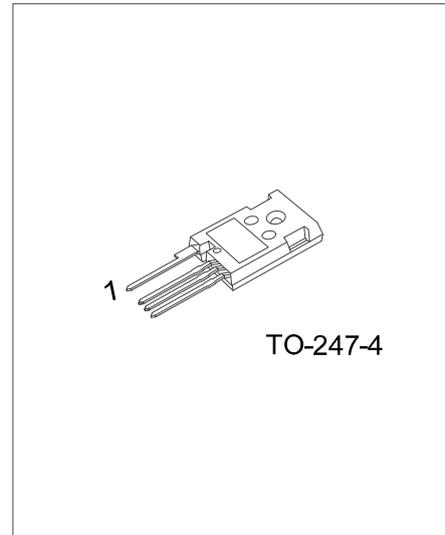




## USC170R022A

Power MOSFET

### 123A, 1700V N-CHANNEL SILICON CARBIDE PLANAR ENHANCEMENT POWER MOSFET



#### DESCRIPTION

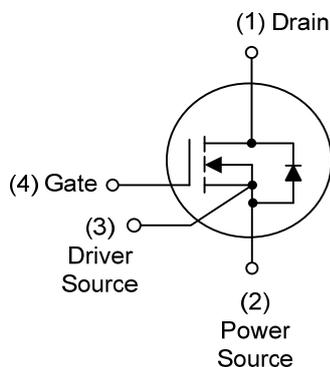
SiC The material can achieve high voltage with most carrier devices (MOSFET) with fast device structure characteristics, so it can realize the three characteristics of "high voltage", "low on resistance" and "high frequency" at the same time.

It is widely used in electric vehicle charger, industrial equipment power supply, efficient power regulator inverter and rectification part and other uses.

#### FEATURES

- \*  $R_{DS(ON)} \leq 22 \text{ m}\Omega @ V_{GS}=18\text{V}, I_D=80\text{A}$
- \* Wide bandgap SiC MOSFET technology
- \* High Speed Switching with Low Capacitances
- \* Easy to Parallel
- \* Low reverse recovery (Qrr)
- \* Power Factor Correction Modules
- \* Switch mode power supplies
- \* DC-AC Inverters
- \* On Board Charger
- \* High voltage DC/DC converters

#### SYMBOL



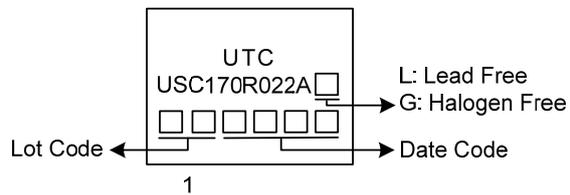
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment							Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	
USC170R022AL-T474-T	USC170R022AG-T474-T	TO-247-4	D	S	S	G	-	-	-	Tube

Note: Pin Assignment: D: Drain S: Source G: Gate

<p>USC170R022AG-T474-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube (2) T474: TO-247-4 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING



■ ABSOLUTE MAXIMUM RATINGS (T<sub>c</sub>=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT	
Drain-Source Voltage		V <sub>DSS</sub>	1700	V	
Gate-Source Voltage	Dynamic	V <sub>GSS</sub>	-8 / +22	V	
	Static		-4 / +18	V	
Drain Current	Continuous	I <sub>D</sub>	V <sub>GS</sub> =18V T <sub>C</sub> =25°C	123	A
			V <sub>GS</sub> =18V T <sub>C</sub> =100°C	78	A
	Pulsed (Note 2)	I <sub>DM</sub>	260	A	
Power Dissipation		P <sub>D</sub>	T <sub>C</sub> =25°C	520	W
			T <sub>C</sub> =100°C	208	W
Junction Temperature		T <sub>J</sub>	-40 ~ +150	°C	
Storage Temperature		T <sub>STG</sub>	-40 ~ +150	°C	

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating: Pulse width limited by maximum junction temperature.

