

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 : 0.4°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 $V_{GS}=20V$	$T_C=25^\circ C$	I_D	107	A	
	$T_C=110^\circ C$		72		
Pulsed Drain Current (Note 5)		I_{DM}	305	A	
Total Power Dissipation	$T_C=25^\circ C$	P_D	375	W	
	$T_C=110^\circ C$		162		
Avalanche Energy, Single Pulse		$V_{DD}=100V, I_D=14A$	E_{AS}	3.2	J

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

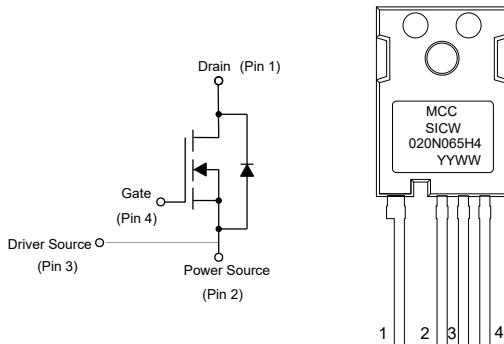
Note2:High Temperature Solder Exemptions Applied, see EU Directive Annex 7a.

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} .

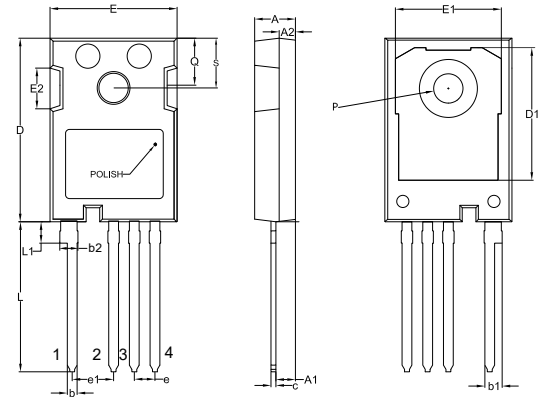
Internal Structure and Marking Code



Device Code: SICW020N065H4
Date Code: YYWW (Year & Week)

SiC N-CHANNEL MOSFET

TO-247-4



DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.189	0.205	4.80	5.20	
A1	0.090	0.098	2.29	2.50	
A2	0.074	0.082	1.88	2.08	
b	0.043	0.054	1.10	1.36	
b1	0.093	0.108	2.35	2.75	
b2	0.094	0.112	2.39	2.84	
c	0.022	0.028	0.55	0.70	
D	0.917	0.929	23.30	23.60	
D1	0.640	0.663	16.25	16.85	
E	0.620	0.632	15.75	16.05	
E1	0.543	0.559	13.80	14.20	
E2	0.173	0.201	4.4	5.10	
e	0.100		2.54		
e1	0.199		5.06		
L	0.683	0.694	17.34	17.64	
L1	0.157	0.169	4.00	4.30	
P	0.138	0.148	3.51	3.75	Φ
Q	0.220	0.236	5.60	6.00	
S	0.220	0.248	5.60	6.30	

