

Features

- SiC MOSFET Technology
- High Switching Speed With Low Gate Charge
- Fast Intrinsic Diode With Low Reverse Recovery
- Higher Frequency Applicability
- Halogen Free. "Green" Device (Note 1)
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant("P" Suffix Designates RoHS Compliant. See Ordering Information) (Note2)

Maximum Ratings

- Operating Junction Temperature Range : -55°C to +175°C
- Storage Temperature Range: -55°C to +175°C
- Thermal Resistance Junction to Ambient,Max(Note 3): 62°C/W
- Thermal Resistance Junction to Case,Typ : 0.32°C/W

Applications

- Solar Inverter
- EV Charging Station
- UPS
- Industrial Power Supply

Parameter	Symbol	Rating	Unit	
Drain-Source Voltage	V_{DS}	1200	V	
Gate-Source Voltage(Note 4)	V_{GSmax}	-10/+22	V	
Recommended Gate-Source Voltage	V_{GSop}	-5/+18	V	
Continuous Drain Current $V_{GS}=18V$	I_D	$T_C=25^{\circ}C$	100	A
		$T_C=100^{\circ}C$	71	
Pulsed Drain Current (Note 5)	I_{DM}	250	A	
Total Power Dissipation	P_D	$T_C=25^{\circ}C$	469	W
		$T_C=110^{\circ}C$	203	

Note1: Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

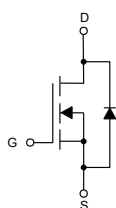
Note2: High Temperature Solder Exemptions Applied, see EU Directive Annex 7a.

Note3: Device in a still air environment with $T_A=25^{\circ}C$.

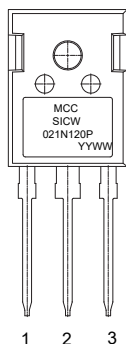
Note4: AC f > 1Hz, duty cycle < 1%

Note5: Pulse Test: Pulse Width Limited by T_{jmax} .

Internal Structure and Marking Code



1. Gate
2. Drain
3. Source

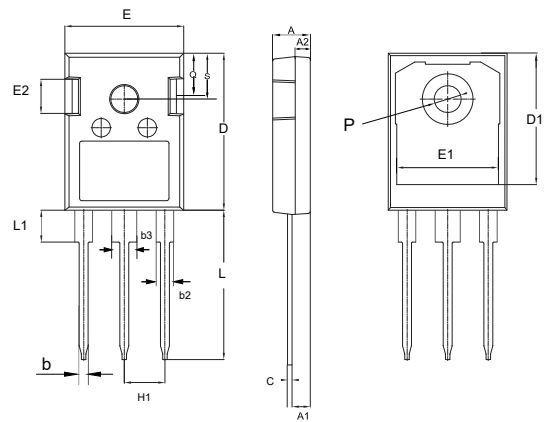


Device Code: SICW021N120P

Date Code: YYWW (Year & Week)

SiC N-CHANNEL MOSFET

TO-247AB



DIMENSIONS

DIM	INCHES		mm		NOTE
	MIN	MAX	MIN	MAX	
A	0.189	0.205	4.80	5.20	
A1	0.090	0.100	2.29	2.54	
A2	0.075	0.083	1.90	2.10	
b	0.043	0.051	1.10	1.30	
b2	0.075	0.087	1.91	2.20	
b3	0.115	0.126	2.92	3.20	
C	0.020	0.028	0.50	0.70	
D	0.819	0.840	20.80	21.34	
D1	0.686	0.702	17.43	17.83	
E	0.620	0.635	15.75	16.13	
E1	0.514	0.530	13.06	13.46	
E2	0.170	0.190	4.32	4.83	
H1	0.215		5.45		TYP
L	0.781	0.797	19.85	20.25	
L1	0.159	0.177	4.05	4.49	
P	0.140	0.144	3.55	3.65	Φ
Q	0.220	0.244	5.59	6.19	
S	0.242		6.15		TYP

