

Figure 2. Wavelength for switching test



Module (Tvj = 25°C unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance, junction - case	$R_{th(j-c)}$	1 arm heating ^{Note 3)}	—	0.33	0.42	°C/W

MOSFET electrical characteristics (Tvj = 25°C unless otherwise specified)

Parameter	Symbol	Conditions		Values			Unit
				Min.	Typ.	Max.	
Drain - Source on resistance	R _{DS(on)}	I _D = 68A, V _{GS} = 18V	Tvj = 25°C	—	11	15	mΩ
			Tvj = 150°C	—	22	—	
Zero gate voltage drain current	I _{DSS}	V _{DS} = 1200V, V _{GS} = 0V		—	—	80	μA
Gate - source threshold voltage	V _{GS(th)}	V _{DS} = 10V, I _D = 36.4mA ^{Note 6)}		2.8	—	4.8	V
Gate - source leakage current	I _{GSS}	V _{GS} = +21V, V _{DS} = 0V		—	—	0.1	μA
		V _{GS} = -4V, V _{DS} = 0V		-0.1	—	—	
Turn - on delay time	t _{d(on)}	V _{GS(on)} = 18V, V _{GS(off)} = 0V V _{DS} = 800V I _D = 68A R _{G(on)} = 5.6Ω, R _{G(off)} = 5.6Ω Inductive load		—	24	—	ns
Rise time	t _r			—	19	—	
Turn - off delay time	t _{d(off)}			—	133	—	
Fall time	t _f			—	16	—	
Turn - on switching loss	E _{on}			—	2.7	—	mJ
Turn - off switching loss	E _{off}			—	0.9	—	
Input capacitance	C _{iss}	V _{DS} = 800V, V _{GS} = 0V, 1MHz		—	7.23	—	nF
Total gate charge	Q _g	V _{GS(on)} = 18V, V _{GS(off)} = 0V V _{DS} = 800V I _D = 68A		—	260	—	nC
Gate - source charge	Q _{gs}			—	52	—	
Gate - drain charge	Q _{gd}			—	75	—	
Internal gate resistance	R _{Gint}	Tvj = 25°C		—	1	—	Ω

Note 6) Tested after applying $V_{GS} = 21V$ for 100ms.

Body diode electrical characteristics (Tvj = 25°C unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Source - drain voltage	V_{SD}	$V_{GS} = 0V, I_S = 68A$	Tvj = 25°C	—	3.3	V
			Tvj = 150°C	—	3.6	
		$V_{GS} = 18V, I_S = 68A$	Tvj = 25°C	—	0.76	
			Tvj = 150°C	—	1.53	

Electrical characteristic curves (Typical)

Figure 3. Output characteristic at 25°C (Typ.)

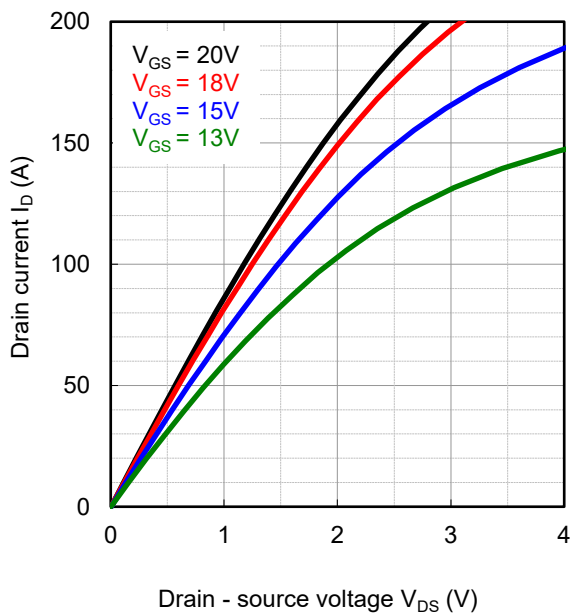


Figure 4. Drain - source voltage characteristic (Typ.)

