



USG135N10H

POWER MOSFET

135A, 100V N-CHANNEL POWER MOSFET

DESCRIPTION

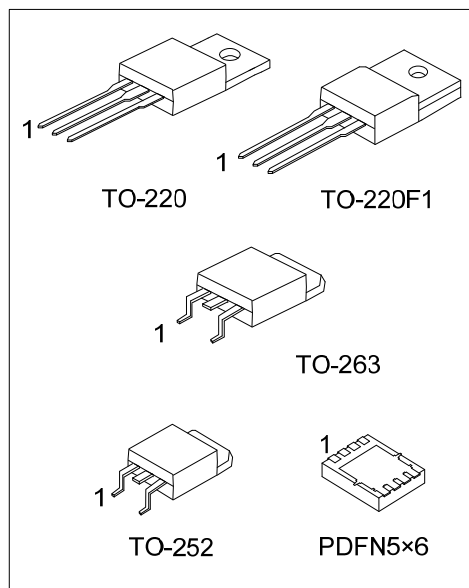
The UTC **USG135N10H** is a N-channel Power MOSFET, it uses UTC's advanced technology to provide the customers with low $R_{DS(ON)}$ characteristic by high cell density trench technology.

The UTC **USG135N10H** is suitable for high efficiency synchronous rectification in SMPS, UPS, hard switched and high frequency circuits.

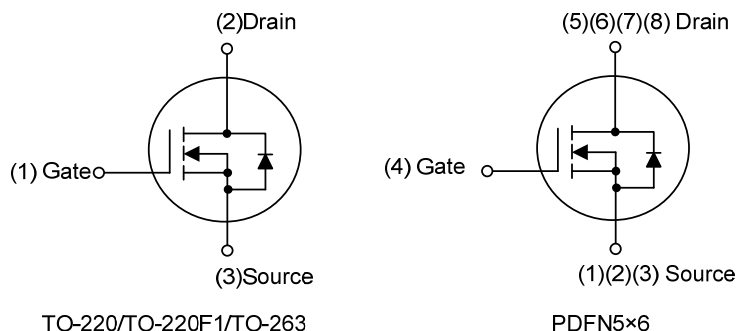
FEATURES

* $R_{DS(ON)} \leq 5.5 \text{ m}\Omega$ @ $V_{GS}=10\text{V}$, $I_D=30\text{A}$

* High Switching Speed



SYMBOL



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
USG135N10HL-TA3-T	USG135N10HG-TA3-T	TO-220	G	D	S	-	-	-	-	-	Tube
USG135N10HL-TF1-T	USG135N10HG-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	Tube
USG135N10HL-TN3-R	USG135N10HG-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
USG135N10HL-TQ2-T	USG135N10HG-TQ2-T	TO-263	G	D	S	-	-	-	-	-	Tube
USG135N10HL-TQ2-R	USG135N10HG-TQ2-R	TO-263	G	D	S	-	-	-	-	-	Tape Reel
USG135N10HL-P5060-R	USG135N10HG-P5060-R	PDFN5x6	S	S	S	G	D	D	D	D	Tape Reel

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

USG135N10HG-TA3-T	(1)Packing Type	(1) T: Tube, R: Tape Reel
	(2)Package Type	(2) TA3: TO-220, TF1: TO-220F1, TN3: TO-252
	(3)Green Package	TQ2: TO-263, P5060: PDFN5x6
		(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

TO-220 / TO-220F1 / TO-252 / TO-263	PDFN5×6
UTC USG135N10H Lot Code ← [] [] [] [] [] → Date Code 1 L: Lead Free G: Halogen Free	UTC USG 135N10H Lot Code ← • [] [] [] [] [] → Date Code

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	100	V
Gate-Source Voltage		V_{GSS}	± 20	V
Drain Current	Continuous	I_D	135	A
	Pulsed (Note 2)	I_{DM}	270	A
Single Pulsed Avalanche Energy (Note 3)		E_{AS}	110	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.9	V/ns
Power Dissipation	TO-220/TO-263	P_D	142	W
	TO-220F1		45	W
	TO-252		71	W
	PDFN5×6		85	W
Junction Temperature		T_J	+150	$^{\circ}\text{C}$
Storage Temperature Range		T_{STG}	-20 ~ +150	$^{\circ}\text{C}$

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.

