

## Features

- SiC MOSFET Technology
- High Speed Switching
- High switching speed with low capacitance
- Very low switching losses
- Excellent avalanche ruggedness
- 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): 40°C/W
- Thermal Resistance Junction to Case,Typ : 1.25°C/W

## Applications

- Solar inverters
- Uninterrupted power supplies
- Switch mode power supplies
- Motor drives

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V <sub>DS</sub>	1700	V
Gate-Source Voltage <sup>(Note 4)</sup>		V <sub>GSmax</sub>	-10/+27	V
Gate-Source Voltage		V <sub>GSmax</sub>	-8/+24	
Gate-Source Voltage		V <sub>GSop</sub>	-5/+20	V
Continuous Drain Current V <sub>GS</sub> =18V	T <sub>c</sub> =25°C	I <sub>D</sub>	6.8	A
	T <sub>c</sub> =100°C		4.8	
Pulsed Drain Current <sup>(Note 5)</sup>		I <sub>DM</sub>	21	A
Total Power Dissipation	T <sub>c</sub> =25°C	P <sub>D</sub>	100	W
Avalanche Energy, Single Pulse	V <sub>DD</sub> =50V, L=5mH	E <sub>AS</sub>	150	mJ

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

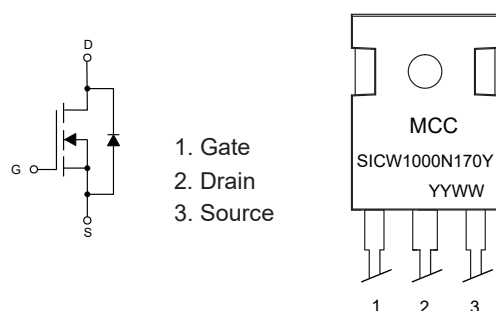
Note2:High Temperature Solder Exemptions Applied, see EU Directive Annex 7a.

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

Note4:tp ≤ 0.5us, D < 1%

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

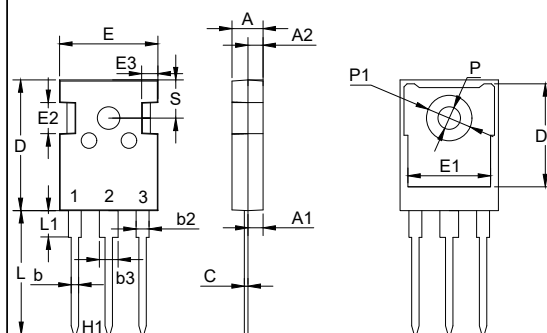
## Internal Structure and Marking Code



Device Code: SICW1000N170Y  
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 <sub>(BR)DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =100μA	1700			V
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =20V			250	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =1700V, V <sub>GS</sub> =0V			100	μA
Gate-Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =0.5mA	2	2.6	4.0	V
		V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =0.5mA,T <sub>j</sub> =175℃				
Drain-Source On-Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =20V, I <sub>D</sub> =2A		1.0	1.2	Ω
		V <sub>GS</sub> =20V, I <sub>D</sub> =2A,T <sub>j</sub> =175℃		1.5		Ω
Internal Gate Resistance	R <sub>g</sub>	f=1MHz, V <sub>AC</sub> =25mV		6		Ω
Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =20V, I <sub>D</sub> =2A		1.0		S
		V <sub>DS</sub> =20V, I <sub>D</sub> =2A,T <sub>j</sub> =175℃		1.2		
Dynamic Characteristics						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =1000V,V <sub>GS</sub> =0V, f=1MHz,V <sub>AC</sub> =25mV		227		pF
Output Capacitance	C <sub>oss</sub>			12.5		
Reverse Transfer Capacitance	C <sub>rss</sub>			2		
Coss Stored Energy	E <sub>oss</sub>			7.7		
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =1200V,V <sub>GS</sub> =-5/+20V, I <sub>D</sub> =2A, I <sub>GS</sub> =1mA		16.7		nC
Gate-Source Charge	Q <sub>gs</sub>			1.67		
Gate-Drain Charge	Q <sub>gd</sub>			9.2		
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =1200V, V <sub>GS</sub> =-5/+20V, R <sub>G</sub> =12Ω, I <sub>D</sub> =2A,L=1364uH		18		ns
Rise Time	t <sub>r</sub>			16		
Turn-Off Delay Time	t <sub>d(off)</sub>			24		
Fall Time	t <sub>f</sub>			79		
Turn-On switching energy	E <sub>on</sub>	V <sub>DD</sub> =1200V, V <sub>GS</sub> =-5/+20V, R <sub>G</sub> =12Ω, I <sub>D</sub> =2A,L=1364uH		63		μJ
Turn-Off switching energy	E <sub>off</sub>			29		