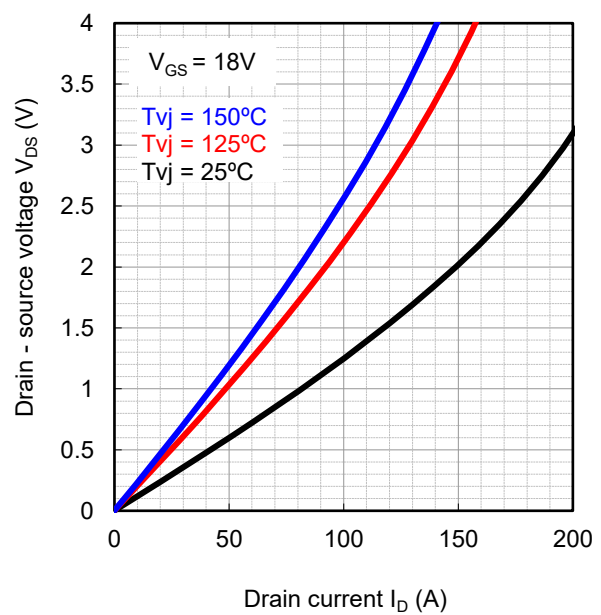
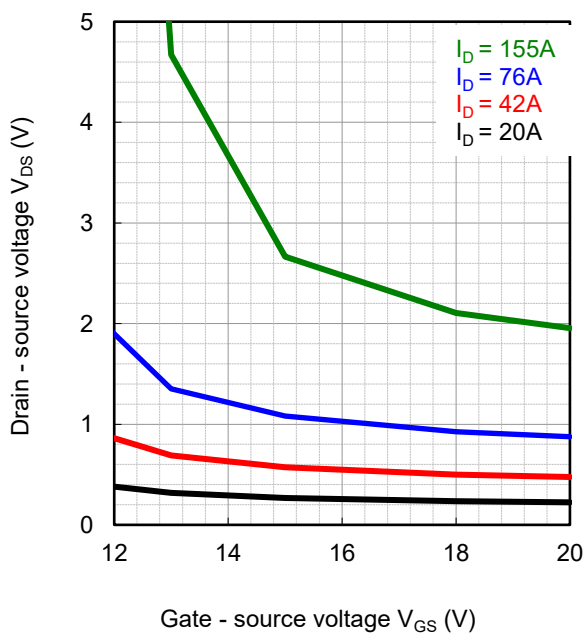


Figure 5. Drain - source voltage characteristic at 25°C (Typ.)



Electrical characteristic curves (Typical)

Figure 6. $R_{DS(on)}$ vs. T_{vj} characteristic (Typ.)

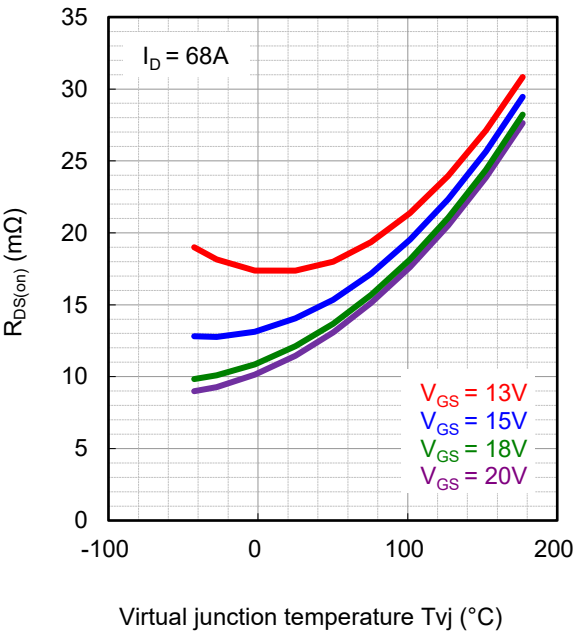


Figure 7. Forward characteristic of diode
 $V_{GS} = 18V$ (Typ.)

