



USC120R040A

Power MOSFET

57A, 1200V N-CHANNEL SILICON CARBIDE PLANAR ENHANCEMENT POWER MOSFET

■ DESCRIPTION

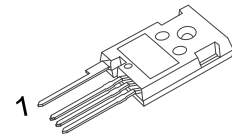
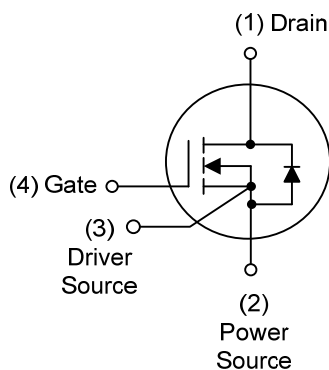
SiC The material can achieve high voltage with most carrier devices (MOSFET) with fast device structure characteristics, so it can realize the three characteristics of "high voltage", "low on resistance" and "high frequency" at the same time.

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

■ FEATURES

- * $R_{DS(ON)} \leq 53 \text{ m}\Omega @ V_{GS}=18\text{V}, I_D=30\text{A}$
- * High Blocking Voltage
- * High Frequency Operation
- * Low on-resistance
- * Fast intrinsic diode with low reverse recovery
- * 100% avalanche tested

■ SYMBOL



TO-247-4

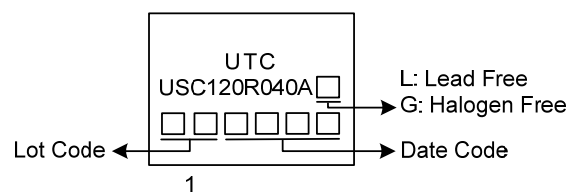
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment				Packing
Lead Free	Halogen Free		1	2	3	4	
USC120R040AL-T474-T	USC120R040AG-T474-T	TO-247-4	D	S	S	G	Tube

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

USC120R040AG-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°C, unless otherwise specified)

PARAMETER			SYMBOL	RATINGS	UNIT
Drain-Source Voltage			V _{DSS}	1200	V
Gate-Source Voltage			V _{GSS}	-10 / +23	V
Gate-Source Voltage (Recommended Operating Values)				-4 / +18	V
Drain Current	Continuous	V _{GS} =18V T _C =25°C	I _D	57	A
		V _{GS} =18V T _C =100°C		40	A
	Pulsed (Note 2)		I _{DM}	130	A
Power Dissipation			P _D	211	W
Avalanche Energy (Note 3)			E _{AS}	289	mJ
Avalanche Peak Current (Note 3)			I _{AV}	17	A
Junction Temperature			T _J	-55 ~ +175	°C
Storage Temperature			T _{STG}	-55 ~ +175	°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.