3. $L = 0.1\text{mH}$, $I_{AS} = 47\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\ \Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 30\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F1	θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
	TO-263			$^{\circ}\text{C}/\text{W}$
	TO-252		110	$^{\circ}\text{C}/\text{W}$
	PDFN5×6		65 (Note)	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220/TO-263	θ_{JC}	0.88	$^{\circ}\text{C}/\text{W}$
	TO-220F1		2.77	$^{\circ}\text{C}/\text{W}$
	TO-252		1.76 (Note)	$^{\circ}\text{C}/\text{W}$
	PDFN5×6		1.47 (Note)	$^{\circ}\text{C}/\text{W}$

Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

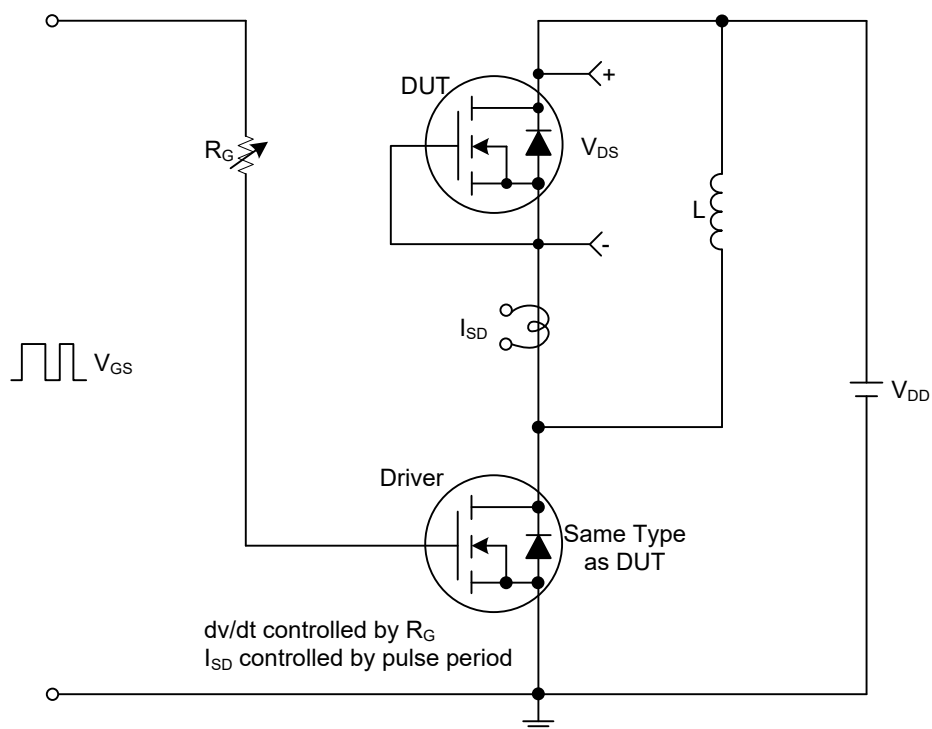
■ **ELECTRICAL CHARACTERISTICS** ($T_J = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =250μA, V _{GS} =0V	100			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =100V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{GS} =+20V, V _{DS} =0V			+100	nA
	Reverse		V _{GS} =-20V, V _{DS} =0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =30A			5.5	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		4245		pF
Output Capacitance		C _{OSS}			2171		pF
Reverse Transfer Capacitance		C _{RSS}			186		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q _G	V _{DS} =80V, V _{GS} =10V, I _D =135A, I _G =1mA (Note 1, 2)		95		nC
Gate to Source Charge		Q _{GS}			24		nC
Gate to Drain Charge		Q _{GD}			33		nC
Turn-on Delay Time (Note 1)		t _{D(ON)}	V _{DD} =50V, V _{GS} =10V, I _D =135A, R _G =3.3Ω (Note 1, 2)		18		ns
Rise Time		t _R			22		ns
Turn-off Delay Time		t _{D(OFF)}			49		ns
Fall-Time		t _F			24		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				135	A
Maximum Body-Diode Pulsed Current		I _{SM}				270	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	I _S =135A, V _{GS} =0V			1.4	V
Reverse Recovery Time (Note 1)		t _{rr}	I _S =30A, V _{GS} =0V,		64		nS
Reverse Recovery Charge		Q _{rr}	dl _F /dt =100A/μs		123		nC