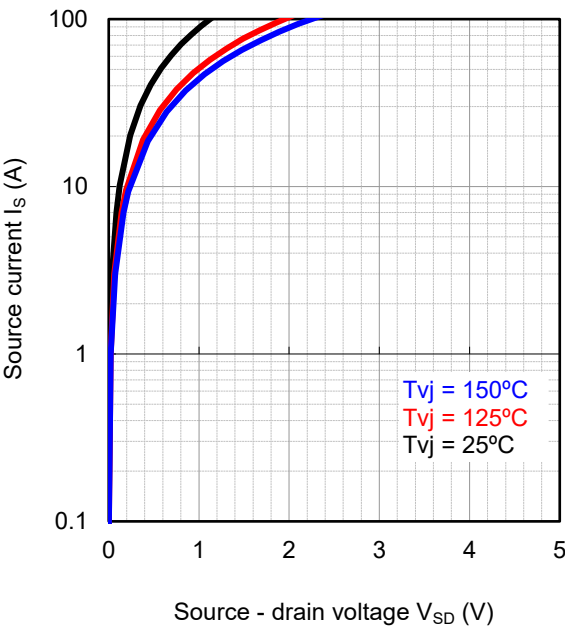
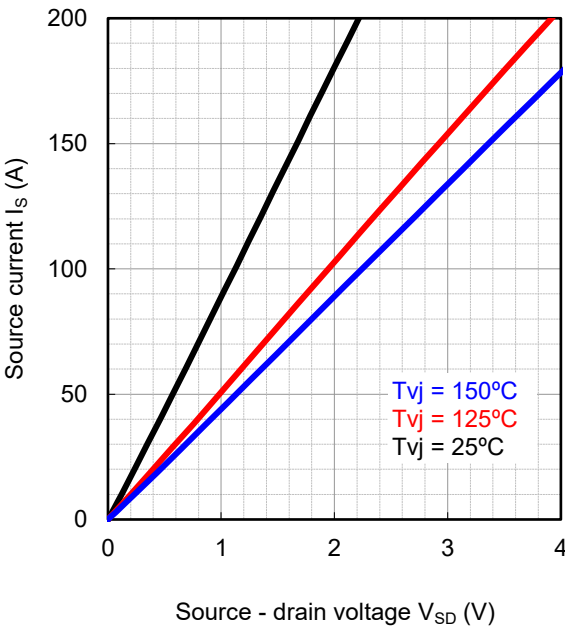


Figure 8. Forward characteristic of diode
 $V_{GS} = 18V$ (Typ.)



Electrical characteristic curves (Typical)

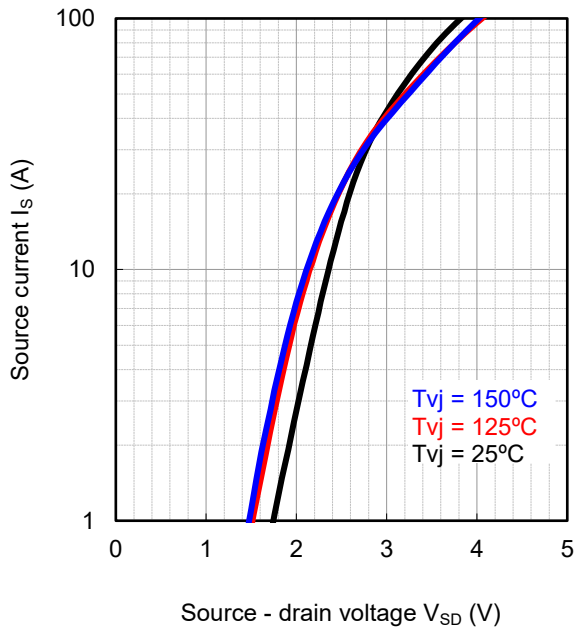
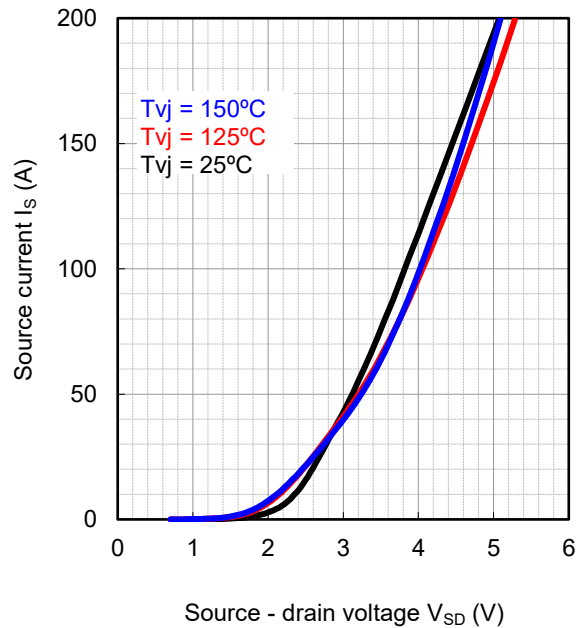
Figure 9. Forward characteristic of diode
 $V_{GS} = 0V$ (Typ.)Figure 10. Forward characteristic of diode
 $V_{GS} = 0V$ (Typ.)

Figure 11. Drain current vs. Gate-source voltage (Typ.)