3. L = 2.0mH, V_{DD} = 100V, V_{GS}=18V.

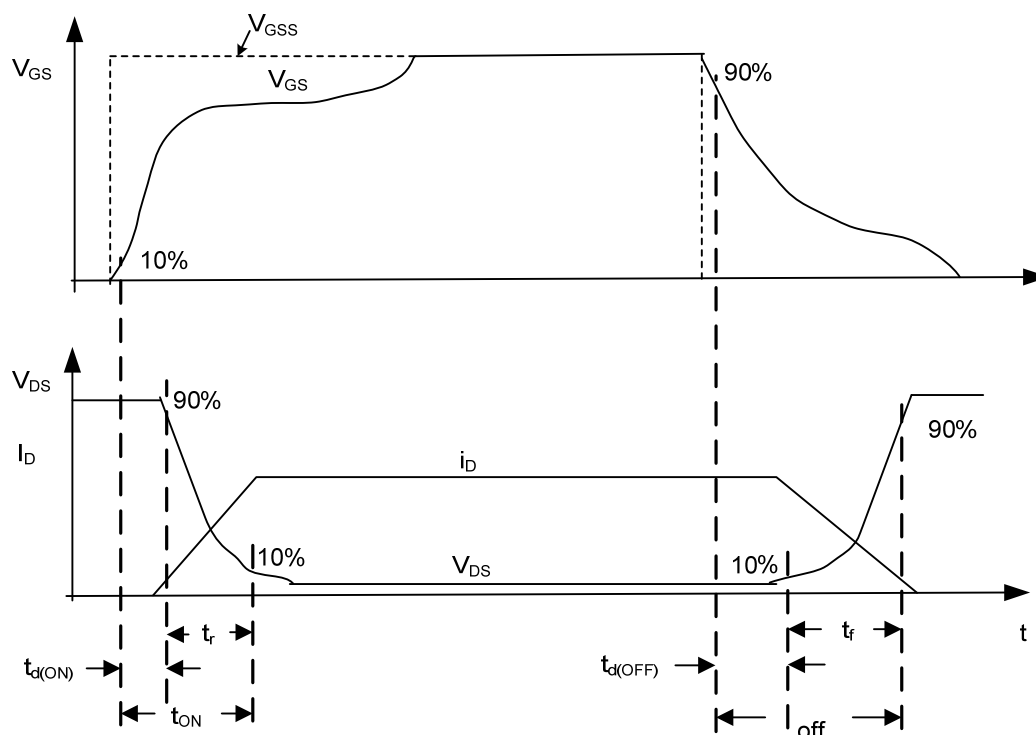
■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ _{JA}	50	°C/W
Junction to Case	θ _{JC}	0.71	°C/W

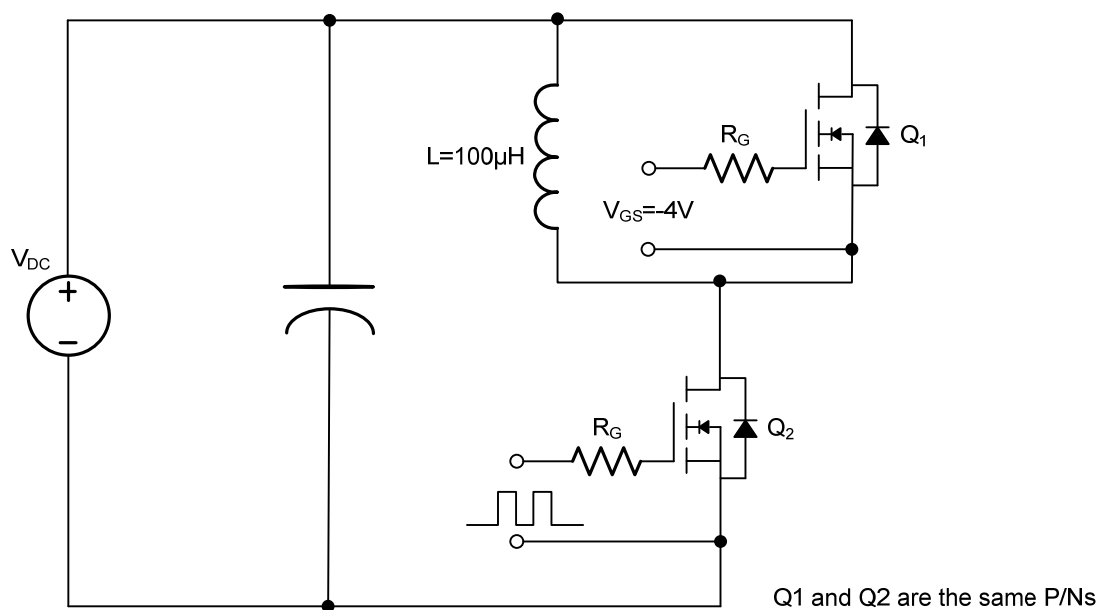
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =100μA, V _{GS} =0V	1200			V
Zero Gate Voltage Drain Current		I _{DSS}	V _{DS} =1200V, V _{GS} =0V		1	50	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =+18V, V _{DS} =0V		1	200	nA
	Reverse		V _{GS} =-4.0V, V _{DS} =0V	-200	-1		nA
ON CHARACTERISTICS							
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _D =10mA, T _J =25°C	2.0	2.8	3.7	V	
		V _{DS} =V _{GS} , I _D =10mA, T _J =150°C		2.0		V	
		V _{DS} =V _{GS} , I _D =10mA, T _J =175°C		1.9		V	
Static Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =18V, I _D =30A, T _J =25°C		39	53	mΩ	
		V _{GS} =18V, I _D =30A, T _J =150°C		63		mΩ	
		V _{GS} =18V, I _D =30A, T _J =175°C		70		mΩ	
Transconductance	g _{FS}	V _{DS} =20V, I _D =30A		22		S	
		V _{DS} =20V, I _D =30A, T _J =150°C		20		S	
		V _{DS} =20V, I _D =30A, T _J =175°C		20		S	
DYNAMIC PARAMETERS							
Input Capacitance	C _{ISS}	V _{DS} =1000V, V _{GS} =0V, f=100KHz		1950		pF	
