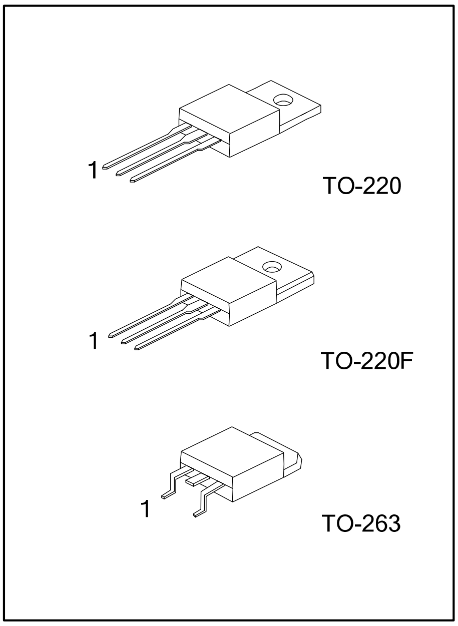
UTC **UNISONIC TECHNOLOGIES CO., LTD**

USG170N10

POWER MOSFET

170A, 100V N-CHANNEL POWER MOSFET



■ DESCRIPTION

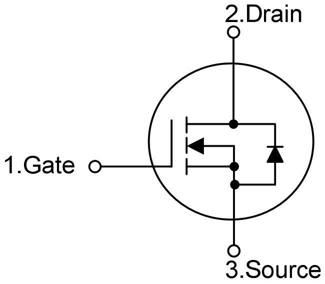
The UTC **USG170N10** is a N-channel Power MOSFET, it uses UTC's advanced technology to provide the customers with low $R_{DS(ON)}$ characteristic by high cell density trench technology.

The UTC **USG170N10** is suitable for high efficiency synchronous rectification in SMPS, UPS, hard switched and high frequency circuits.

■ FEATURES

* $R_{DS(ON)} \le 3.5\ m\Omega$ @ V_{GS}=10V, I_D=20A
* High Switching Speed

■ SYMBOL



■ ORDERING INFORMATION

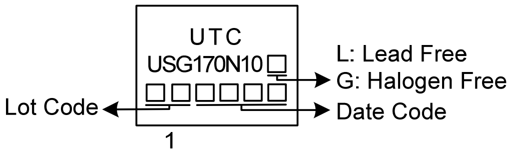
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
USG170N10L-TA3-T	USG170N10G-TA3-T	TO-220	G	D	S	Tube
USG170N10L-TF3-T	USG170N10G-TF3-T	TO-220F	G	D	S	Tube
USG170N10L-TQ2-T	USG170N10G-TQ2-T	TO-263	G	D	S	Tube
USG170N10L-TQ2-R	USG170N10G-TQ2-R	TO-263	G	D	S	Tape Reel

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

USG170N10G-TA3-T

(1)Packing Type	(1) T: Tube, R: Tape Reel
(2)Package Type	(2) TA3: TO-220, TF3: TO-220F, TQ2: TO-263
(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



■ ABSOLUTE MAXIMUM RATING (T_C=25°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	170	A
	Pulsed (Note 2)	I_{DM}	340	A
Single Pulsed Avalanche Energy (Note 3)		E_{AS}	371	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3.9	V/ns
Power Dissipation	TO-220/TO-263	P_D	180	W
	TO-220F		55	W
Junction Temperature		T_J	+150	°C
Storage Temperature Range		T_{STG}	-20 ~ +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.
3. L=0.1mH, I_{AS}=86.2A, V_{DD}=50V, R_G=25 Ω, Starting T_J = 25°C
4. $I_{SD} \leq$ 30A, di/dt≤200A/μs, $V_{DD} \leq BV_{DSS}$, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		θ_{JA}	62.5	°C/W
Junction to Case	TO-220/TO-263	θ_{JC}	0.69 (Note)	°C/W
	TO-220F		2.2 (Note)	°C/W

