

Features

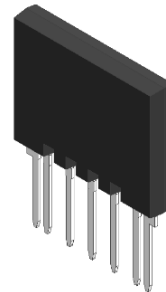
- DOT247 package with the 4th Generation SiC-MOSFET
- $V_{DSS} = 1200V$
- Low $R_{DS(on)}$
- High-speed switching possible
- Low switching losses
- $T_{vjmax} = 175^{\circ}C$
- Compact design
- High power density

Construction

The power module is a half bridge module which implements SiC-MOSFETs.

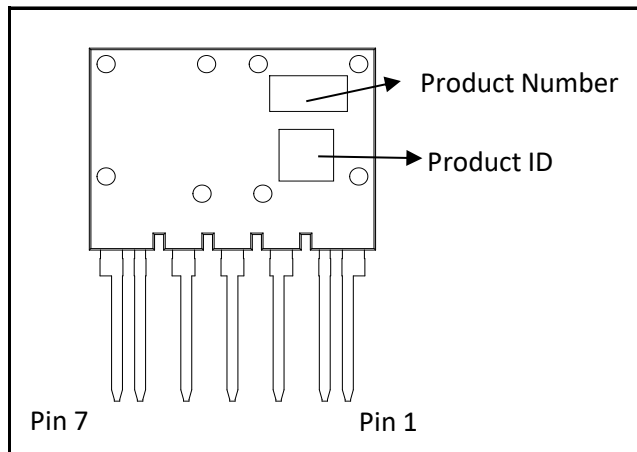
Application

- Inverter, Converter

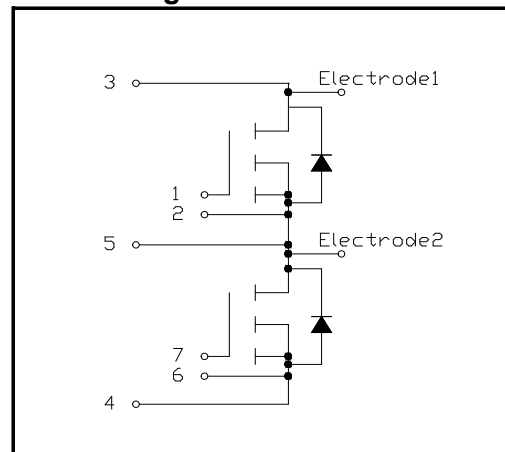


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Outline



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	
Total power dissipation ^{Note 3), 5)}	P_{tot}	$T_c = 25^{\circ}C$	361	W
Virtual junction temperature	T_{vj}		-40 to +175	$^{\circ}C$
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

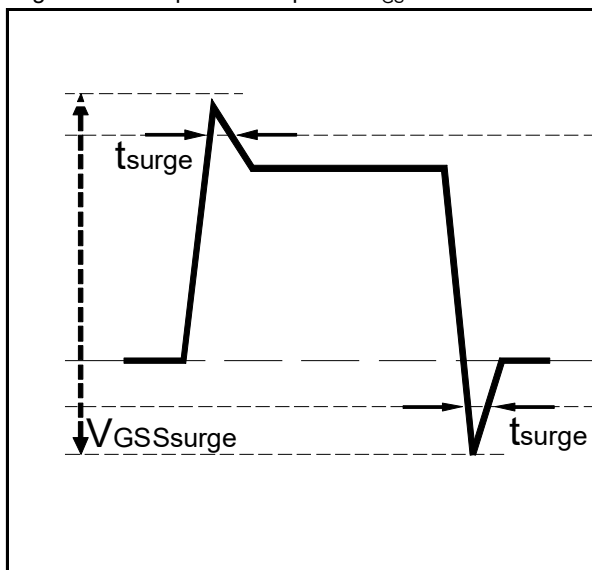
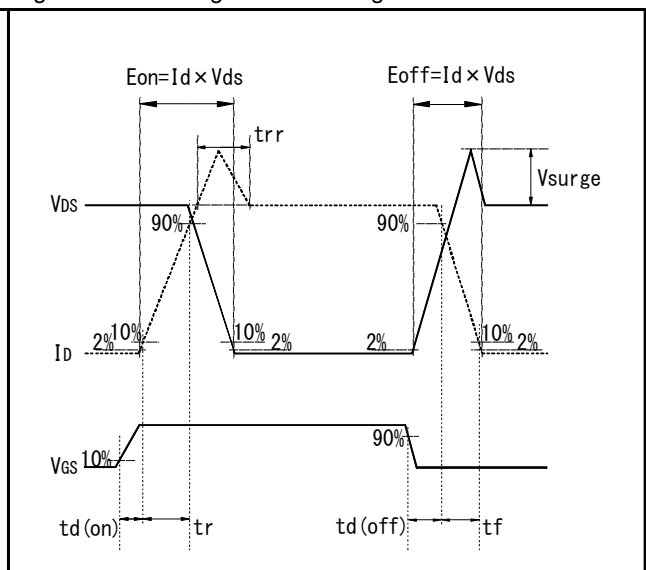


