

Features

- SiC MOSFET Technology
- High Speed Switching
- Reduction Of Heat Sink Requirements
- Essentially No Switching Losses
- Halogen Free. "Green" Device (Note 1)
- 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 : 0.6°C/W

Applications

- Solar Inverters
- Uninterruptible Power Supply
- Photovoltaic Inverter
- Battery Chargers
- Motor Drives

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DS}	650	V
Gate-Source Voltage(Note 4)	V_{GSmax}	-10/+25	V
Gate-Source Voltage	V_{GSop}	-5/+20	V
Continuous Drain Current $V_{GS}=20V$	I_D	$T_C=25^{\circ}C$ 60	A
		$T_C=110^{\circ}C$ 41	
Pulsed Drain Current (Note 5)	I_{DM}	127	A
Total Power Dissipation	P_D	$T_C=25^{\circ}C$ 250	W
		$T_C=110^{\circ}C$ 108	
Avalanche Energy, Single Pulse	$V_{DD}=100V, I_D=10A$ E_{AS}	1.6	J

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

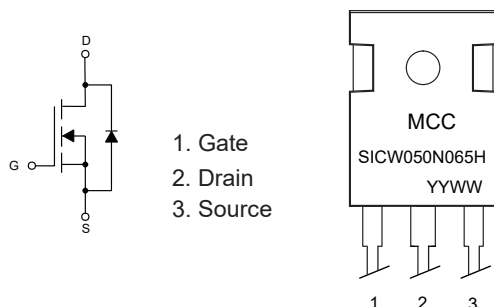
Note2:High Temperature Solder Exemptions Applied, see EU Directive Annex 7a.

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} .

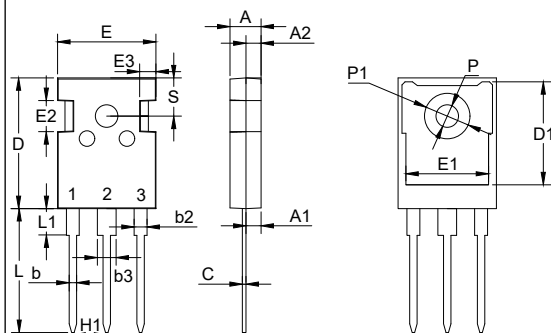
Internal Structure and Marking Code



Device Code: SICW050N065H
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	0.087	0.103	2.21	2.61	
A2	0.073	0.085	1.85	2.15	
b	0.039	0.055	1.00	1.40	
b2	0.075	0.087	1.91	2.21	
C	0.020	0.028	0.50	0.70	
D	0.815	0.839	20.70	21.30	
D1	0.640	0.663	16.25	16.85	
E	0.610	0.634	15.50	16.10	
E1	0.512	0.535	13.00	13.60	
E2	0.189	0.205	4.80	5.20	
E3	0.091	0.106	2.30	2.70	
L	0.772	0.796	19.62	20.22	
L1	-	0.177	-	4.50	
P	0.134	0.150	3.40	3.80	Φ
P1	-	0.287	-	7.30	Φ
S	0.242		6.15		TYP
H1	0.214		5.44		TYP
b3	0.110	0.126	2.80	3.20	