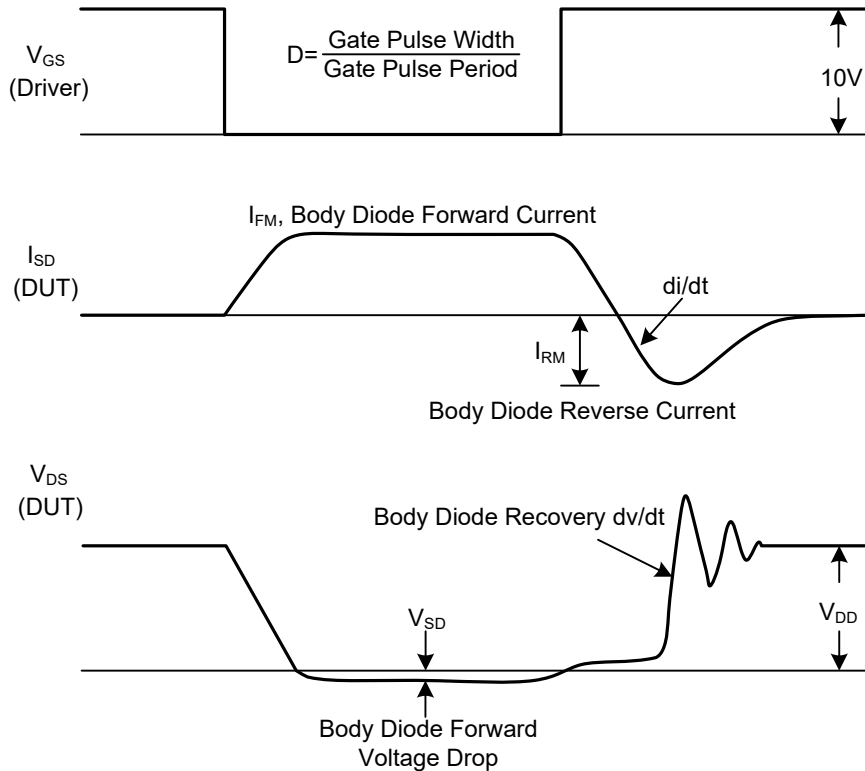
Notes: 1. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS



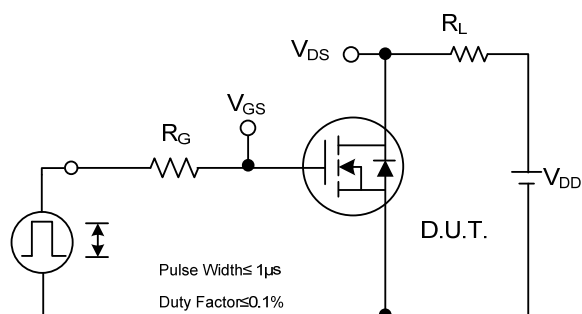
Peak Diode Recovery dv/dt Test Circuit



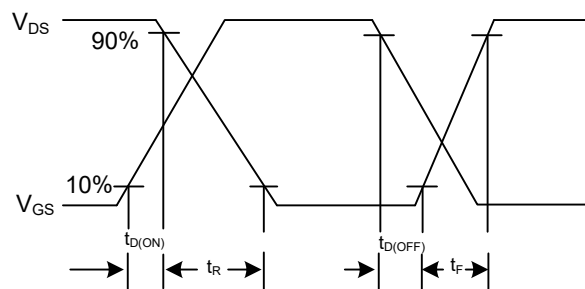
Peak Diode Recovery dv/dt Test Circuit and Waveforms