**Electrical Characteristics @  $T_j=25^{\circ}\text{C}$  (Unless Otherwise Specified)**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Diode Characteristics</b>						
Continuous Body Diode Current	$I_S$	$V_{GS}=-5\text{V}$ , $T_C=25^{\circ}\text{C}$			5	A
Diode Forward Voltage	$V_{SD}$	$V_{GS}=-5\text{V}$ , $I_{SD}=1\text{A}$		3.6		V
		$V_{GS}=-5\text{V}$ , $I_{SD}=1\text{A}$ , $T_j=175^{\circ}\text{C}$		3.2		
Reverse Recovery Time	$t_{rr}$	$V_{GS}=-5\text{V}$ , $I_{SD}=2\text{A}$ , $V_R=1200\text{V}$ , $dI_F/dt=0.19\text{KA}/\mu\text{s}$		34		ns
Reverse Recovery Charge	$Q_{rr}$			0.04		uC
Peak Reverse Recovery Current	$I_{rrm}$			1.85		A
Reverse Recovery Time	$t_{rr}$	$V_{GS}=-5\text{V}$ , $I_{SD}=2\text{A}$ , $V_R=1200\text{V}$ , $dI_F/dt=0.19\text{KA}/\mu\text{s}$ , $T_j=175^{\circ}\text{C}$		39		ns
Reverse Recovery Charge	$Q_{rr}$			0.08		uC
Peak Reverse Recovery Current	$I_{rrm}$			3.57		A

