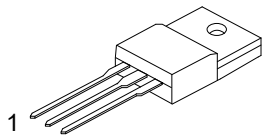
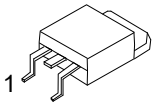
USG10R088M

POWER MOSFET

N-CHANNEL SGT ENHANCEMENT POWER MOSFET



TO-220F1



TO-252

PDFN5×6

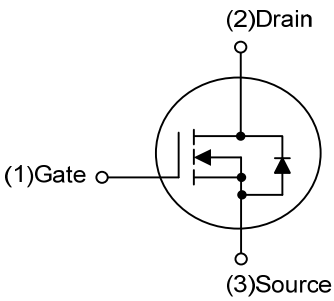
■ DESCRIPTION

The UTC **USG10R088M** 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.

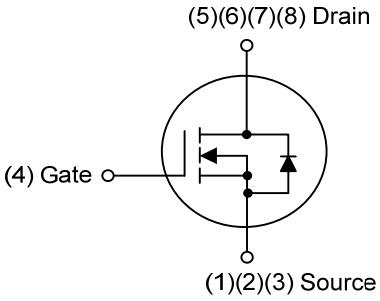
■ FEATURES

* $R_{DS(ON)}$ ≤ 8.8 mΩ @ V_{GS}=10V, I_D=32A
  $R_{DS(ON)}$ ≤ 11 mΩ @ V_{GS}=4.5V, I_D=20A
* Extremely low on-resistance $R_{DS(ON)}$
* Excellent Low Ciss

■ SYMBOL



TO-252 / TO-220F1



PDFN5×6

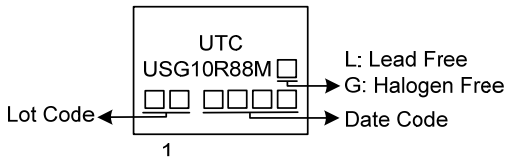
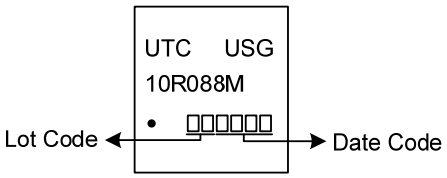
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
USG10R088ML-TF1-T	USG10R088MG-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	Tube
USG10R088ML-TN3-R	USG10R088MG-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
USG10R088ML-P5060-R	USG10R088MG-P5060-R	PDFN5×6	S	S	S	G	D	D	D	D	Tape Reel

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

USG10R088MG-TF1-T (1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube, R: Tape Reel (2) TF1: TO-220F1, TN3: TO-252, P5060: PDFN5×6 (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

TO-220F1 / TO-252	PDFN5×6
	

■ 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	DC	I_D	65	A
	Pulsed (Note 2)	I_{DM}	130	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	3.5	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.3	V/ns
Power Dissipation	TO-220F1	P_D	31	W
	TO-252		53	W
	PDFN5×6		43	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} = 8.4A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C
4. I_{SD} ≤ 30A, di/dt ≤ 200A/μs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F1	θ_{JA}	62.5	°C/W
	TO-252		110	°C/W
	PDFN5×6		65 (Note)	°C/W
Junction to Case	TO-220F1	θ_{JC}	4.0	°C/W
	TO-252		2.36	°C/W
	PDFN5×6		2.9 (Note)	°C/W

