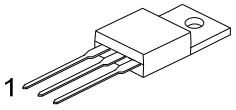
UT90N09

Power MOSFET

90A, 90V N-CHANNEL POWER MOSFET



TO-220

PDFN5×6

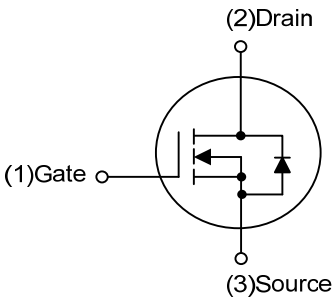
■ DESCRIPTION

The **UTC UT90N09** is a high voltage and high current power MOSFET, designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient AC to DC converters and bridge circuits.

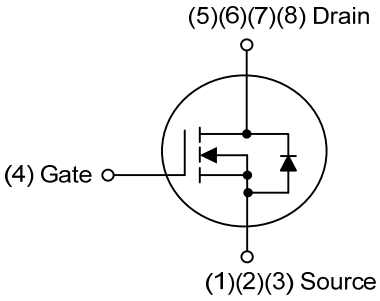
■ FEATURES

* $R_{DS(ON)}$ ≤ 11.5 mΩ @ V_{GS}=10V, I_D=45A
  $R_{DS(ON)}$ ≤ 12.8 mΩ @ V_{GS}=4.5V, I_D=20A
* Fast switching
* 100% avalanche tested
* Improved dv/dt capability

■ SYMBOL



TO-220



PDFN5×6

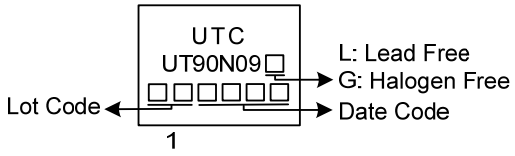
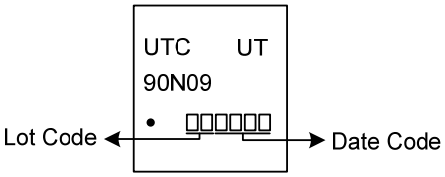
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
UT90N09L-TA3-R	UT90N09G-TA3-R	TO-220	G	D	S	-	-	-	-	-	Tube
UT90N09L-P5060-R	UT90N09G-P5060-R	PDFN5×6	S	S	S	G	D	D	D	D	Tape Reel

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

UT90N09G-TA3-R (1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, P5060: PDFN5×6 (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

TO-220	PDFN5×6
	

■ ABSOLUTE MAXIMUM RATINGS (T_C =25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	90	V
Gate-Source Voltage		V_{GSS}	±20	V
Drain Current	Continuous	I_D	90	A
	Pulsed	I_{DM}	180	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	156	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.9	V/ns
Power Dissipation	TO-220	P_D	142	W
	PDFN5×6		42	W
Junction Temperature		T_J	+150	°C
Storage Temperature Range		T_{STG}	-55 ~ +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}=55.8A, V_{DD}=50V, R_G=25Ω, Starting T_J = 25°C
4. I_{SD} ≤ 30A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220	θ_{JA}	62.5	°C/W
	PDFN5×6		65 (Note)	°C/W
Junction to Case	TO-220	θ_{JC}	0.88	°C/W
	PDFN5×6		2.97 (Note)	°C/W