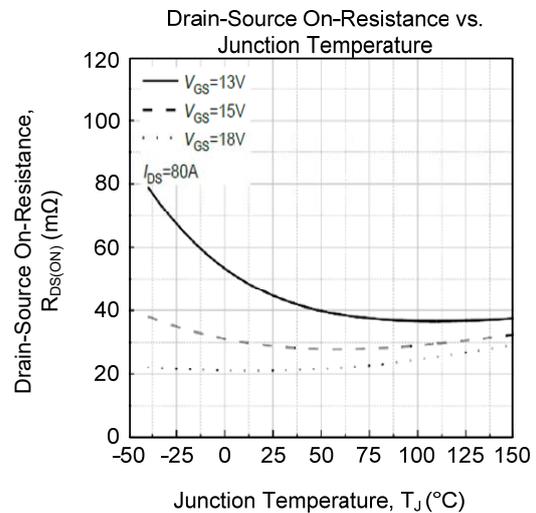
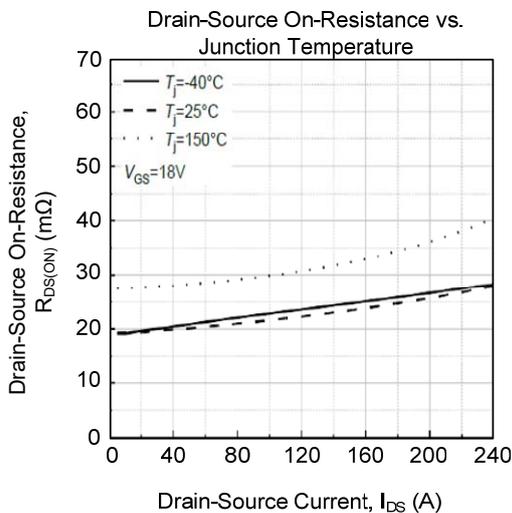
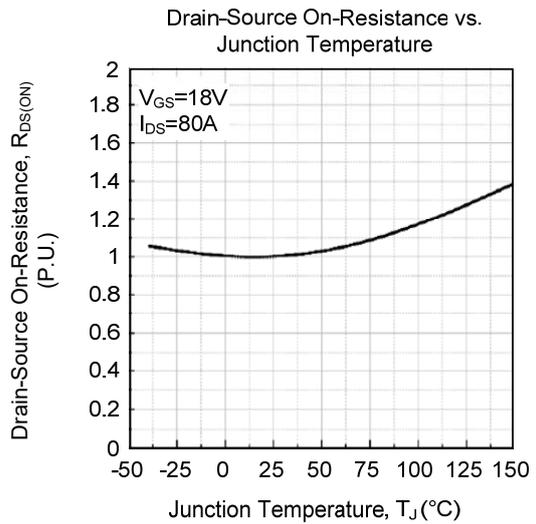
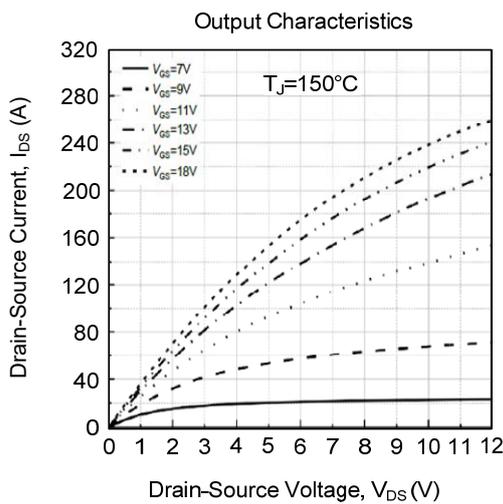
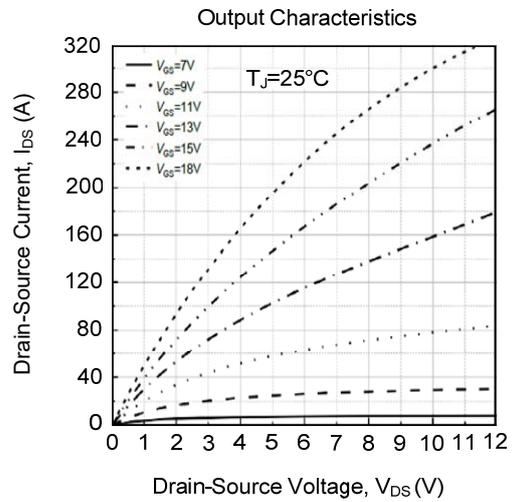
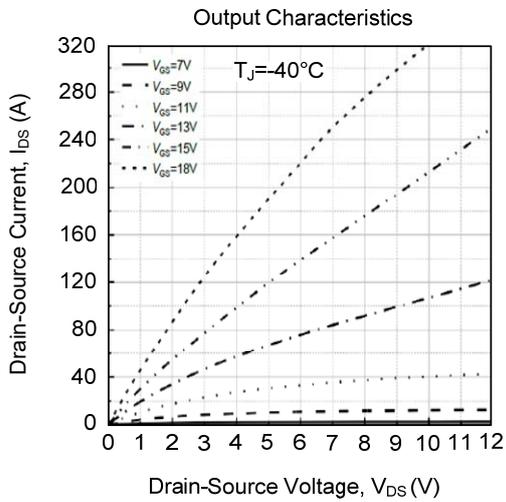
■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ <sub>JA</sub>	50	°C/W
Junction to Case	θ <sub>JC</sub>	0.24	°C/W

