

Features

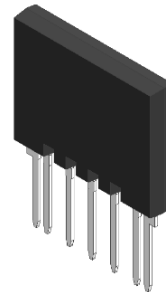
- DOT247 package with the 4th Generation SiC-MOSFET
- $V_{DSS} = 750V$
- Low $R_{DS(on)}$
- High-speed switching possible
- Low switching losses
- $T_{vjmax} = 175^{\circ}C$
- Compact design
- High power density

Construction

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

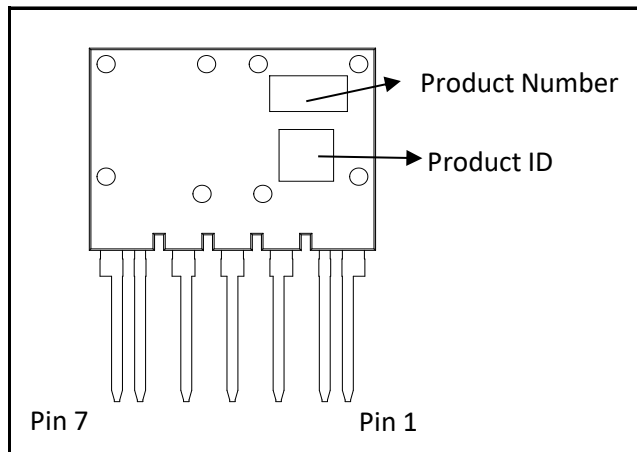
Application

- Inverter, Converter

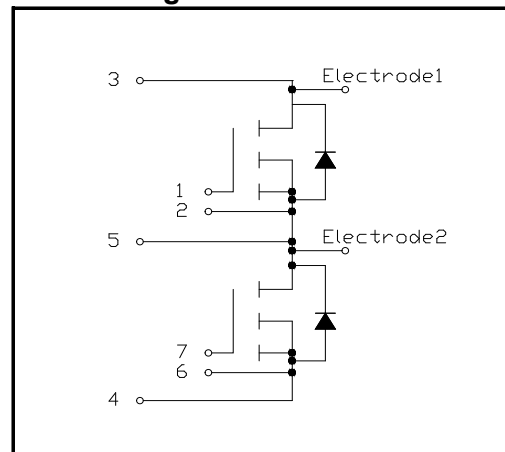


"EcoSiC™" is a trademark or a registered trademark of ROHM Co., Ltd.

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}	$V_{GS} = 0V$	750	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	$T_c = 25^\circ C, V_{GS} = 18V$	251	A
		$T_c = 100^\circ C, V_{GS} = 18V$	177	
Pulsed drain current	$I_{D,pulse}$	Pulse 1ms, $T_c = 25^\circ C, V_{GS} = 18V$ ^{Note 2), 5)}	459	
		Pulse 1ms, $T_c = 100^\circ C, V_{GS} = 18V$ ^{Note 2), 5)}	323	
Continuous source current (DC)	I_S	$T_c = 25^\circ C, V_{GS} = 18V$	251	
Pulsed source current	$I_{S,pulse}$	Pulse 1.5μs, $T_c = 25^\circ C, V_{GS} = 18V$ ^{Note 2)}	459	
Body diode surge forward current	$I_{S,pulse}$	Pulse 1.5μs, $T_c = 25^\circ C, V_{GS} = 0V$ ^{Note 2), 4), 5)}	334	W
Total power dissipation ^{Note 3), 5)}	P_{tot}	$T_c = 25^\circ C$	704	
Virtual junction temperature	T_{vj}		-40 to +175	
Storage temperature	T_{stg}		-40 to +125	°C

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.

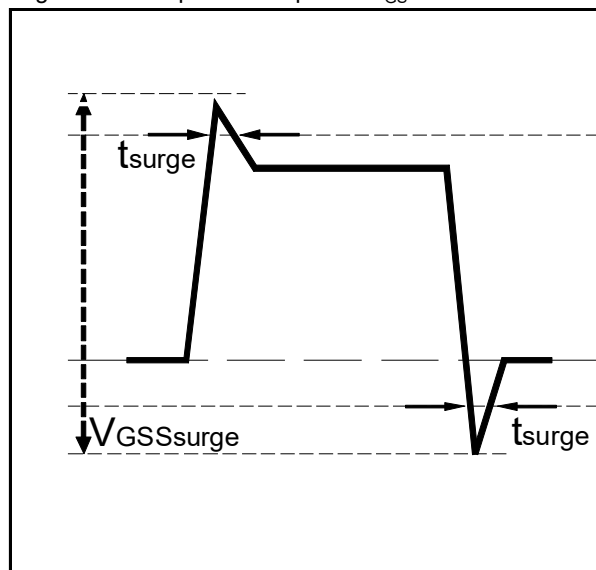
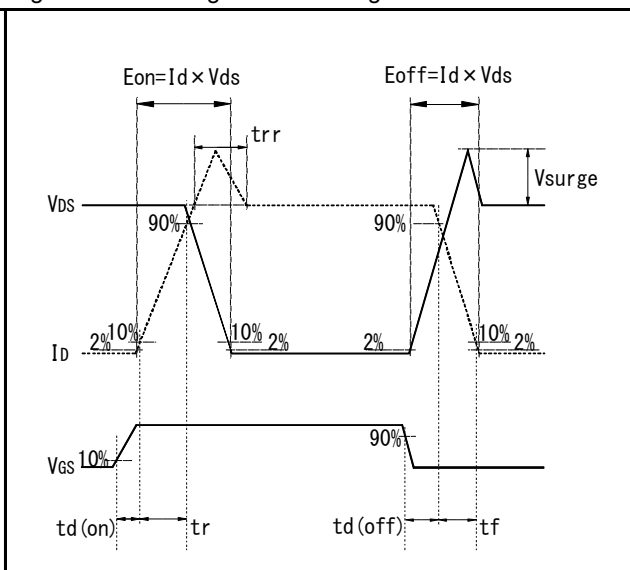
Figure 1. Example of acceptable V_{GS} waveform