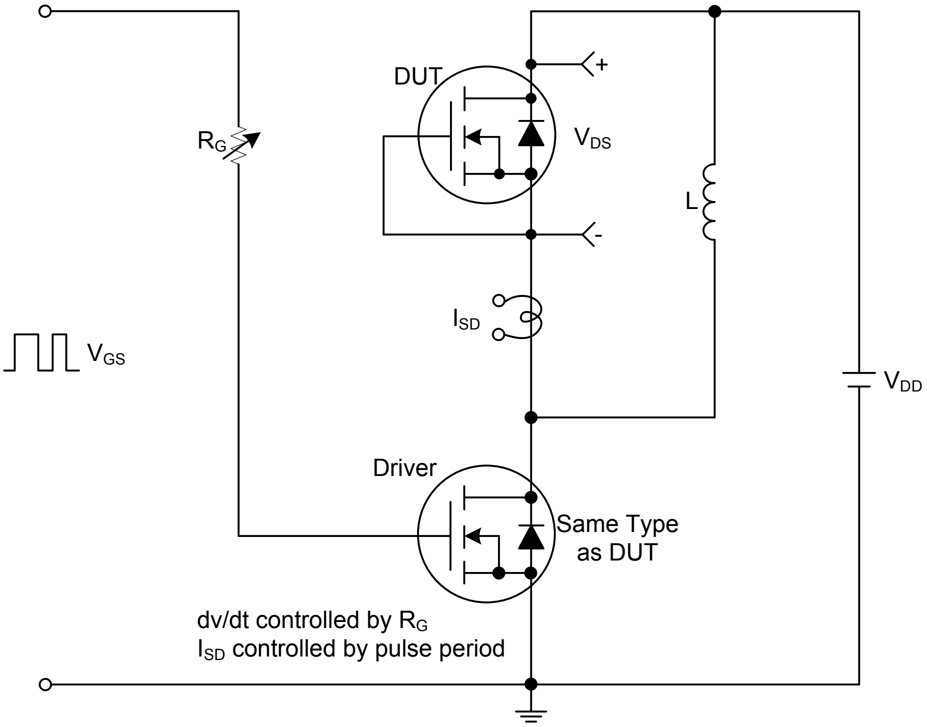
Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

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

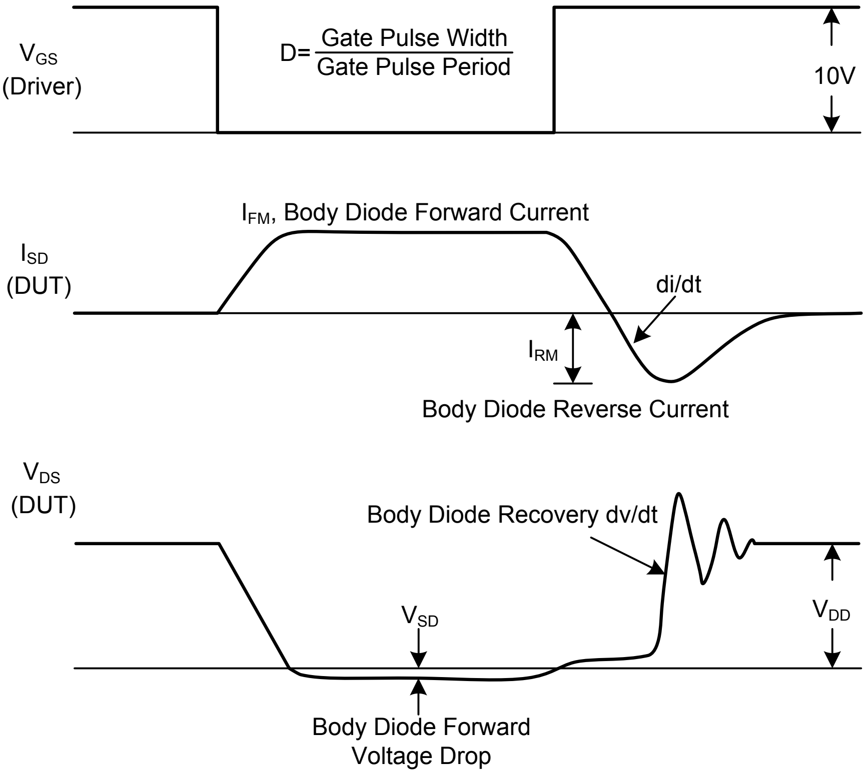
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, V_{GS}=0V	100			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=100V, V_{GS}=0V			1	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=+20V, V_{DS}=0V			+100	nA
	Reverse		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=20A		2.8	3.5	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		5500		pF
Output Capacitance		C_{OSS}			3300		pF
Reverse Transfer Capacitance		C_{RSS}			270		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=80V, V_{GS}=10V, I_D=20A, I_G=1.0mA (Note 1, 2)		117		nC
Gate to Source Charge		Q_{GS}			24		nC
Gate to Drain Charge		Q_{GD}			38		nC
Turn-on Delay Time (Note 1)		$t_{D(ON)}$	V_{DD}=50V, V_{GS}=10V, I_D=20A, R_G =10Ω (Note 1, 2)		40		ns
Rise Time		t_R			32		ns
Turn-off Delay Time		$t_{D(OFF)}$			112		ns
Fall-Time		t_F			35		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				170	A
Maximum Body-Diode Pulsed Current		I_{SM}				340	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	I_S=20A, V_{GS}=0V			1.3	V
Reverse Recovery Time (Note 1)		t_{rr}	I_S=30A, V_{GS}=0V, dI_F/dt =100A/μs		86		nS
Reverse Recovery Charge		Q_{rr}			238		nC

Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.
2. Essentially independent of operating ambient temperature.

- TEST CIRCUITS AND WAVEFORMS



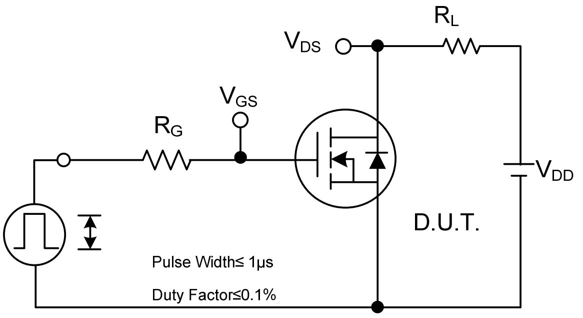
Peak Diode Recovery dv/dt Test Circuit



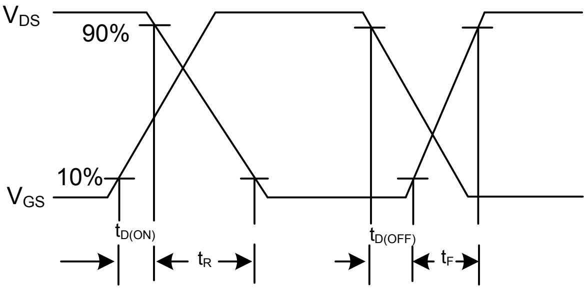
Peak Diode Recovery dv/dt Test Circuit and Waveforms