Electrical Characteristics @ T_j=25°C (Unless Otherwise Specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Static Characteristics							
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} =0V, I _D =1mA	1200			V	
Gate-Source Leakage Current	I _{GSS}	V _{DS} =0V, V _{GS} =+22V			+100	nA	
		V _{DS} =0V, V _{GS} =-10V			-100		
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =1200V, V _{GS} =0V		1	100	μA	
		V _{DS} =1200V, V _{GS} =0V, T _J =175 °C		10			
Gate-Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =17mA	2.0	3.0	4.5	V	
Drain-Source On-Resistance	R _{DS(on)}	V _{GS} =18V, I _D =50A		21	29.4	mΩ	
		V _{GS} =18V, I _D =50A, T _J =175 °C		33.6		mΩ	
Transconductance	g _{FS}	V _{DS} =20V, I _D =50A		24.4		S	
Dynamic Characteristics							
Input Capacitance	C _{iss}	V _{DS} =800V, V _{GS} =0V, f=250kHz		3741		pF	
Output Capacitance	C _{oss}			224			
Reverse Transfer Capacitance	C _{rss}			17			
Coss Stored Energy	E _{oss}	V _{DS} =0 to 800V, V _{GS} =0V		93		μJ	
Effective Transfer Capacitance	Energy Related		C _{o(er)}		291		pF
	Time Related		C _{o(tr)}		456		
Total Gate Charge	Q _g	V _{DS} =800V, V _{GS} =-5/+18V, I _D =50A Inductive load		200		nC	
Gate-Source Charge	Q _{gs}			48			
Gate-Drain Charge	Q _{gd}			68			
Internal Gate Resistance	R _g	f=1MHz		3		Ω	
Turn-On Delay Time	t _{d(on)}	V _{DS} =800V, V _{GS} =-5/+18V, R _G =2Ω, I _D =50A, Inductive load		30		ns	
Turn-On Rise Time	t _r			49			
Turn-Off Delay Time	t _{d(off)}			62			
Turn-Off Fall Time	t _f			14			
Turn-On switching energy	E _{on}				1676		μJ
Turn-Off switching energy	E _{off}				377		
Diode Characteristics							
Maximum Continuous Diode Forward Current	I _S				100	A	
Maximum Pulsed Diode Forward Current	I _{SM}				250	A	
Diode Forward Voltage	V _{SD}	V _{GS} =-5V, I _{SD} =50A		4.1		V	
Reverse Recovery Time	t _{rr}	I _{SD} =50A, V _{DD} =800V, dI _F /dt=1300A/μs		50		ns	
Reverse Recovery Charge	Q _{rr}				531		nC

Curve Characteristics($T_j=25^\circ\text{C}$ unless otherwise specified)

