T1M60120D

SiC N-MOSFET 1200V, 60mΩ, 40A

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Avalanche Ruggednes

Product Summary

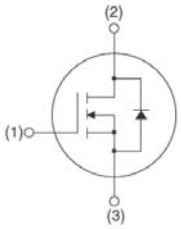
V_{DS}	1200V
$R_{DS(on)\_typ}$	60mΩ
I_D	40A

Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC-DC Converters
- Batterry Chargers

RoHS

Halogen Free



Package Marking and Ordering Information

Part #	Marking	Package
T1M60120D	1M60120D	TO-247-3

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	1200	V
Continuous drain current T_C = 25°C T_C = 100°C	I_D	 40 28	A
Pulsed drain current (T_C = 25°C, t_p limited by T_{jmax})	$I_{D\ pulse}$	80	A
Avalanche energy, single pulse (L=10mH)	E_{AS}	600	mJ
Gate-Source voltage	V_{GS}	-4/+18	V
Gate-Source voltage（Absolute maximum values）	V_{GSmax}	-8/+22	V
Power dissipation (T_C = 25°C)	P_{tot}	214	W
Operating junction and storage temperature	T_j , T_{stg}	-55...+175	°C

•Example of acceptable V_{GS} waveform

Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal resistance, junction – case. Max	R_{thJC}	0.70	°C/W
Thermal resistance, junction – ambient. Max	R_{thJA}	40	

Electrical Characteristic (at Tj = 25 °C, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Static Characteristic						
Drain-source breakdown voltage	BV_{DSS}	1200	-	-	V	V_{GS}=0V, I_D=100uA
Gate threshold voltage	$V_{GS(th)}$	2.3	2.8	3.6	V	V_{DS}=V_{GS},I_D=5mA
Zero gate voltage drain current	I_{DSS}	- -	1 5	10 -	μA	V_{DS}=1200V,V_{GS}=0V T_C=25°C T_C=175°C
Gate-source leakage current	I_{GSS}	-		100	nA	V_{GS}=18V,V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	- -	60 120	75 -	mΩ	V_{GS}=18V, I_D=20A, T_J=25°C T_J=175°C
Transconductance	g_{fs}	-	10	-	S	V_{DS}=20V,I_D=20A
Dynamic Characteristic						
Input Capacitance	C_{iss}	-	940	-	pF	V_{DS} = 1000V V_{GS} = 0V T_J = 25°C V_{AC} = 25mV f = 1MHz
Output Capacitance	C_{oss}	-	59	-		
Reverse Transfer Capacitance	C_{rss}	-	4.1	-		
Gate Total Charge	Q_G	-	42	-	nC	V_{DS} = 800V V_{GS} = -4/18V I_D = 20A
Gate-Source charge	Q_{gs}	-	8	-		
Gate-Drain charge	Q_{gd}	-	20	-		
Turn-On Switching Energy	E_{ON}	-	330	-	μJ	V_{DD} = 800V V_{GS} = -4/+15V I_D = 20A R_G = 0Ω L = 120uH
Turn-Off Switching Energy	E_{OFF}	-	51	-		
Turn-on delay time	$t_{d(on)}$	-	21	-	ns	
Rise time	t_r	-	23	-		
Turn-off delay time	$t_{d(off)}$	-	16	-		
Fall time	t_f	-	19	-		
Gate resistance	R_G	-	1.7	-	Ω	V_{AC} = 25mV, f=1MHz

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}		4.3		V	V_{GS}=-4V,I_{SD}=10A, T_J=25°C
			3.8			V_{GS}=-4V,I_{SD}=10A, T_J=175°C
Body Diode Reverse Recovery Time	t_{rr}	-	43	-	ns	V_R = 800V, V_{GS} = -4V I_D = 20A di/dt = 700A/μS T_J = 150°C
Body Diode Reverse Recovery Charge	Q_{rr}	-	413	-	nC	

Typical Performance Characteristics

Fig 1. Output Characteristic (T_J=-40℃)

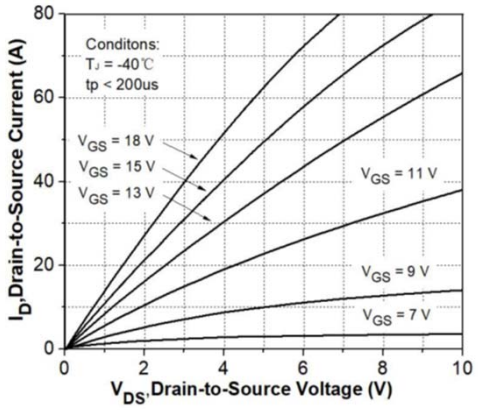


Fig 2. Output Characteristic (T_J=25℃)