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	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=100\mu A$	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	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=50mA$	2	3.1	4.5	V	
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=20V, I_D=50A$		20	26	m Ω	
		$V_{GS}=20V, I_D=50A, T_j=175^\circ C$		30		m Ω	
Internal Gate Resistance	R_g	$f=1MHz, V_{AC}=25mV$		0.6		Ω	
Transconductance	g_{FS}	$V_{DS}=10V, I_D=60A$		18.2		S	
Dynamic Characteristics							
Input Capacitance	C_{iss}	$V_{DS}=400V, V_{GS}=0V, f=1MHz, V_{AC}=25mV$		5740		pF	
Output Capacitance	C_{oss}			359			
Reverse Transfer Capacitance	C_{rss}			47			
Coss Stored Energy	E_{oss}			34			μJ
Total Gate Charge	Q_g	$V_{DS}=400V, V_{GS}=-5/+20V, I_D=50A$		287		nC	
Gate-Source Charge	Q_{gs}			80			
Gate-Drain Charge	Q_{gd}			75			
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=400V, V_{GS}=-4/+20V, R_G=2.7\Omega, I_D=35A, R_L=11.4\Omega$		29		ns	
Rise Time	t_r			51			
Turn-Off Delay Time	$t_{d(off)}$			30			
Fall Time	t_f			16			
Turn-On switching energy	E_{on}	$V_{DS}=400V, V_{GS}=0/+20V, R_G=2.7\Omega, I_D=50A$		61.7		μJ	
Turn-Off switching energy	E_{off}			101			
Short-Circuit Withstand Time	t_{SC}	$V_{GS}=0/15V, V_{DS}=400V, R_G=100\Omega$		<18		μs	
Diode Characteristics							
Continuous Body Diode Current	I_S	$V_{GS}=0V, T_C=25^\circ C$		61.5		A	
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_{SD}=10A$		2.9		V	
Reverse Recovery Time	t_{rr}	$V_{GS}=0V, I_{SD}=30A, V_{DS}=400V, dI_F/dt=300A/\mu s$		77		ns	
Reverse Recovery Charge	Q_{rr}				301		nC
Peak Reverse Recovery Current	I_{rrm}				6.9		A

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

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

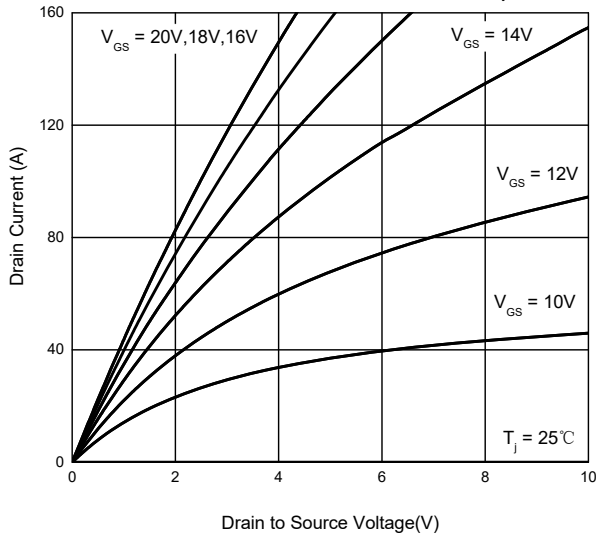


Fig. 2 - Typical Output Characteristic ($T_j=175^\circ\text{C}$)