Figure 2. Wavelength for switching test



Module (Tvj = 25°C unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Stray inductance	L_s	Terminal P to Terminal N	—	14	—	nH
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
			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	$t_{d(on)}$	$V_{GS(on)} = 18V, V_{GS(off)} = 0V$ $V_{DS} = 800V$ $I_D = 68A$ $R_{G(on)} = 5.6\Omega, R_{G(off)} = 5.6\Omega$ 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.	
Souce - 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.)

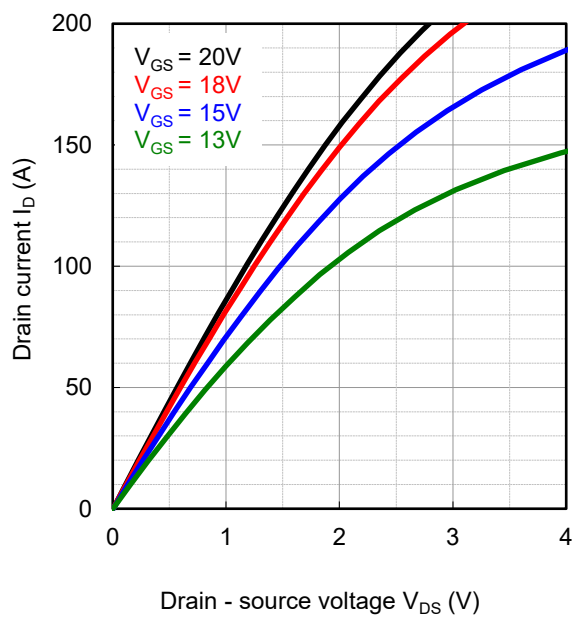


Figure 4. Drain - source voltage characteristic (Typ.)

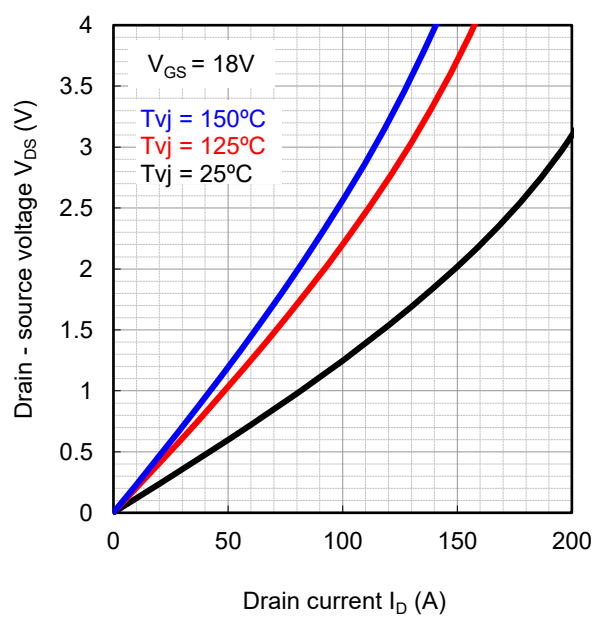
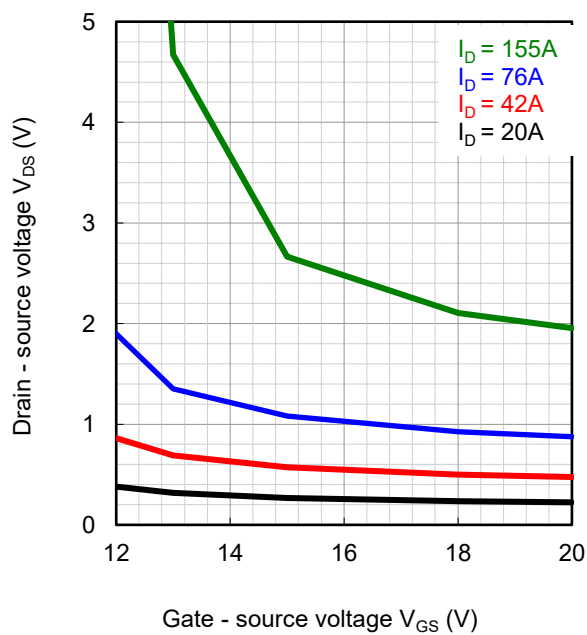


Figure 5. Drain - source voltage characteristic at 25°C (Typ.)