Peak Diode Recovery dv/dt Waveforms

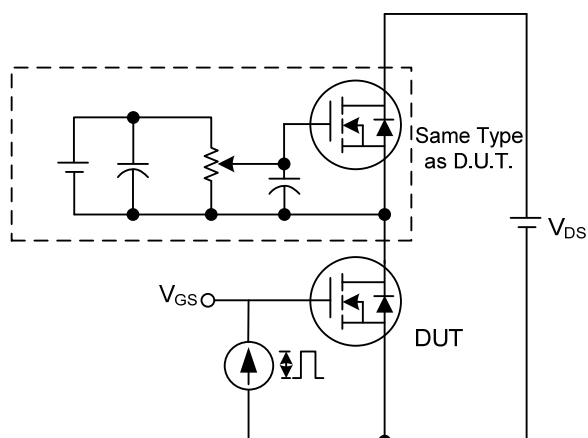
■ TEST CIRCUITS AND WAVEFORMS



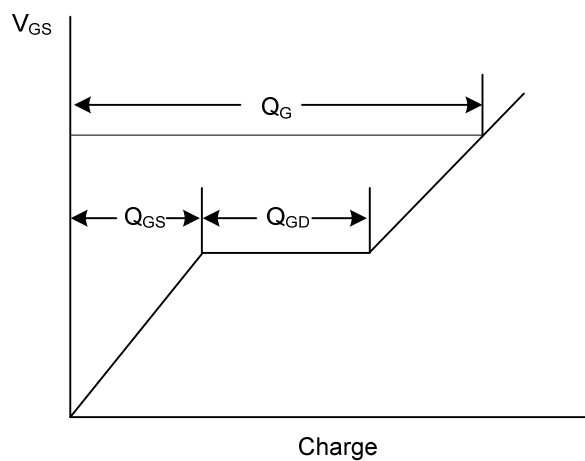
Switching Test Circuit



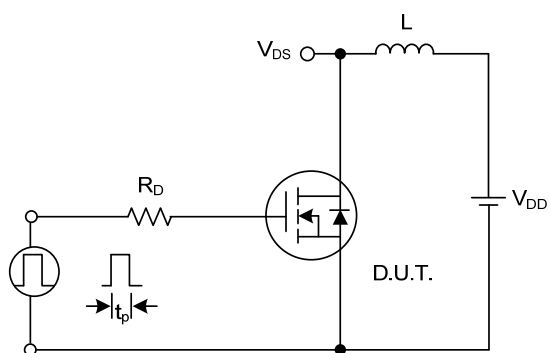
Switching Waveforms



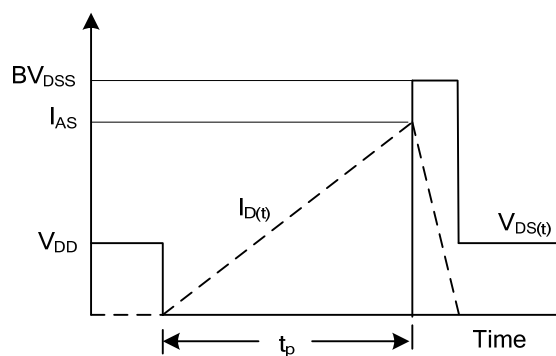