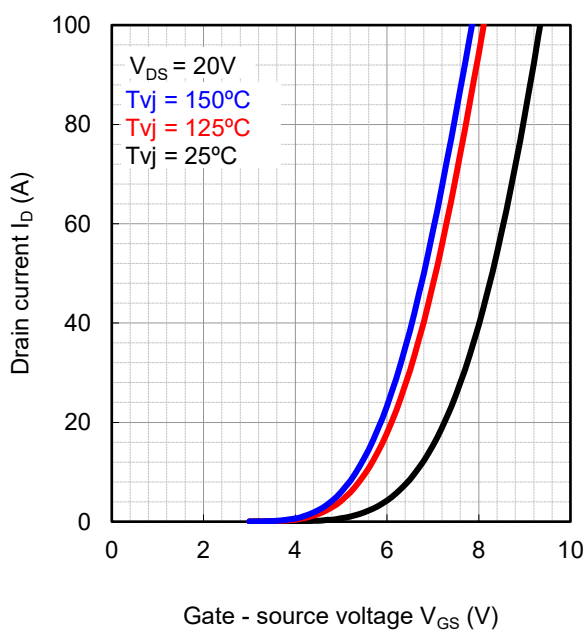
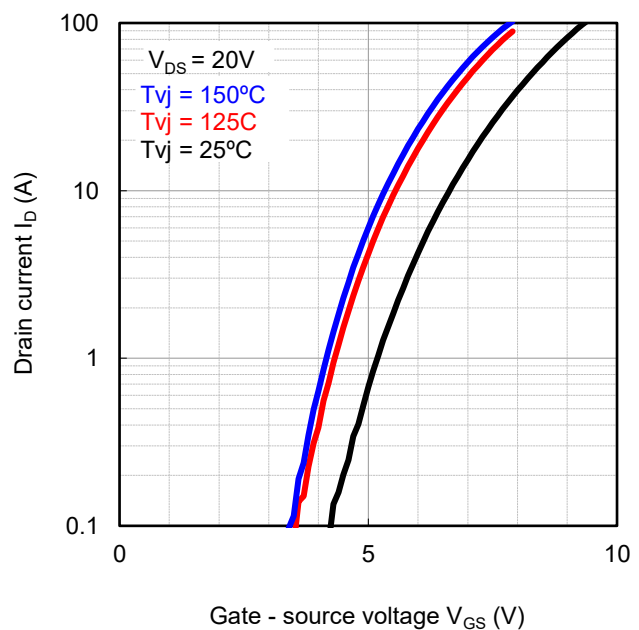


Figure 12. Drain current vs. Gate-source voltage (Typ.)



Electrical characteristic curves (Typical)

Figure 13. Switching time vs. Drain current at 25°C (Typ.)

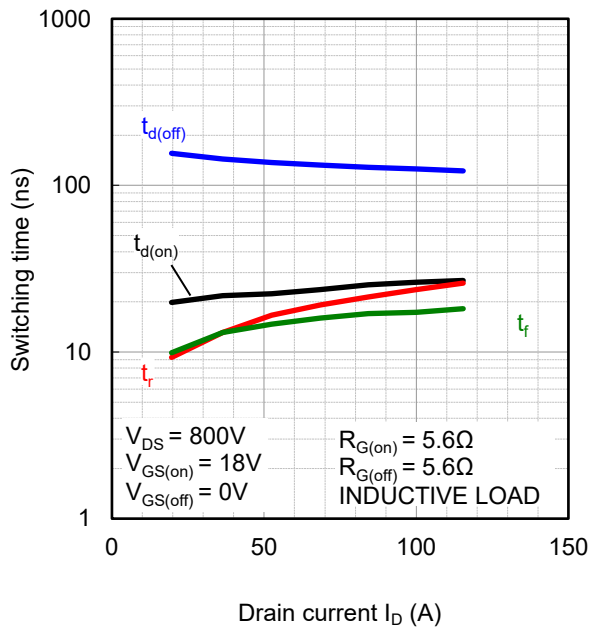


Figure 14. Switching time vs. Drain current at 150°C (Typ.)

