



USC065R023A

Power MOSFET

111A, 650V N-CHANNEL SILICON CARBIDE PLANAR ENHANCEMENT POWER MOSFET

■ DESCRIPTION

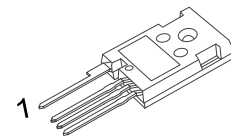
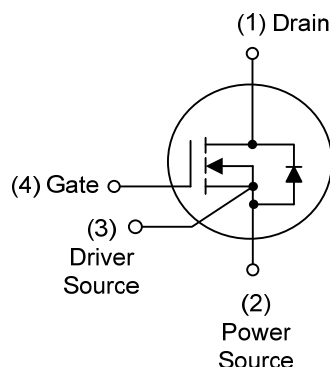
SiC The material can achieve high voltage with most carrier devices (MOSFET) with fast device structure characteristics, so it can realize the three characteristics of "high voltage", "low on resistance" and "high frequency" at the same time.

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

■ FEATURES

- * $R_{DS(ON)} \leq 31 \text{ m}\Omega @ V_{GS}=18\text{V}, I_D=33.5\text{A}$
- * 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



TO-247-4

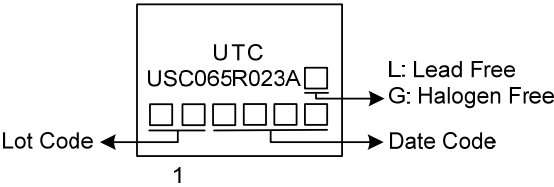
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment				Packing
Lead Free	Halogen Free		1	2	3	4	
USC065R023AL-T474-T	USC065R023AG-T474-T	TO-247-4	D	S	S	G	Tube

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

USC065R023AG-T474-T (1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube (2) T474: TO-247-4 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING



■ ABSOLUTE MAXIMUM RATINGS ($T_C=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER			SYMBOL	RATINGS	UNIT
Drain-Source Voltage			V_{DS}	650	V
Gate-Source Voltage	Dynamic		V_{GS}	-8 / +22	V
	Max. Transient Voltage	$t_P \leq 0.5\mu\text{s}$, $D < 0.001$		-8 / +22	V
	Static			-4 / +18	V
Drain Current	Continuous	$V_{GS}=18\text{A}$ $T_C=25^{\circ}\text{C}$	I_D	111	A
		$V_{GS}=18\text{A}$ $T_C=100^{\circ}\text{C}$		79	A
	Pulsed (Note 2)		I_{DM}	230	A
Power Dissipation		$T_C=25^{\circ}\text{C}$	P_D	357	W
		$T_C=100^{\circ}\text{C}$		178	W
Repetitive Avalanche Energy			E_{AR}	627	mJ
Non-Repetitive Avalanche Switching Energy			E_{AS}	1012	mJ
Short-Circuit Withstand Time			t_{SC}	2.5	μs
Junction Temperature			T_J	-40 ~ +175	$^{\circ}\text{C}$
Storage Temperature			T_{STG}	-40 ~ +175	$^{\circ}\text{C}$

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.