Fig. 1 - Typical Output Characteristic

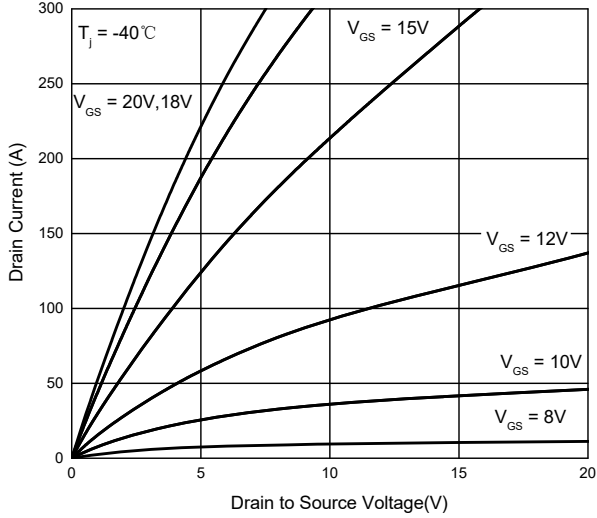


Fig. 2 - Typical Output Characteristic

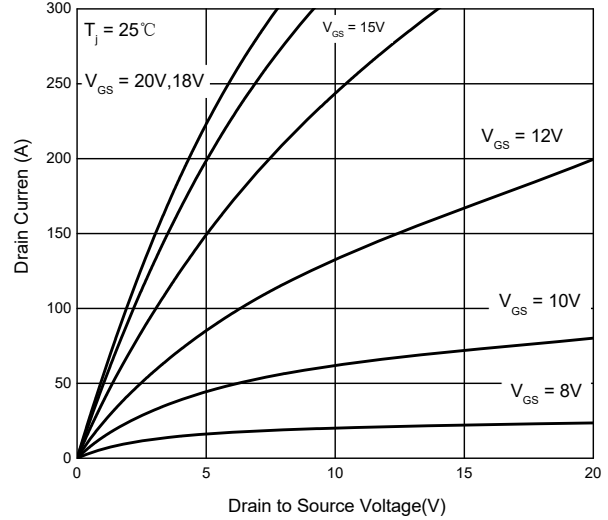


Fig. 3 - Typical Output Characteristic

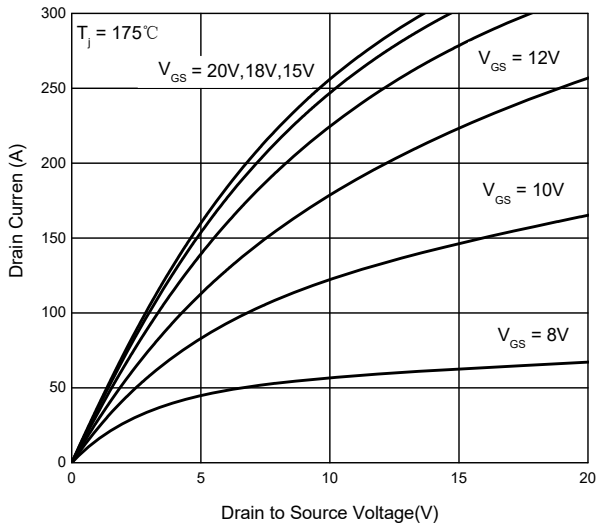


Fig. 4 - Typical Transfer Characteristic