Electrical Characteristics @ $T_j=25^{\circ}\text{C}$ (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 =100μA	650			V
Gate-Source Leakage Current	I _{GSS}	V _{DS} =0V, V _{GS} =20V			250	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =650V, V _{GS} =0V			100	μA
Gate-Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =20mA	2	2.6	4.5	V
Drain-Source On-Resistance	R _{DS(on)}	V _{GS} =20V, I _D =20A		50	65	mΩ
		V _{GS} =20V, I _D =20A,T _J =175°C		65		mΩ
Internal Gate Resistance	R _g	f=1MHz, V _{AC} =25mV		1.2		Ω
Transconductance	g _{FS}	V _{DS} =15V, I _D =40A		13.2		S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =400V,V _{GS} =0V, f=1MHz,V _{AC} =25mV		1850		pF
Output Capacitance	C _{oss}			208		
Reverse Transfer Capacitance	C _{rss}			33		
Coss Stored Energy	E _{oss}				24	
Total Gate Charge	Q _g	V _{DS} =400V,V _{GS} =-5/+20V, I _D =30A		121		nC
Gate-Source Charge	Q _{gs}			30		
Gate-Drain Charge	Q _{gd}			43		
Turn-On Delay Time	t _{d(on)}	V _{DD} =400V, V _{GS} =-4/+20V, R _G =2.7Ω, I _D =20A, R _L =20Ω		16		ns
Rise Time	t _r			17		
Turn-Off Delay Time	t _{d(off)}			20		
Fall Time	t _f			10		
Turn-On switching energy	E _{on}	V _{DS} =400V, V _{GS} =0/+20V, R _G =2.7Ω, I _D =50A		21		μJ
Turn-Off switching energy	E _{off}			28		
Diode Characteristics						
Continuous Body Diode Current	I _S	V _{GS} =0V, T _C =25°C		42.5		A
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _{SD} =5A		3		V
Reverse Recovery Time	t _{rr}	V _{GS} =0V, I _{SD} =30A, V _{DS} =400V, dI _F /dt=300A/μs		58		ns
Reverse Recovery Charge	Q _{rr}			122		nC
Peak Reverse Recovery Current	I _{rrm}				3.75	

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

Fig. 1 - Typical Output Characteristic ($T_J=25^\circ\text{C}$)

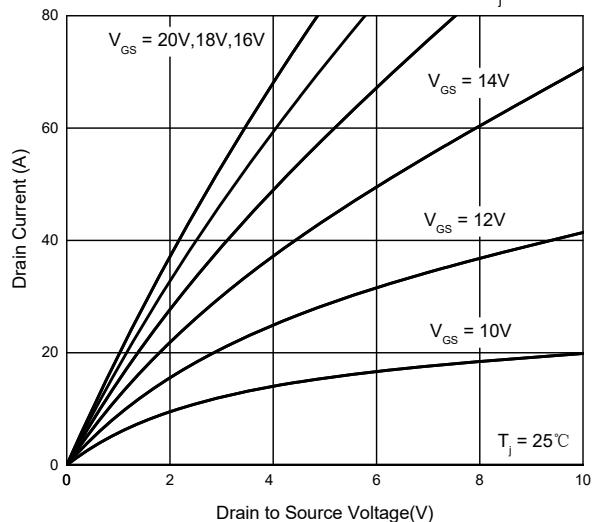


Fig. 2 - Typical Output Characteristic ($T_J=175^\circ\text{C}$)