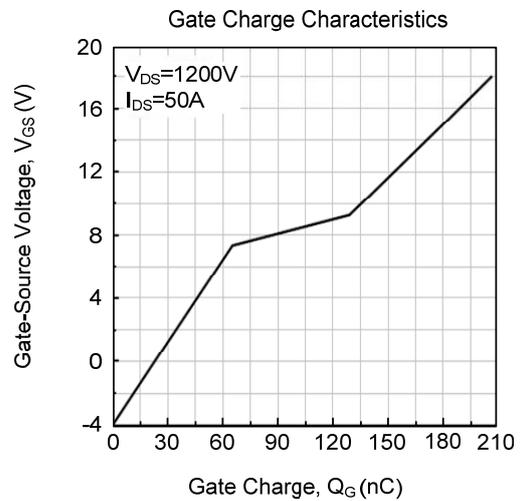
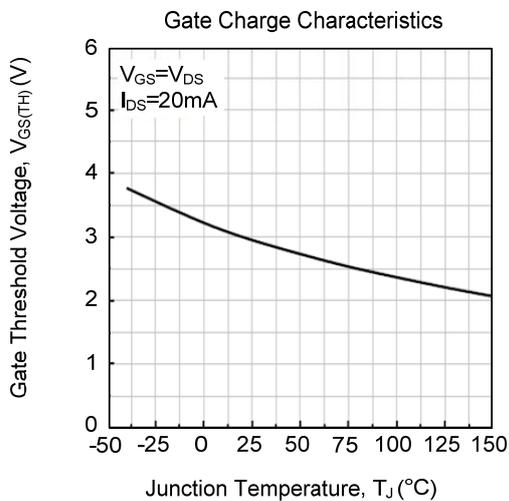
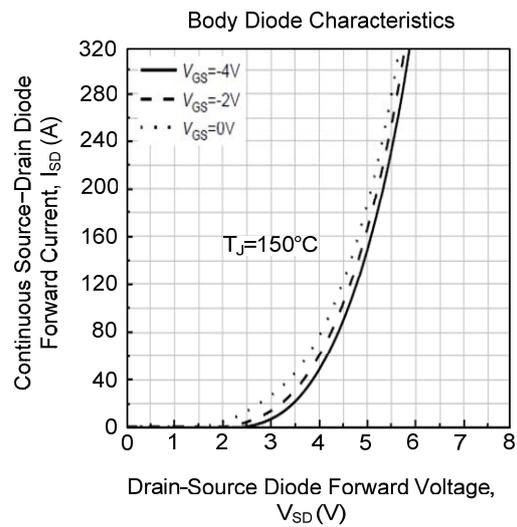
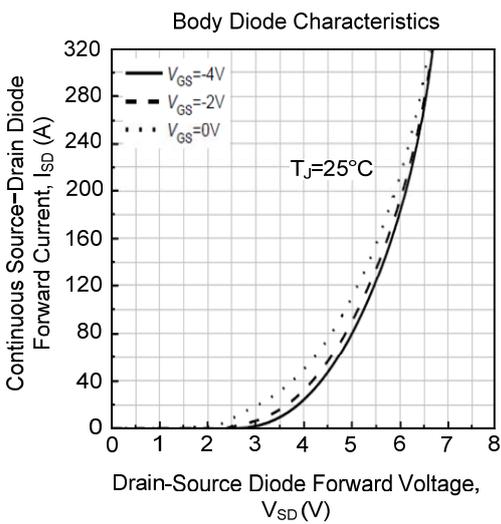
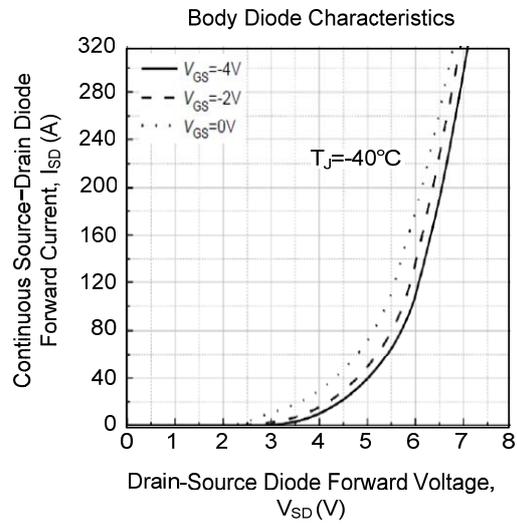
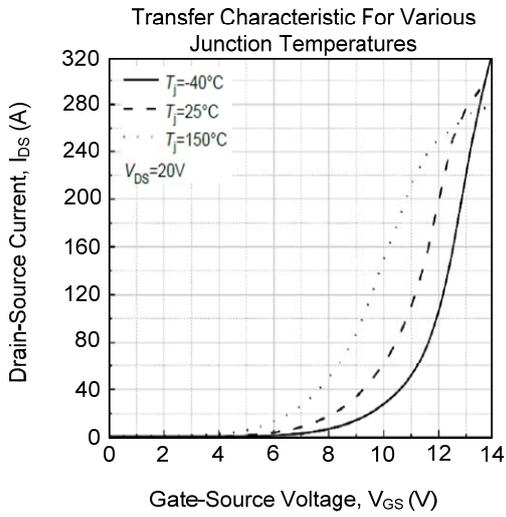
■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
<b>OFF CHARACTERISTICS</b>							
Drain-Source Breakdown Voltage	B <sub>V</sub> DSS	I <sub>D</sub> =100μA, V <sub>GS</sub> =0V	1700			V	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =1700V, V <sub>GS</sub> =0V		1		μA	
Gate- Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =18V, V <sub>DS</sub> =0V			250	nA	
<b>ON CHARACTERISTICS</b>							
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =0.5mA	2.0	2.8	4.0	V	
		V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =0.5mA T <sub>J</sub> =150°C		2.0		V	
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =18V, I <sub>D</sub> =80A		22		mΩ	
		V <sub>GS</sub> =18V, I <sub>D</sub> =80A, T <sub>J</sub> =150°C		30		mΩ	
<b>DYNAMIC PARAMETERS</b>							
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =1200V, V <sub>GS</sub> =0V, f=1MHz		5133		pF	
Output Capacitance	C <sub>OSS</sub>			187		pF	
Reverse Transfer Capacitance	C <sub>RSS</sub>			8		pF	
<b>SWITCHING PARAMETERS</b>							