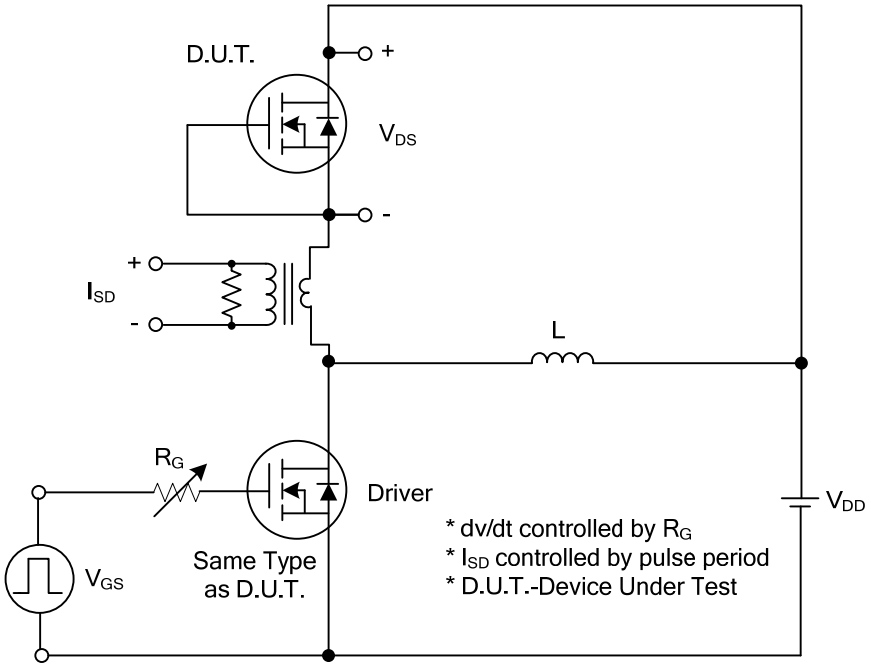
Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

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

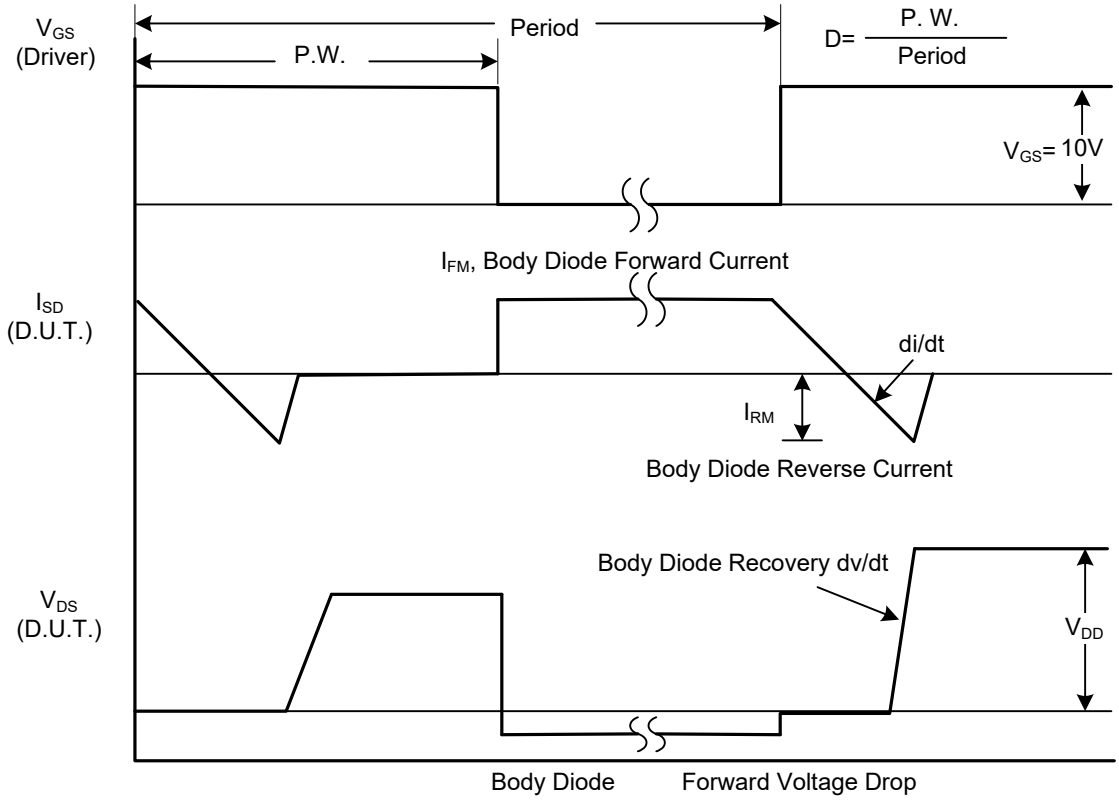
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA	100			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=100V, V_{GS}=0V			1	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=+20V, V_{DS}=0V			+100	nA
	Reverse		V_{GS}=-20V, V_{DS}=0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}= V_{GS}, I_D=250μA	1.0		2.5	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS} =10V, I_D=32A			8.8	mΩ
			V_{GS} =4.5V, I_D=20A			11	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		2544		pF
Output Capacitance		C_{OSS}			1064		pF
Reverse Transfer Capacitance		C_{RSS}			165		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q_G	V_{DS}=80V, V_{GS}=10V, I_D=65A (Note 1, 2)		74		nC
Gate to Source Charge		Q_{GS}			9		nC
Gate to Drain Charge		Q_{GD}			26		nC
Turn-ON Delay Time		$t_{D(ON)}$	V_{DD}=50V, V_{GS}=10V, I_D=65A, R_G=3Ω (Note 1, 2)		12		ns
Rise Time		t_R			20		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			40		ns
Fall-Time		t_F			23		ns
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I_S				65	A
Diode Forward Voltage		V_{SD}	I_F=65A, V_{GS}=0V			1.4	V
Reverse Recovery Time (Note 1)		t_{rr}	I_S=30A, V_{GS}=0V, dI_F/dt =100A/μs		46		nS
Reverse Recovery Charge		Q_{rr}			66		nC