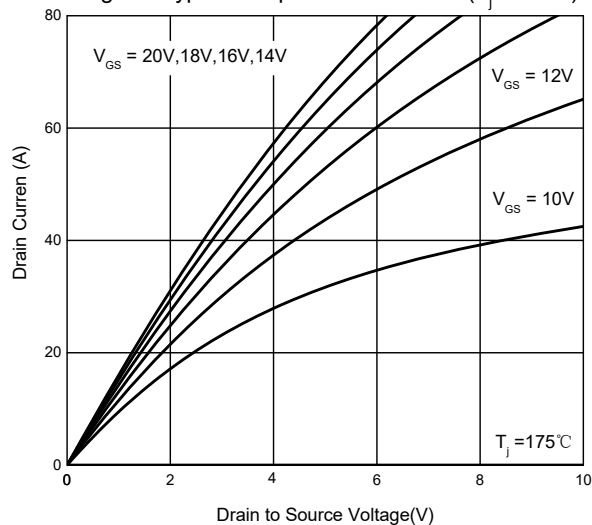


Fig. 3 - On-Resistance vs. Drain Current

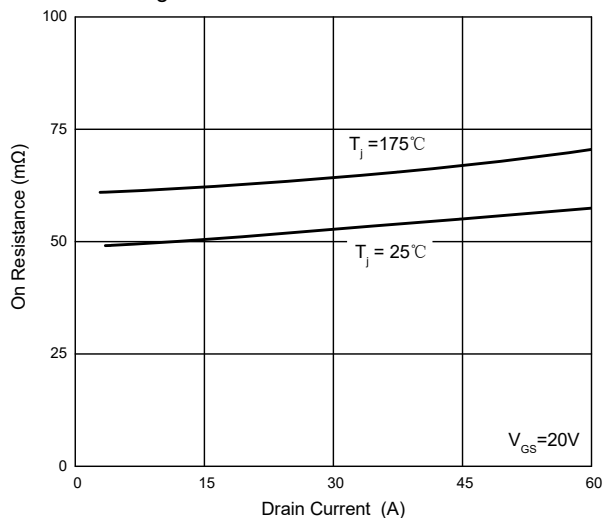


Fig. 4 - Typical Transfer Characteristic

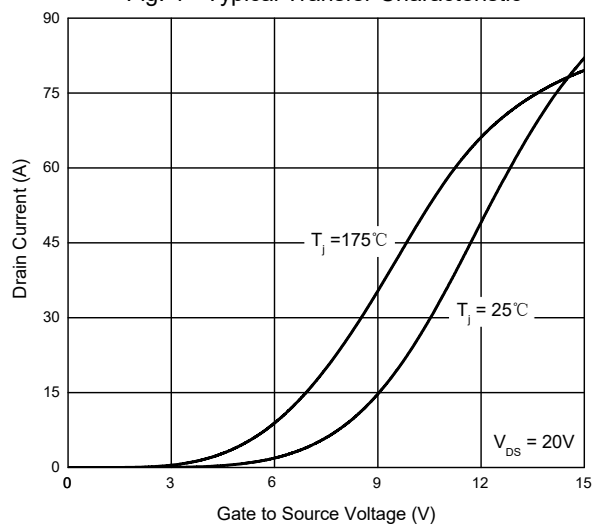


Fig. 5 - On-Resistance vs. Gate Voltage

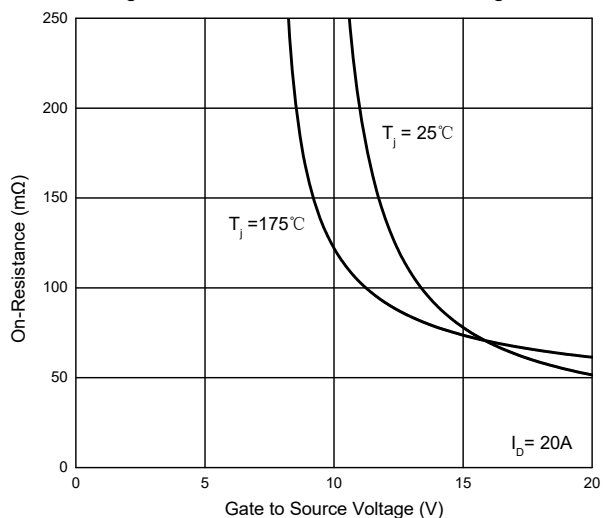
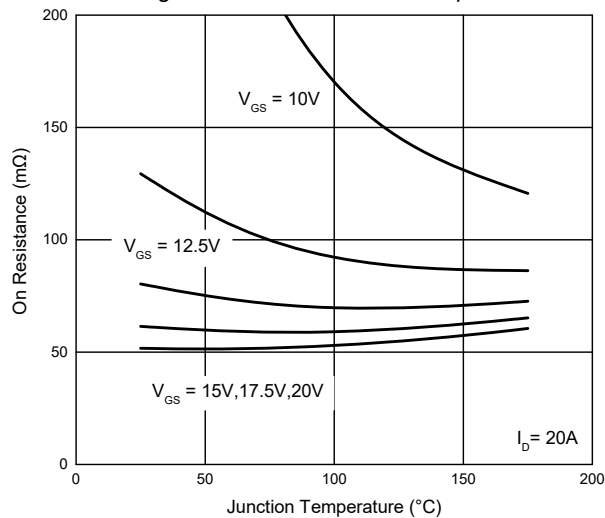