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)}	—	0.17	0.22	°C/W

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source on resistance	$R_{DS(on)}$	$I_D = 188A, V_{GS} = 18V$	Tvj = 25°C	—	4	5
			Tvj = 150°C	—	8	—
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 750V, V_{GS} = 0V$	—	—	160	μA
Gate - source threshold voltage	$V_{GS(th)}$	$V_{DS} = 10V, I_D = 100mA$ ^{Note 6)}	2.8	—	4.8	V
Gate - source leakage current	I_{GSS}	$V_{GS} = +21V, V_{DS} = 0V$	—	—	0.2	μA
		$V_{GS} = -4V, V_{DS} = 0V$	-0.2	—	—	
Turn - on delay time	$t_{d(on)}$	$V_{GS(on)} = 18V, V_{GS(off)} = 0V$ $V_{DS} = 400V$ $I_D = 188A$ $R_{G(on)} = 10\Omega, R_{G(off)} = 10\Omega$ Inductive load	—	97	—	ns
Rise time	t_r		—	93	—	
Turn - off delay time	$t_{d(off)}$		—	344	—	
Fall time	t_f		—	34	—	
Turn - on switching loss	E_{on}		—	5.0	—	mJ
Turn - off switching loss	E_{off}		—	4.2	—	
Input capacitance	C_{iss}	$V_{DS} = 500V, V_{GS} = 0V, 1MHz$	—	14.7	—	nF
Total gate charge	Q_g	$V_{GS(on)} = 18V, V_{GS(off)} = 0V$ $V_{DS} = 500V$ $I_D = 188A$	—	520	—	nC
Gate - source charge	Q_{gs}		—	112	—	
Gate - drain charge	Q_{gd}		—	140	—	
Internal gate resistance	R_{Gint}	Tvj = 25°C	—	0.5	—	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}	$V_{GS} = 0V, I_S = 188A$	Tvj = 25°C	—	3.3	V
			Tvj = 150°C	—	3.4	
		$V_{GS} = 18V, I_S = 188A$	Tvj = 25°C	—	0.76	
			Tvj = 150°C	—	1.21	

Electrical characteristic curves (Typical)

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

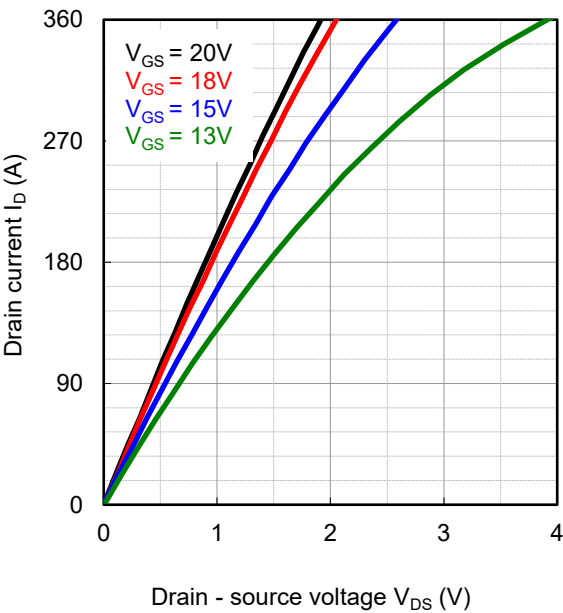


Figure 4. Drain - source voltage characteristic (Typ.)

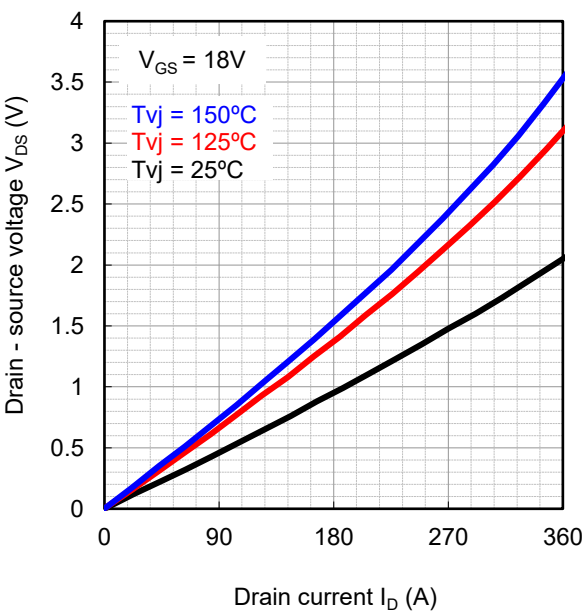
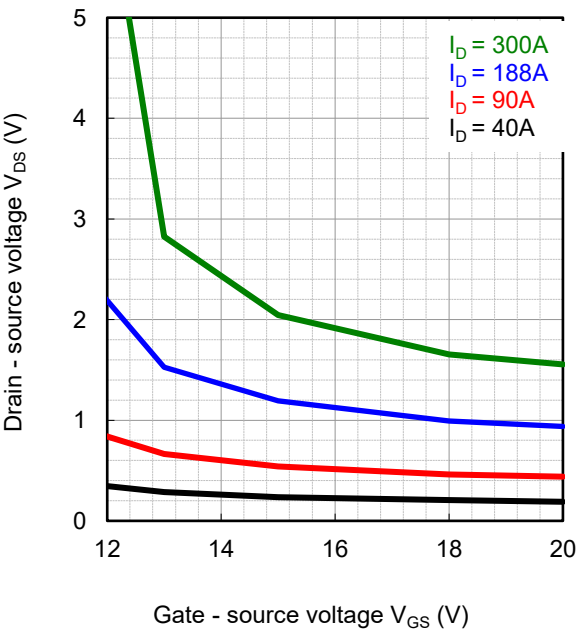