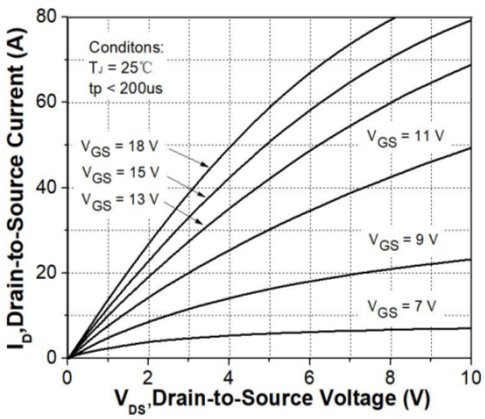


Fig 3. Output Characteristic (T_J=175℃)

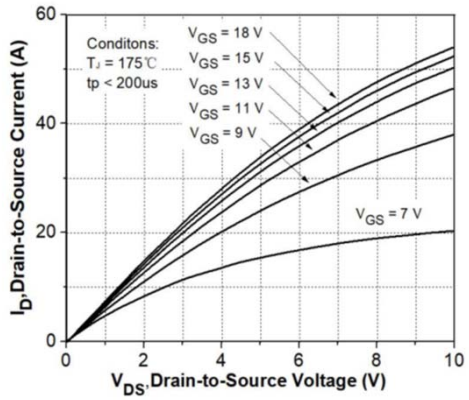


Fig 4: Rdson Vs Ids Characteristic

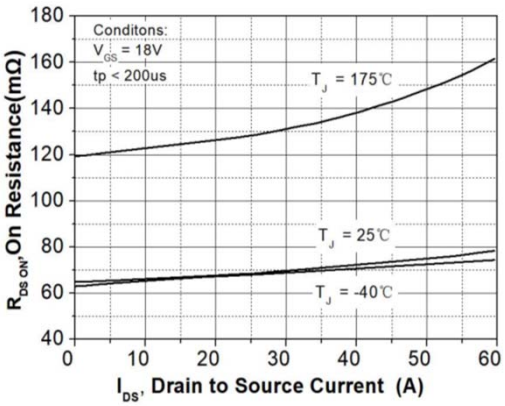


Fig 5: Rds(on) vs. Temperature

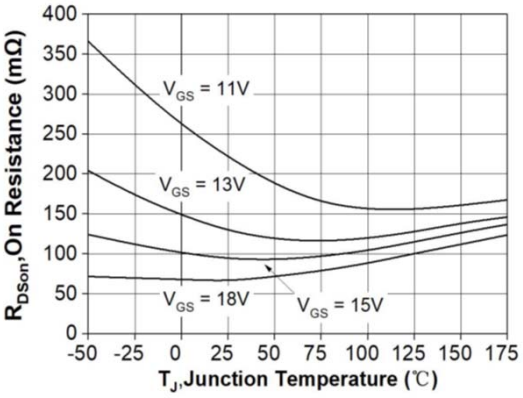


Fig 6: Transfer Characteristic

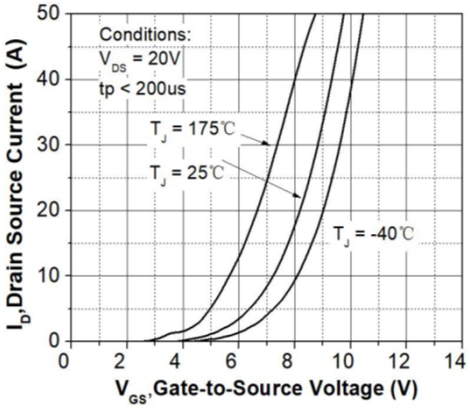


Fig 7: Body-diode Characteristic (T_J=-40°C)