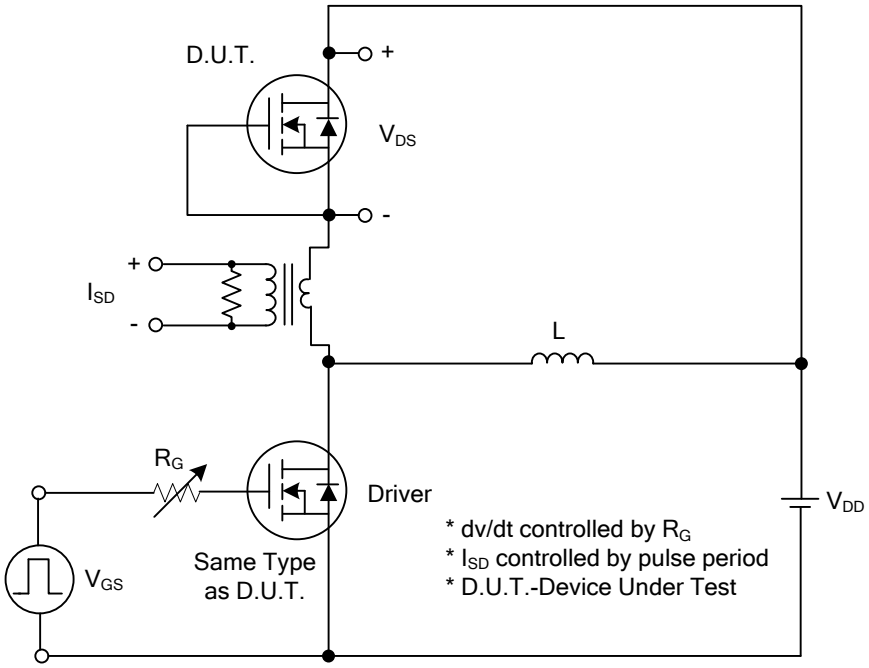
Note: The data tested by surface mounted on a 1 $inch^2$ FR-4 board with 2OZ copper.

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

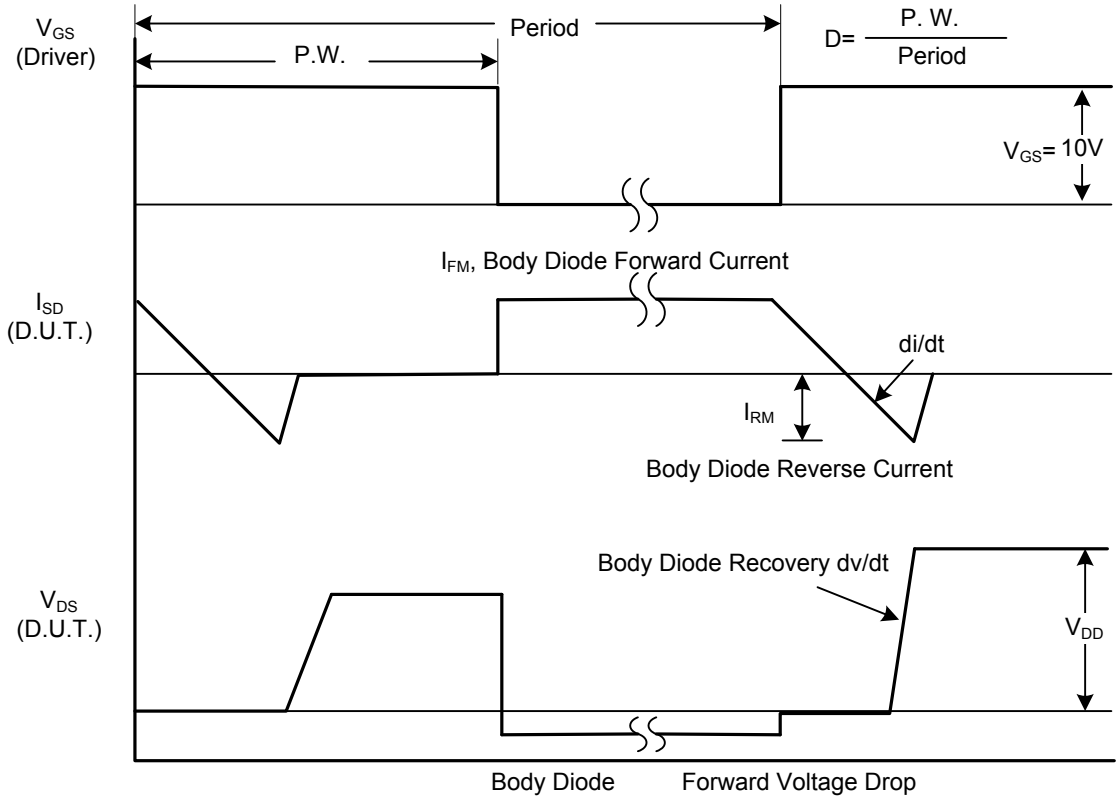
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, V_{GS}=0V	90			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=90V, V_{GS}=0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=+20V, V_{DS}=0V			+100	nA
	Reverse		V_{GS}=-20V, V_{DS}=0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	1.0		3.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=45A			11.5	mΩ
			V_{GS}=4.5V, I_D=20A			12.8	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		3753		pF
Output Capacitance		C_{OSS}			335		pF
Reverse Transfer Capacitance		C_{RSS}			300		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=45V, V_{GS}=10V, I_D=90A, I_G=1mA (Note 1, 2)		111		nC
Gate to Source Charge		Q_{GS}			24.4		nC
Gate to Drain Charge		Q_{GD}			17.2		nC
Turn-ON Delay Time (Note 1)		$t_{D(ON)}$	V_{DD}=45V, V_{GS}=10V, I_D=90A, R_G =25Ω (Note 1, 2)		12.8		ns
Rise Time		t_R			20.8		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			64		ns
Fall-Time		t_F			27.2		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I_S				90	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				180	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	I_S=90A, V_{GS}=0V			1.4	V
Reverse Recovery Time (Note 1)		t_{rr}	I_S=30A,V_{GS}=0V, dI/dt=100A/μs		62.4		ns
Reverse Recovery Charge		Q_{rr}			193		nC