Output Capacitance	C _{OSS}			88		pF	
Reverse Transfer Capacitance	C _{RSS}			8		pF	
C _{OSS} Stored Energy	E _{OSS}			51		μJ	
SWITCHING PARAMETERS							
Total Gate Charge	Q _G	V _{DS} =800V, V _{GS} =-4V / 18V, I _D =30A		93		nC	
Gate to Source Charge	Q _{GS}			23		nC	
Gate to Drain Charge	Q _{GD}			35		nC	
Internal Gate Input Resistance	R _{G(int)}	f=1MHz, I _D =0A		1.1		Ω	
Turn-ON Switching Energy	E _{ON}	V _{DS} =800V, V _{GS} =-4V / 18V, I _D =30A, R _{G(ext)} =2Ω, L=100μH		270		μJ	
Turn-OFF Switching Energy	E _{OFF}			25		μJ	
Turn-ON Delay Time	t _{d(ON)}			12		ns	
Rise Time	t _r			12		ns	
Turn-OFF Delay Time	t _{d(OFF)}			24		ns	
Fall-Time	t _f			8		ns	
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =-4.0V, I _{SD} =15A		4.0		V	
		V _{GS} =-4.0V, I _{SD} =15A, T _J =150°C		3.6		V	
		V _{GS} =-4.0V, I _{SD} =15A, T _J =175°C		3.5		V	
Reverse Recovery Charge	I _S	V _{GS} =-4.0V			40	A	
Body Diode Reverse Recovery Time	t _{rr}	V _{GS} =-4.0V, I _{SD} =30A, V _R =800V, diF/dt=4200A/μs		13		ns	
Body Diode Reverse Recovery Charge	Q _{rr}			175		nC	
Peak Reverse Recovery Current	I _{rrm}			25		A	