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

Figure 1. Output characteristics at  $T_J = -55^\circ\text{C}$

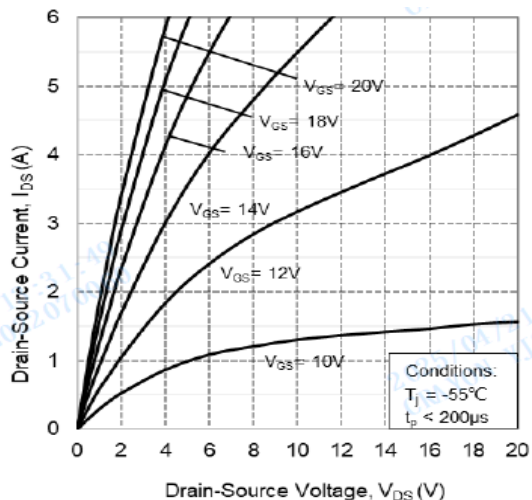


Figure 2. Output characteristics at  $T_J = 25^\circ\text{C}$

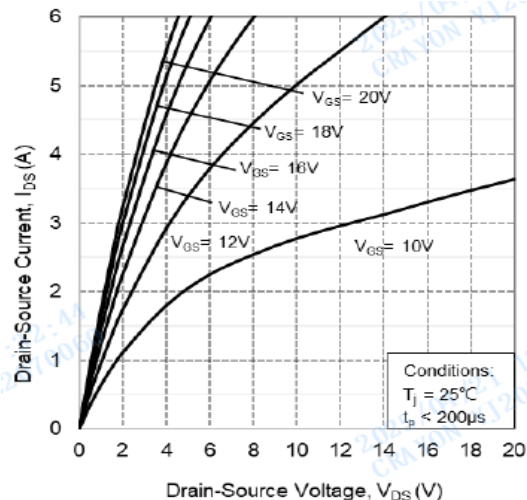


Figure 3. Output characteristics at  $T_J = 175^\circ\text{C}$

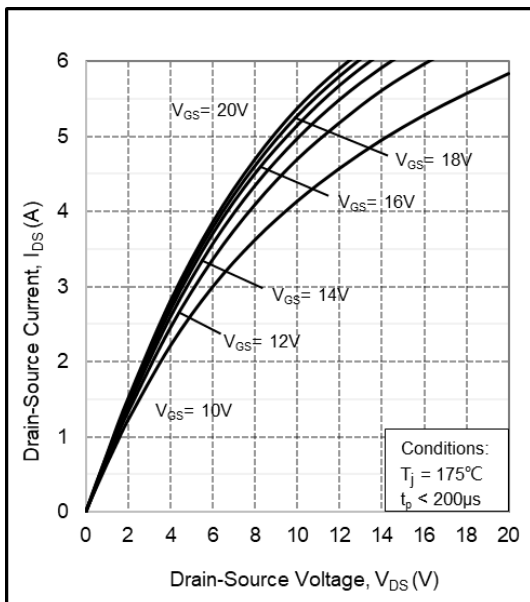


Figure 4. Normalized on-resistance vs. temperature

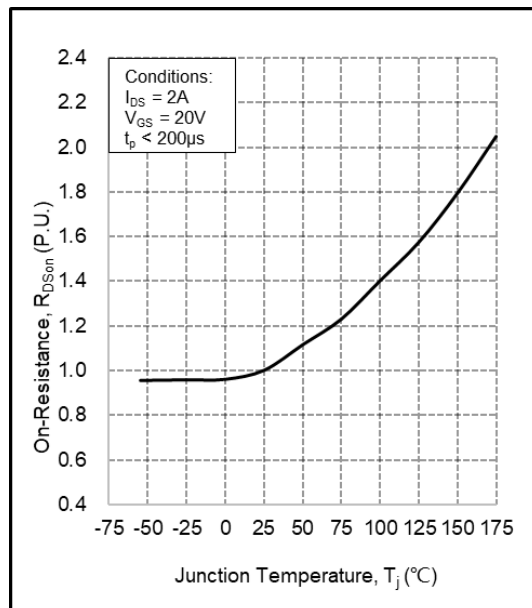


Figure 5. On-resistance vs. drain current

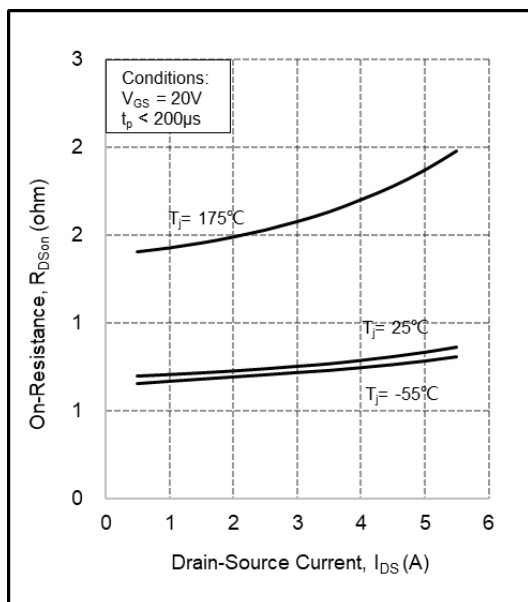
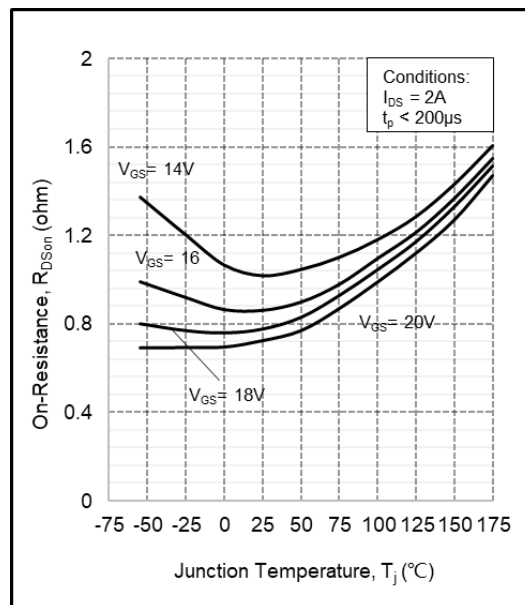