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

■ TEST CIRCUITS AND WAVEFORMS

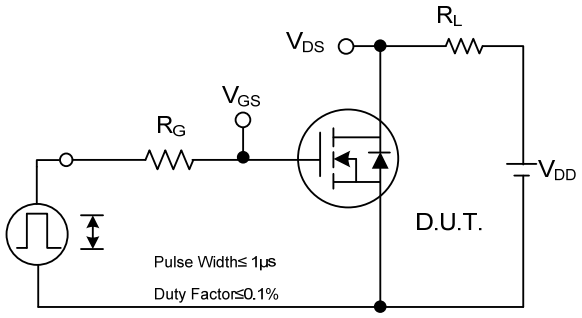


Peak Diode Recovery dv/dt Test Circuit

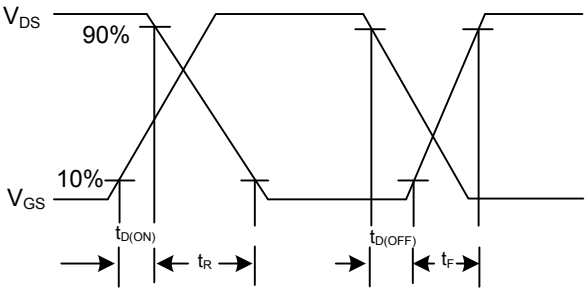


Peak Diode Recovery dv/dt Waveforms

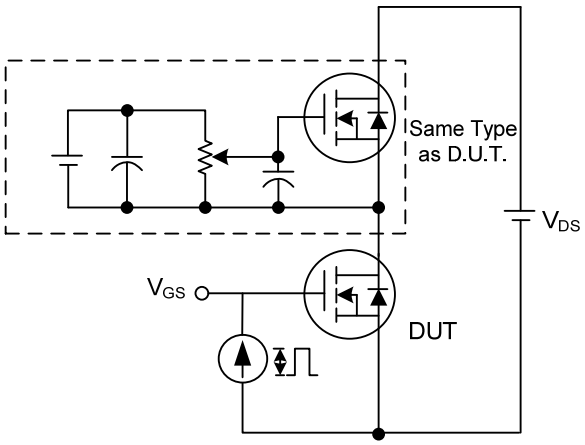
■ TEST CIRCUITS AND WAVEFORMS



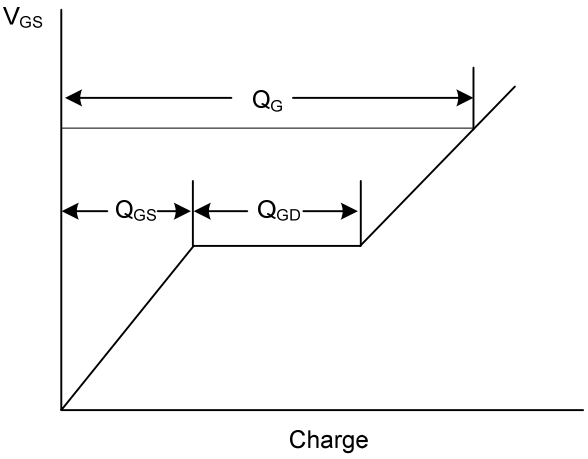