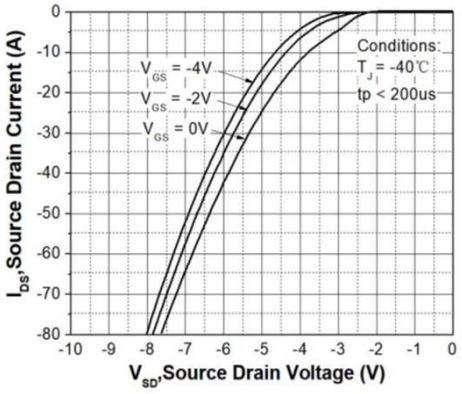


Fig 8: Body-diode Characteristic (T_J=25℃)

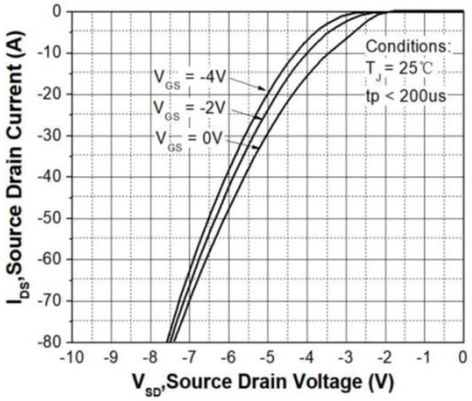


Fig 9: Body-diode Characteristic (T_J=175℃)

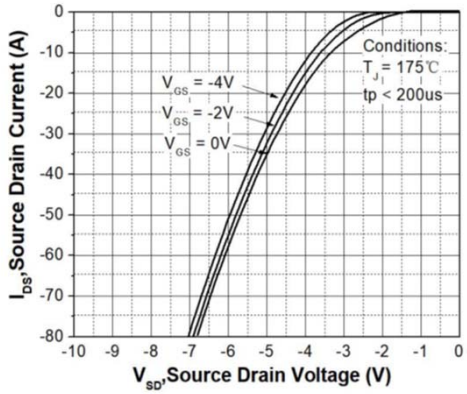


Fig 10: V_{TH} Vs T_J Temperature Characteristic

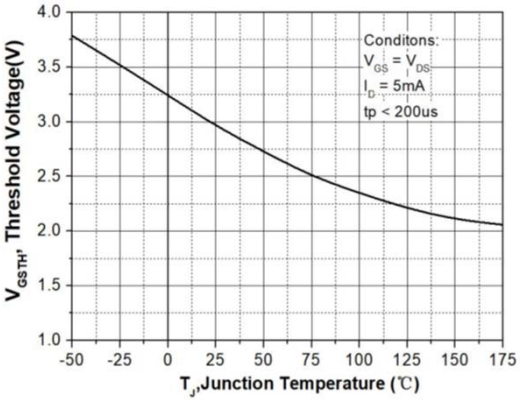


Fig 11: Gate Charge Characteristics

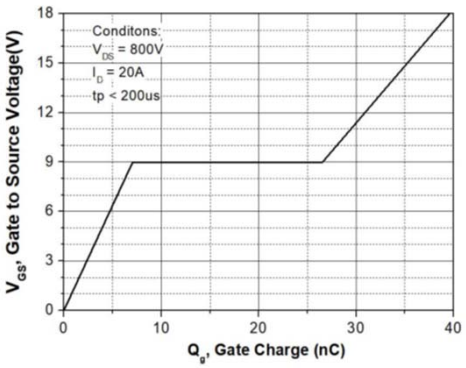


Fig 12: 3rd Quadrant Characteristic(T_J=-40°C)

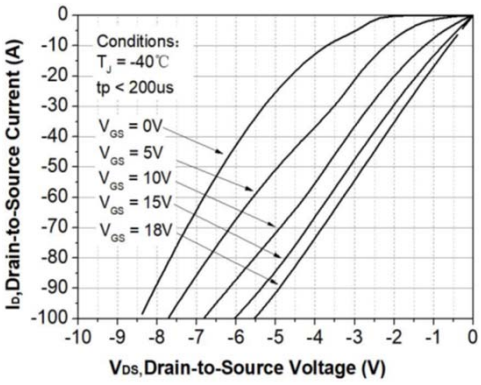


Fig 13: 3rd Quadrant Characteristic(T_J=25℃)