Figure 5. Drain - source voltage characteristic at 25°C (Typ.)



Electrical characteristic curves (Typical)

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

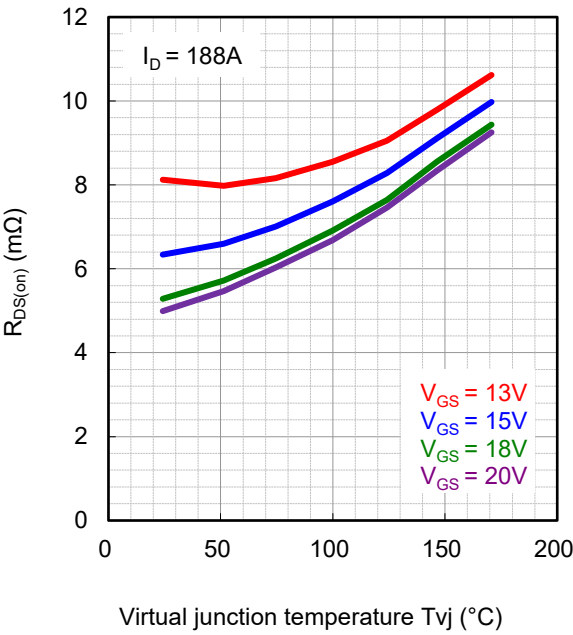


Figure 7. Forward characteristic of diode $V_{GS} = 18V$ (Typ.)

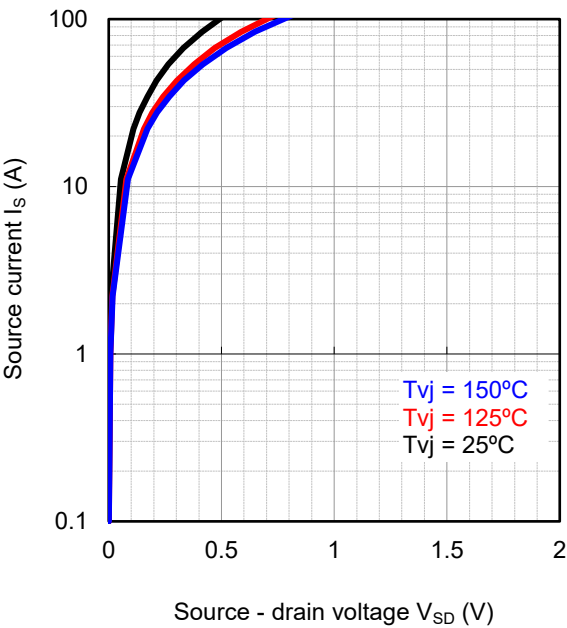
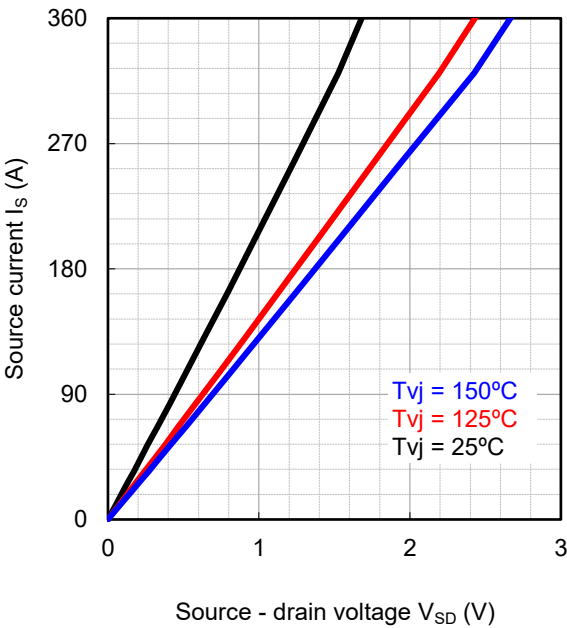


Figure 8. Forward characteristic of diode $V_{GS} = 18V$ (Typ.)