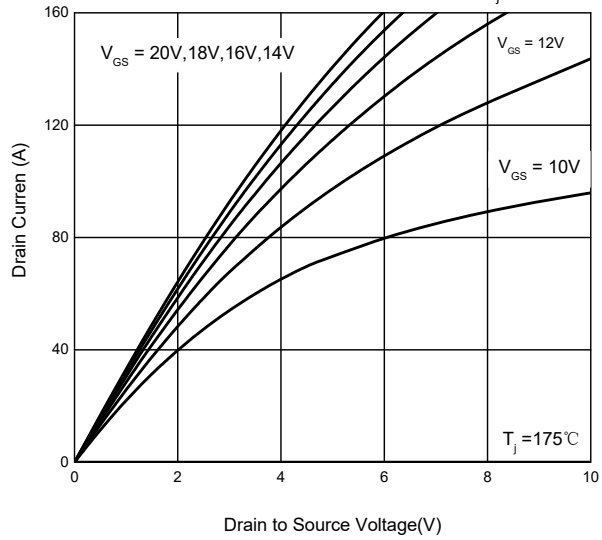


Fig. 3 - On-Resistance vs. Drain Current

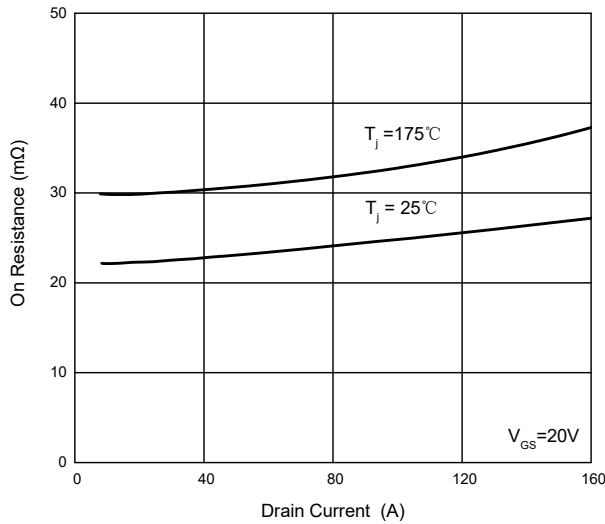


Fig. 4 - Typical Transfer Characteristic

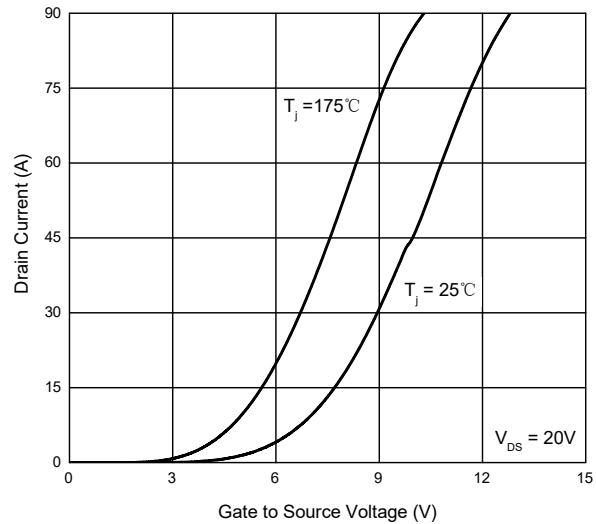


Fig. 5 - On-Resistance vs. Gate Voltage

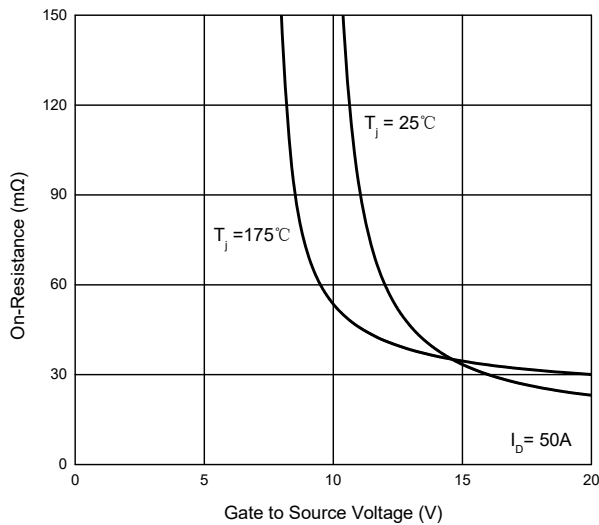
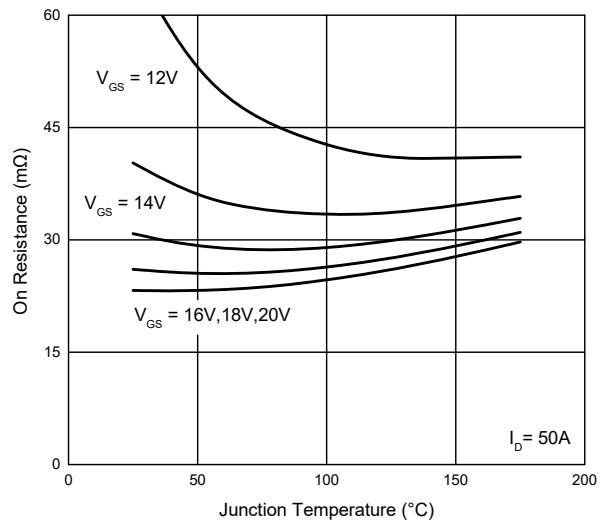