Figure 6. On-resistance vs. temperature



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

Figure 7. Transfer characteristic

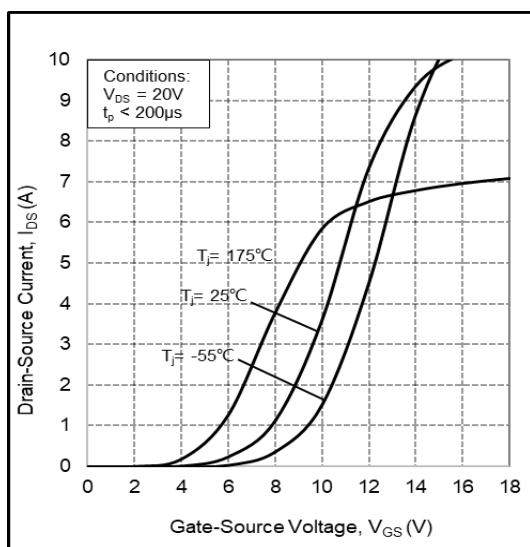


Figure 8. Body diode characteristic at  $T_J = -55^\circ\text{C}$

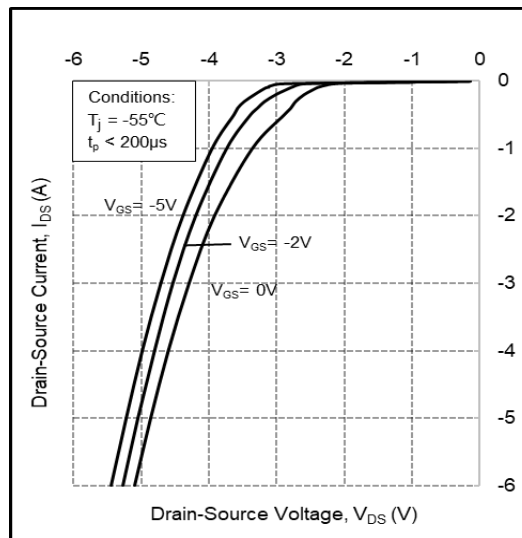


Figure 9. Body diode characteristic at  $T_J = 25^\circ\text{C}$

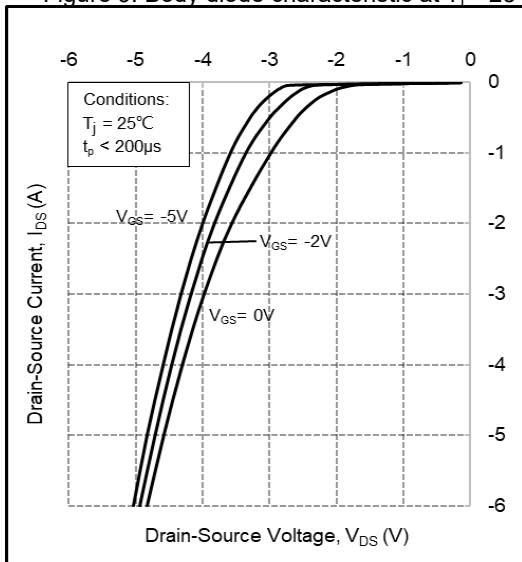


Figure 10. Body diode characteristic at  $T_J = 175^\circ\text{C}$

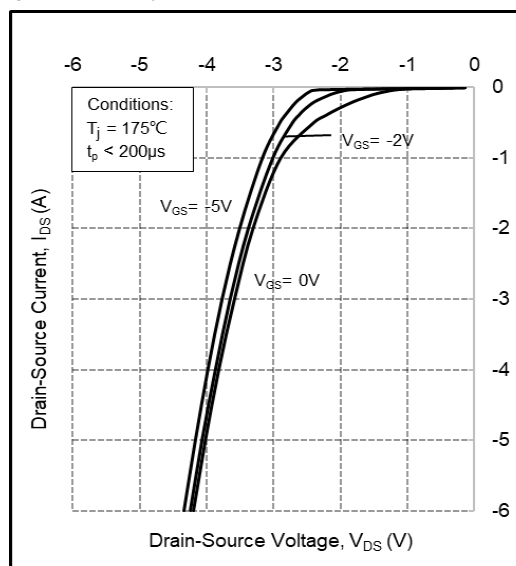


Figure 11. Threshold voltage vs. temperature

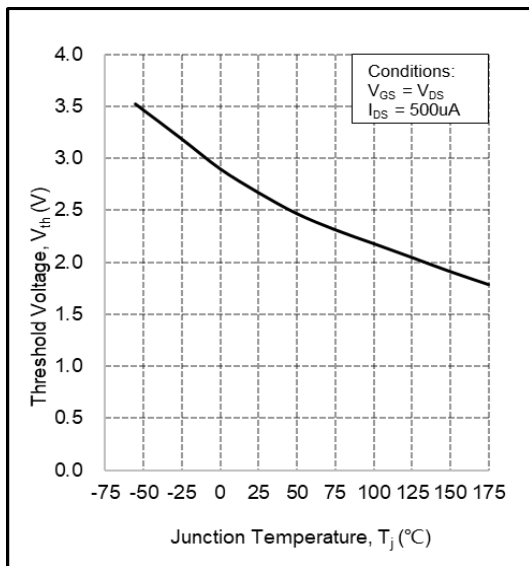
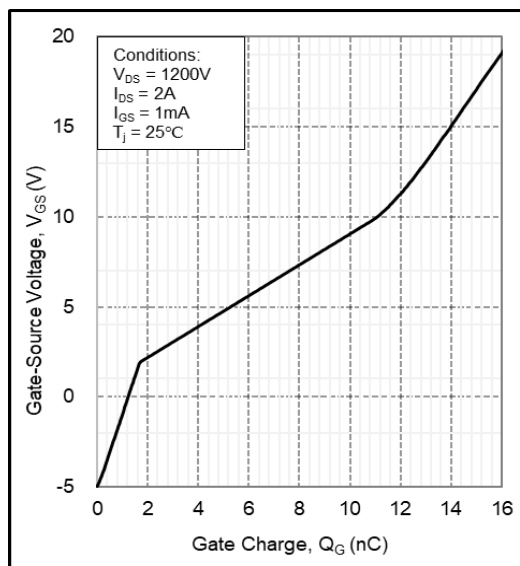