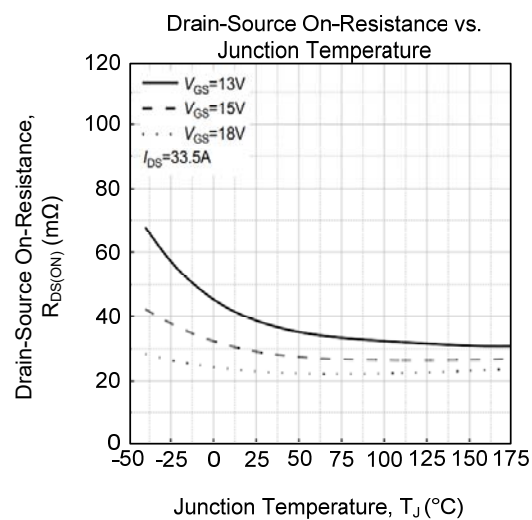
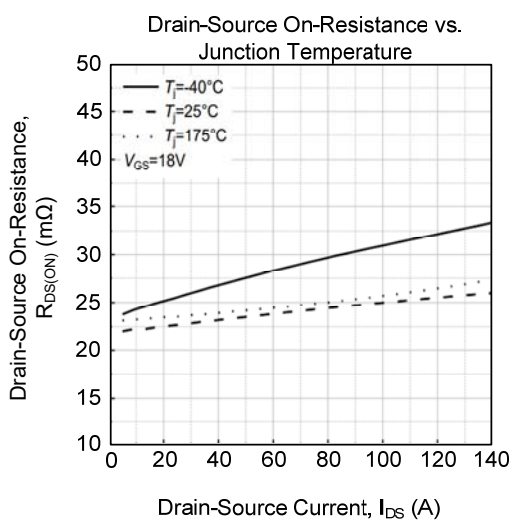
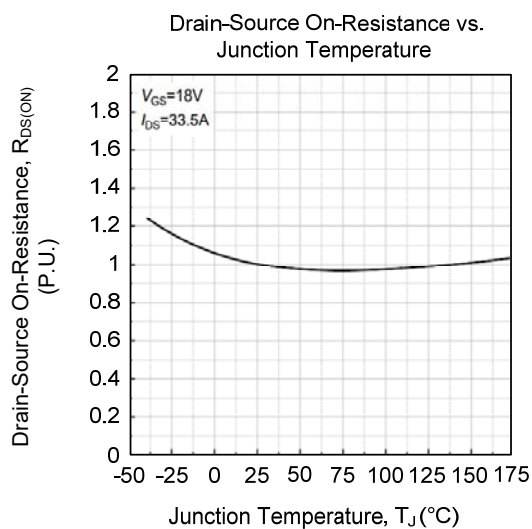
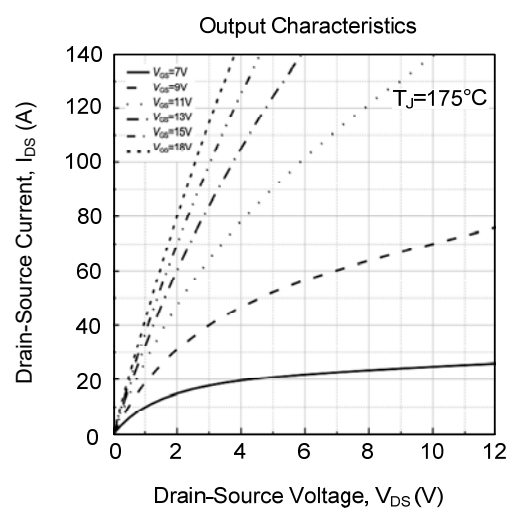
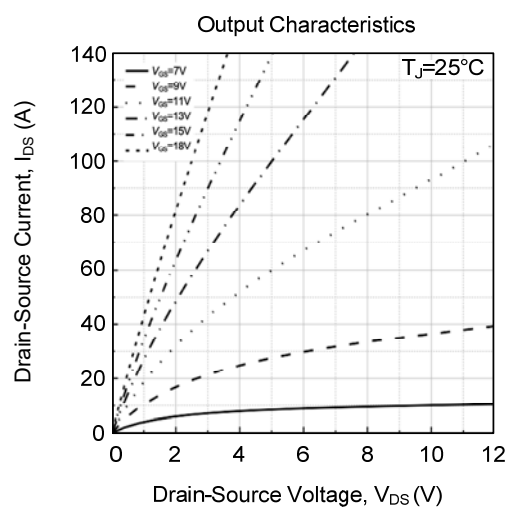
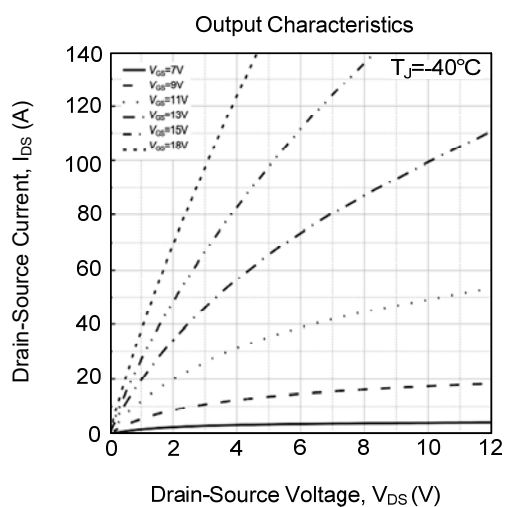
■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	50	$^{\circ}\text{C/W}$
Junction to Case	θ_{JC}	0.42	$^{\circ}\text{C/W}$