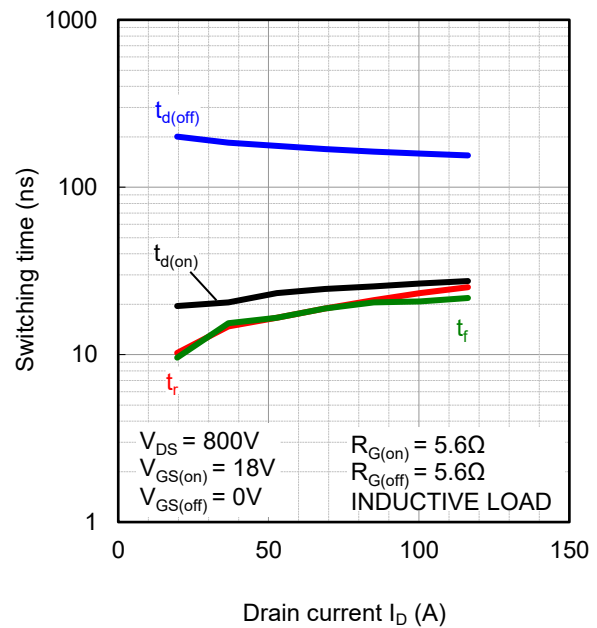


Figure 15. Switching loss vs. Drain current at 25°C (Typ.)

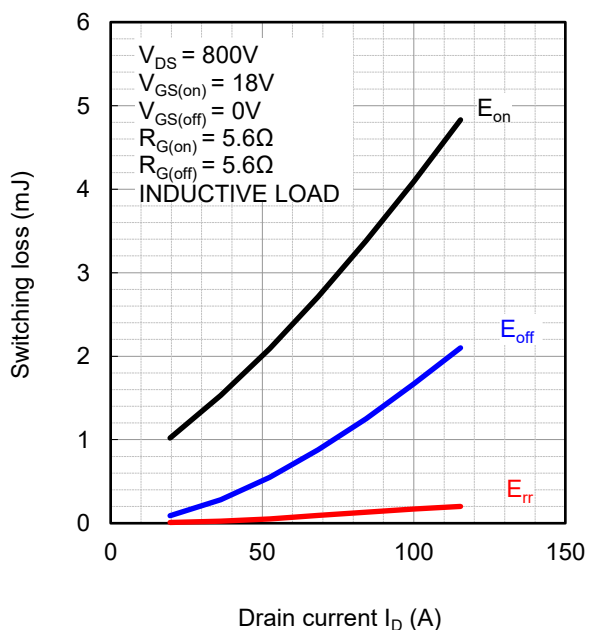
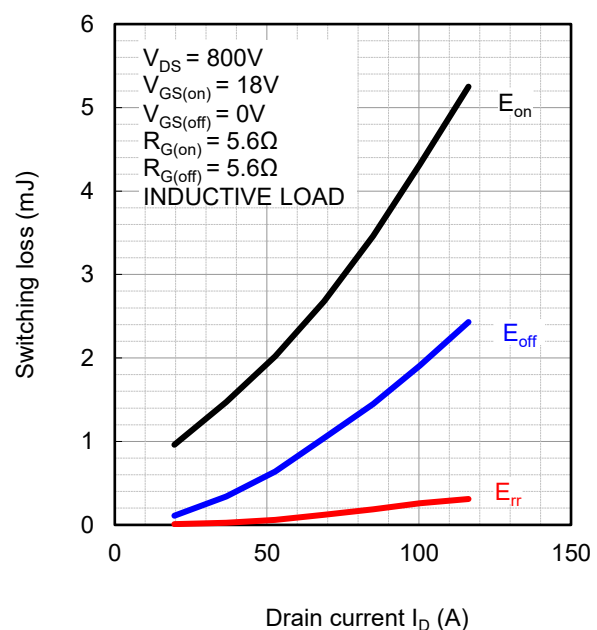


Figure 16. Switching loss vs. Drain current at 150°C (Typ.)



Electrical characteristic curves (Typical)

Figure 17. Recovery characteristic vs. Drain current at 25°C (Typ.)

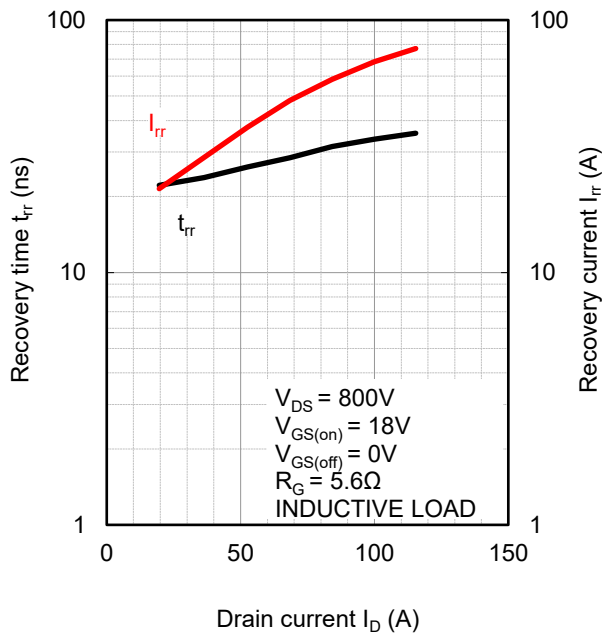


Figure 18. Recovery characteristic vs. Drain current at 150°C (Typ.)