Electrical characteristic curves (Typical)

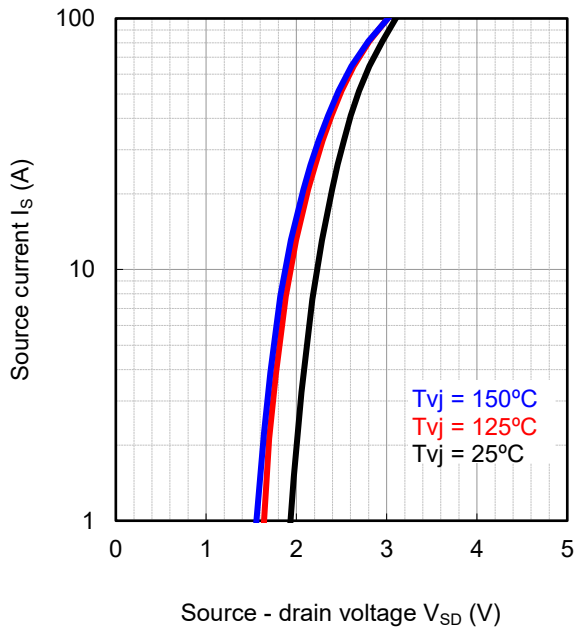
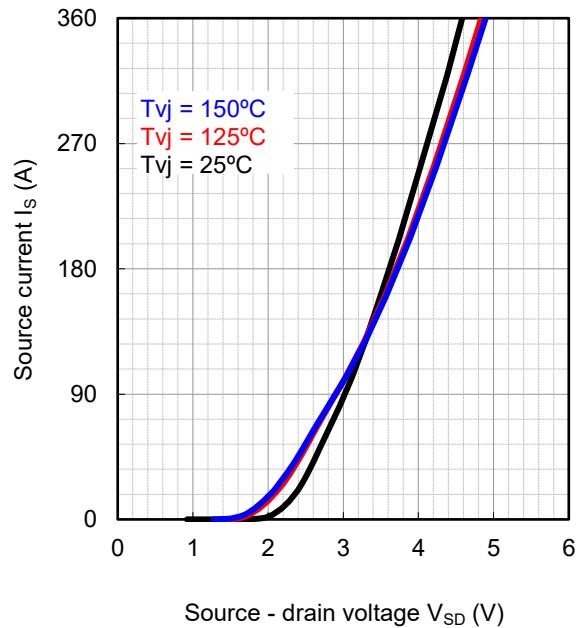
Figure 9. Forward characteristic of diode
 $V_{GS} = 0V$ (Typ.)Figure 10. Forward characteristic of diode
 $V_{GS} = 0V$ (Typ.)

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

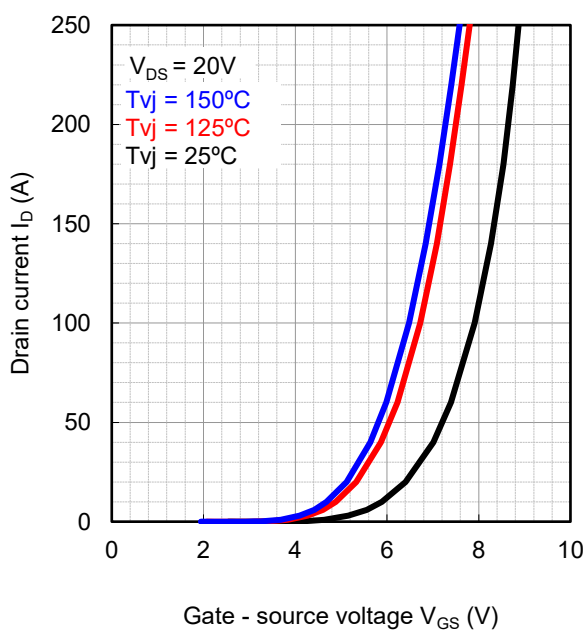
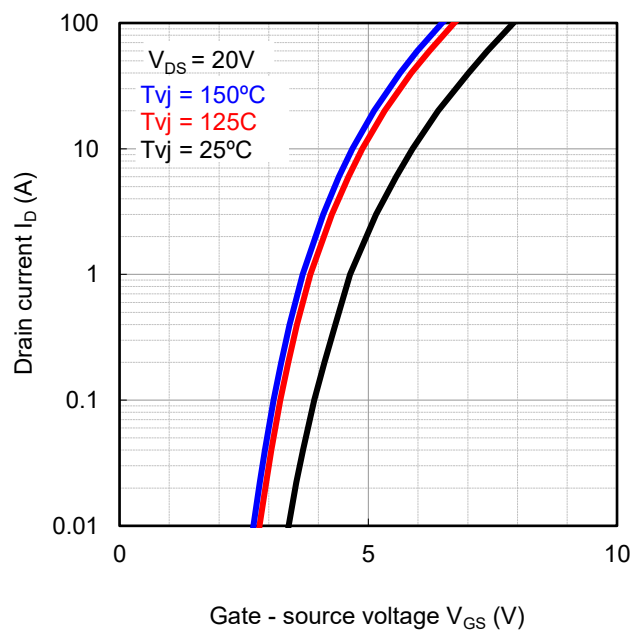


Figure 12. Drain current vs. Gate-source voltage (Typ.)



