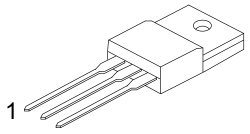
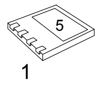
21A, 800V N-CHANNEL SUPER-JUNCTION MOSFET



TO-220F1



DFN8080-4

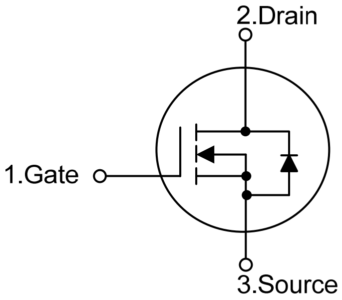
DESCRIPTION

The **UTC 21NM80-Q** is a Super Junction MOSFET Structure and is 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 AC-DC converters for power applications.

FEATURES

* $R_{DS(ON)} \leq 0.3\ \Omega$ @ V_{GS}=10V, I_D=10.5A
* Fast switching capability
* Avalanche energy tested
* Improved dv/dt capability, high ruggedness

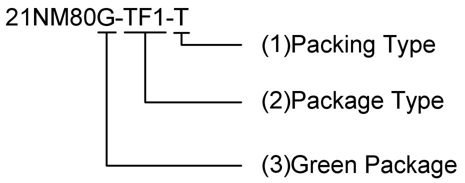
SYMBOL



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment					Packing
Lead Free	Halogen Free		1	2	3	4	5	
21NM80L-TF1-T	21NM80G-TF1-T	TO-220F1	G	D	S	-	-	Tube
21NM80L-K04-8080-R	21NM80G-K04-8080-R	DFN8080-4	G	S	S	S	D	Tape Reel

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

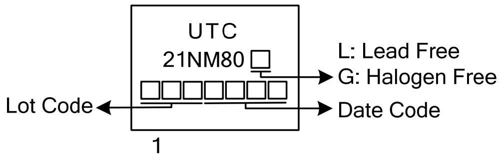
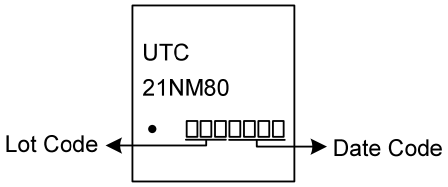


(1) T: Tube, R: Tape Reel

(2) TF1: TO-220F1, K04-8080: DFN8080-4

(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

TO-220F1	DFN8080-4
	

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

PARAMETER			SYMBOL	RATINGS	UNIT
Drain-Source Voltage			V_{DSS}	800	V
Gate-Source Voltage			V_{GSS}	±30	V
Drain Current	Continuous	T_C=25°C	I_D	21	A
		T_C=100°C		13.6	A
	Pulsed (Note 2)		I_{DM}	63	A
Avalanche Energy	Single Pulsed (Note 3)		E_{AS}	840	mJ
Peak Diode Recovery dv/dt (Note 4)			dv/dt	1.7	V/ns
Power Dissipation	TO-220F1		P_D	33	W
	DFN8080-4			65	W
Junction Temperature			T_J	+150	°C
Storage Temperature			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=100mH, I_{AS}=4.1A, V_{DD}=90V, R_G=25 Ω, Starting T_J = 25°C

4. $I_{SD} \leq$ 21A, di/dt ≤ 200A/μs, $V_{DD} \leq BV_{DSS}$, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F1	θ_{JA}	62.5	°C/W
	DFN8080-4		35	°C/W
Junction to Case	TO-220F1	θ_{JC}	3.78	°C/W
	DFN8080-4		1.92(Note)	°C/W