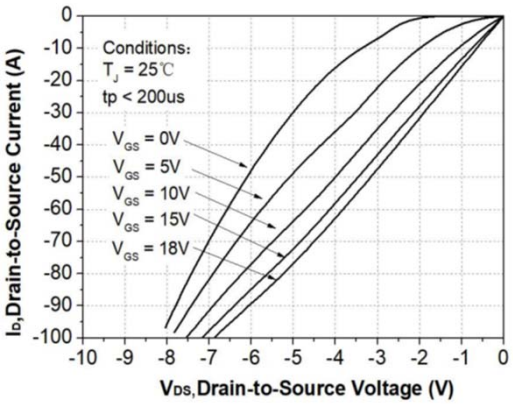


Fig 14: 3rd Quadrant Characteristic(T_J=175℃)

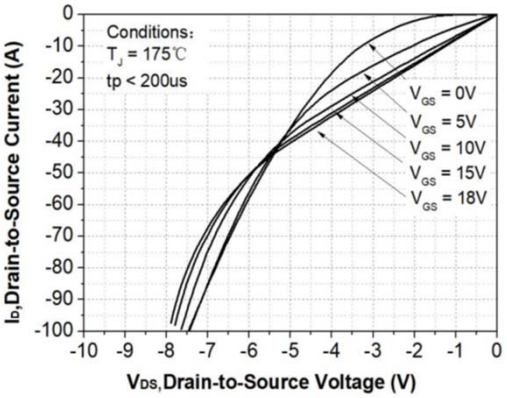


Fig 15: Capacitance Characteristic

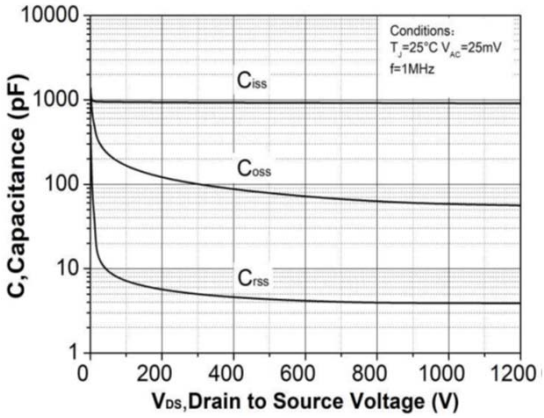


Fig 16: Safe Operating Area

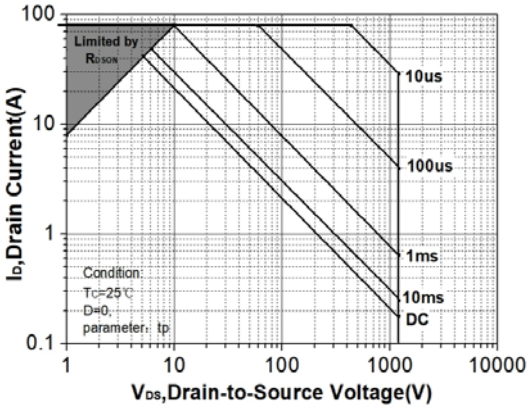
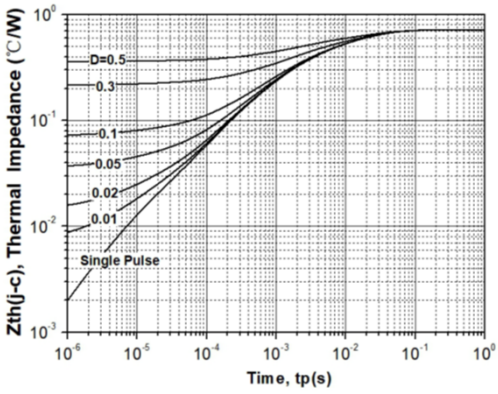