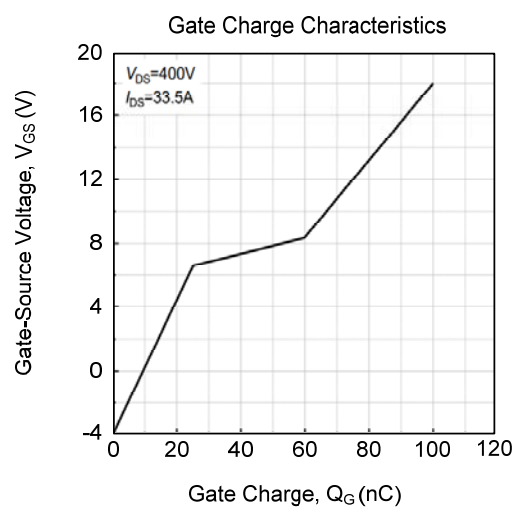
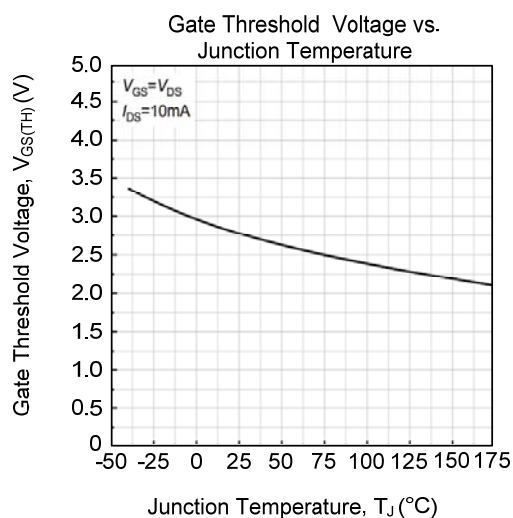
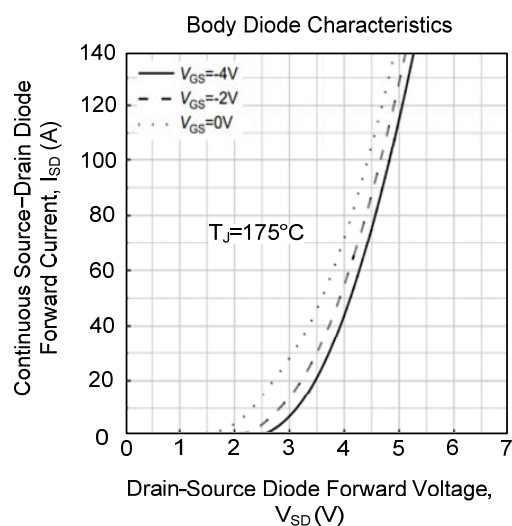
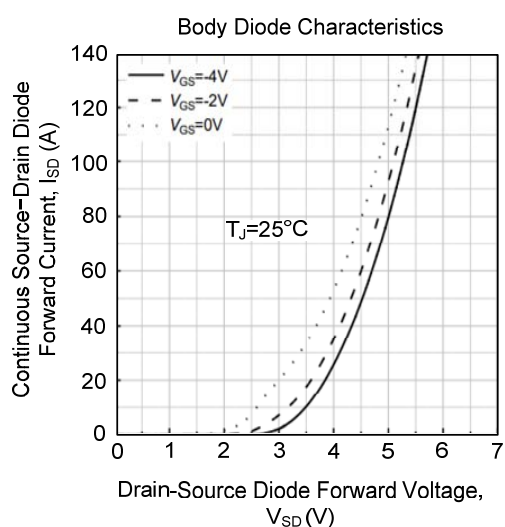
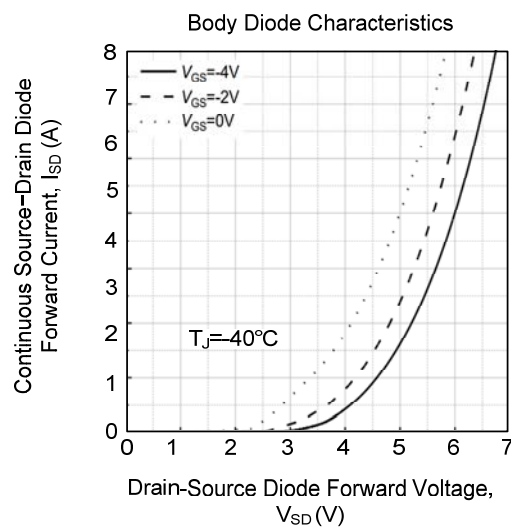
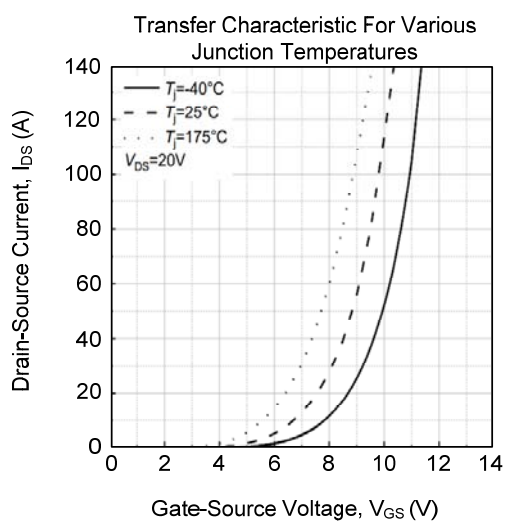
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	I _D =100μA, V _{GS} =0V	650			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =650V, V _{GS} =0V		1		μA
Gate- Source Leakage Current	I _{GSS}	V _{GS} =18V, V _{DS} =0V			250	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _D =10mA	2.0	2.7	4.0	V
		V _{DS} =V _{GS} , I _D =10mA T _J =175°C		2.0		V
Static Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =18V, I _D =33.5A		23	31	mΩ
		V _{GS} =18V, I _D =33.5A, T _J =175°C		25		mΩ
Forward Transconductance	g _{FS}	V _{DS} =20V, I _D =33.5A		24		S
DYNAMIC PARAMETERS						
Input Capacitance	C _{ISS}	V _{DS} =600V, V _{GS} =0V, f=100KHz		2162		pF
Output Capacitance	C _{OSS}			195		pF
Reverse Transfer Capacitance	C _{RSS}			14		pF
C _{OSS} Stored Energy	E _{OSS}			40		μJ
SWITCHING PARAMETERS						
Total Gate Charge	Q _G	V _{DS} =400V, V _{GS} =-4V / +18V, I _D =33.5A		100		nC
Gate to Source Charge	Q _{GS}			25		nC
Gate to Drain Charge	Q _{GD}			28		nC
Internal Gate Input Resistance	R _{G(int)}	f=1MHz		1.6		Ω