Electrical characteristic curves (Typical)

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

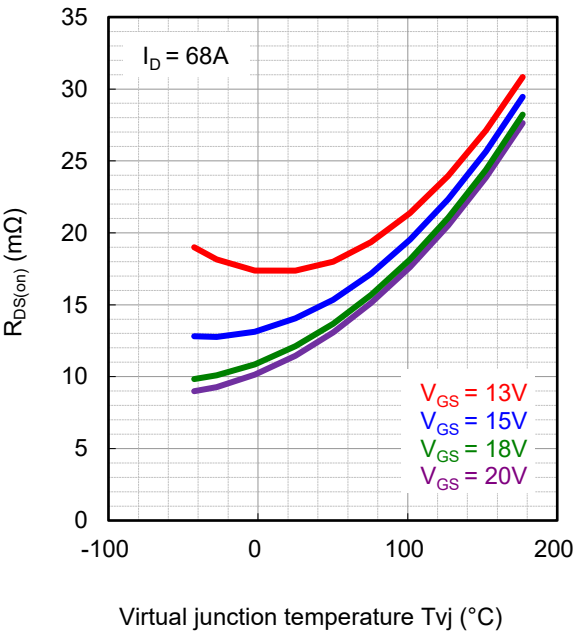


Figure 7. Forward characteristic of diode
 $V_{GS} = 18V$ (Typ.)

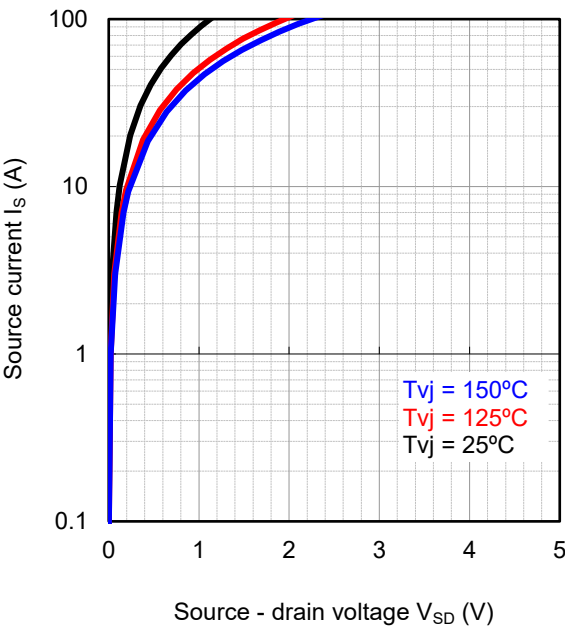
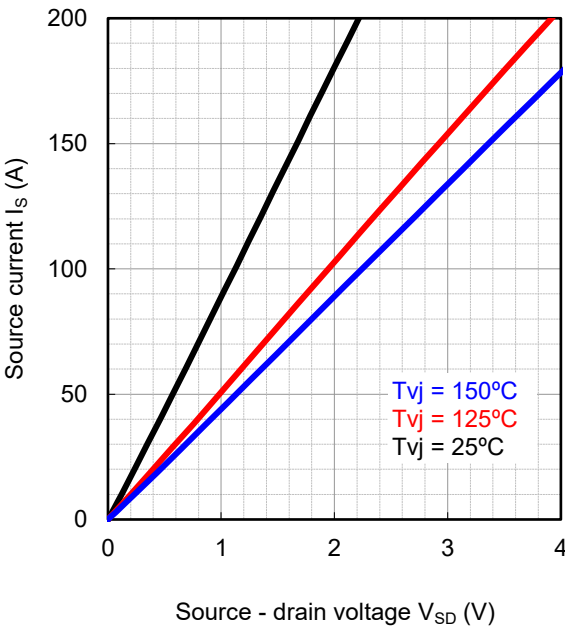


Figure 8. Forward characteristic of diode
 $V_{GS} = 18V$ (Typ.)



Electrical characteristic curves (Typical)