Electrical characteristic curves (Typical)

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

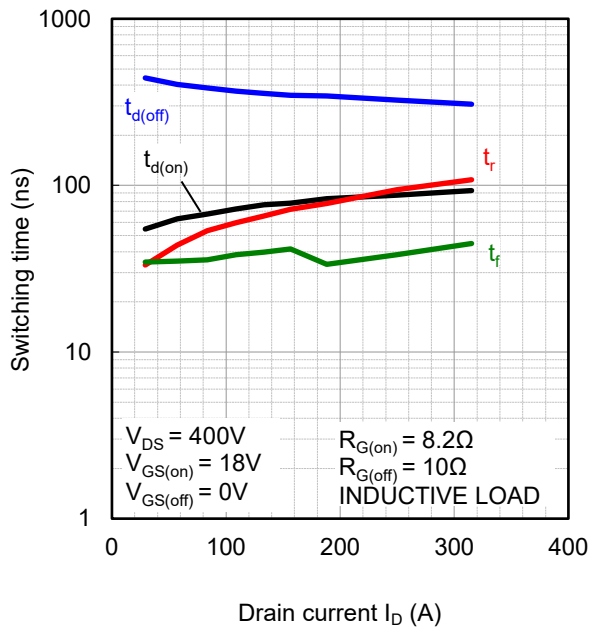


Figure 14. Switching time vs. Drain current at 150°C (Typ.)

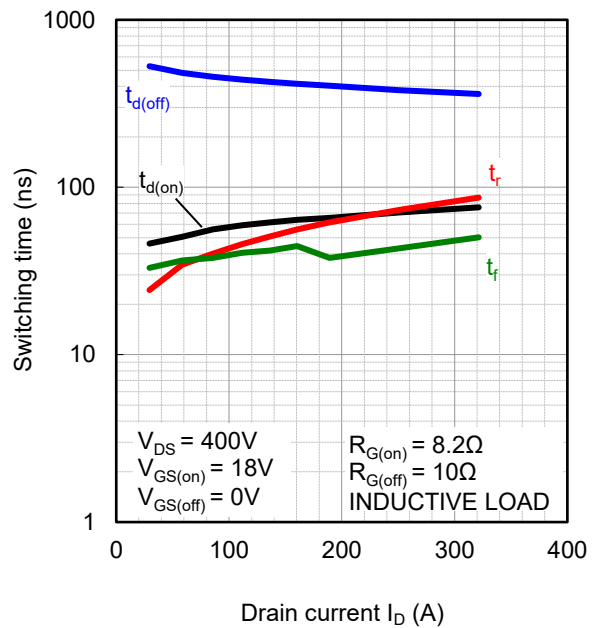


Figure 15. Switching loss vs. Drain current at 25°C (Typ.)

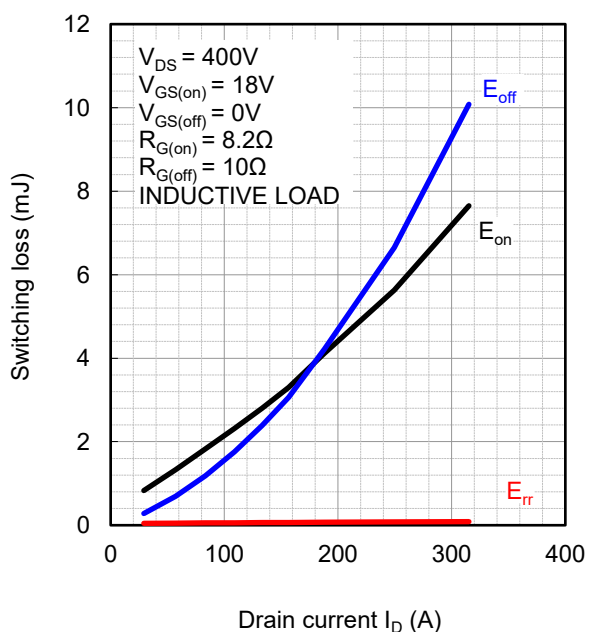
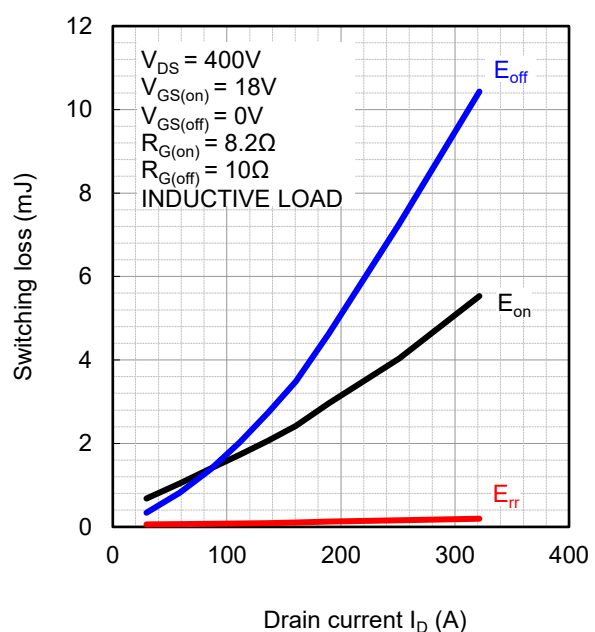


Figure 16. Switching loss vs. Drain current at 150°C (Typ.)