Fig. 6 - On-Resistance vs. Temperature



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

Fig. 7 - Normalized On-Resistance vs. Temperature

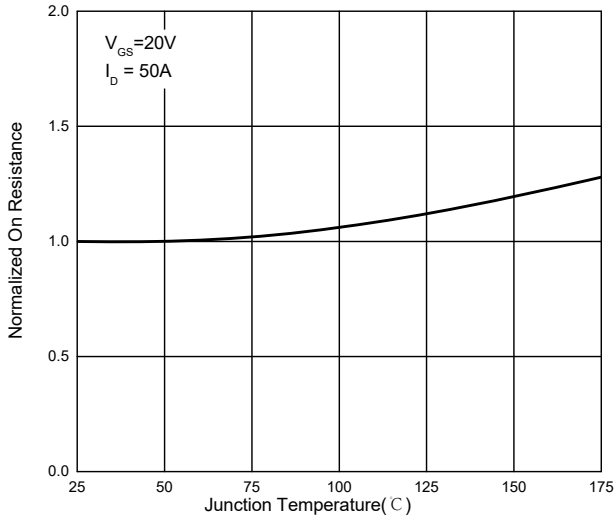


Fig. 8 - Reverse Output Voltage

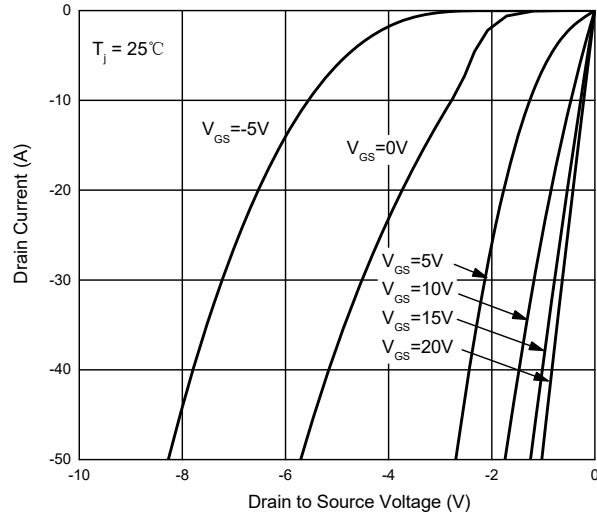