Fig. 6 - On-Resistance vs. Temperature



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

Fig. 7 - Normalized On Resistance vs. Temperature

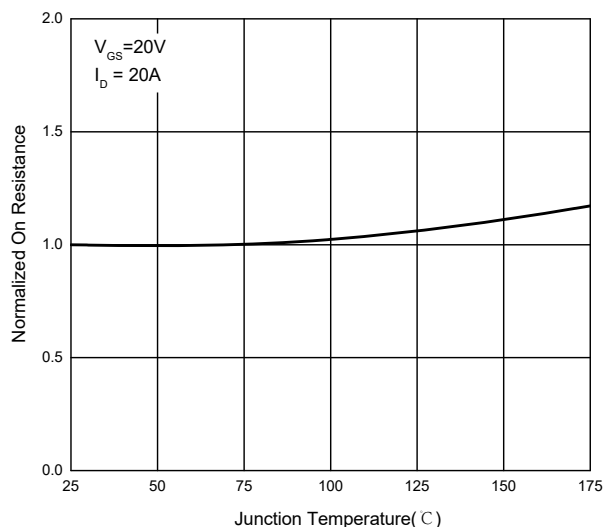


Fig. 8 - Reverse Output Voltage

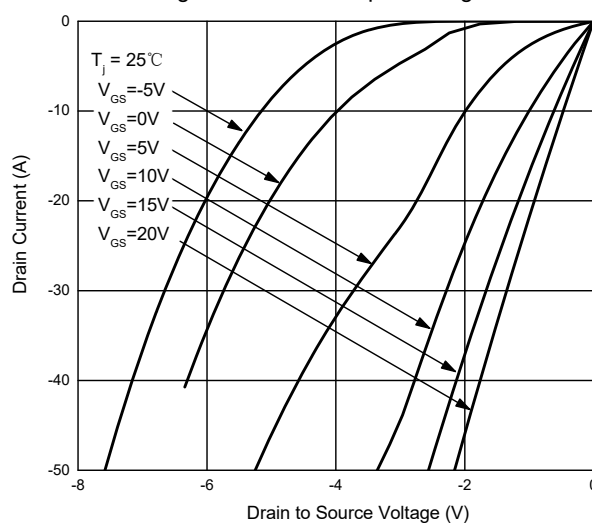