Electrical characteristic curves (Typical)

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

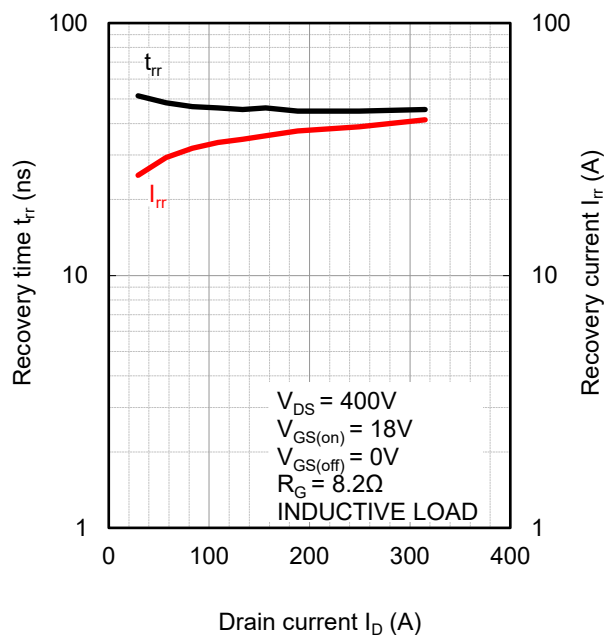


Figure 18. Recovery characteristic vs. Drain current at 150°C (Typ.)

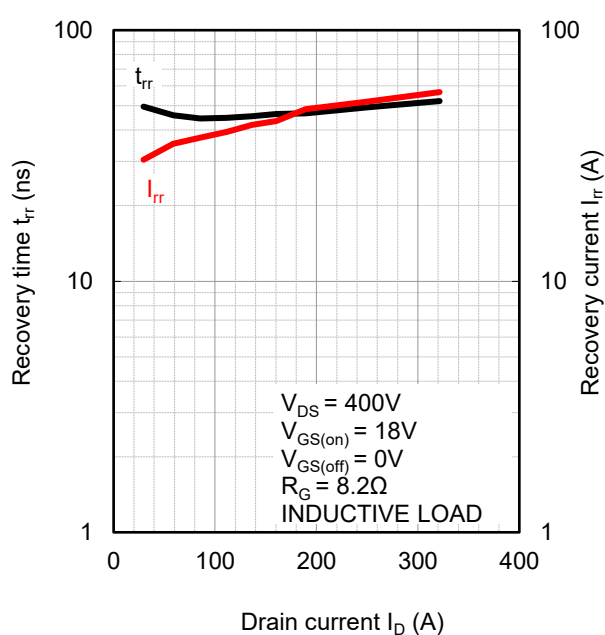


Figure 19. Switching time vs. Gate resistance at 25°C (Typ.)

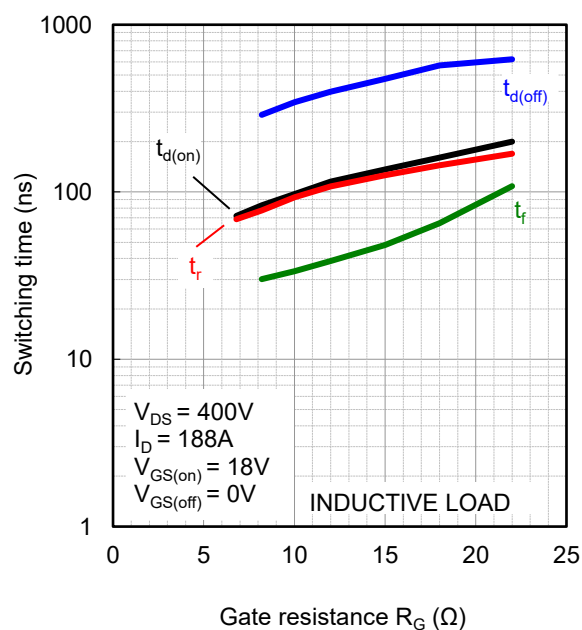
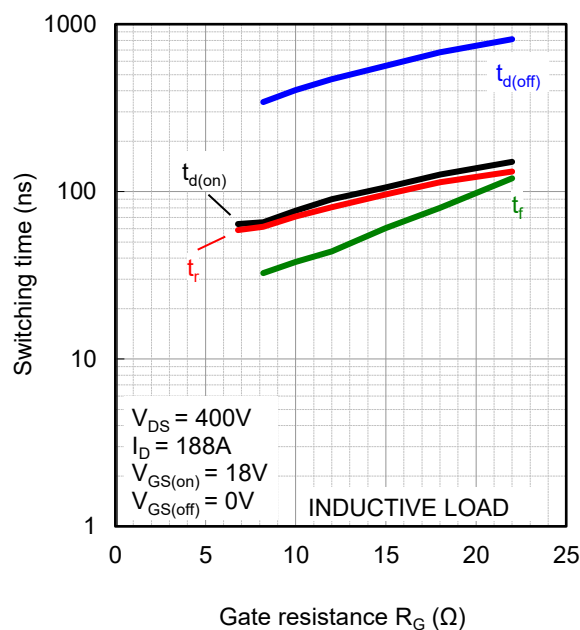


Figure 20. Switching time vs. Gate resistance at 150°C (Typ.)