Peak Diode Recovery dv/dt Waveforms

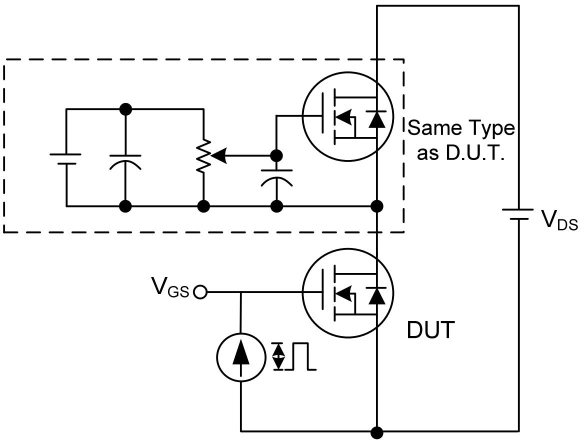
■ TEST CIRCUITS AND WAVEFORMS



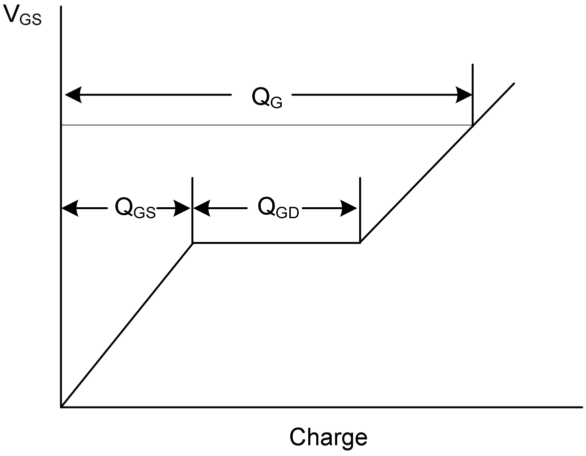
Switching Test Circuit



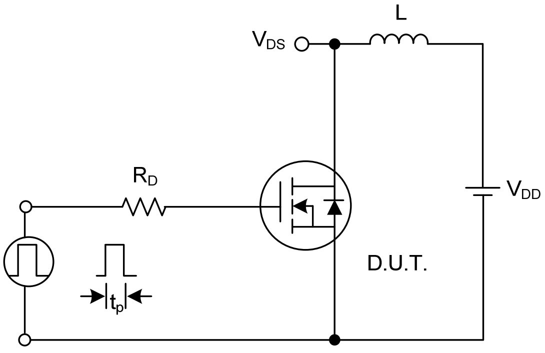
Switching Waveforms



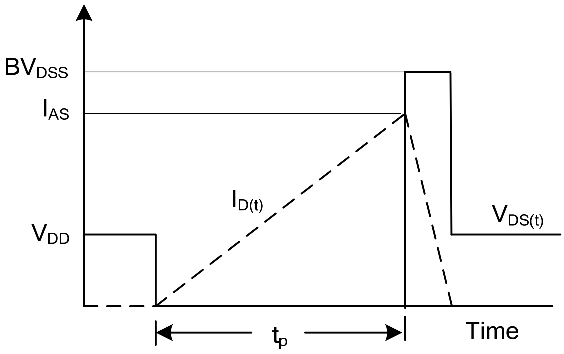
Gate Charge Test Circuit



Gate Charge Waveform

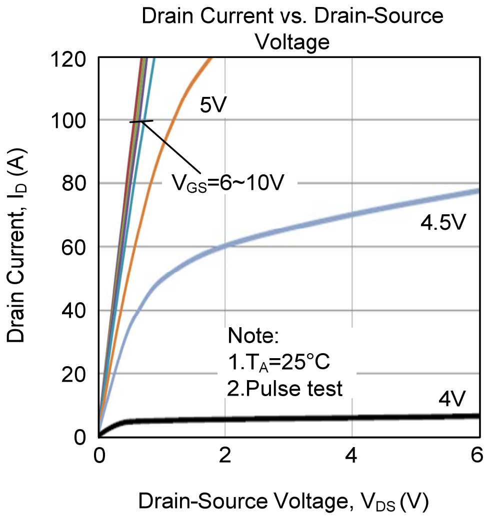


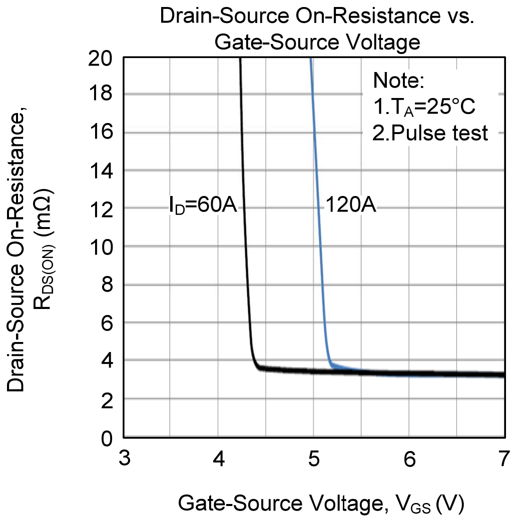
Unclamped Inductive Switching Test Circuit