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

■ TEST CIRCUITS AND WAVEFORMS

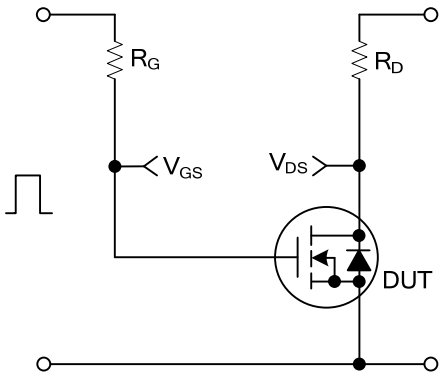


Peak Diode Recovery dv/dt Test Circuit

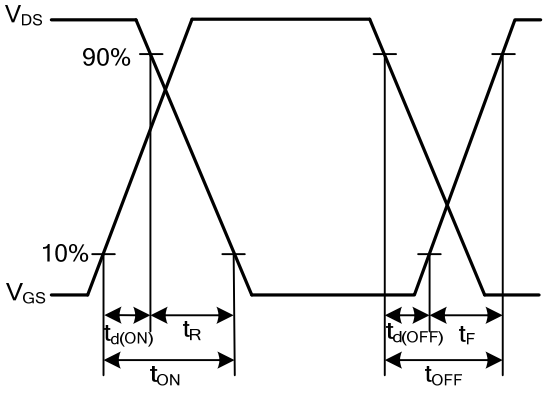


Peak Diode Recovery dv/dt Waveforms

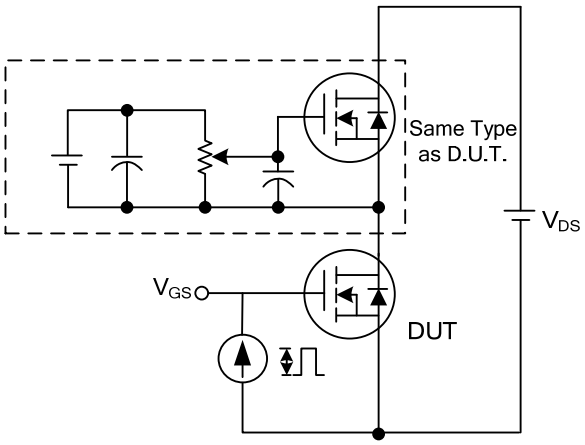
■ TEST CIRCUITS AND WAVEFORMS