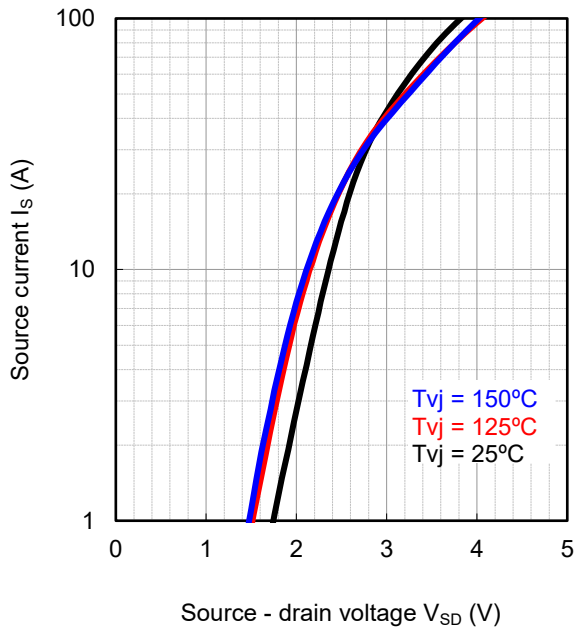
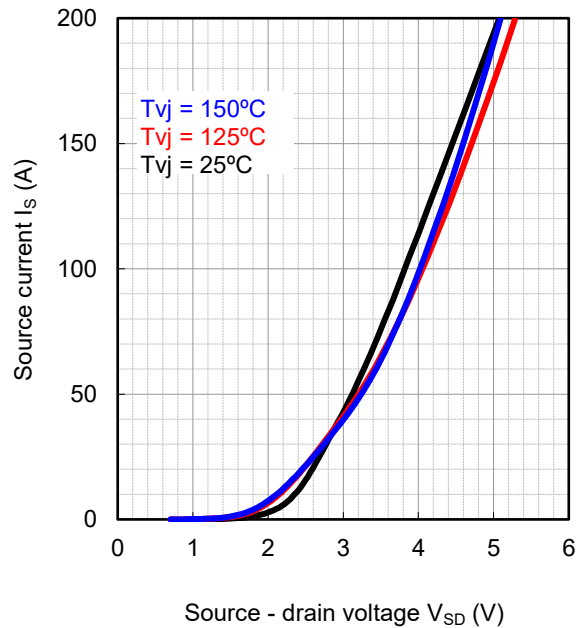
Figure 9. Forward characteristic of diode
 $V_{GS} = 0V$ (Typ.)Figure 10. Forward characteristic of diode
 $V_{GS} = 0V$ (Typ.)

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

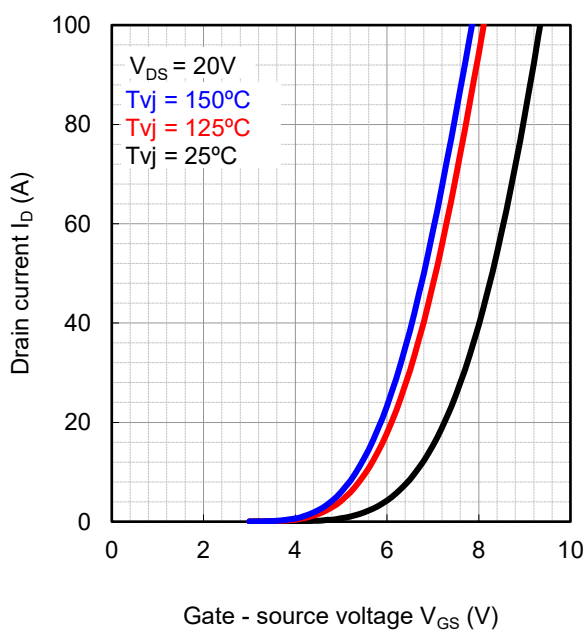
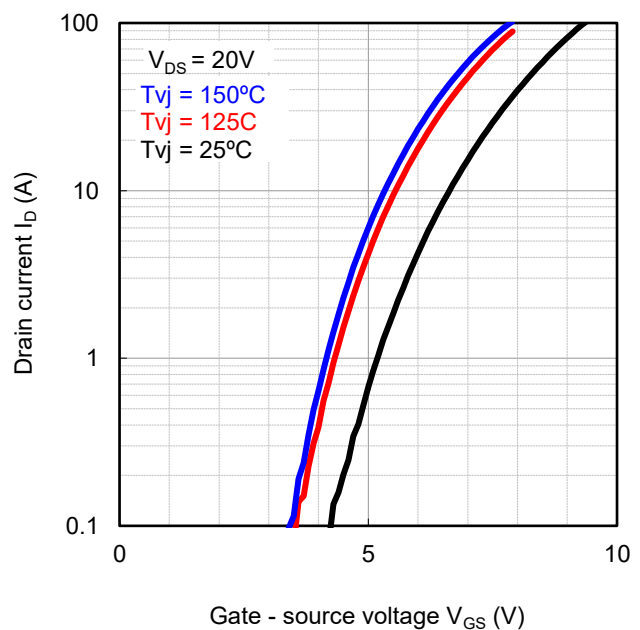


Figure 12. Drain current vs. Gate - source voltage (Typ.)