Electrical characteristic curves (Typical)

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

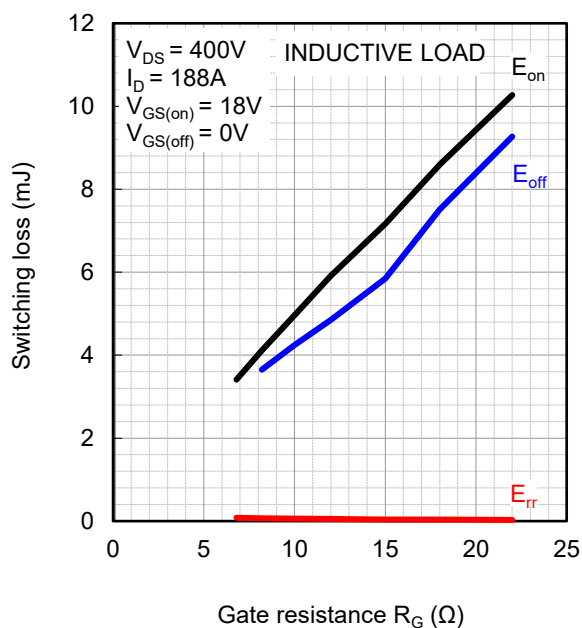


Figure 22. Switching loss vs. Gate resistance at 150°C (Typ.)

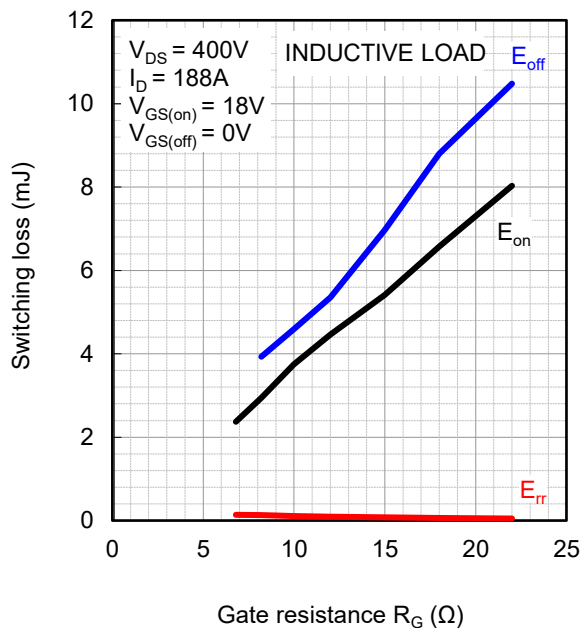


Figure 23. Capacitance vs. Drain - source voltage at 25°C (Typ.)

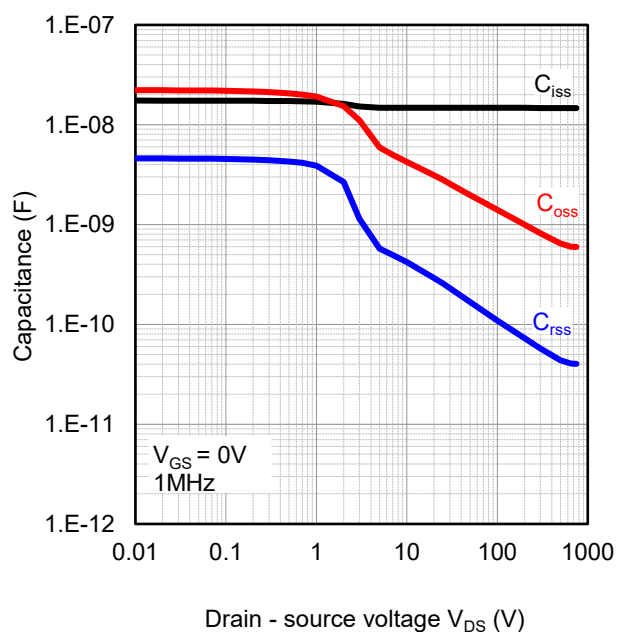
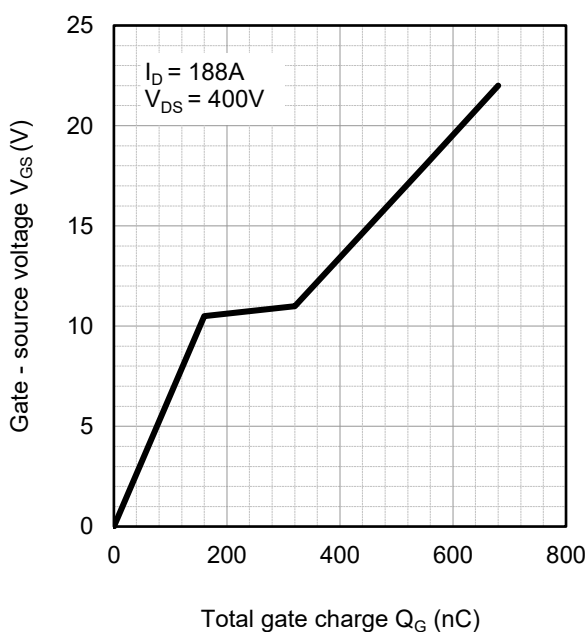
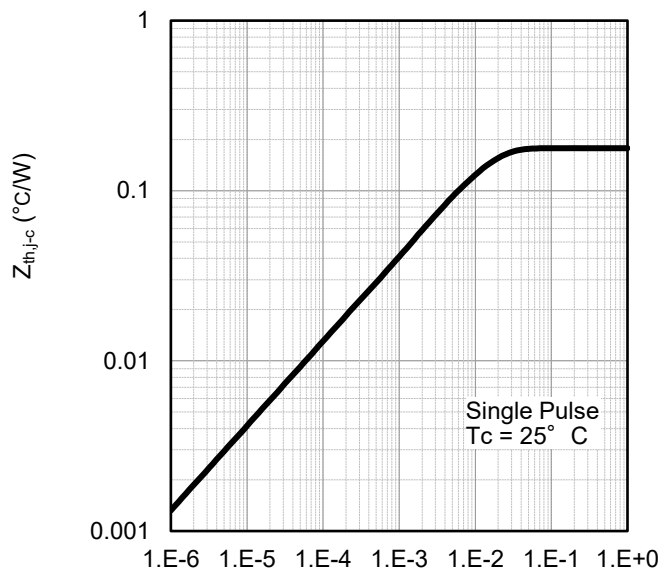