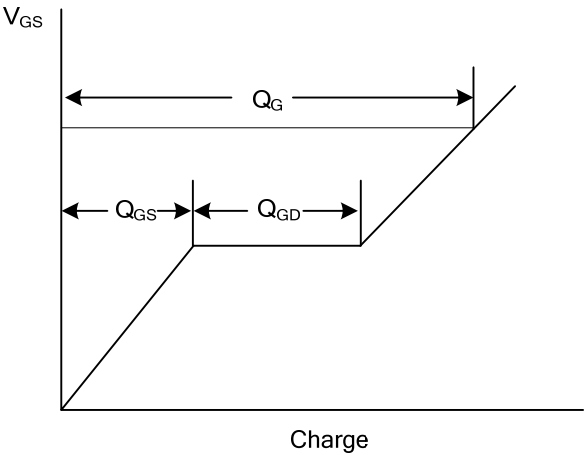
itching Test Circuit



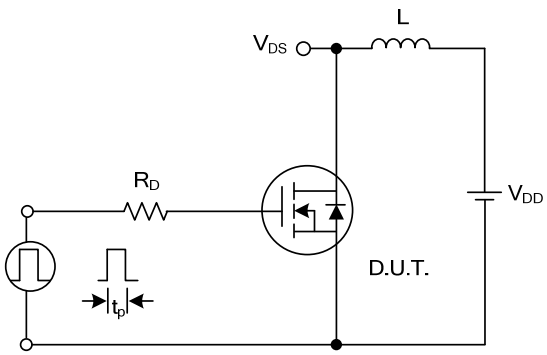
Switching Waveforms



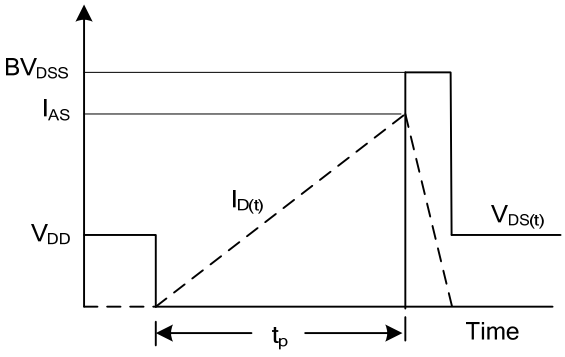
Gate Charge Test Circuit



Gate Charge Waveform

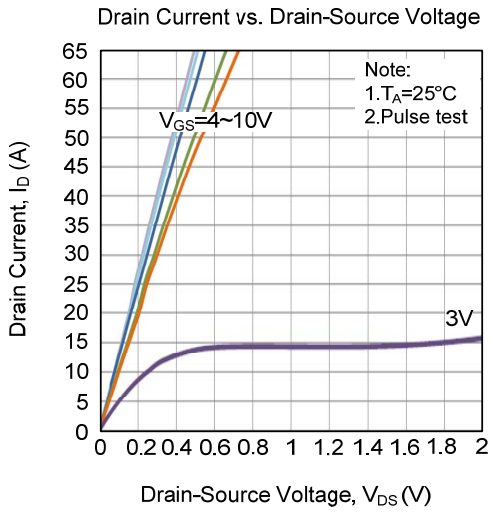


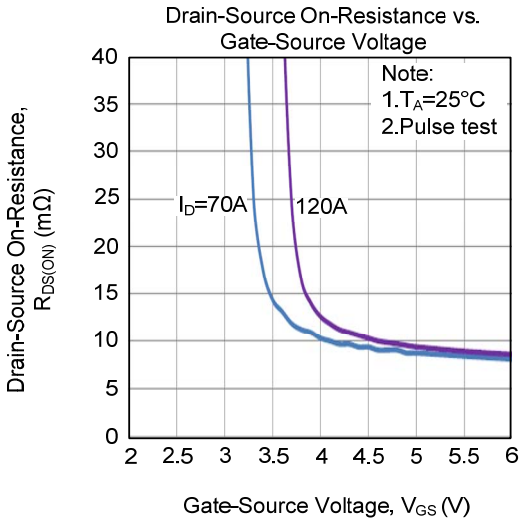
Unclamped Inductive Switching Test Circuit