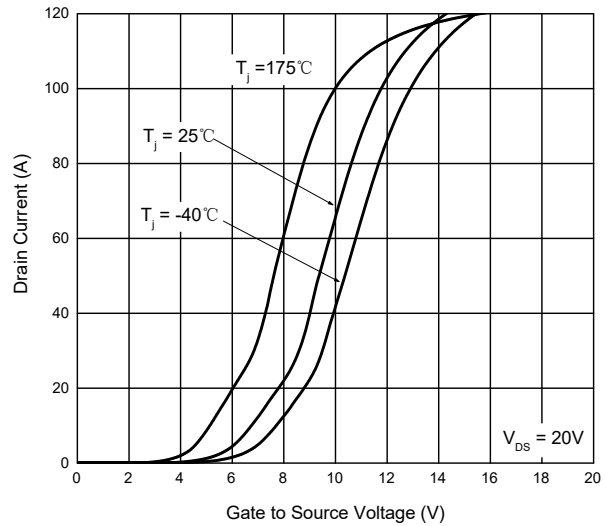


Fig. 5 - Normalized On-Resistance vs. Temperature

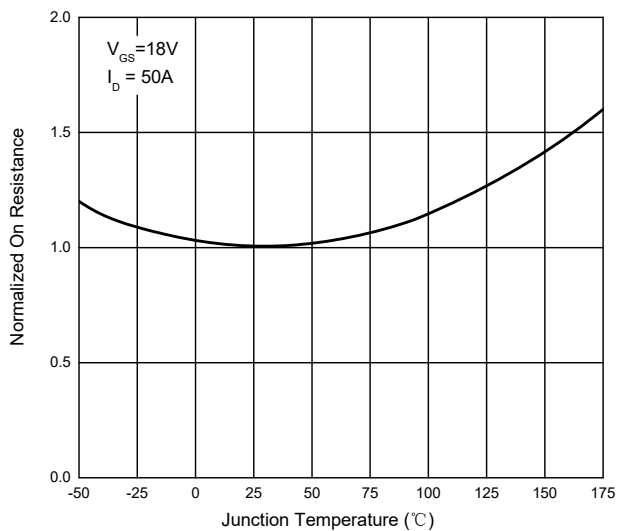
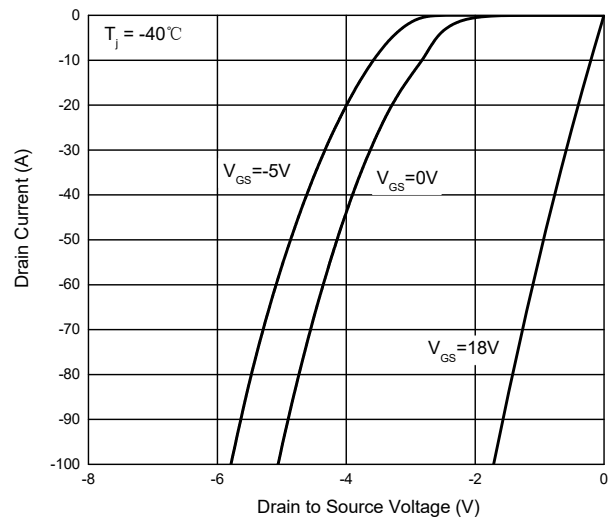


Fig. 6 - Reverse Output Voltage



Curve Characteristics ($T_j=25^\circ\text{C}$ unless otherwise specified)