Fig. 9 - Reverse Output Voltage

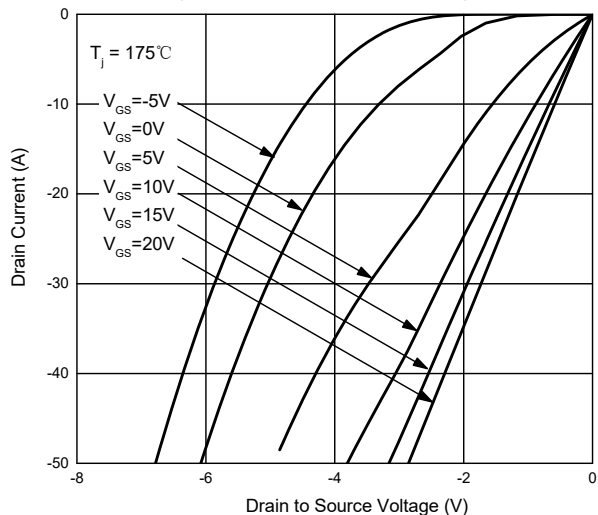


Fig. 10 - Capacitances vs. V_{DS}

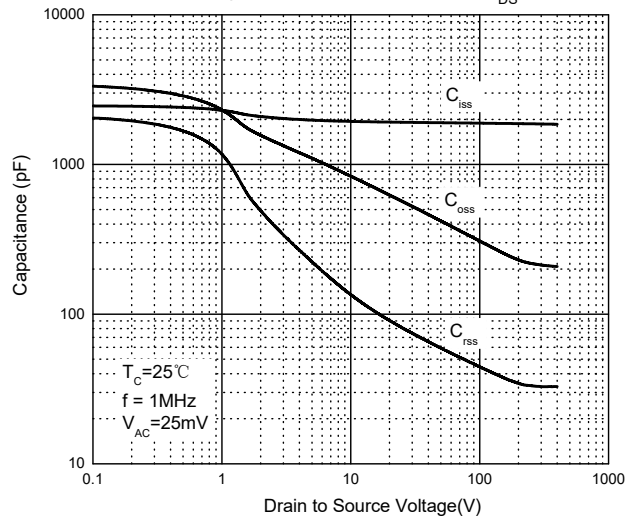


Fig. 11 - Threshold Voltage vs. Temperature

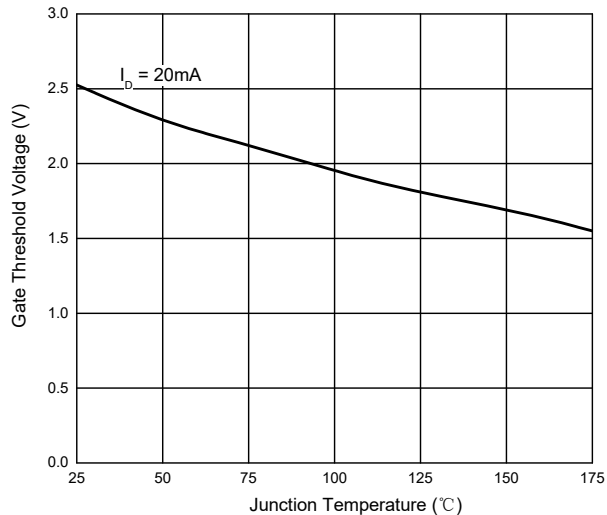
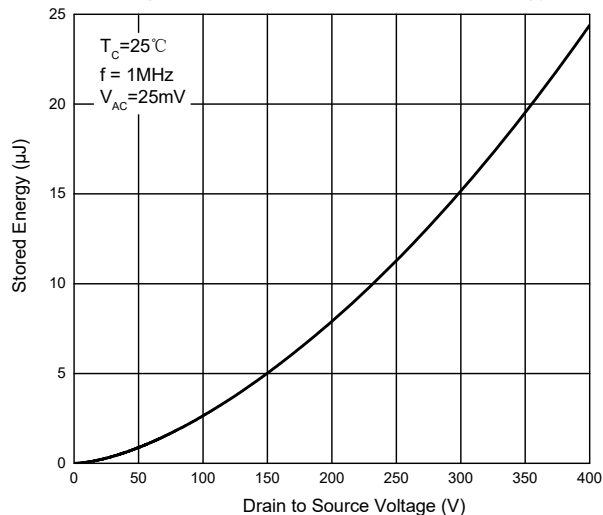