Electrical characteristic curves (Typical)

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

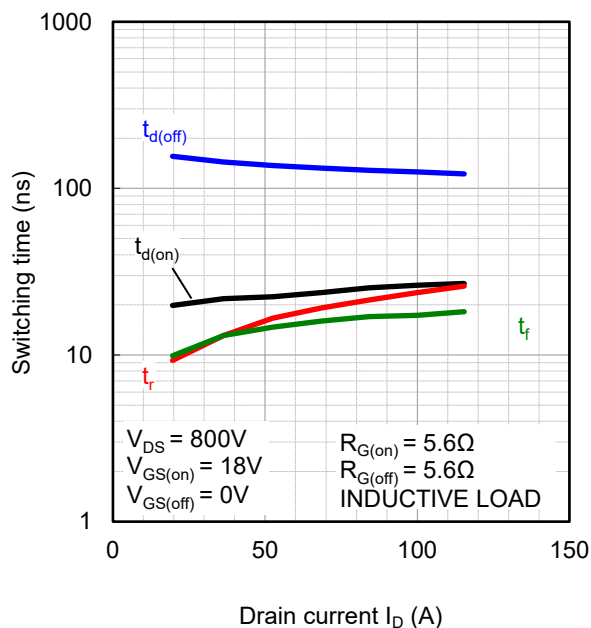


Figure 14. Switching time vs. Drain current at 150°C (Typ.)

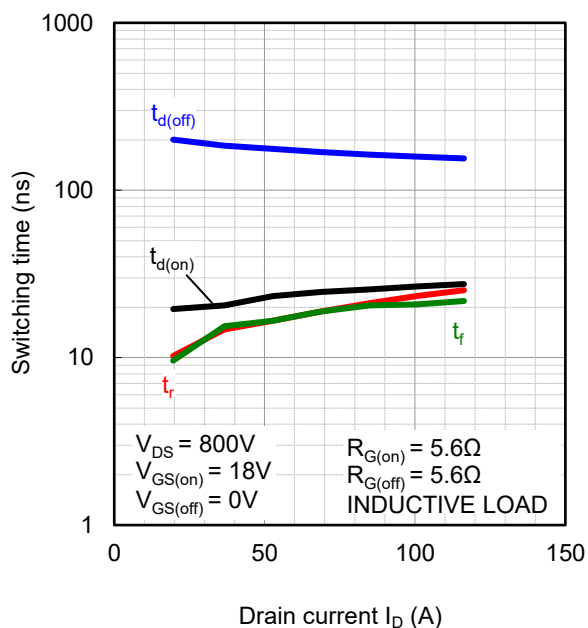


Figure 15. Switching loss vs. Drain current at 25°C (Typ.)

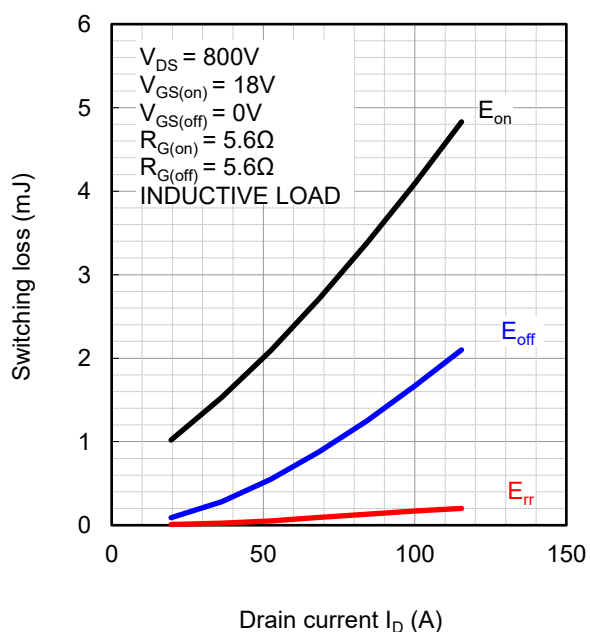
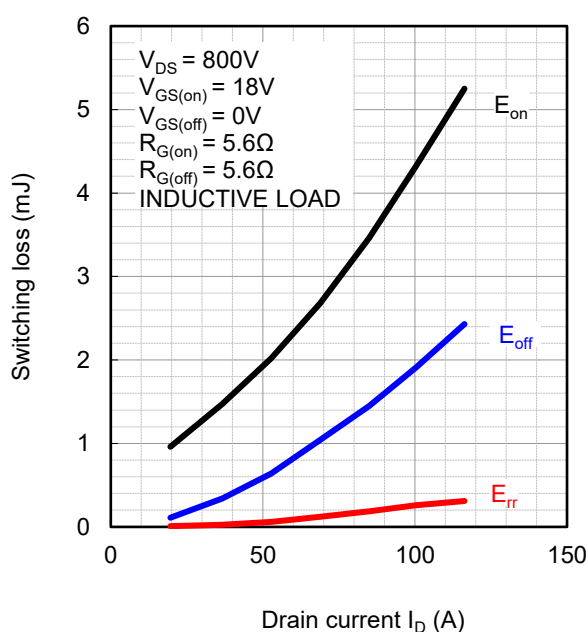


Figure 16. Switching loss vs. Drain current at 150°C (Typ.)