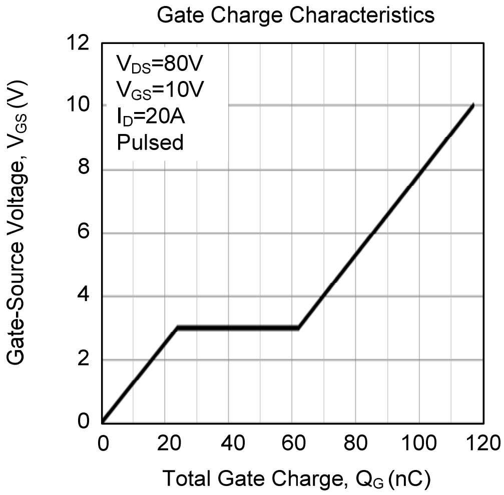


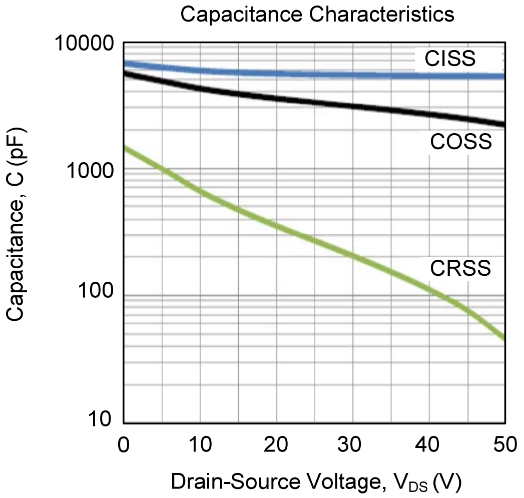
Unclamped Inductive Switching Waveforms

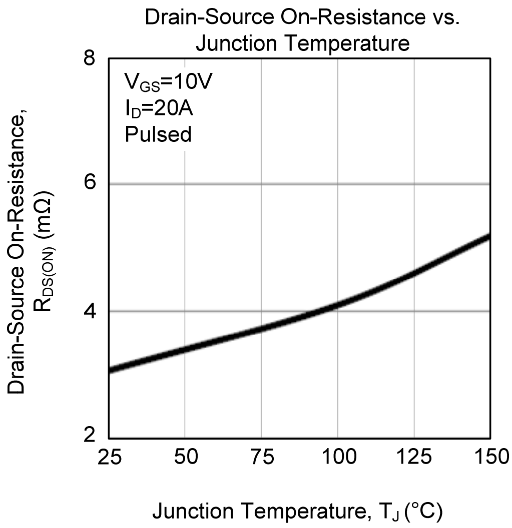
■ TYPICAL CHARACTERISTICS

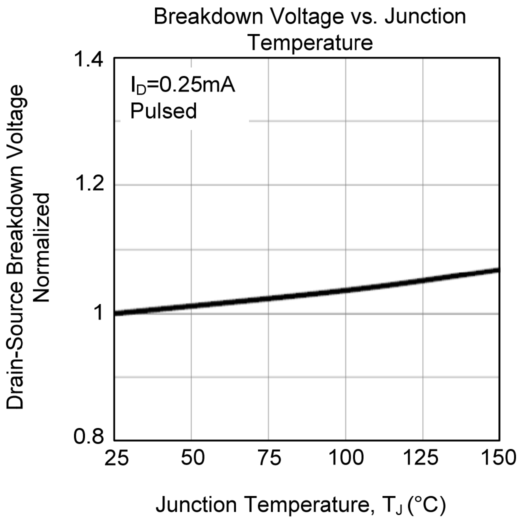

Drain Current vs. Drain-Source Voltage


Drain-Source On-Resistance vs. Gate-Source Voltage


Gate Charge Characteristics

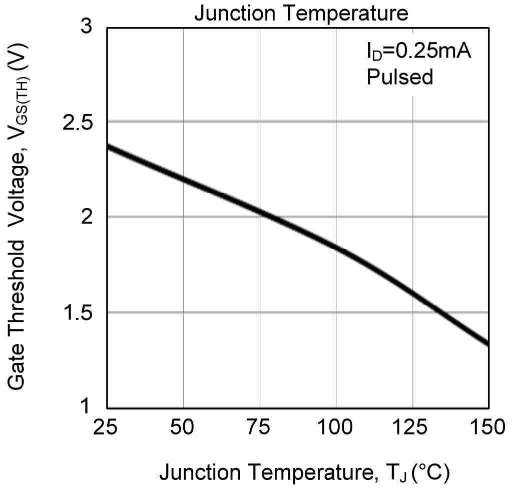

Capacitance Characteristics


Drain-Source On-Resistance vs. Junction Temperature

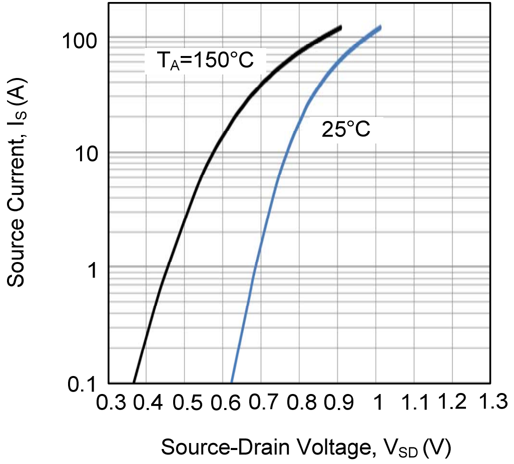

Breakdown Voltage vs. Junction Temperature

■ TYPICAL CHARACTERISTICS (Cont.)