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> =1200V, V <sub>GS</sub> =-4V / +18V, I <sub>D</sub> =50A		207		nC	
Gate to Source Charge	Q <sub>GS</sub>			65		nC	
Gate to Drain Charge	Q <sub>GD</sub>			49		nC	
Internal Gate Input Resistance	R <sub>G(int)</sub>	f=1MHz		4.4		Ω	
Turn-on switching energy	E <sub>ON</sub>	V <sub>DS</sub> =1200V, V <sub>GS</sub> =-4V / +18V, I <sub>D</sub> =50A, R <sub>G(ext)</sub> =2.5Ω, L=200μH		1541		μJ	
Turn-off switching energy	E <sub>OFF</sub>			565		μJ	
Turn-ON Delay Time	t <sub>D(ON)</sub>			28		ns	
Rise Time	t <sub>R</sub>			40		ns	
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			52		ns	
Fall-Time	t <sub>F</sub>			19		ns	
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>							
Drain-Source Diode Forward Voltage	V <sub>SD</sub>		V <sub>GS</sub> =-4.0V, I <sub>SD</sub> =40A		4.4		V
		V <sub>GS</sub> =-4.0V, I <sub>SD</sub> =40A, T <sub>J</sub> =150°C		3.9		V	
Continuous Diode Forward Current	I <sub>S</sub>	V <sub>GS</sub> =-4.0V		105		A	
		V <sub>GS</sub> =-4.0V, T <sub>J</sub> =100°C		45		A	
Body Diode Reverse Recovery Time	t <sub>rr</sub>	V <sub>GS</sub> =-4.0V, I <sub>SD</sub> =50A, V <sub>R</sub> =1200V, di <sub>F</sub> /dt=3506A/μs		16		ns	
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			228		nC	
Peak Reverse Recovery Current	I <sub>rrm</sub>			24		A	