Turn-on switching energy	E _{ON}	V _{DS} =400V, V _{GS} =-4V / +18V, I _D =33.5A, R _{G(ext)} =2.5Ω, L=103μH, T _J =25°C		63		μJ
Turn-off switching energy	E _{OFF}			31		μJ
Turn-ON Delay Time	t _{D(ON)}			12		ns
Rise Time	t _r			14		ns
Turn-OFF Delay Time	t _{D(OFF)}			25		ns
Fall-Time	t _f			8		ns
Turn-on switching energy	E _{ON}	V _{DS} =400V, V _{GS} =-4V / +18V, I _D =33.5A, R _{G(ext)} =2.5Ω, L=103μH, T _J =175°C		58		μJ
Turn-off switching energy	E _{OFF}			41		μJ
Turn-ON Delay Time	t _{D(ON)}			11		ns
Rise Time	t _r			14		ns
Turn-OFF Delay Time	t _{D(OFF)}			29		ns
Fall-Time	t _f			9		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =-4.0V, I _{SD} =16.8A, T _J =25°C		3.8		V
		V _{GS} =-4.0V, I _{SD} =16.8A, T _J =175°C		3.4		V
		V _{GS} =-4.0V, I _{SD} =33.5A, T _J =25°C		4.2		V
		V _{GS} =-4.0V, I _{SD} =33.5A, T _J =175°C		3.9		V
Continuous Diode Forward Current	I _S	V _{GS} =-4.0V		79		A
		V _{GS} =-4.0V, T _J =100°C		45		A
Body Diode Reverse Recovery Time	t _{rr}	V _{GS} =-4.0V, I _{SD} =33.5A, V _R =400V, diF/dt=1862A/μs, T _J =25°C		19		ns
Body Diode Reverse Recovery Charge	Q _{rr}			230		nC
Peak Reverse Recovery Current	I _{rrm}			22.2		A
Body Diode Reverse Recovery Time	t _{rr}	V _{GS} =-4.0V, I _{SD} =33.5A, V _R =400V, diF/dt=1764A/μs, T _J =175°C		22		ns
Body Diode Reverse Recovery Charge	Q _{rr}			343		nC
Peak Reverse Recovery Current	I _{rrm}			27.1		A