Electrical characteristic curves (Typical)

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

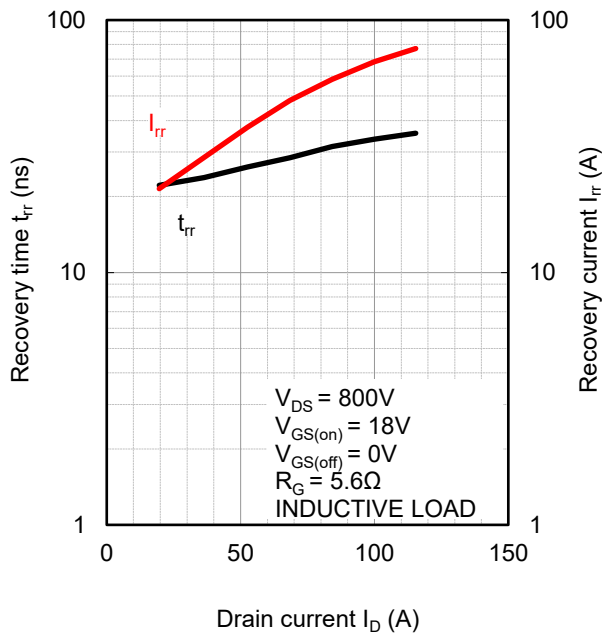


Figure 18. Recovery characteristic vs. Drain current at 150°C (Typ.)

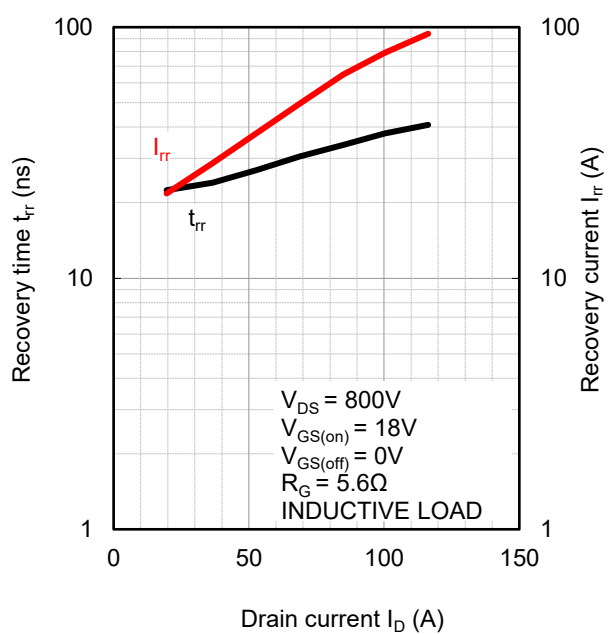


Figure 19. Switching time vs. Gate resistance at 25°C (Typ.)

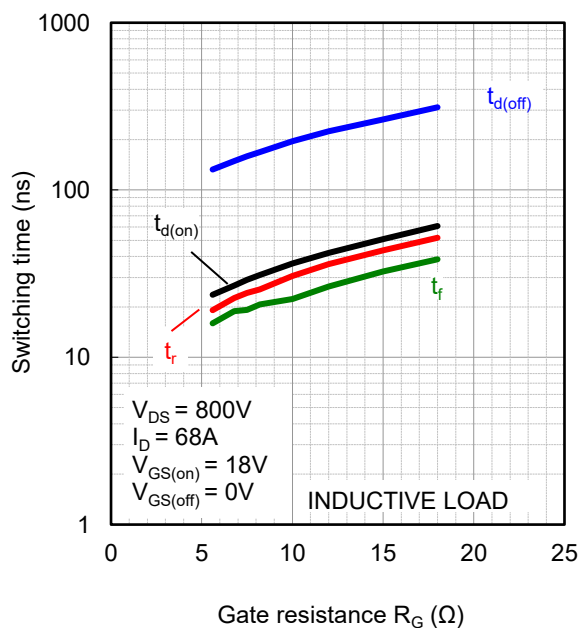
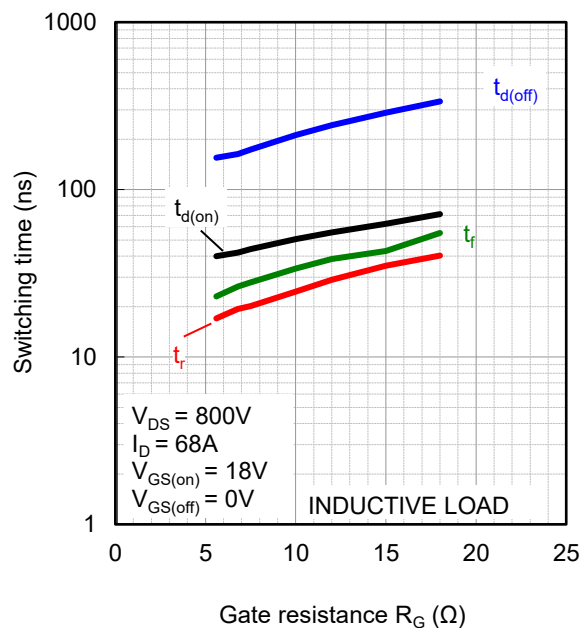


Figure 20. Switching time vs. Gate resistance at 150°C (Typ.)