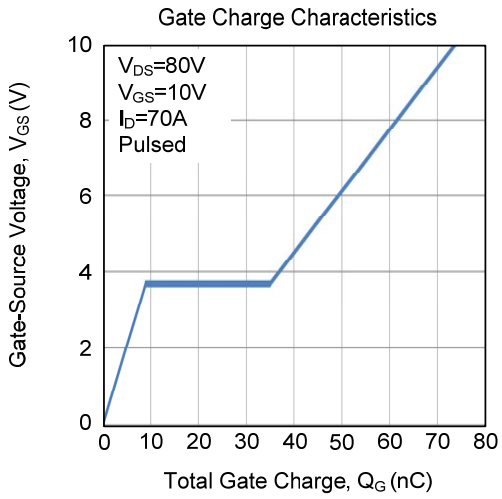


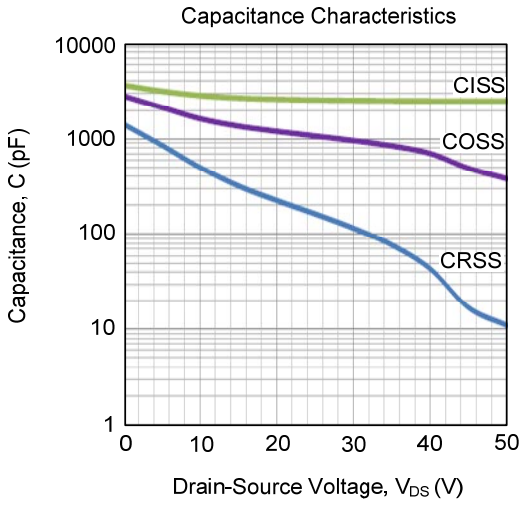
Unclamped Inductive Switching Waveforms

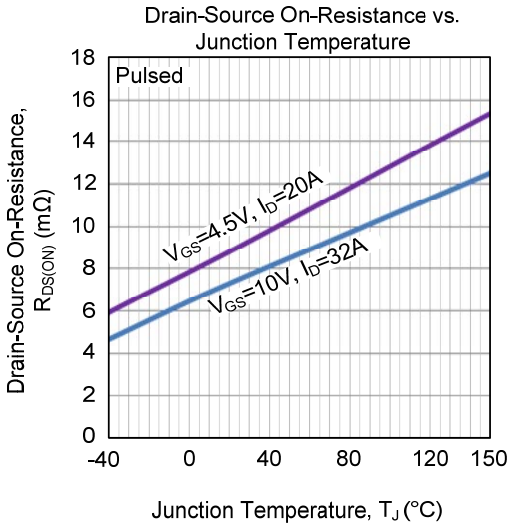
■ TYPICAL CHARACTERISTICS

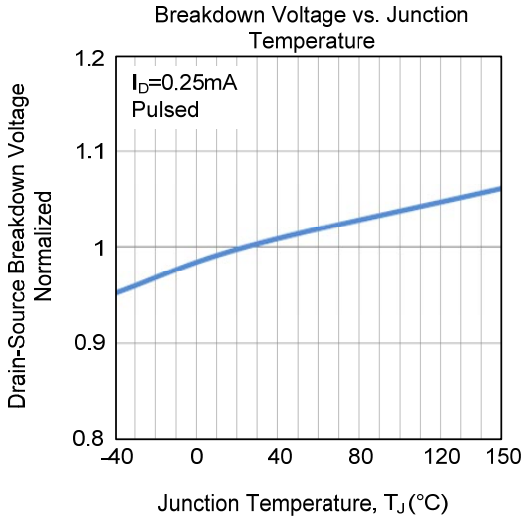






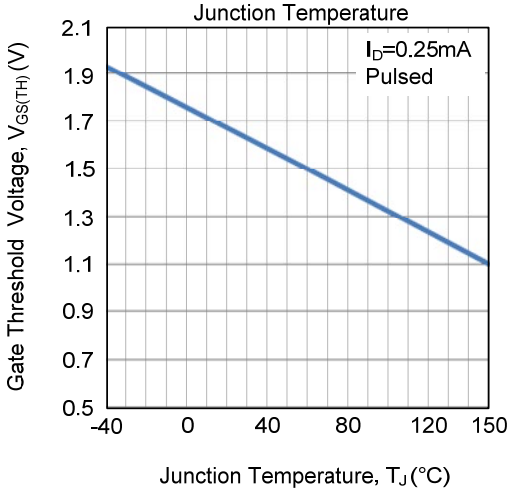




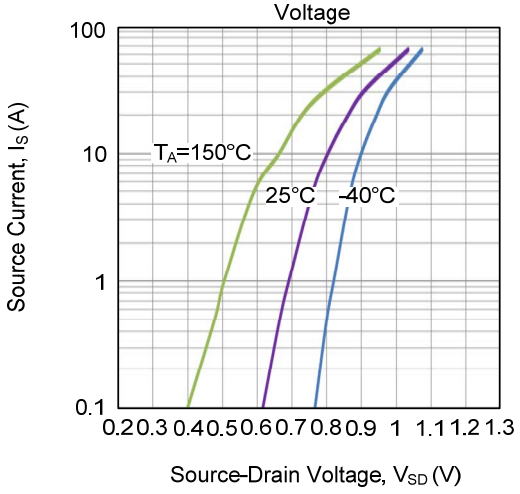


■ TYPICAL CHARACTERISTICS (Cont.)