Fig. 12 - Output Capacitor Stored Energy



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

Fig. 13 - Power Derating

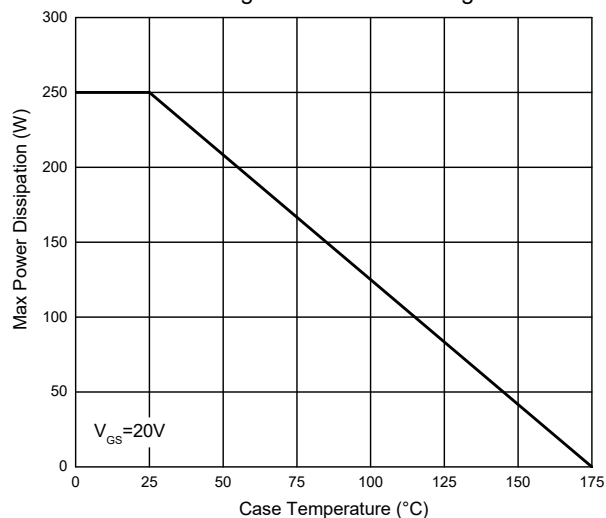


Fig. 14 - Drain Current Derating

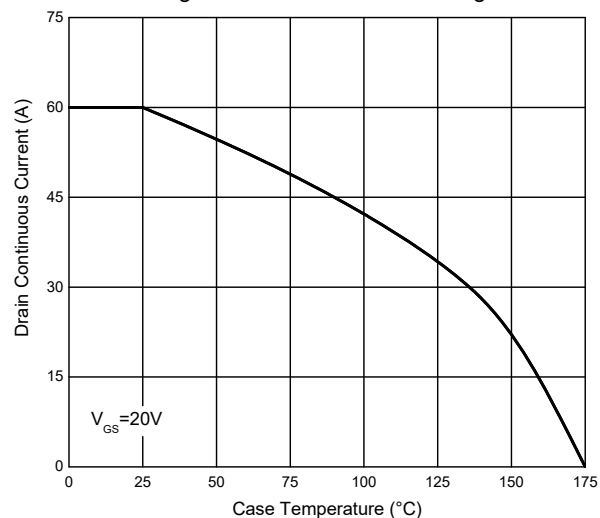


Fig. 15 - Safe Operation Area

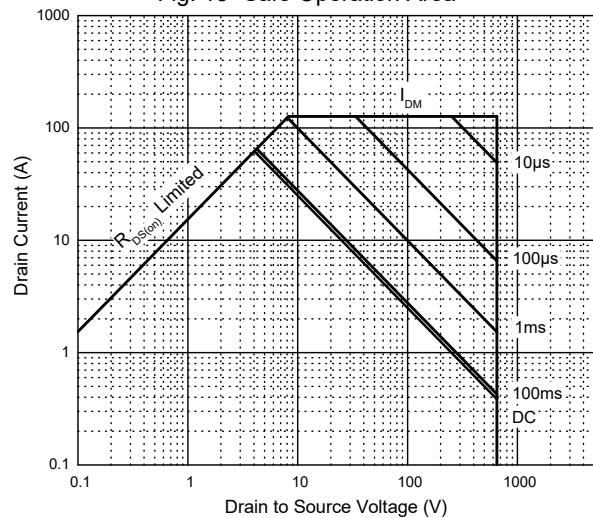


Fig. 16 - Typical Gate Charge

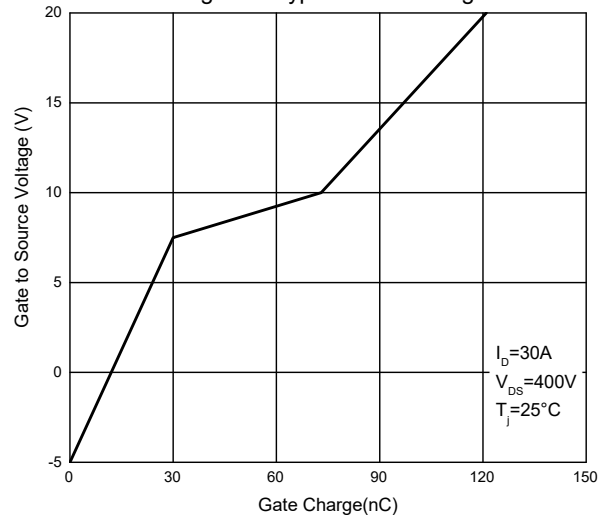


Fig. 17 - Clamped Inductive Switching Energy vs. Drain Current