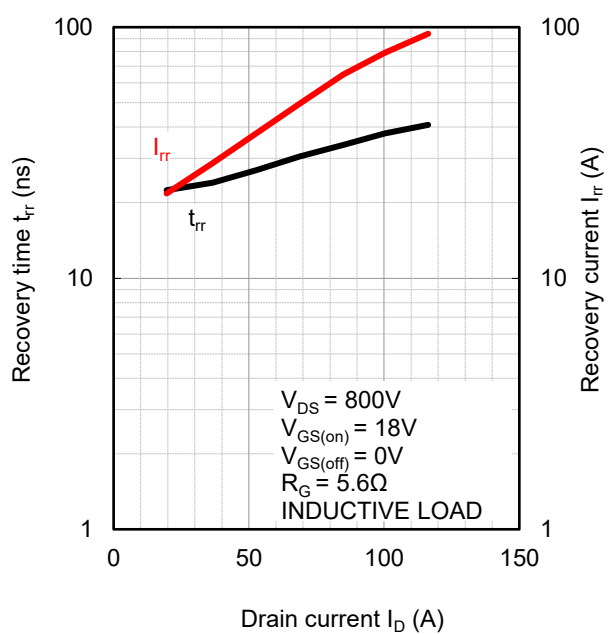


Figure 19. Switching time vs. Gate resistance at 25°C (Typ.)

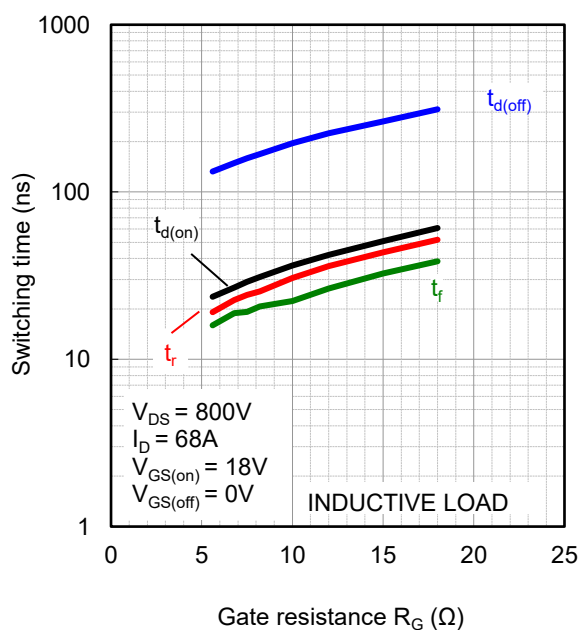
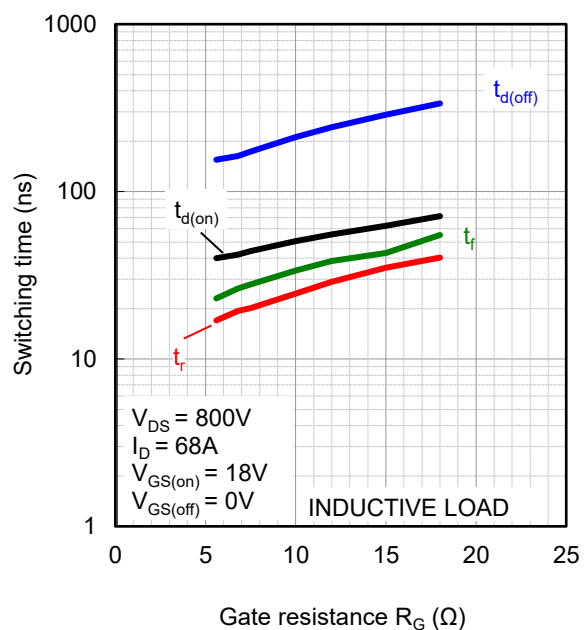


Figure 20. Switching time vs. Gate resistance at 150°C (Typ.)