Electrical characteristic curves (Typical)

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

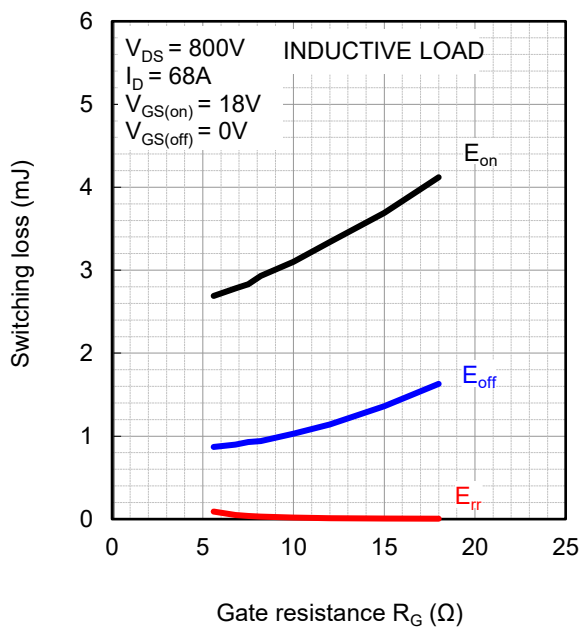


Figure 22. Switching loss vs. Gate resistance at 150°C (Typ.)

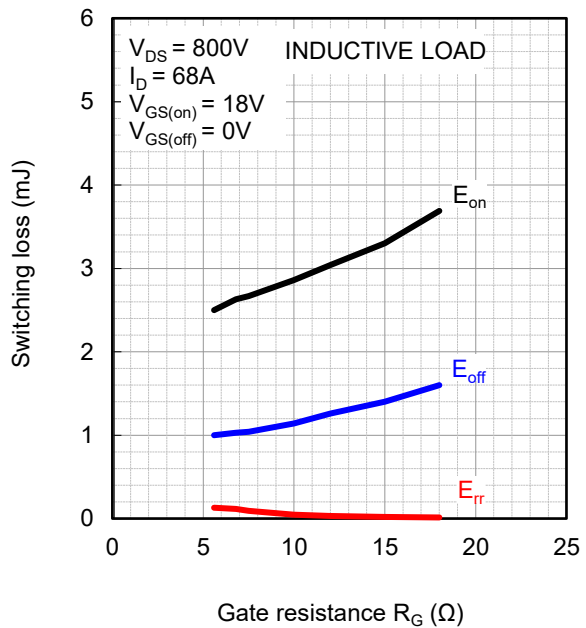


Figure 23. Capacitance vs. Drain - source voltage at 25°C (Typ.)