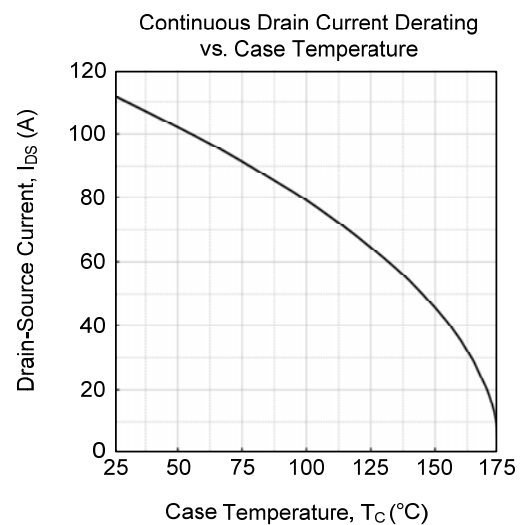
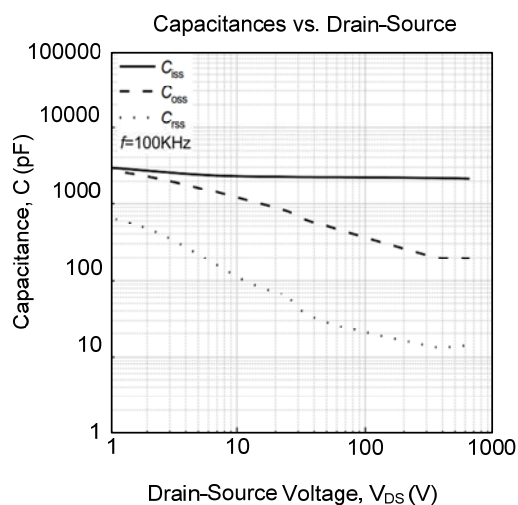
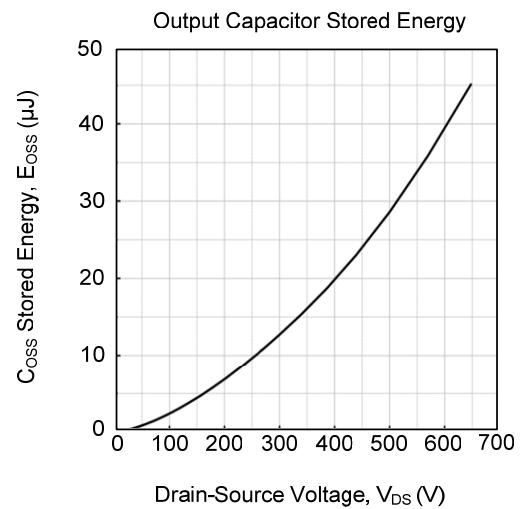
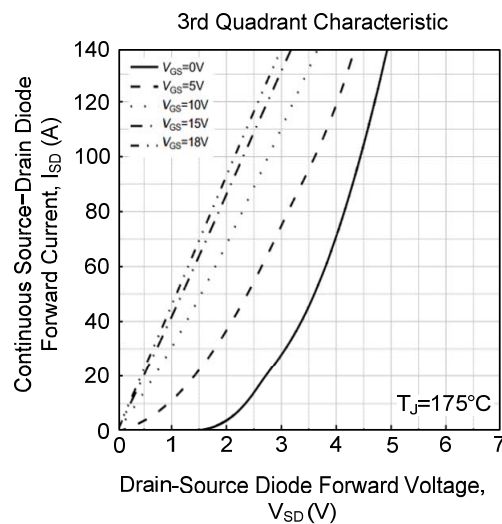
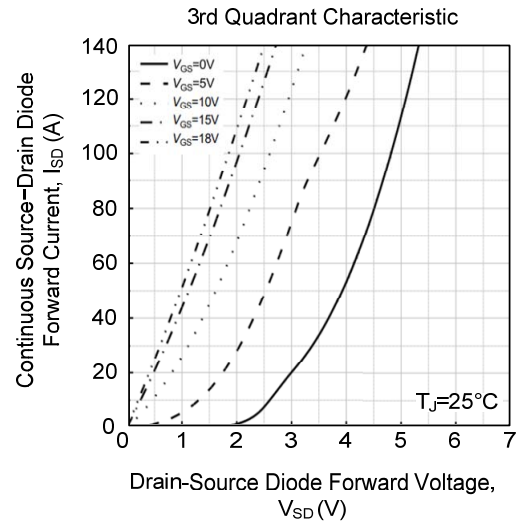
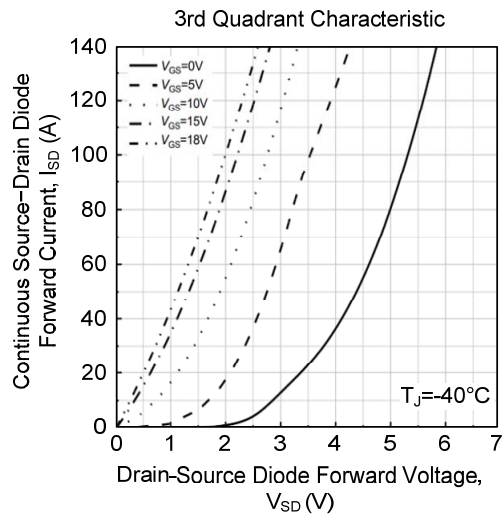
TYPICAL CHARACTERISTICS