■ SWITCHING TIMES DEFINITION AND TEST CIRCUIT

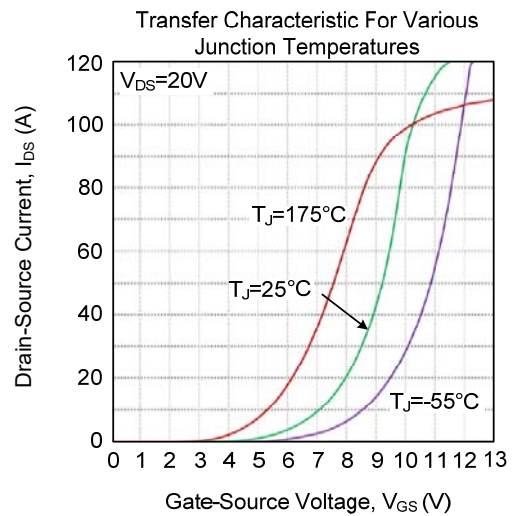
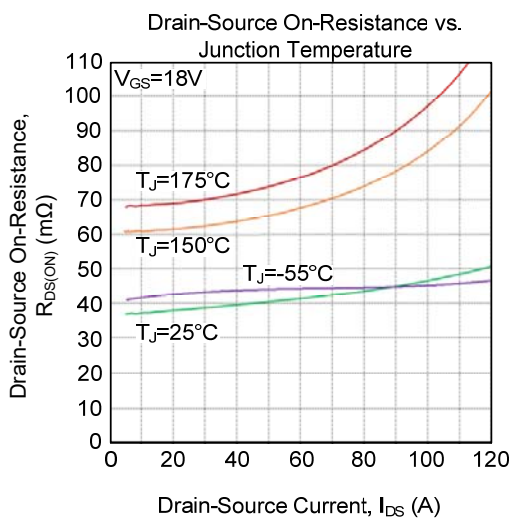
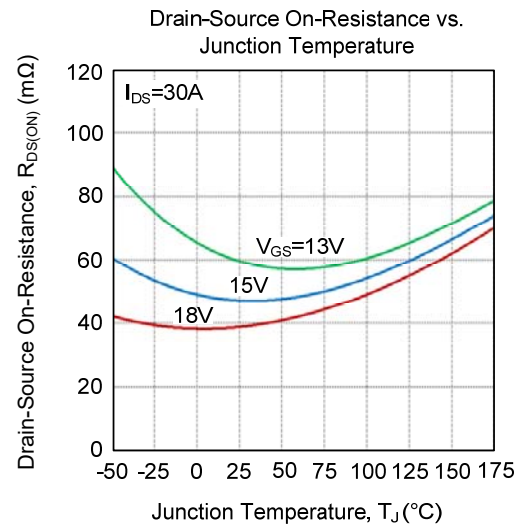
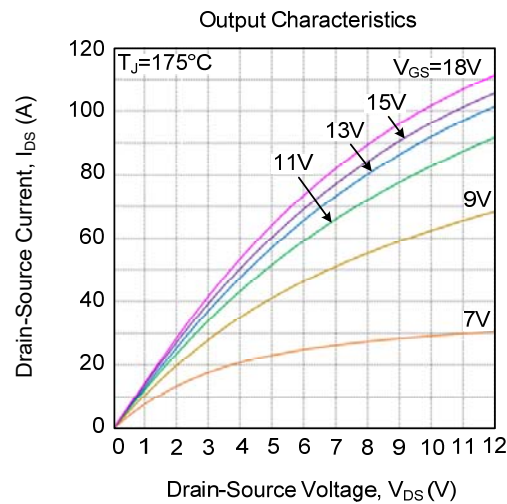
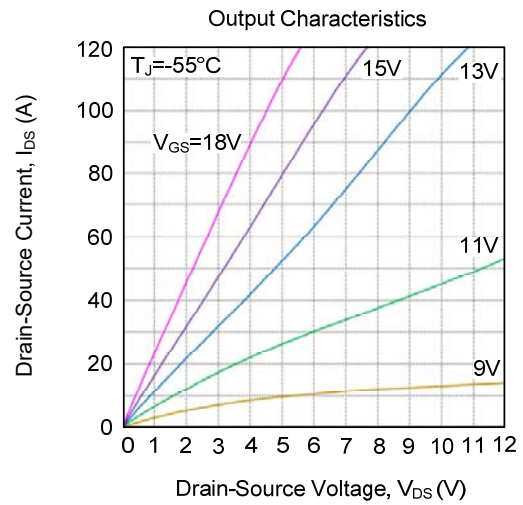
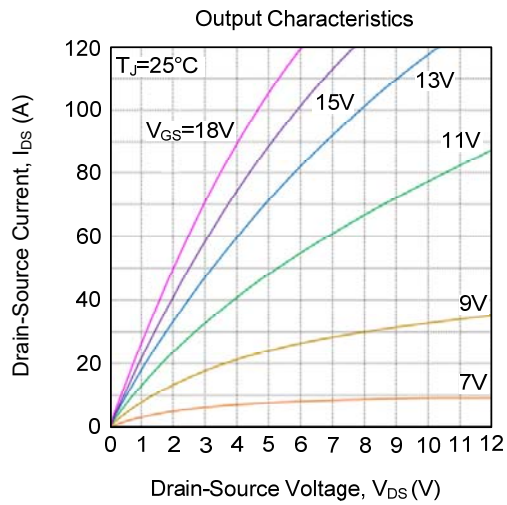