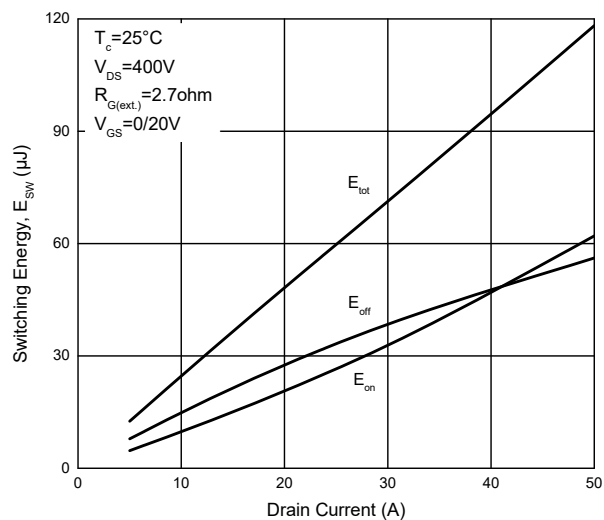
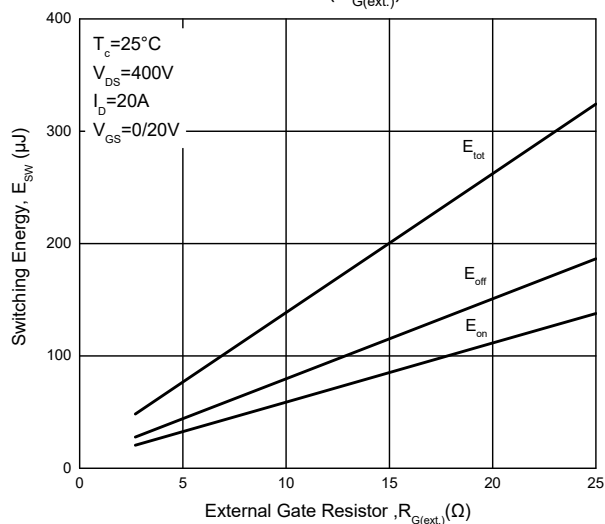
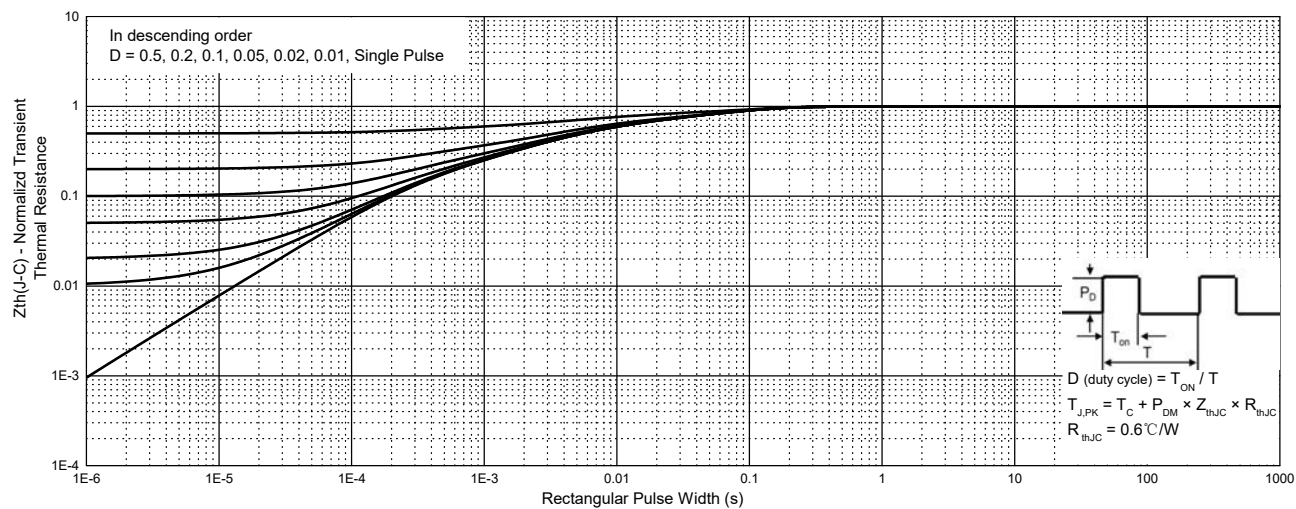


Fig. 18 - Clamped Inductive Switching Energy vs. External Gate Resistor ($R_{G(ext.)}$)



Curve Characteristics (T_J=25 °C unless otherwise specified)

Fig.19 - Normalized Transient Thermal Impedance



Ordering Information

Device	Packing
SICW050N065H-BP	Tube:30pcs/Tube, 1.8K/Ctn;

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