Figure 12. Gate Charge Characteristic



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

Figure 13. 3rd quadrant characteristic at  $T_J = -55^\circ\text{C}$

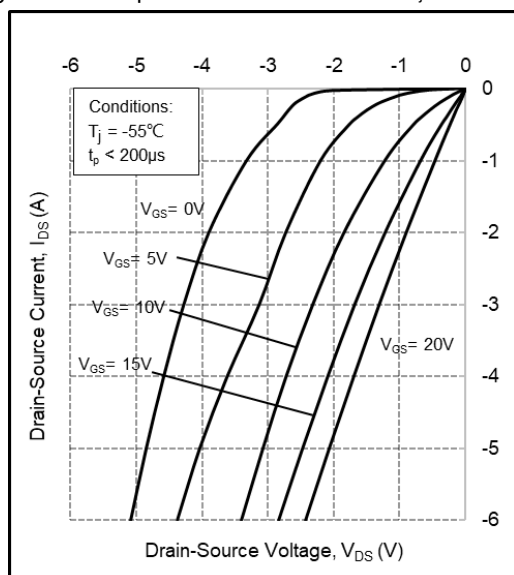


Figure 14. 3rd quadrant characteristic at  $T_J = 25^\circ\text{C}$

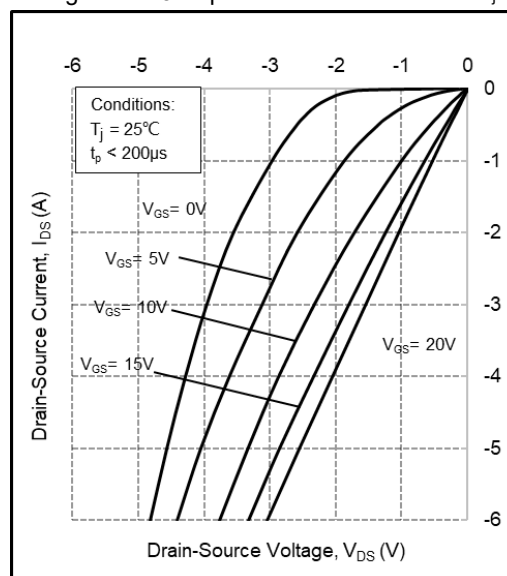


Figure 15. 3rd quadrant characteristic at  $T_J = 175^\circ\text{C}$