SWITCHING TIMES

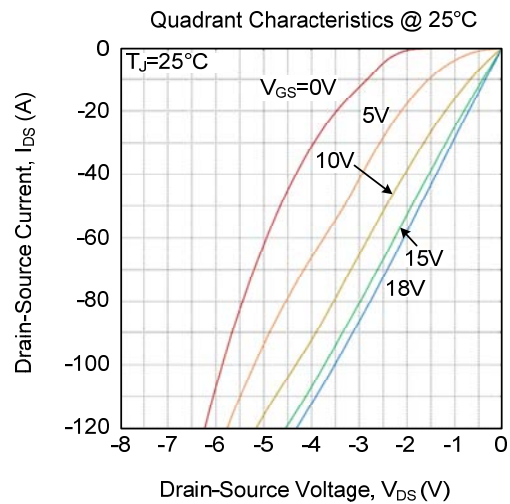
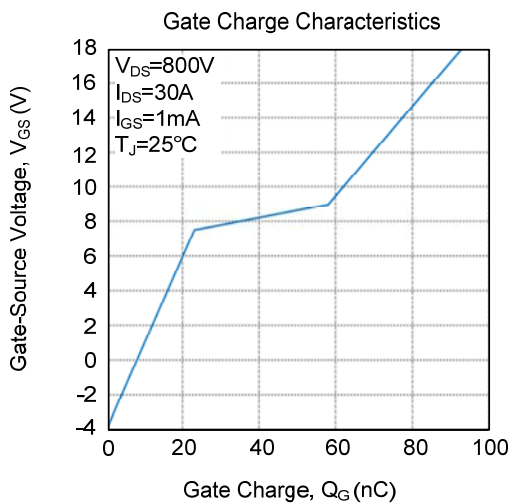
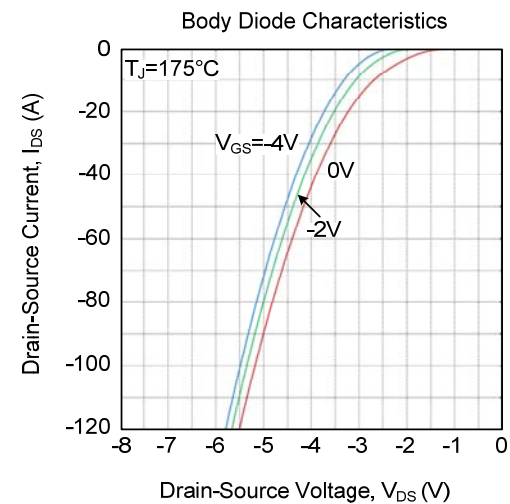
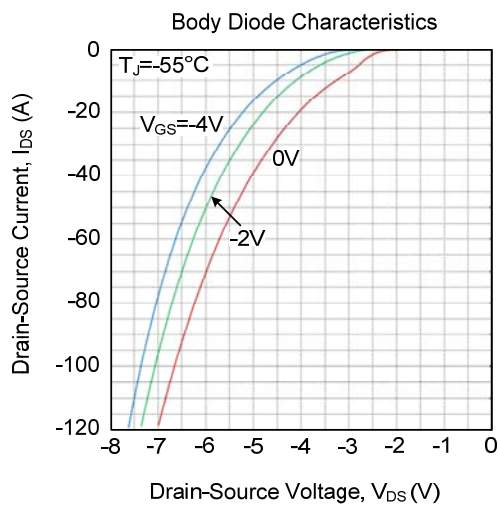
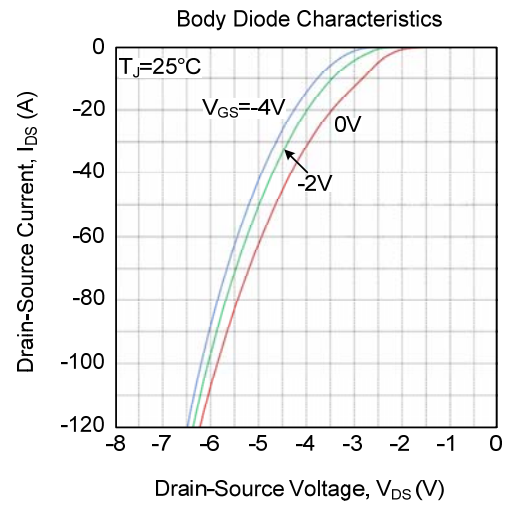
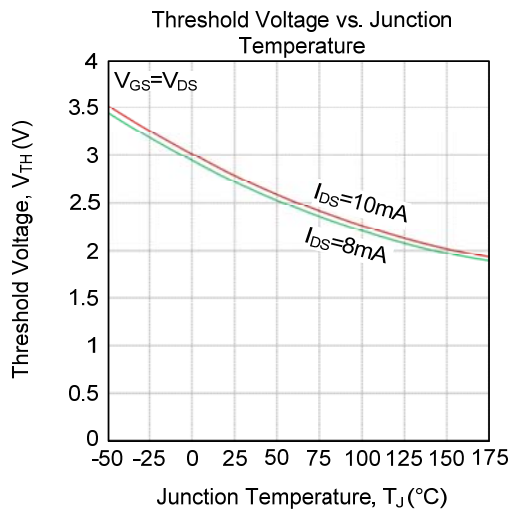