Fig. 9 - Reverse Output Voltage

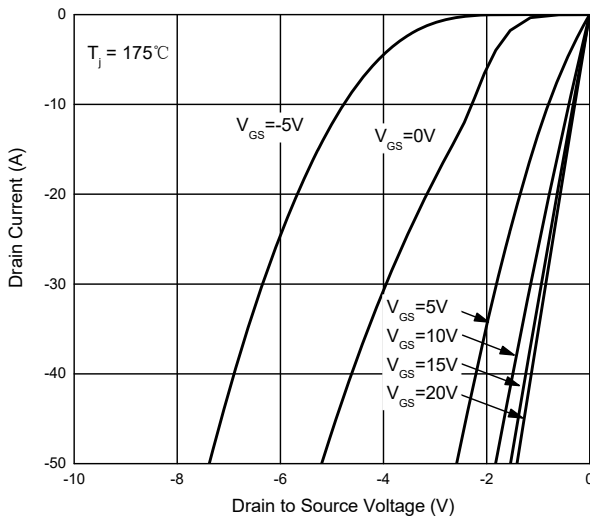


Fig. 10 - Capacitances vs. V_{DS}

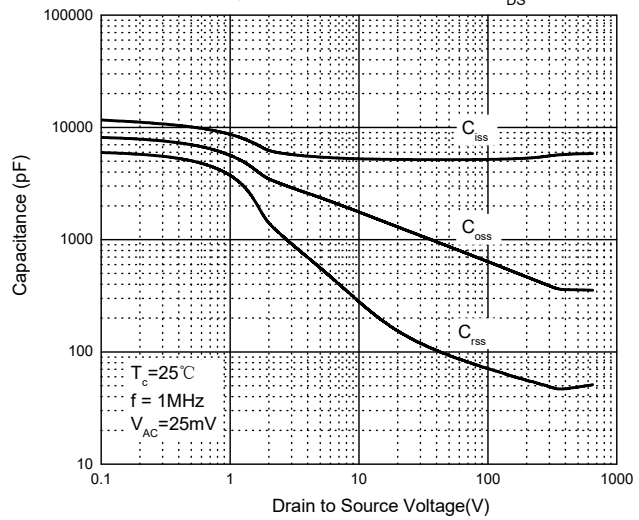


Fig. 11 - Threshold Voltage vs. Temperature

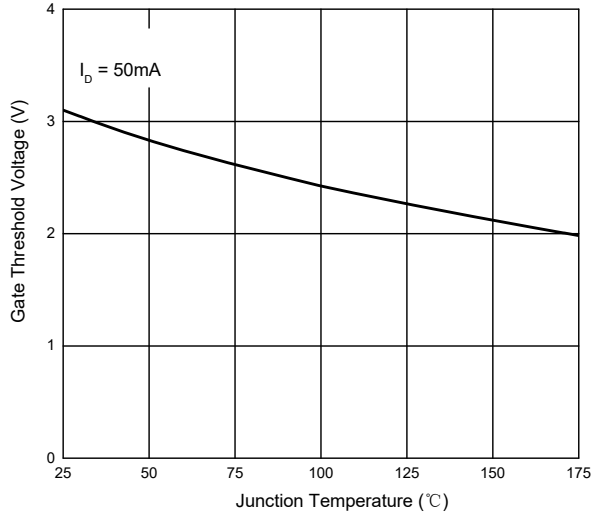
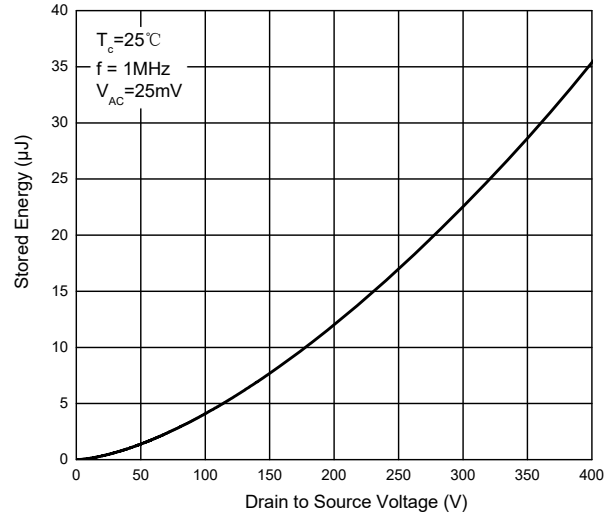