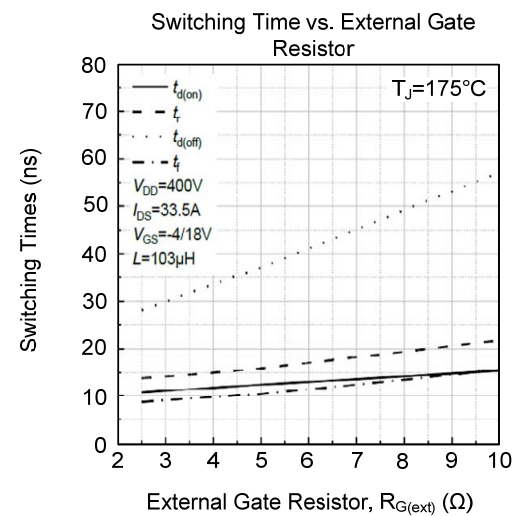
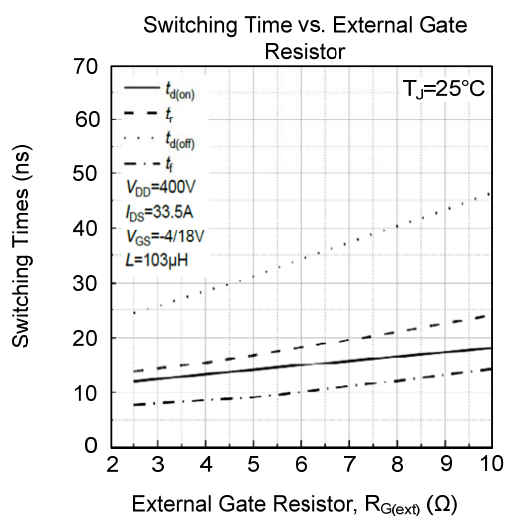
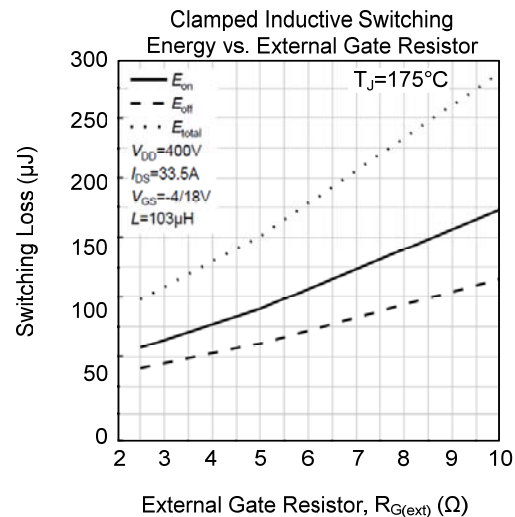
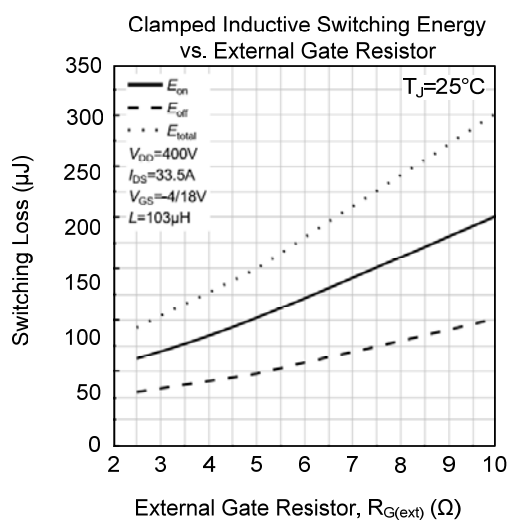
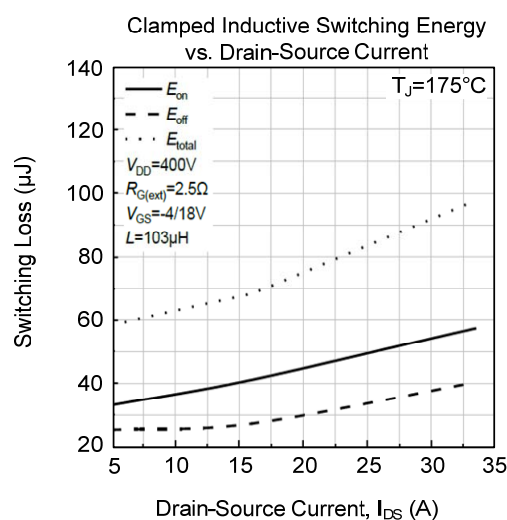
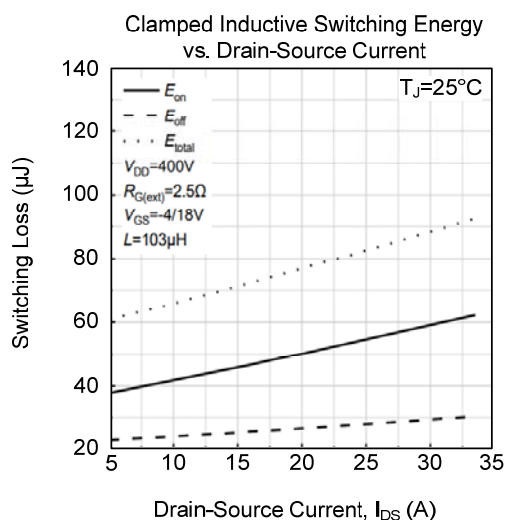
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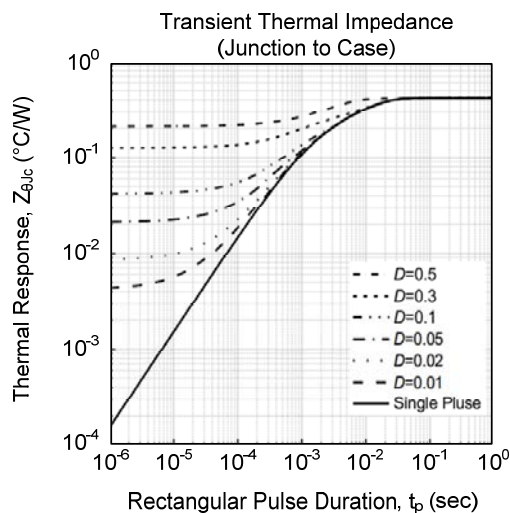