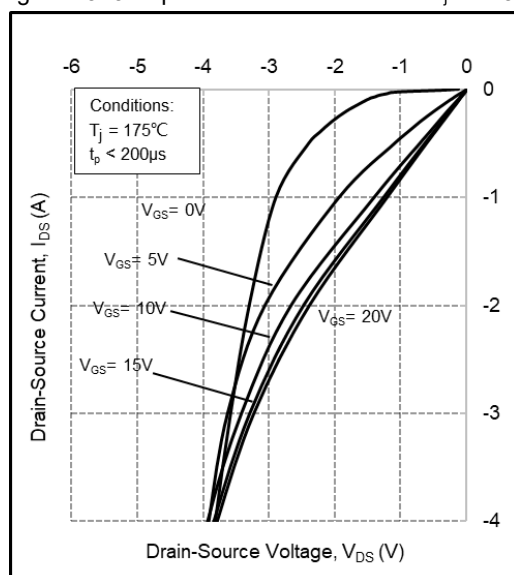


Figure 16. Output capacitor stored energy

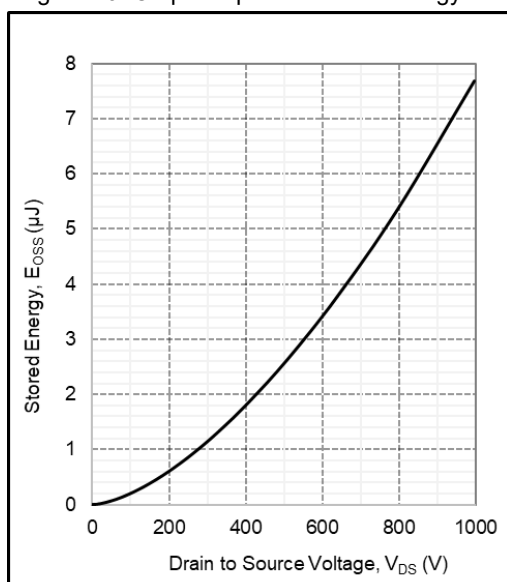


Figure 17. Capacitance vs. drain-source voltage (0 - 200V)

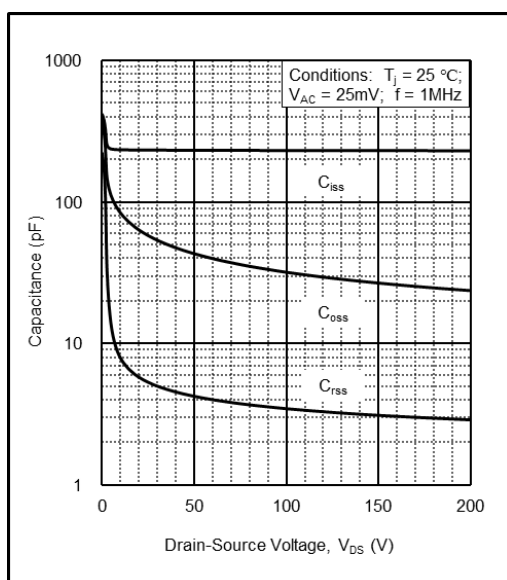
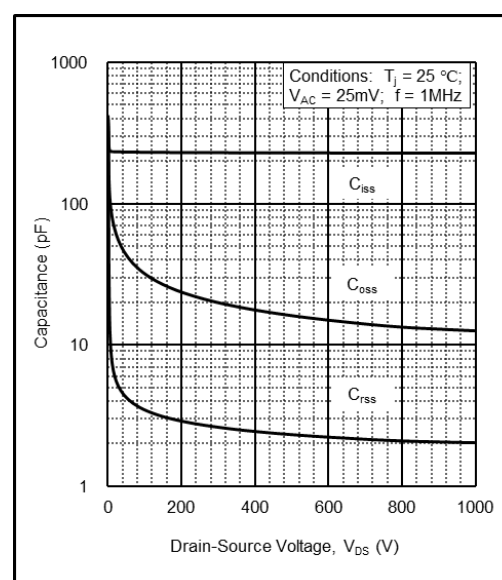


Figure 18. Capacitance vs. drain-source voltage (0 - 1000V)