Fig. 7 - Reverse Output Voltage

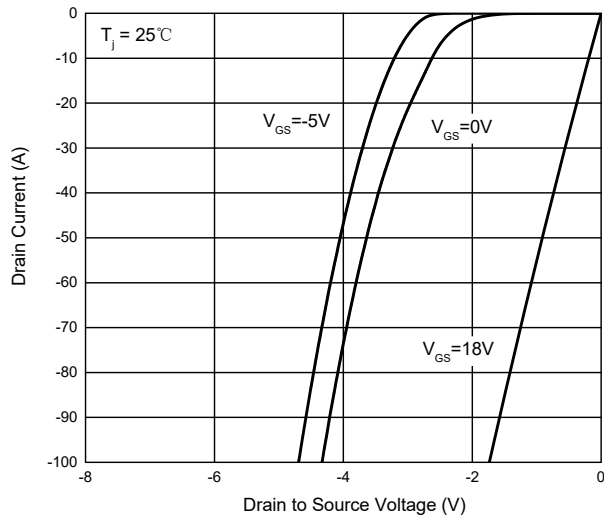


Fig. 8 - Reverse Output Voltage

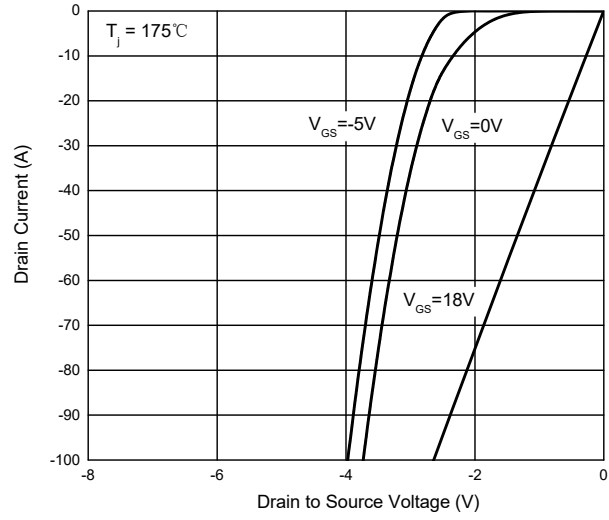


Fig.9 - Capacitances vs. V_{DS}

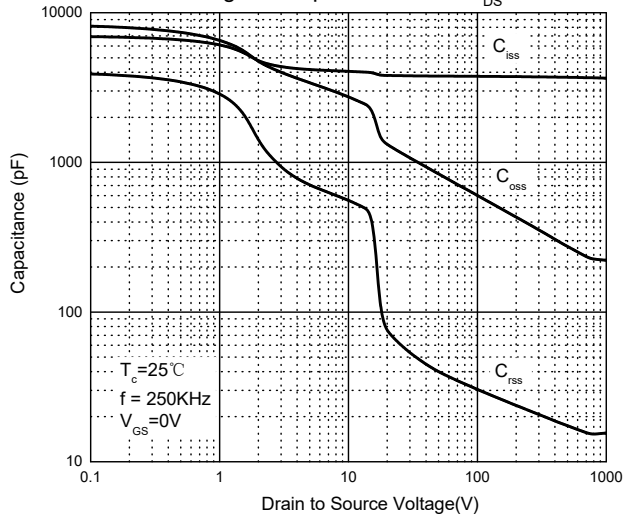


Fig. 10- Threshold Voltage vs. Temperature

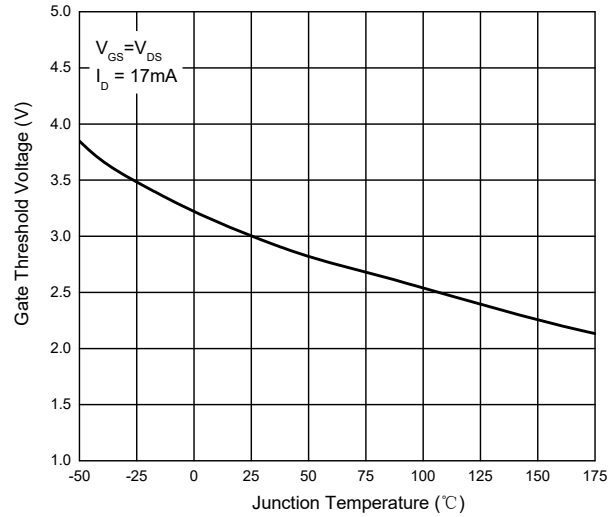


Fig.11 - Output Capacitor Stored Energy

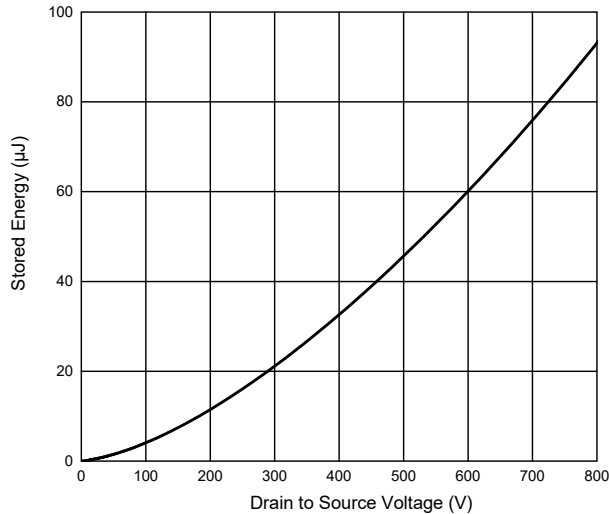
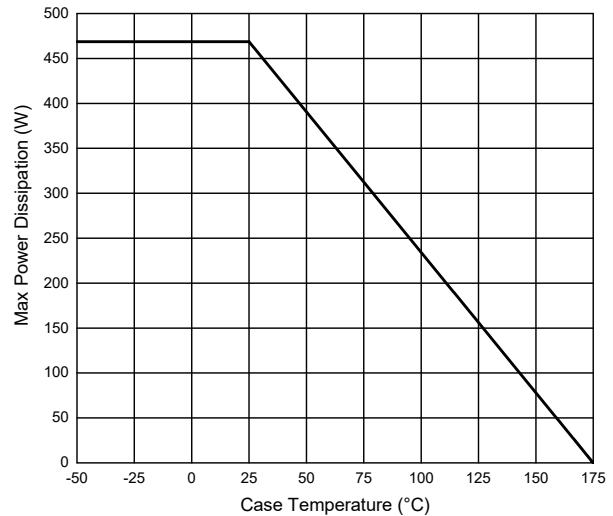


Fig.12 - Power Derating



Curve Characteristics ($T_j=25^\circ\text{C}$ unless otherwise specified)