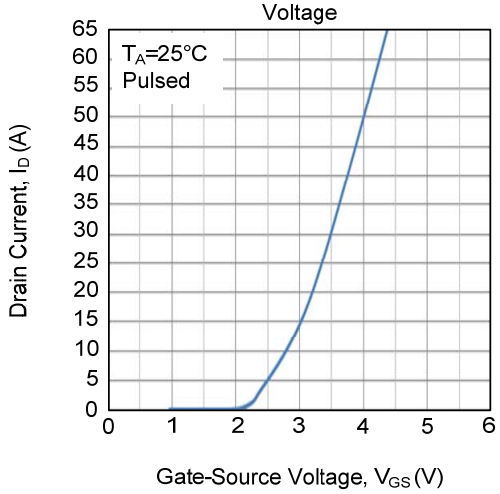
Gate Threshold Voltage vs. Junction Temperature



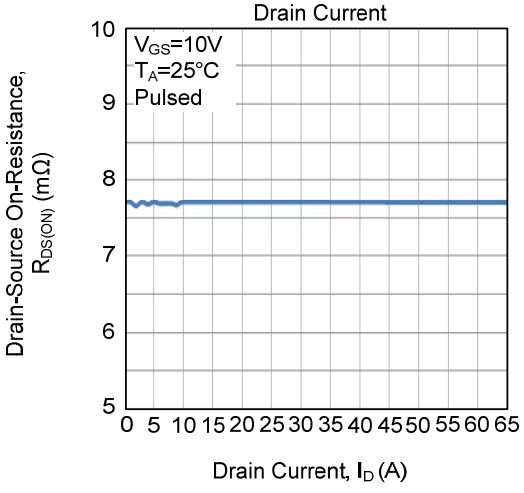
Source Current vs. Source-Drain Voltage



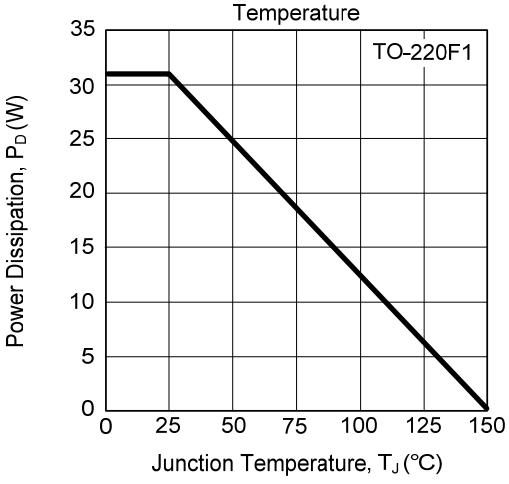
Drain Current vs. Gate-Source Voltage



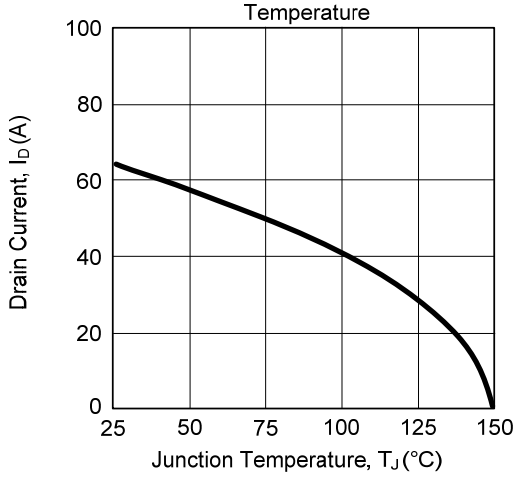
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature



Drain Current vs. Junction Temperature



■ TYPICAL CHARACTERISTICS (Cont.)