TEST CIRCUIT

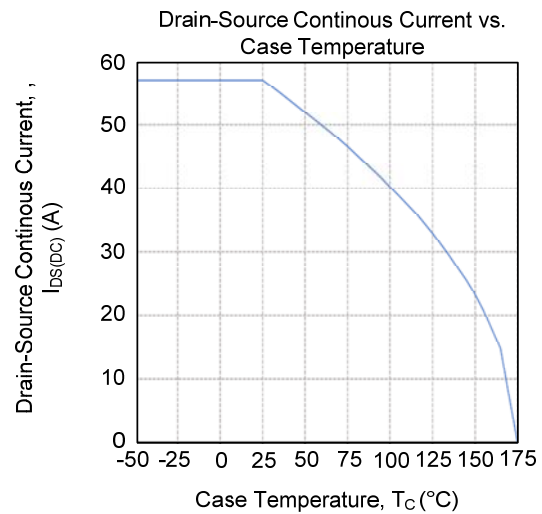
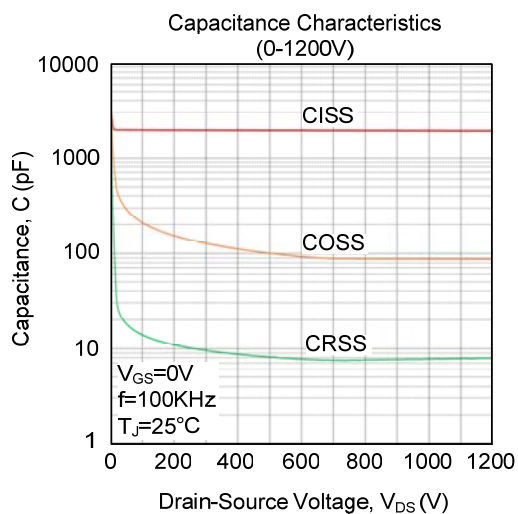
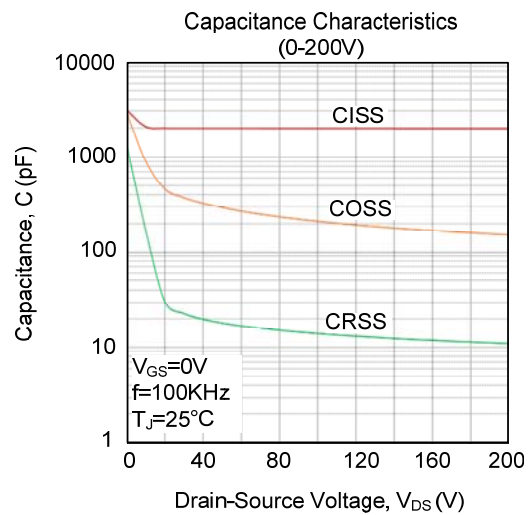
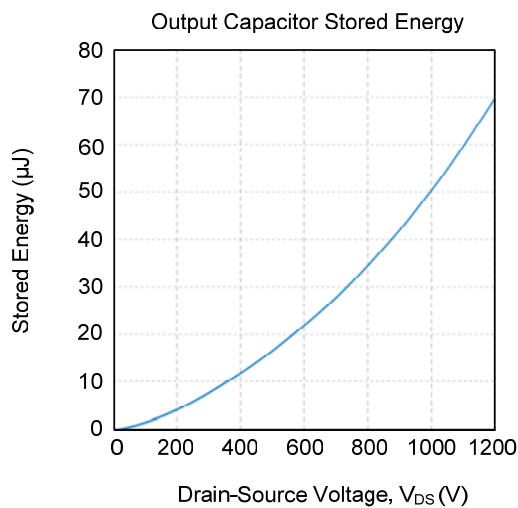
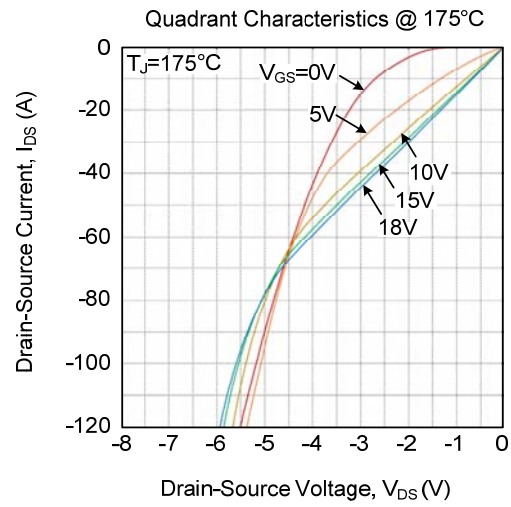
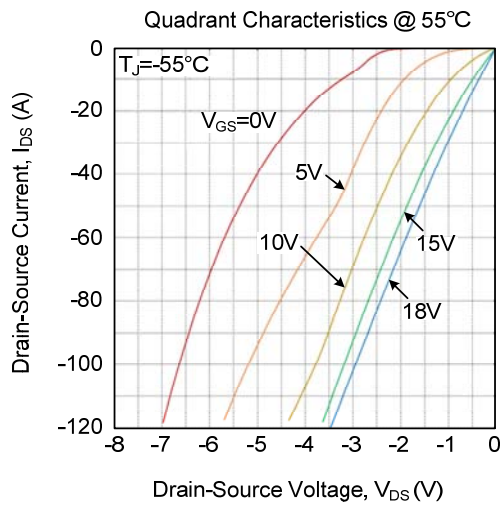
■ TYPICAL CHARACTERISTICS