Fig.13 - Drain Current Derating

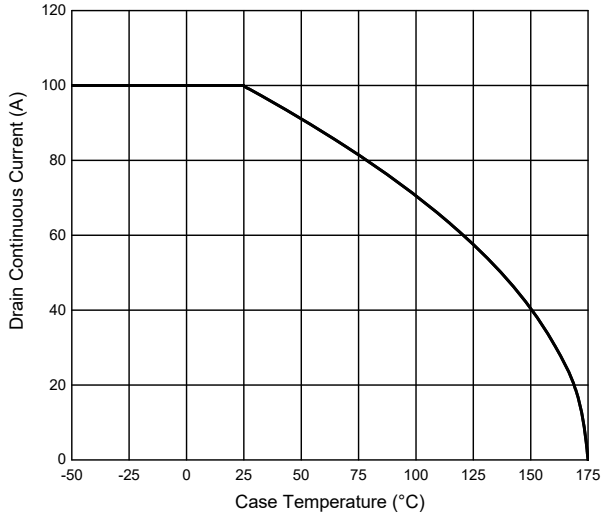


Fig.14 - Safe Operation Area

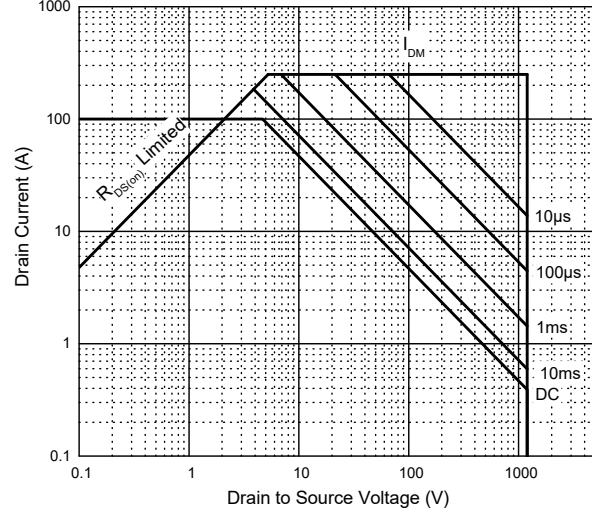


Fig. 15 - Typical Gate Charge

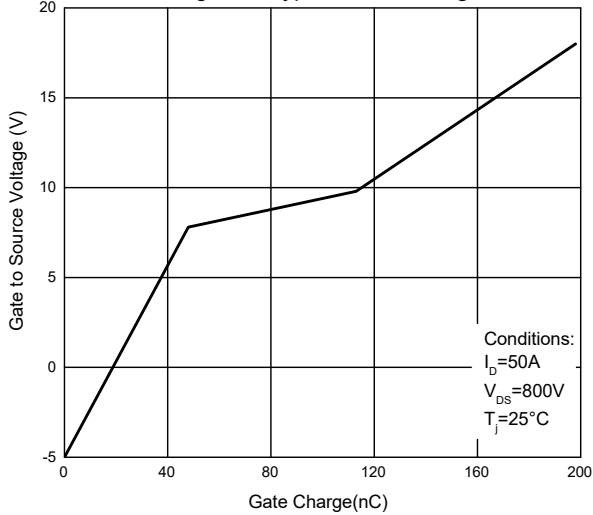


Fig. 16 - Switching Losses vs. Drain Current

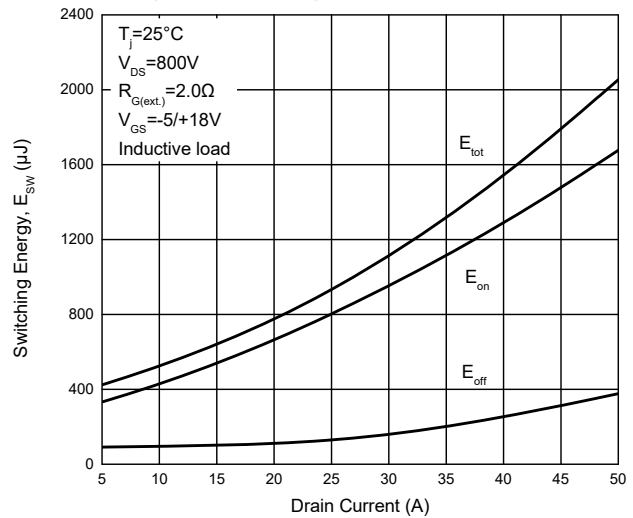
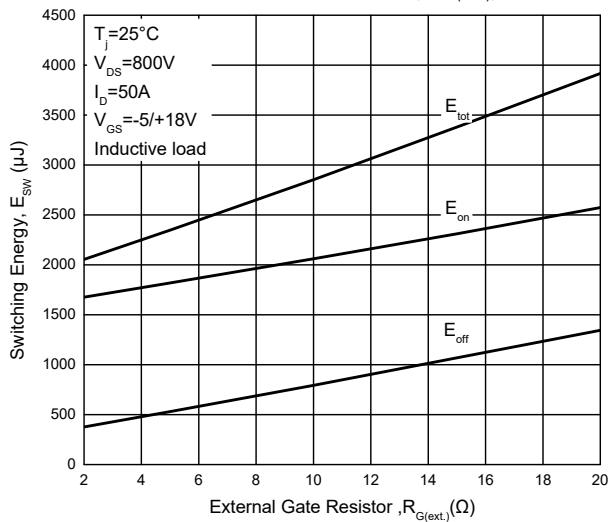