Gate Charge Test Circuit



Gate Charge Waveform

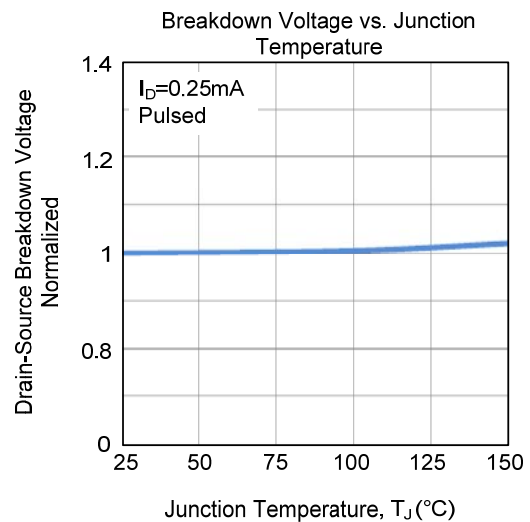
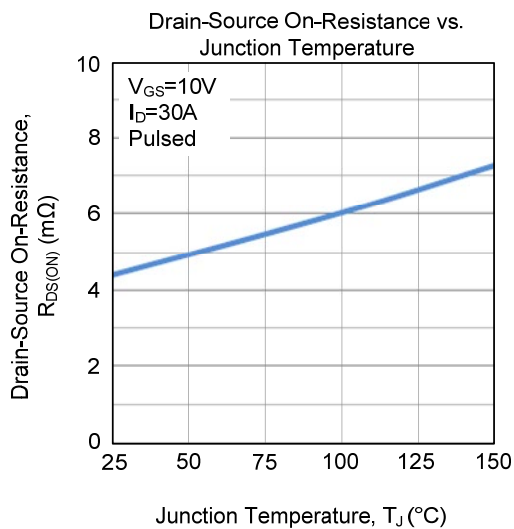
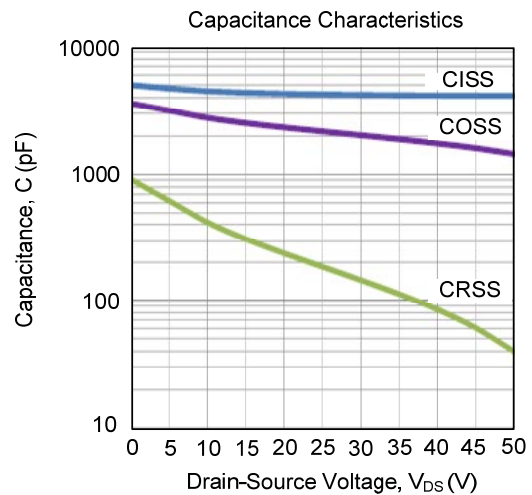
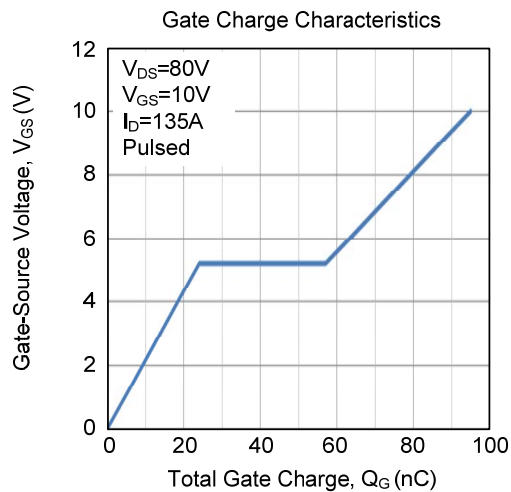
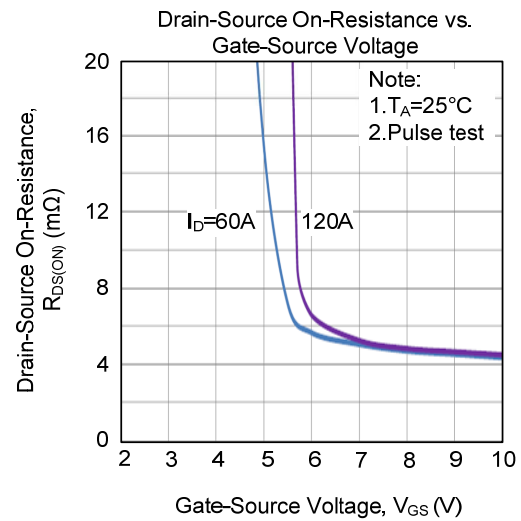
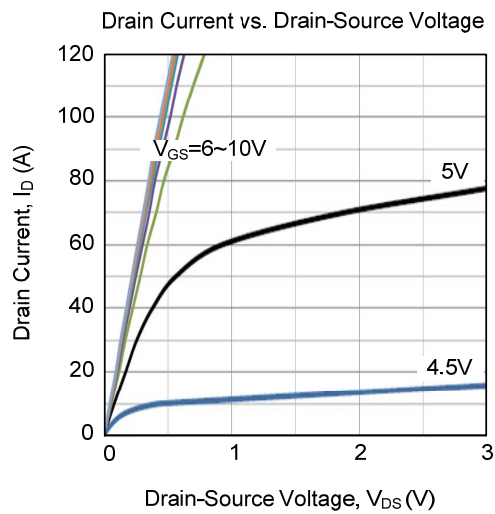