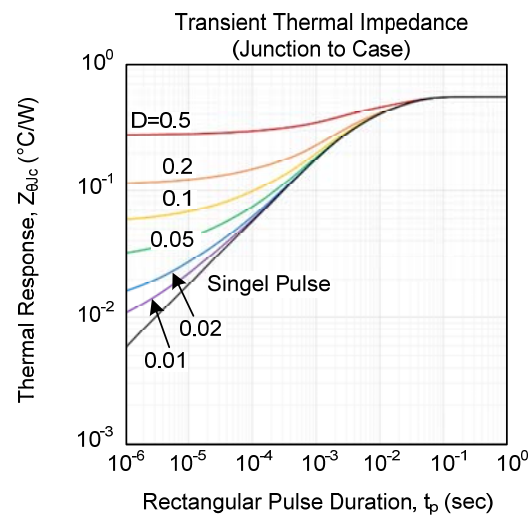
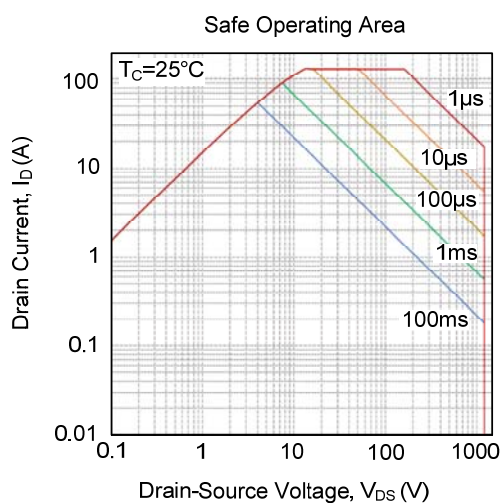
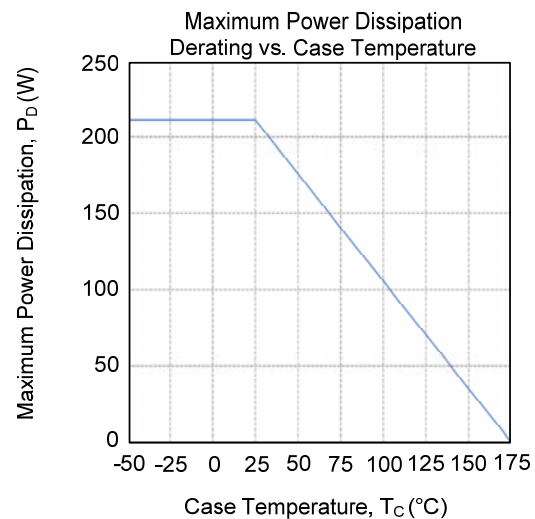
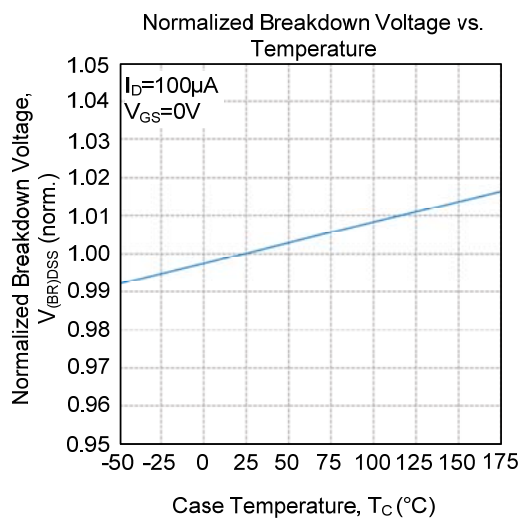
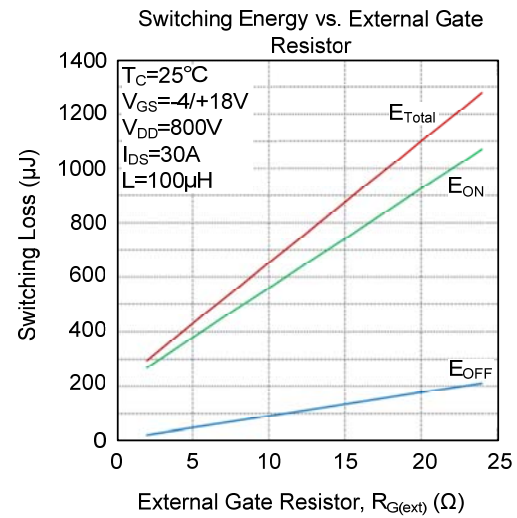
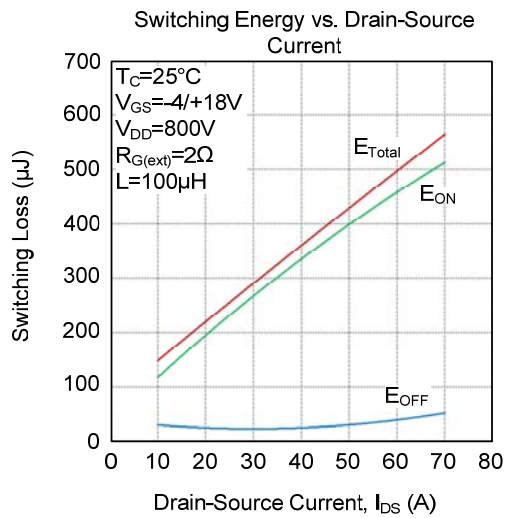
■ TYPICAL CHARACTERISTICS (Cont.)



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■ TYPICAL CHARACTERISTICS (Cont.)



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