Fig. 12 - Output Capacitor Stored Energy



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

Fig. 13 - Power Derating

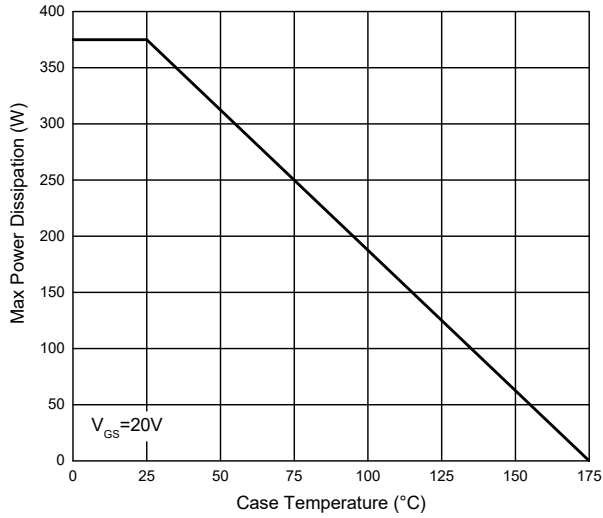


Fig. 14 - Drain Current Derating

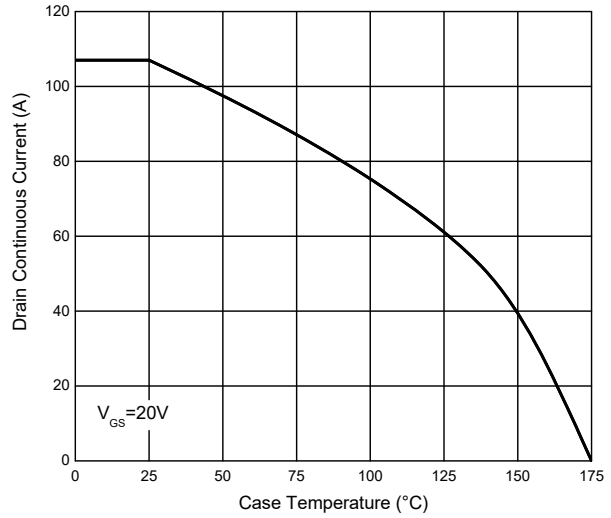


Fig. 15 - Safe Operation Area

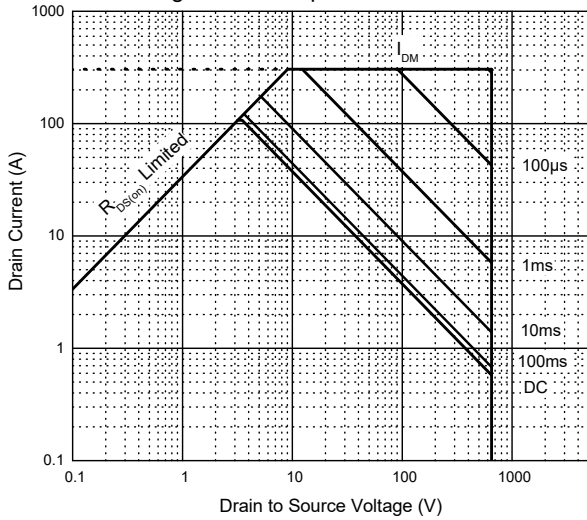


Fig. 16 - Typical Gate Charge

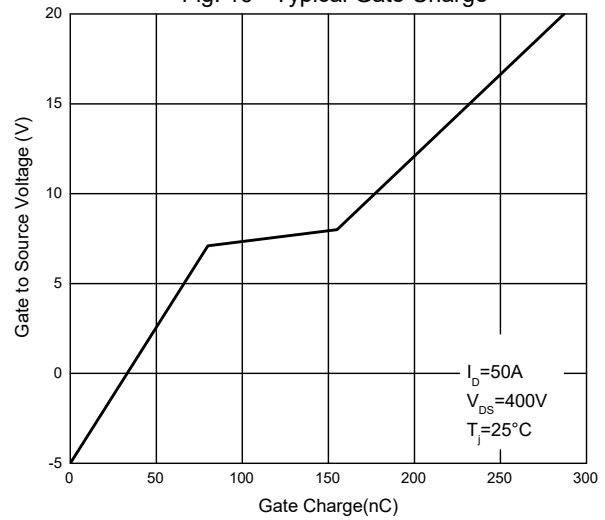


Fig. 17 - Clamped Inductive Switching Energy vs. Drain Current