Unclamped Inductive Switching Test Circuit

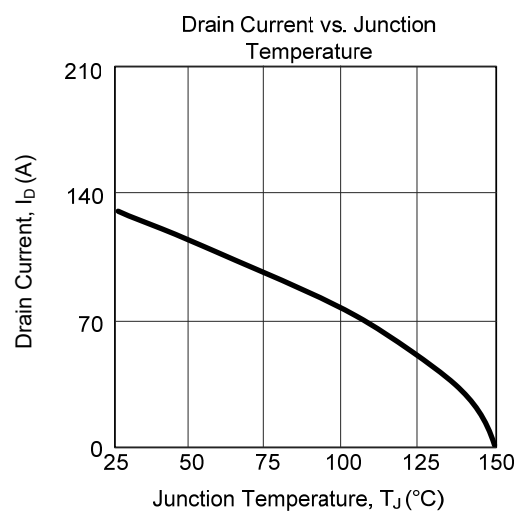
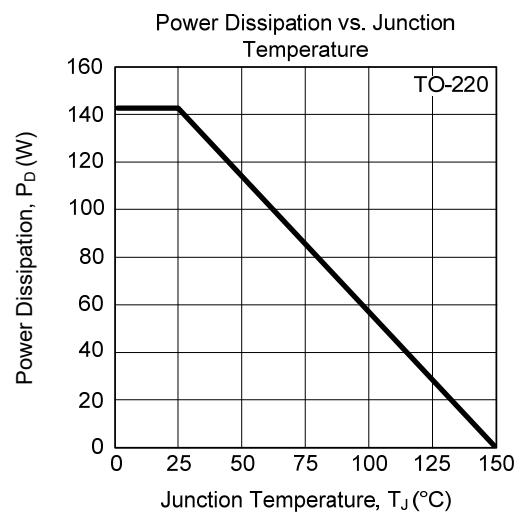
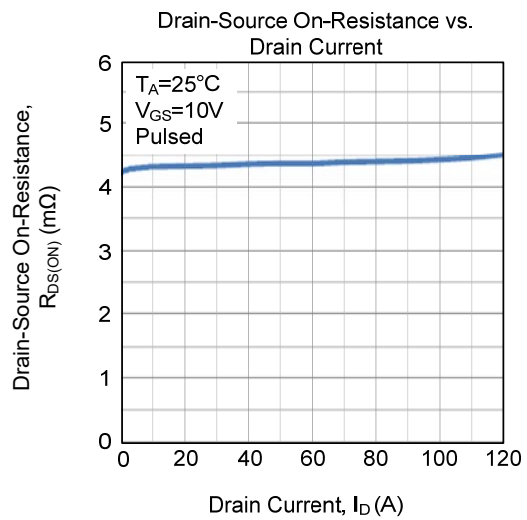
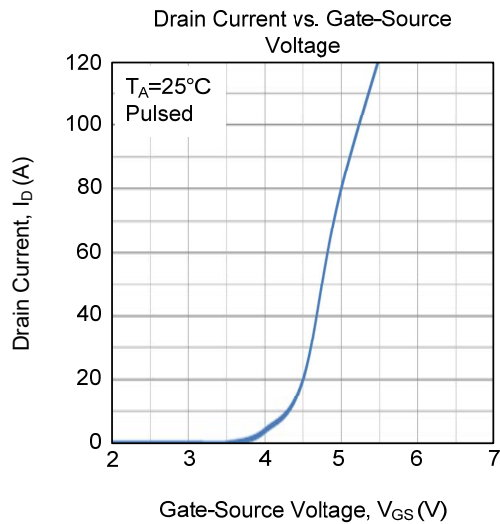
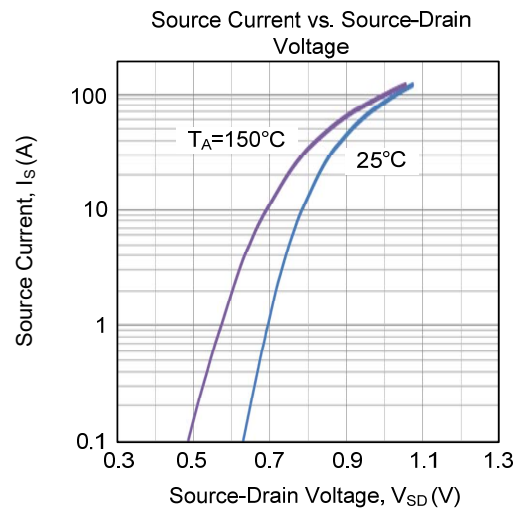