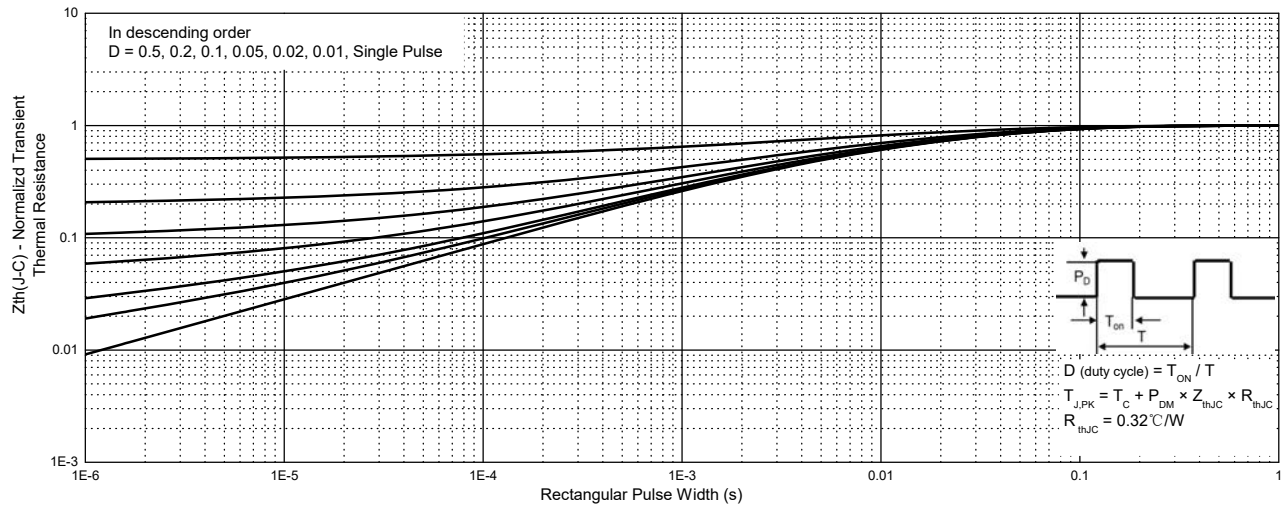


Fig. 17 - Switching Losses vs. External Gate Resistor ($R_{G(\text{ext.})}$)



Curve Characteristics ($T_j=25^\circ\text{C}$ unless otherwise specified)

Fig.18 - Normalized Transient Thermal Impedance



Ordering Information

Device	Packing
SICW021N120P-BP	Tube:30pcs/Tube, 1.8K/Ctn;

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