Figure 24. Gate charge characteristic at 25°C (Typ.)



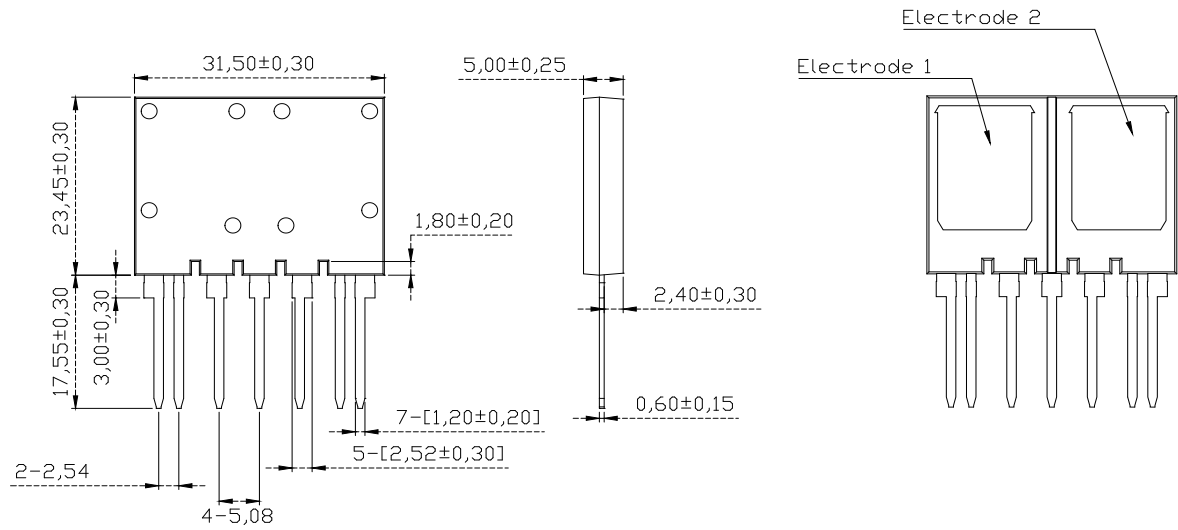
Electrical characteristic curves (Typical)

Figure 25. Transient thermal impedance (Typ.)



Package outlines

Unit : mm



Notes

- 1) The information contained herein is subject to change without notice.
- 2) Before you use our Products, please contact our sales representative and verify the latest specifications.
- 3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.
Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. ROHM shall have no responsibility for any damages arising out of the use of our Products beyond the rating specified by ROHM.
- 4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.
- 5) The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. ROHM does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by ROHM or any other parties. ROHM shall have no responsibility whatsoever for any dispute arising out of the use of such technical information.
- 6) The Products specified in this document are not designed to be radiation tolerant.
- 7) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative : transportation equipment (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, and power transmission systems.
- 8) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.
- 9) ROHM shall have no responsibility for any damages or injury arising from non-compliance with the recommended usage conditions and specifications contained herein.
- 10) ROHM has used reasonable care to ensure the accuracy of the information contained in this document. However, ROHM does not warrants that such information is error-free, and ROHM shall have no responsibility for any damages arising from any inaccuracy or misprint of such information.
- 11) Please use the Products in accordance with any applicable environmental laws and regulations, such as the RoHS Directive. For more details, including RoHS compatibility, please contact a ROHM sales office. ROHM shall have no responsibility for any damages or losses resulting non-compliance with any applicable laws or regulations.
- 12) When providing our Products and technologies contained in this document to other countries, you must abide by the procedures and provisions stipulated in all applicable export laws and regulations, including without limitation the US Export Administration Regulations and the Foreign Exchange and Foreign Trade Act.
- 13) This document, in part or in whole, may not be reprinted or reproduced without prior consent of ROHM.



Thank you for your accessing to ROHM product informations.
More detail product informations and catalogs are available, please contact us.

ROHM Customer Support System

<http://www.rohm.com/contact/>

General Precaution

1. Before you use our Products, you are requested to carefully read this document and fully understand its contents. ROHM shall not be in any way responsible or liable for failure, malfunction or accident arising from the use of any ROHM's Products against warning, caution or note contained in this document.
2. All information contained in this document is current as of the issuing date and subject to change without any prior notice. Before purchasing or using ROHM's Products, please confirm the latest information with a ROHM sales representative.
3. The information contained in this document is provided on an "as is" basis and ROHM does not warrant that all information contained in this document is accurate and/or error-free. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties resulting from inaccuracy or errors of or concerning such information.