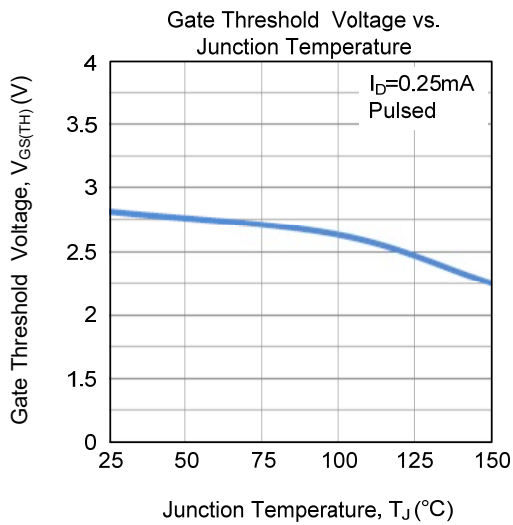


Unclamped Inductive Switching Waveforms

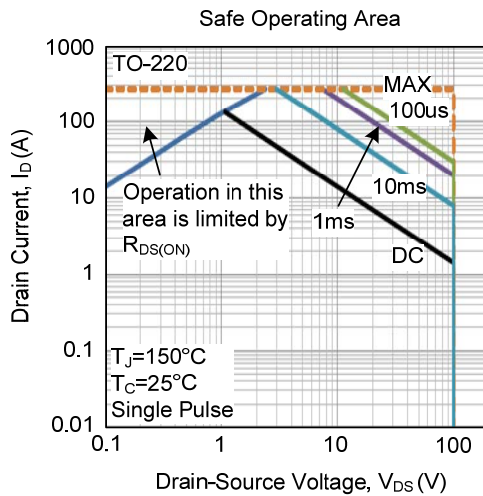
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



TYPICAL CHARACTERISTICS (Cont.)



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