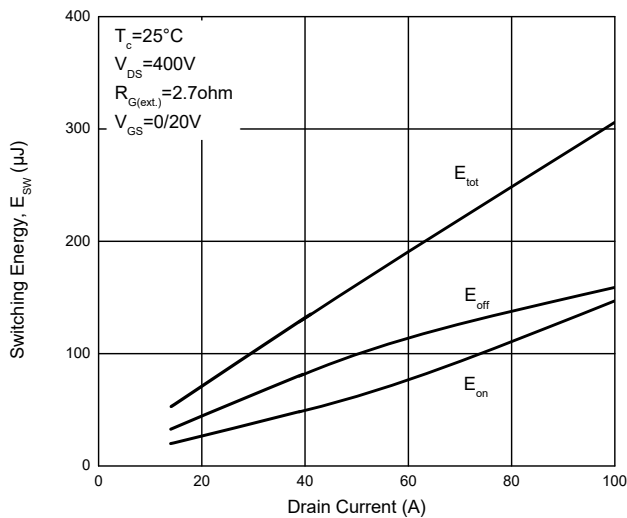
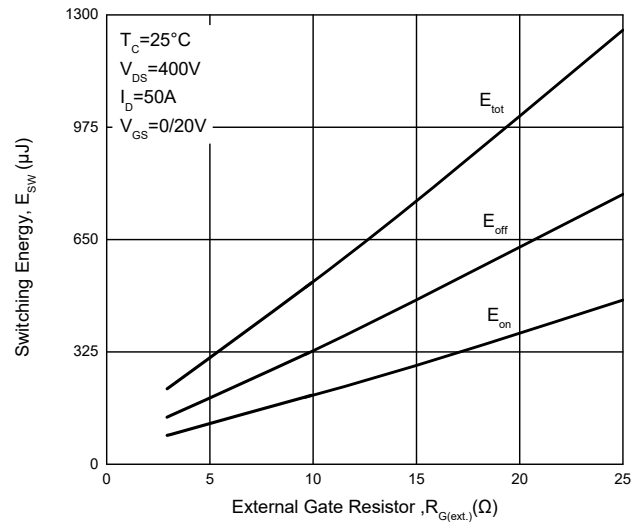
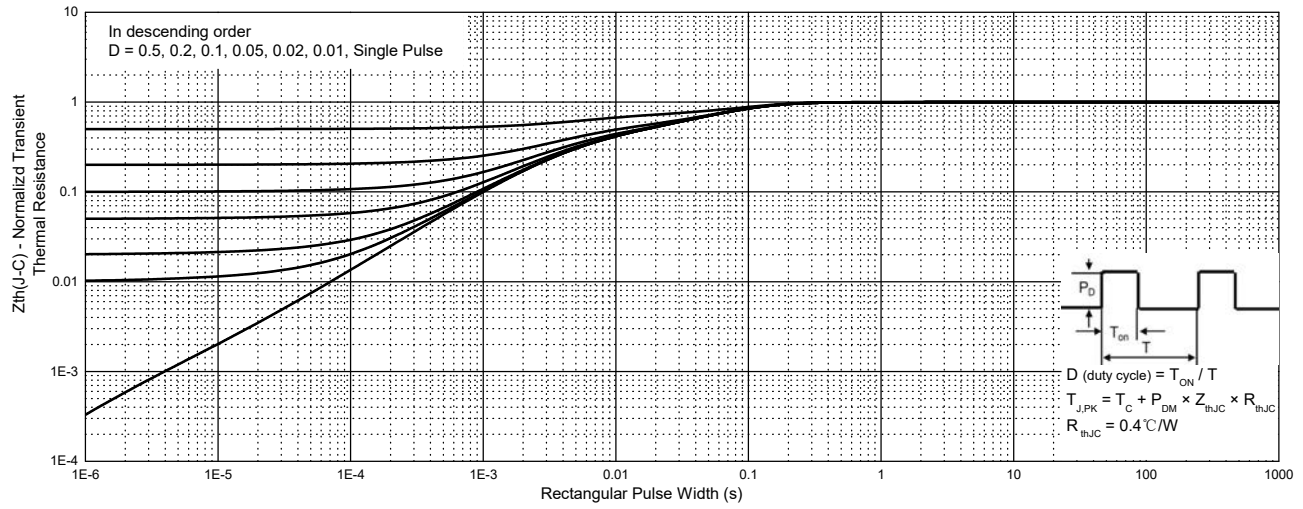


Fig. 18 - Clamped Inductive Switching Energy vs. External Gate Resistor ($R_{G(ext.)}$)



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

Fig.19 - Normalized Transient Thermal Impedance



Ordering Information

Device	Packing
SICW020N065H4-BP	Tube:30pcs/Tube, 1.8K/Ctn;

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