Switching Test Circuit



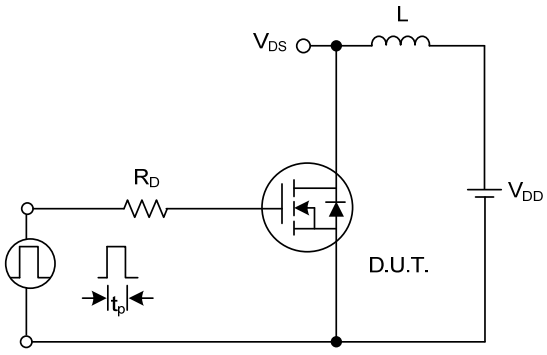
Switching Waveforms



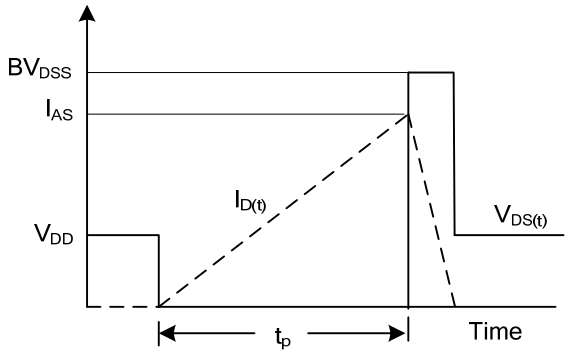
Gate Charge Test Circuit



Gate Charge Waveform



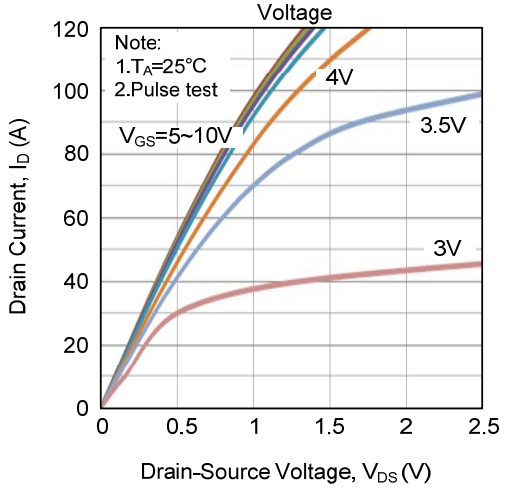
Unclamped Inductive Switching Test Circuit



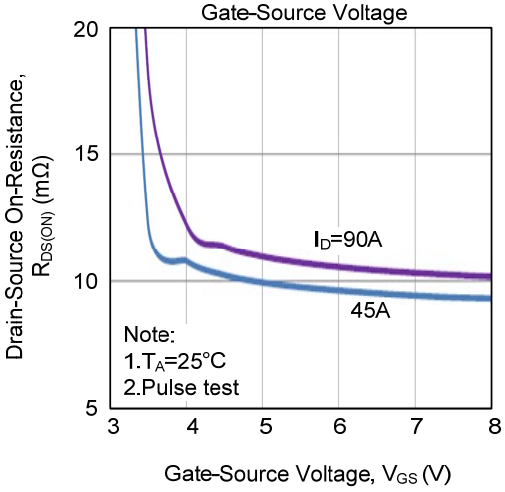
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