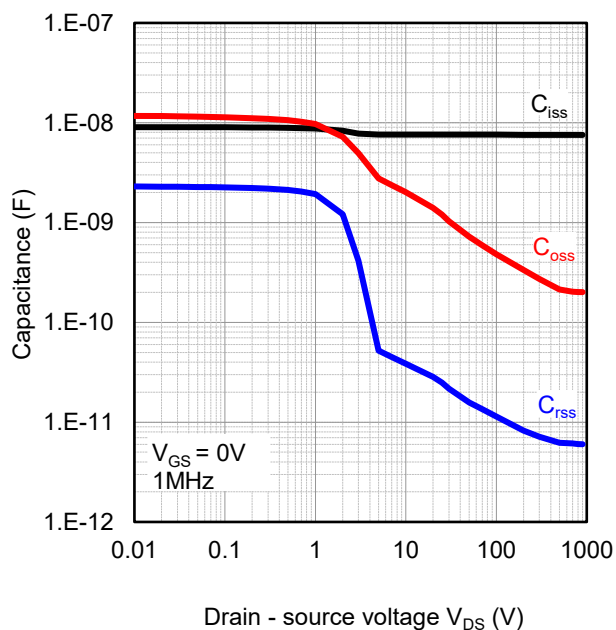
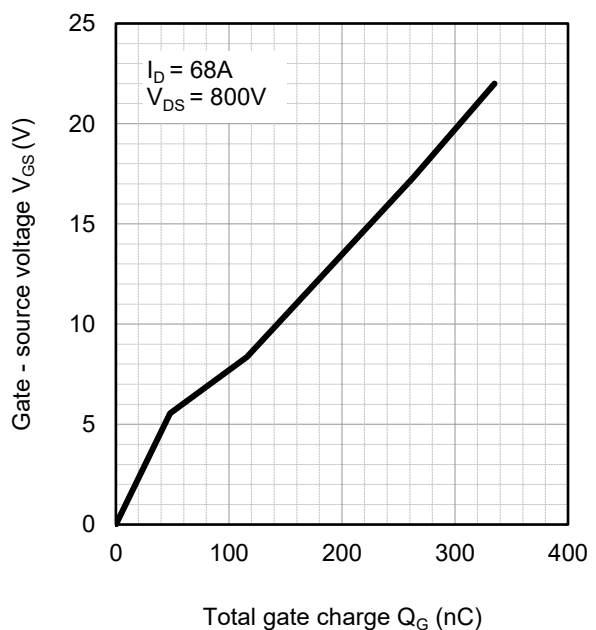
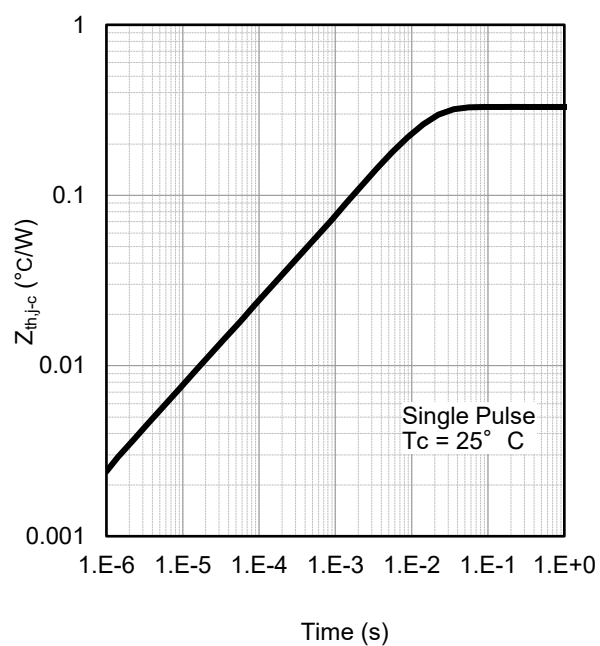


Figure 24. Gate charge characteristic at 25°C (Typ.)



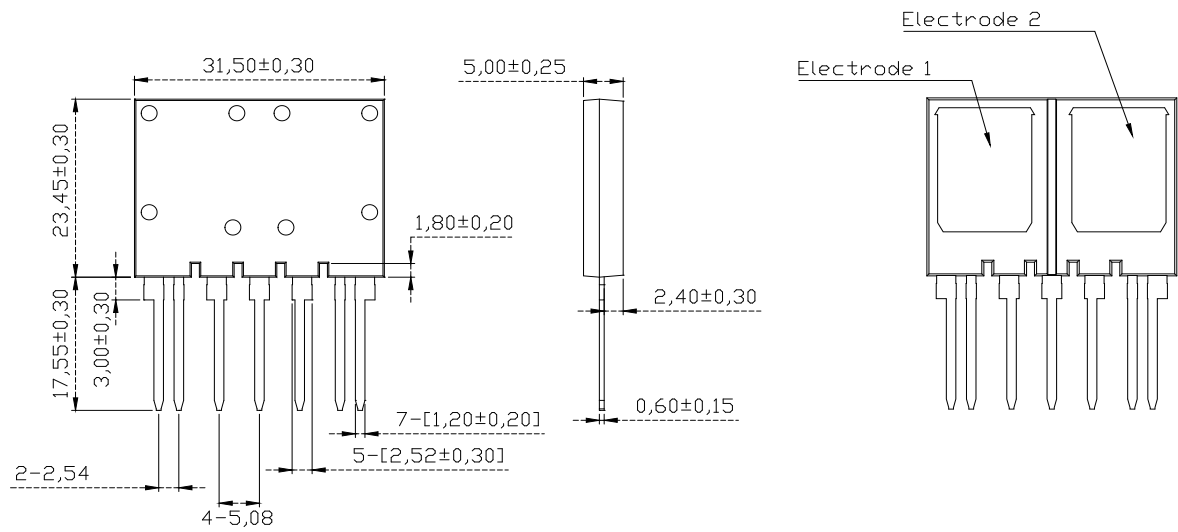
Electrical characteristic curves (Typical)

Figure 25. Transient thermal impedance (Typ.)



Package outlines

Unit : mm



Notes

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