Electrical characteristic curves (Typical)

Figure 21. Switching loss vs. Gate resistance at 25°C (Typ.)

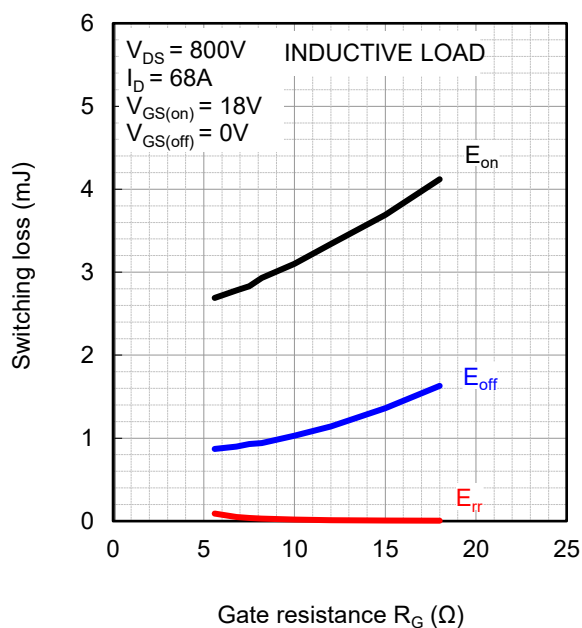


Figure 22. Switching loss vs. Gate resistance at 150°C (Typ.)

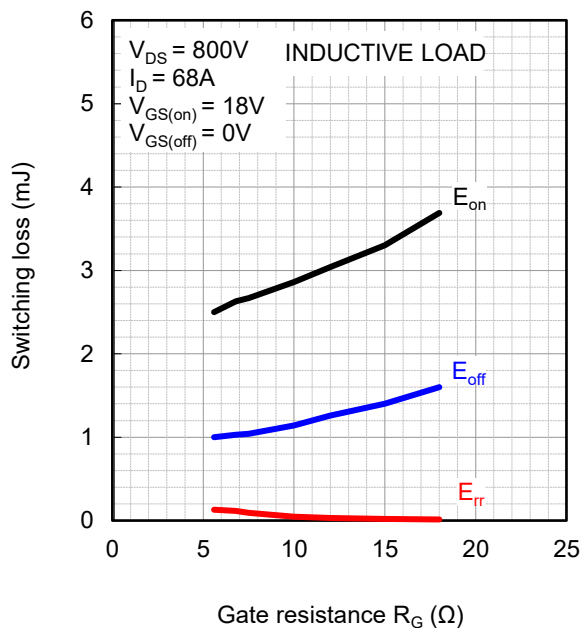


Figure 23. Capacitance vs. Drain - source voltage at 25°C (Typ.)