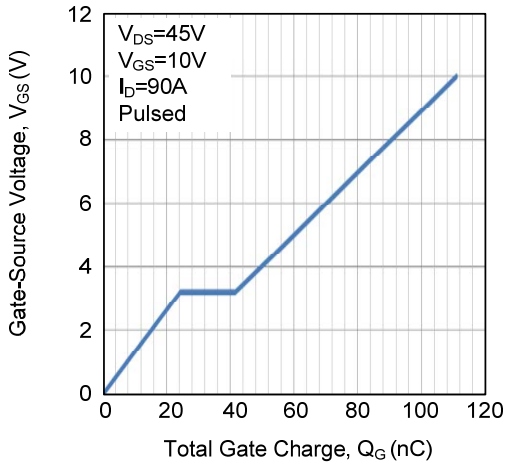
Drain Current vs. Drain-Source Voltage



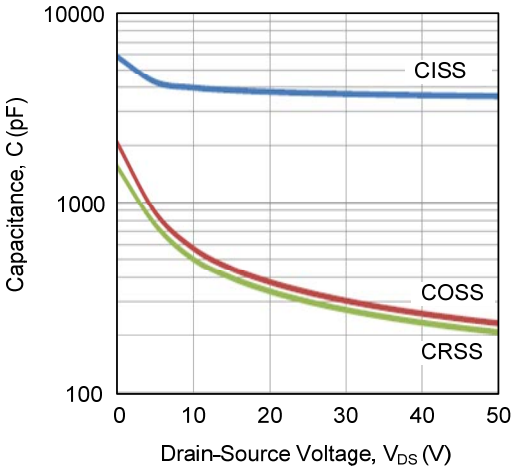
Drain-Source On-Resistance vs. Gate-Source Voltage



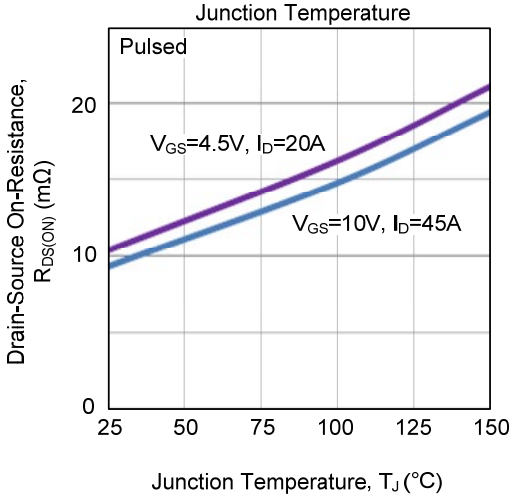
Gate Charge Characteristics



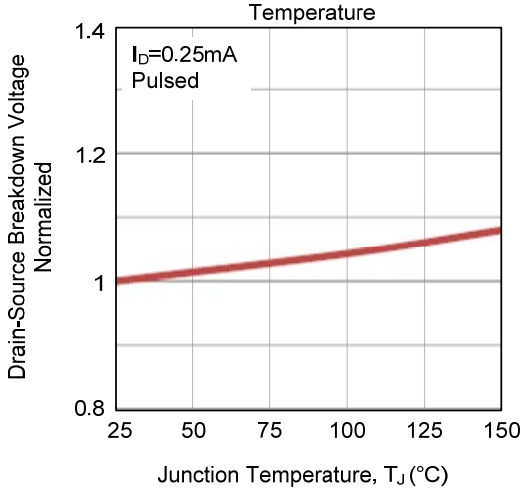
Capacitance Characteristics



Drain-Source On-Resistance vs. Junction Temperature

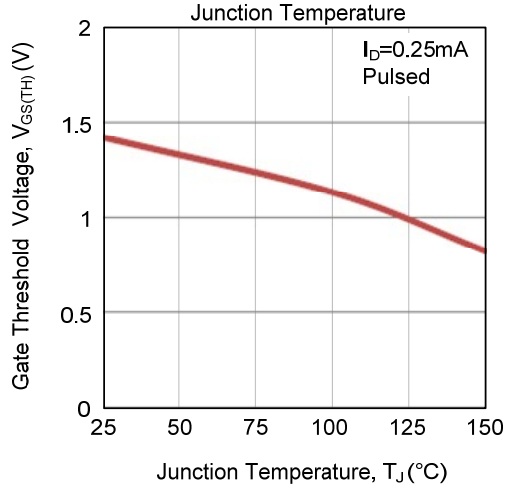


Breakdown Voltage vs. Junction Temperature

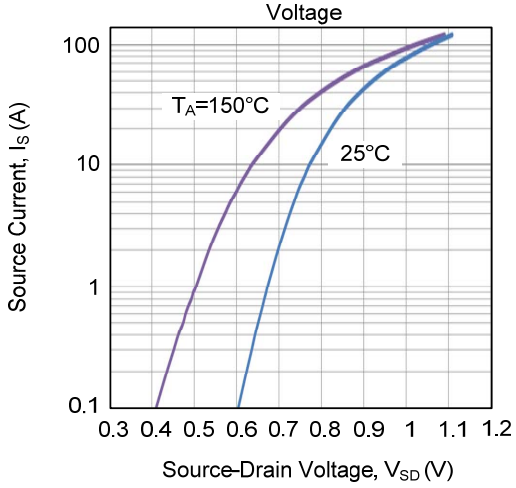


■ TYPICAL CHARACTERISTICS (Cont.)