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

Figure 19. Continuous drain current derating vs. temperature

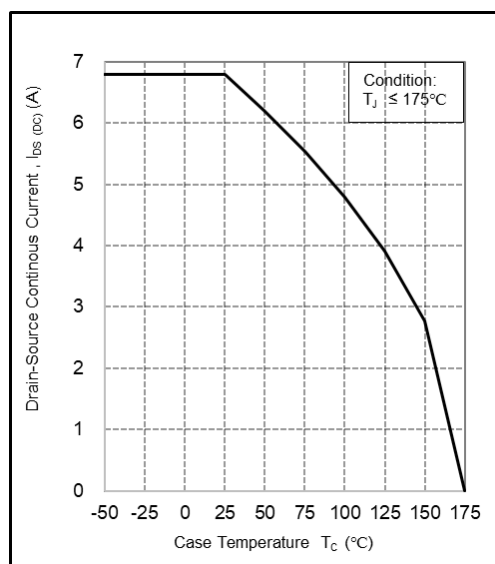


Figure 21. Switching Times vs.  $R_{G(ext)}$

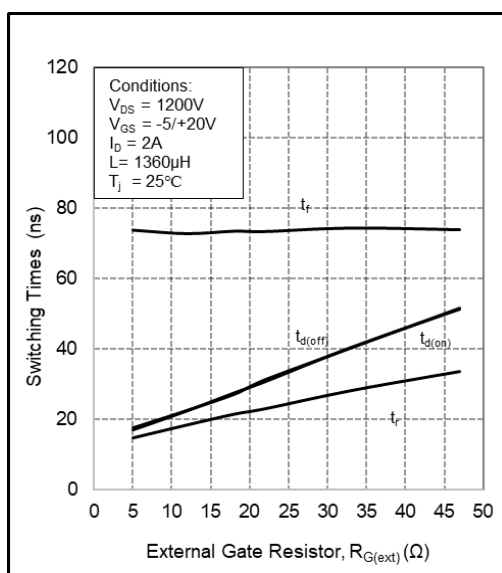


Figure 23. Clamped inductive Switching energy vs. temperature

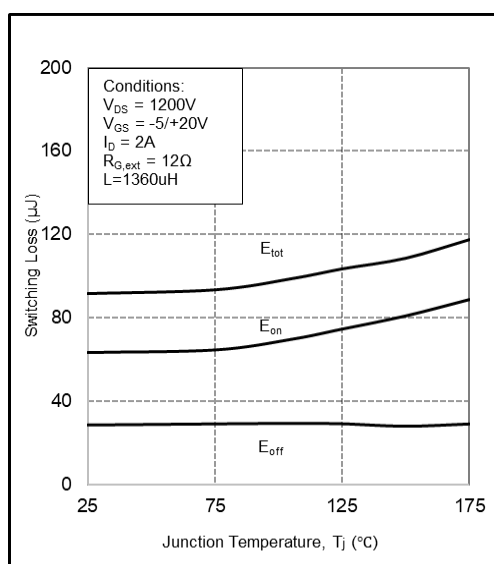


Figure 20. Maximum power dissipation derating vs. temperature

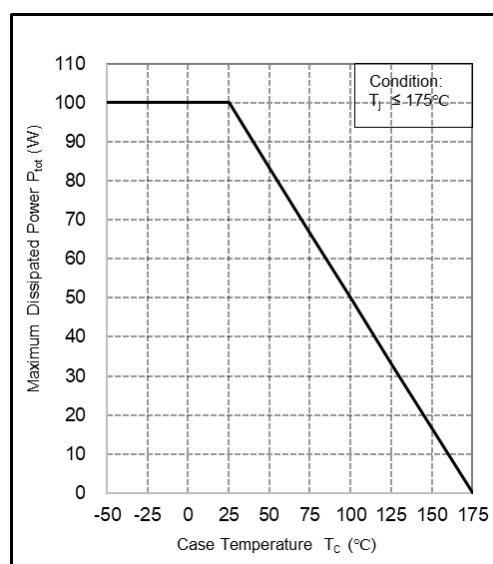


Figure 22. Clamped inductive Switching energy vs. drain current

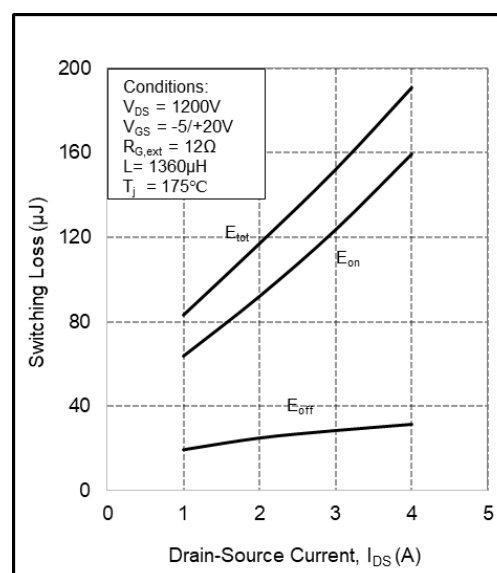
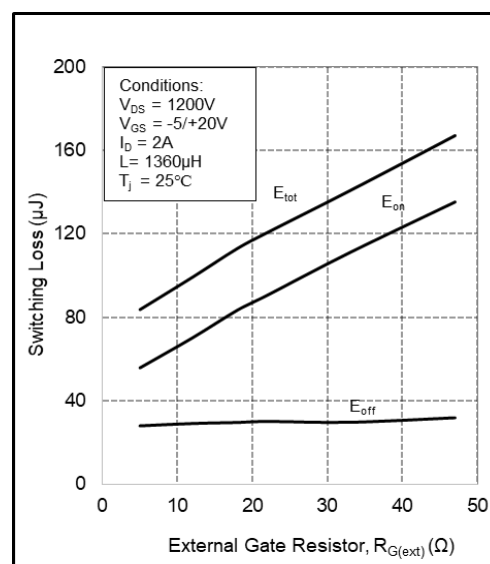