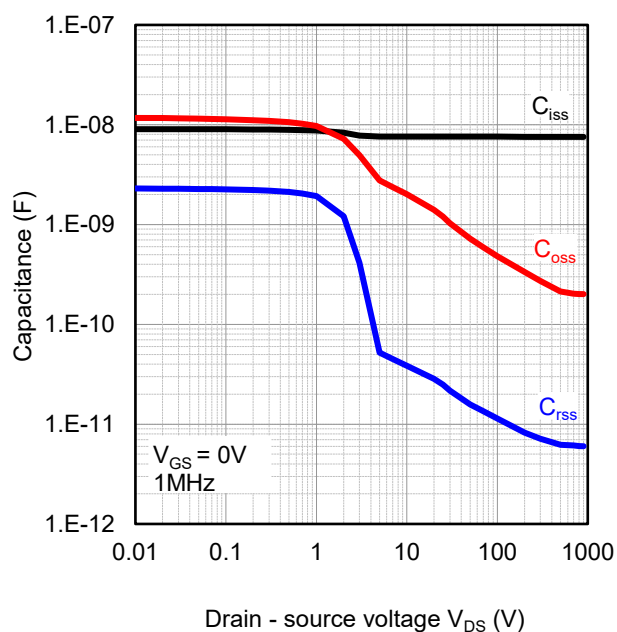
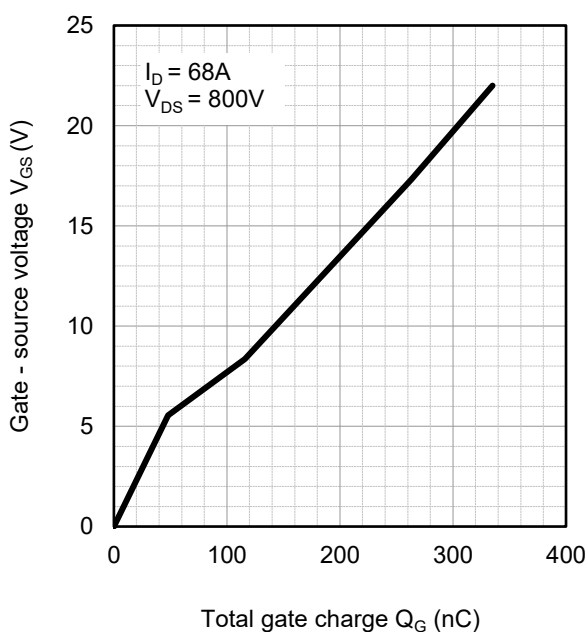
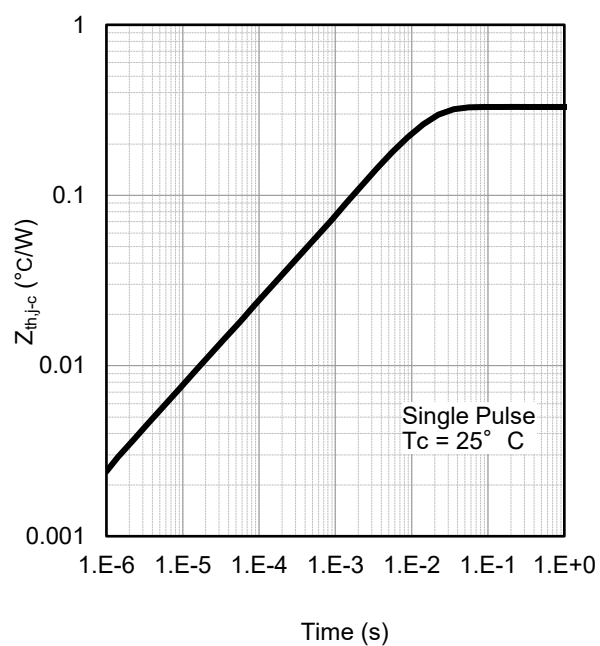


Figure 24. Gate charge characteristic at 25°C (Typ.)



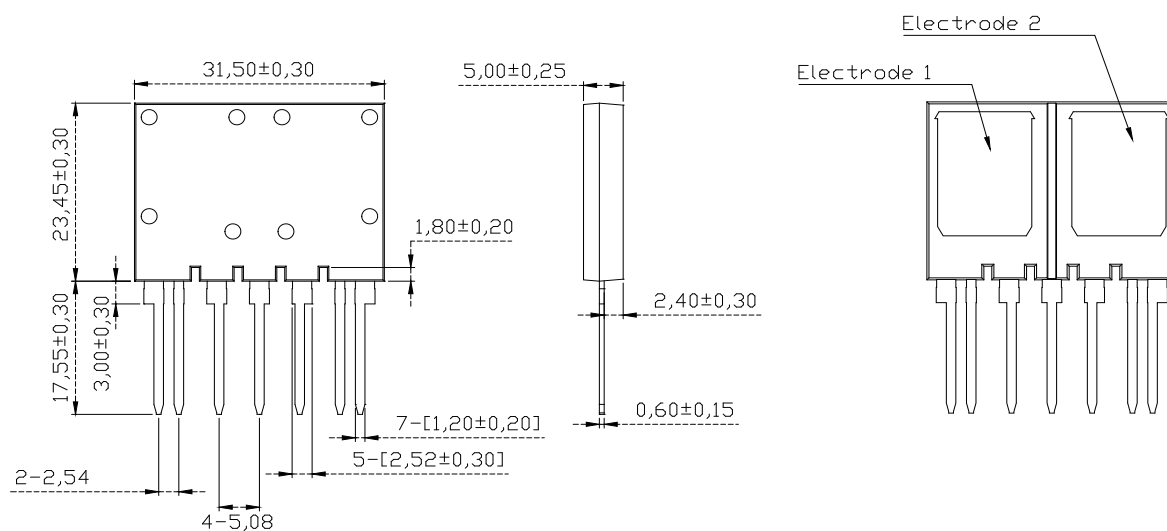
Electrical characteristic curves (Typical)

Figure 25. Transient thermal impedance (Typ.)



Package outlines

Unit : mm



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