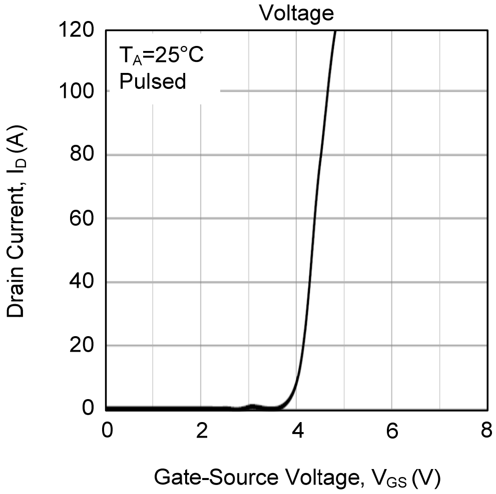
Gate Threshold Voltage vs. Junction Temperature



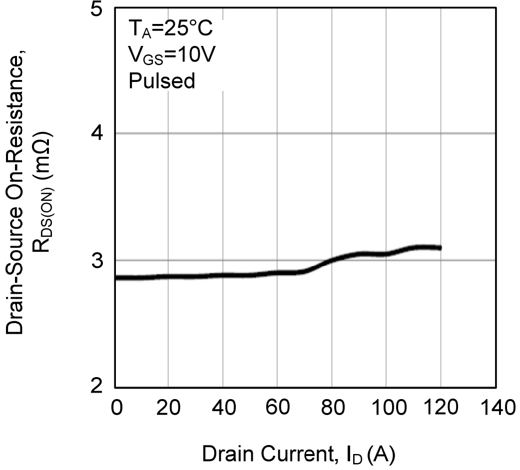
Source Current vs. Source-Drain Voltage



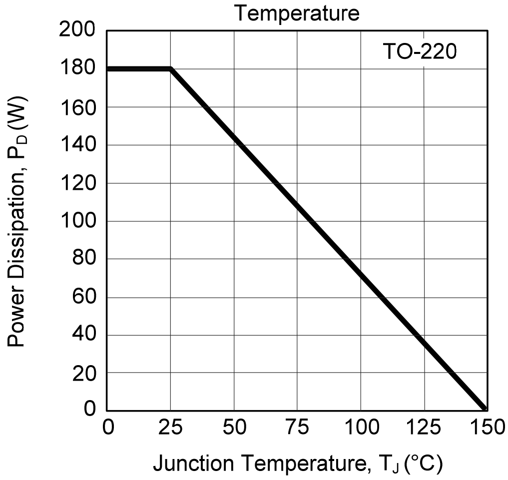
Drain Current vs. Gate-Source Voltage



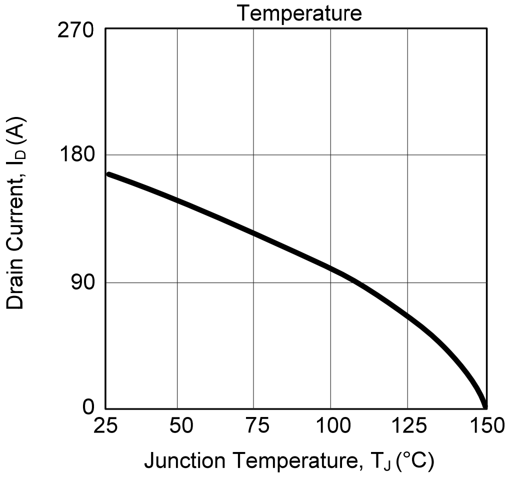
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature



Drain Current vs. Junction Temperature



■ TYPICAL CHARACTERISTICS (Cont.)