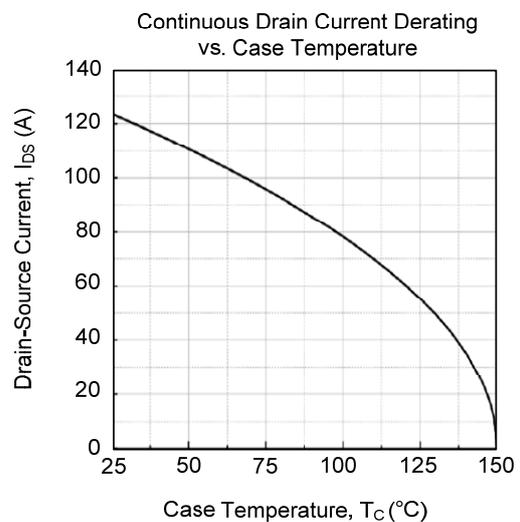
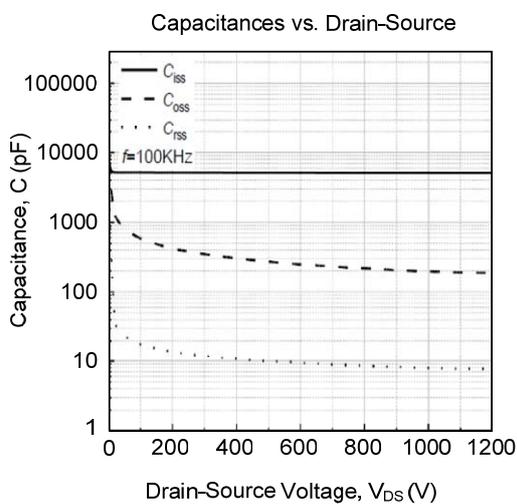
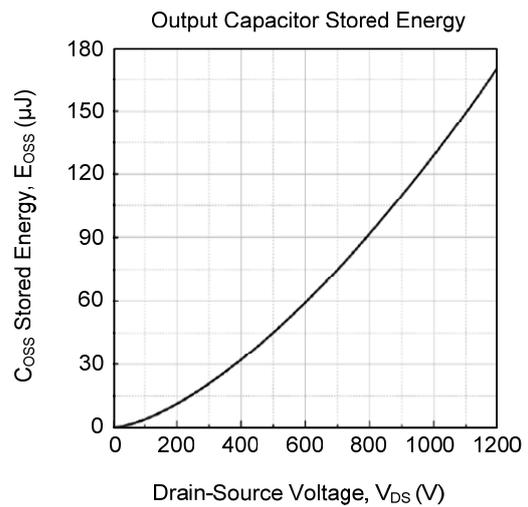
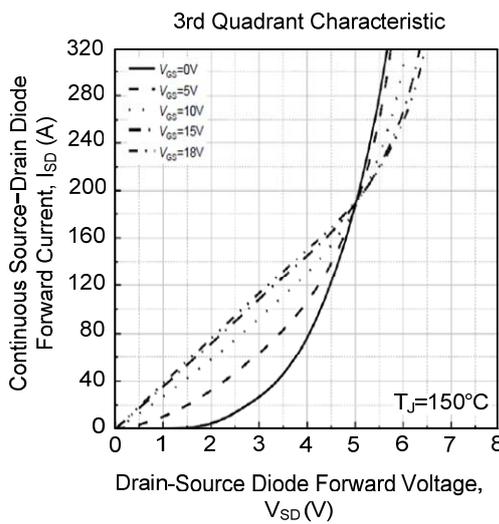
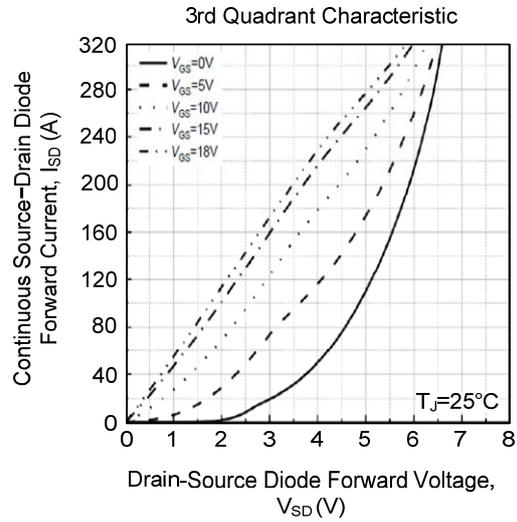
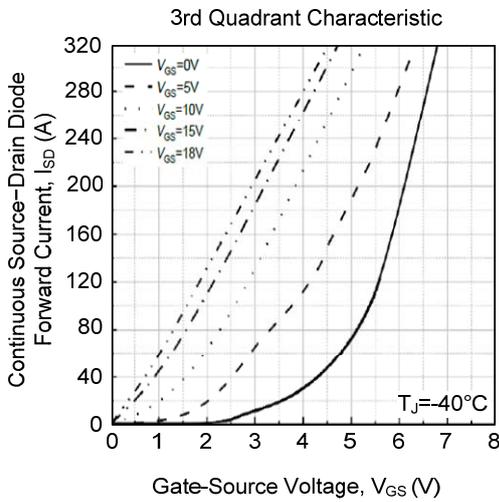