Fig 17: Transient Thermal Impedance



Test Circuit & Waveform

Figure A. Definition of switching times

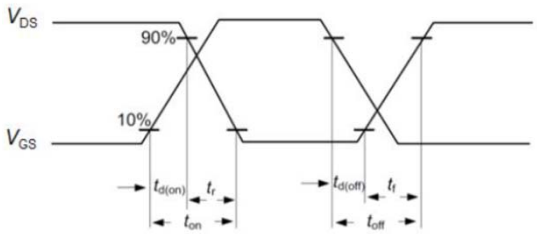


Figure B. Dynamic test circuit

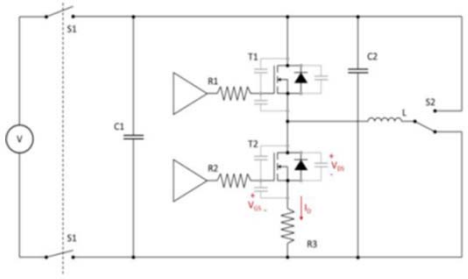


Figure C. Definition of body diodeswitching characteristics

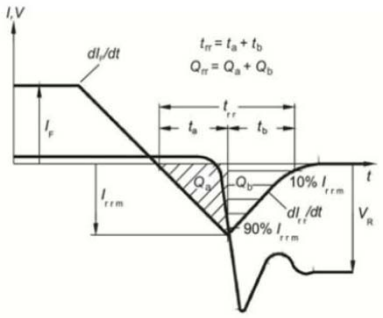
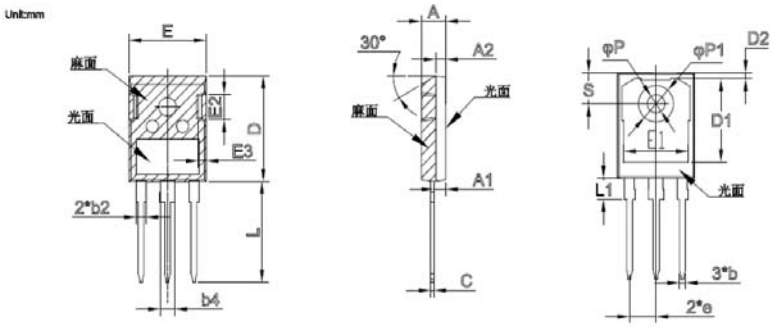


Figure C. **Definition of diode switching characteristics**

Package Outline:



TO247-3L							
	Min	Nom	Max		Min	Nom	Max
A	4.70	5.00	5.20	E1	13.06	13.26	13.56
A1	2.30		2.50	E2	4.90	5.00	5.10
A2	1.90	2.00	2.10	E3	1.50	1.60	1.70
b	1.10	1.20	1.30	e	5.34	5.44	5.54
b2		2.00		L	19.80	20.00	20.32
b4		3.00		L1		4.17	4.50
C	0.5	0.6	0.7	P	3.50	3.60	3.70
D	20.8	20.95	21.1	P1	7.00	7.19	7.40
D1		16.55		S	6.04	6.15	6.3
D2	0.95	1.17	1.35				
E	15.48	15.88	16.28				

Contact Information

TANI website: **http://www.tanisemi.com** Email:tani@tanisemi.com

For additional information, please contact your local Sales Representative.

Product Specification Statement

The product specification aims to provide users with a reference regarding various product parameters, performance, and usage. It presents certain aspects of the product's performance in graphical form and is intended solely for users to select product and make product comparisons, enabling users to better understand and evaluate the characteristics and advantages of the product. It does not constitute any commitment, warranty, or guarantee.

The product parameters described in the product specification are numerical values, characteristics, and functions obtained through actual testing or theoretical calculations of the product in an independent or ideal state. Due to the complexity of product applications and variations in test conditions and equipment, there may be slight fluctuations in parameter test values. TANI shall not guarantee that the actual performance of the product when installed in the customer's system or equipment will be entirely consistent with the product specification, especially concerning dynamic parameters. It is recommended that users consult with professionals for product selection and system design. Users should also thoroughly validate and assess whether the actual parameters and performance when installed in their respective systems or equipment meet their requirements or expectations. Additionally, users should exercise caution in verifying product compatibility issues, and TANI assumes no responsibility for the application of the product. TANI strives to provide accurate and up -to-date information to the best of our ability. However, due to technical, human, or other reasons, TANI cannot guarantee that the information provided in the product specification is entirely accurate and error-free. TANI shall not be held responsible for any losses or damages resulting from the use or reliance on any information in these product specifications.

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Users are advised to pay attention to the parameter limit values specified in the product specification and maintain a certain margin in design or application to ensure that the product does not exceed the parameter limit values defined in the product specification. This precaution should be taken to avoid exceeding one or more of the limit values, which may result in permanent irreversible damage to the product, ultimately affecting the quality and reliability of the system or equipment.

The design of the product is intended to meet civilian needs and is not guaranteed for use in harsh environments or precision equipment. It is not recommended for use in systems or equipment such as medical devices, aircraft, nuclear power, and similar systems, where failures in these systems or equipment could reasonably be expected to result in personal injury. TANI shall assume no responsibility for any consequences resulting from such usage.

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