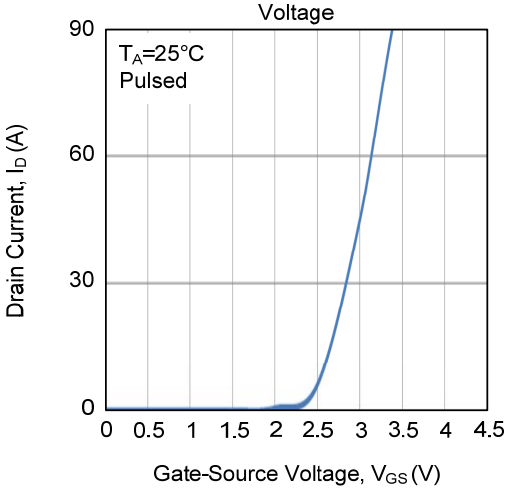
Gate Threshold Voltage vs. Junction Temperature



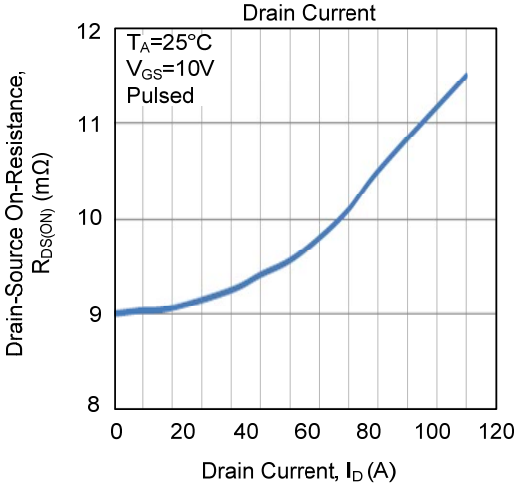
Source Current vs. Source-Drain Voltage



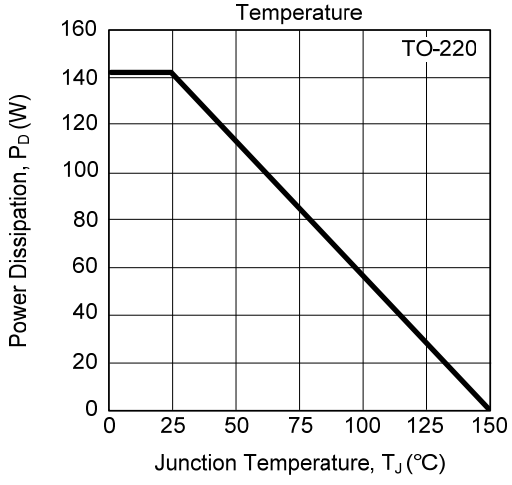
Drain Current vs. Gate-Source Voltage



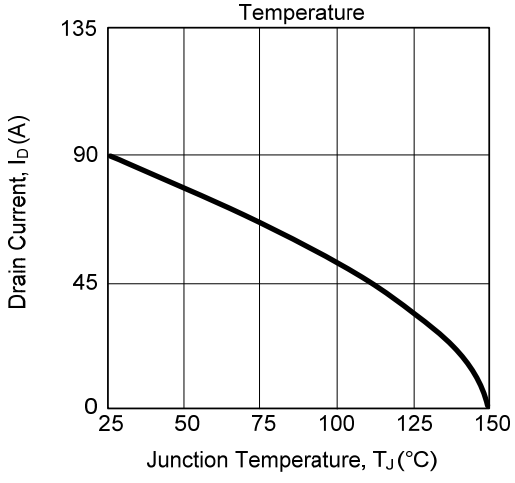
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature



Drain Current vs. Junction Temperature



■ TYPICAL CHARACTERISTICS (Cont.)