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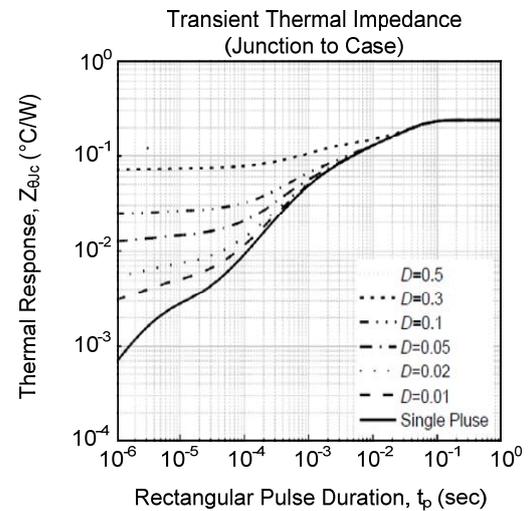
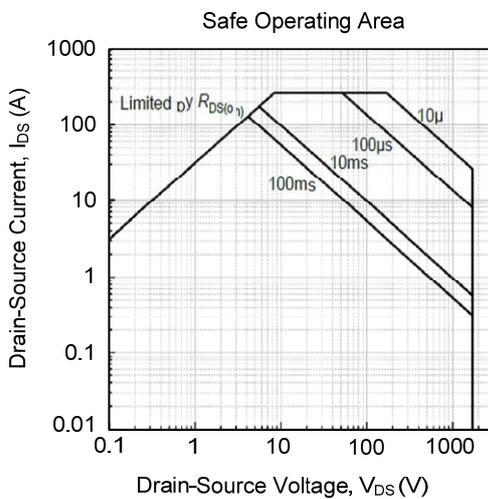
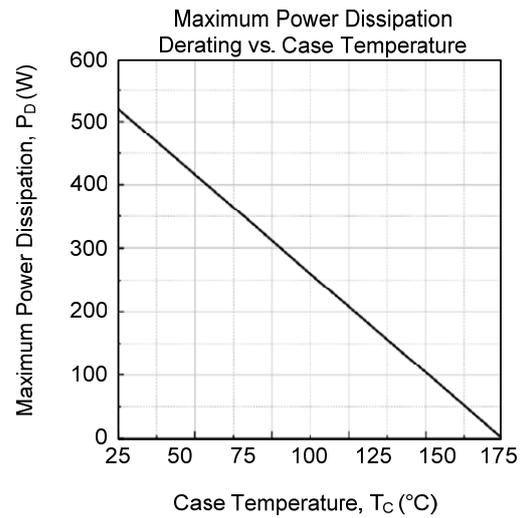
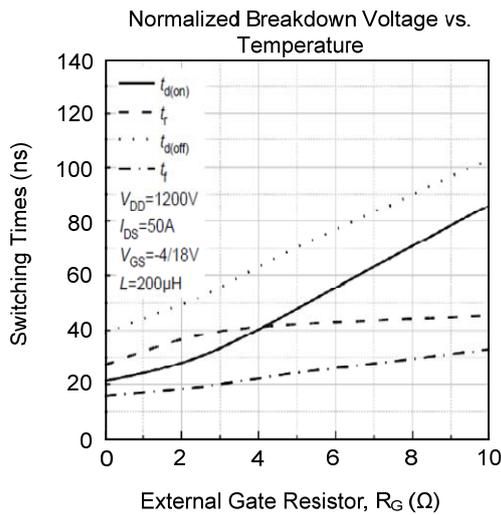
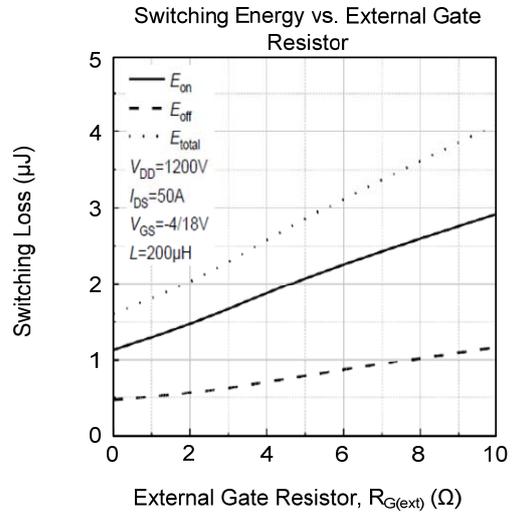
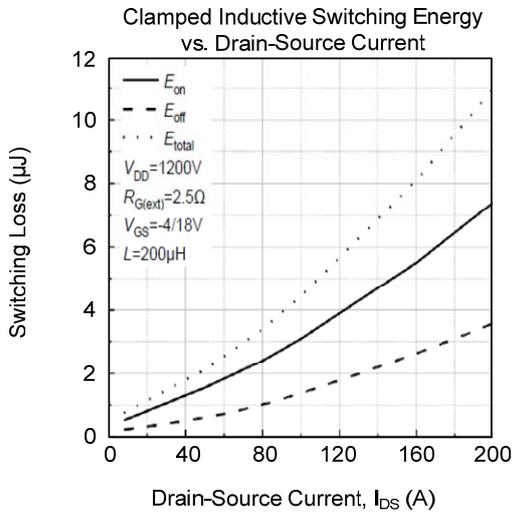
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## ■ TYPICAL CHARACTERISTICS (Cont.)



## TYPICAL CHARACTERISTICS (Cont.)



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