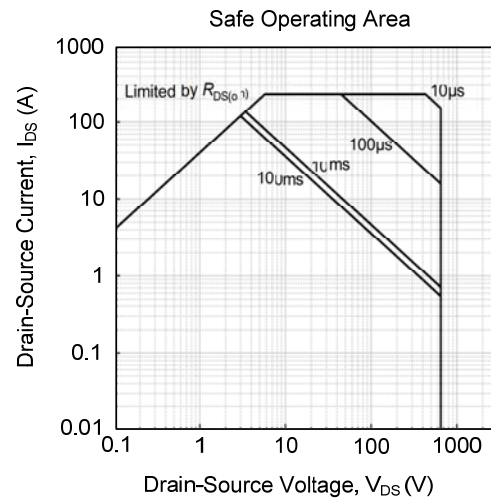
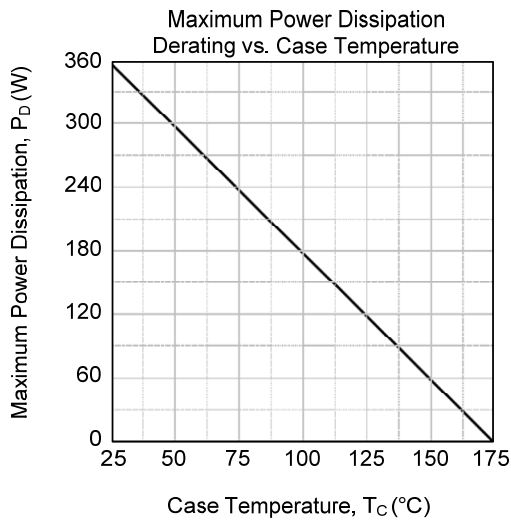
■ TYPICAL CHARACTERISTICS (Cont.)



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■ TYPICAL CHARACTERISTICS (Cont.)



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