Figure 24. Clamped inductive Switching energy vs.  $R_{G(ext)}$



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

Figure 25. Reverse recovery charge vs.  $di/dt$

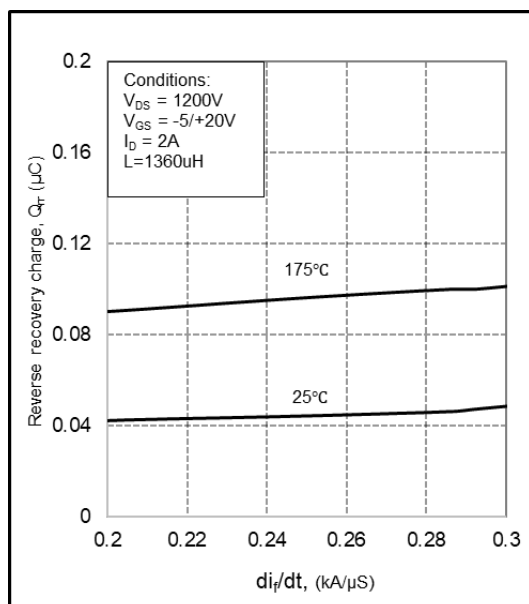


Figure 26. Reverse recovery current vs.  $di/dt$

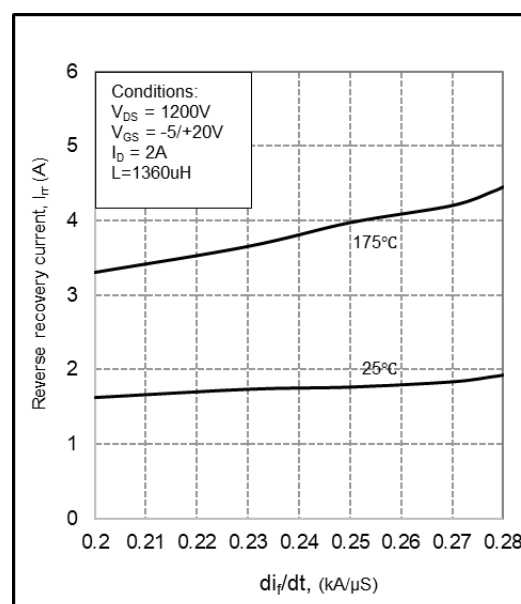


Figure 27. Transient Thermal Impedance (Junction - Case)

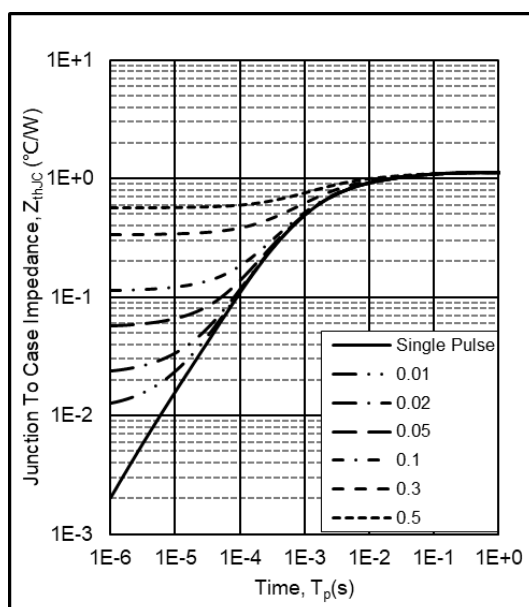
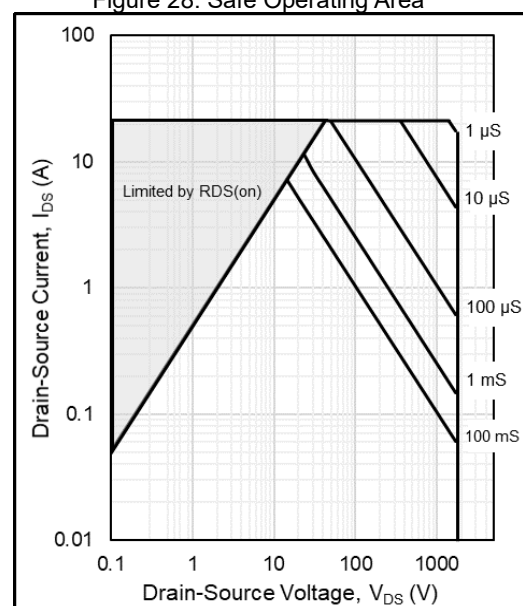


Figure 28. Safe Operating Area





## Ordering Information

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

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