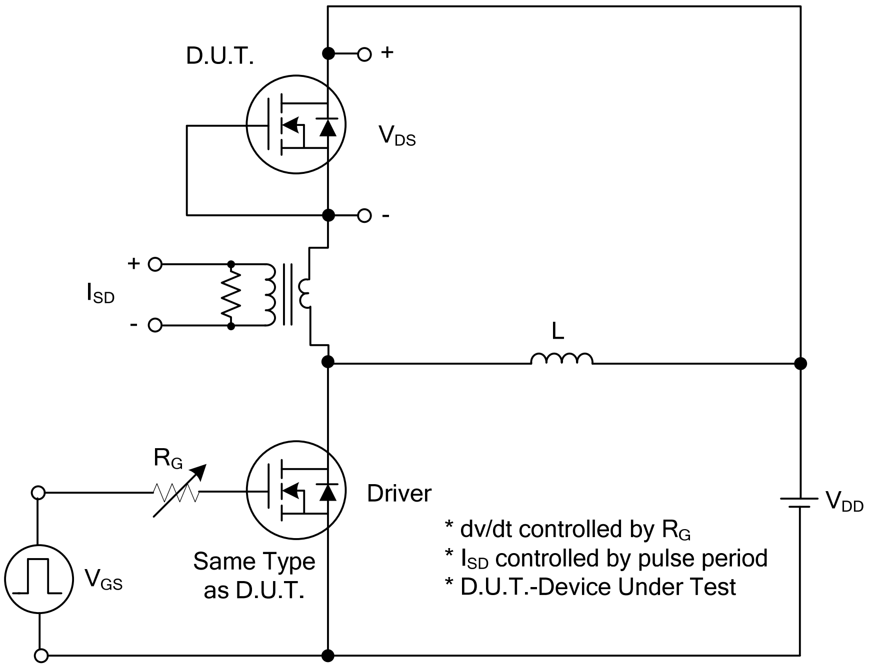
Note: Device mounted on FR-4 substrate P_C board, 2oz copper, with 1inch square copper plate.

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

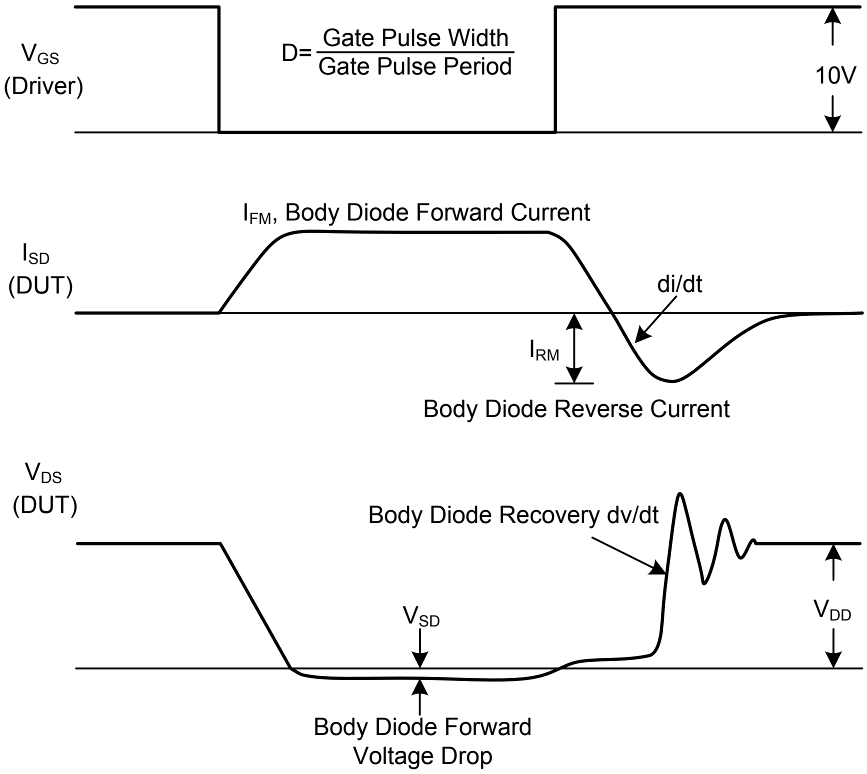
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=250μA	800			V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=800V, V_{GS}=0V			10	μA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=±30V, V_{DS}=0V			±100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	2.5		4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=10.5A			0.3	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	V_{GS}=0V, V_{DS}=50V, f=1MHz		1550		pF
Output Capacitance	C_{OSS}			190		pF
Reverse Transfer Capacitance	C_{RSS}			4.2		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge	Q_G	V_{DS}=640V, V_{GS}=10V, I_D=21A (Note 1, 2)		73		nC
Gate-Source Charge	Q_{GS}			20		nC
Gate-Drain Charge	Q_{DD}			30		nC
Turn-On Delay Time	$t_{D(ON)}$	V_{DD}=100V, V_{GS}=10V, I_D =21A, R_G =25Ω (Note 1, 2)		18		ns
Turn-On Rise Time	t_R			29		ns
Turn-Off Delay Time	$t_{D(OFF)}$			170		ns
Turn-Off Fall Time	t_F			58		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I_S				21	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				63	A
Drain-Source Diode Forward Voltage	V_{SD}	I_S=21A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time	t_{rr}	I_S=21A, V_{GS}=0V, dI_F/dt=100A/μs		540		nS
Body Diode Reverse Recovery Charge	Q_{rr}			11.3		μC

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

■ TEST CIRCUITS AND WAVEFORMS

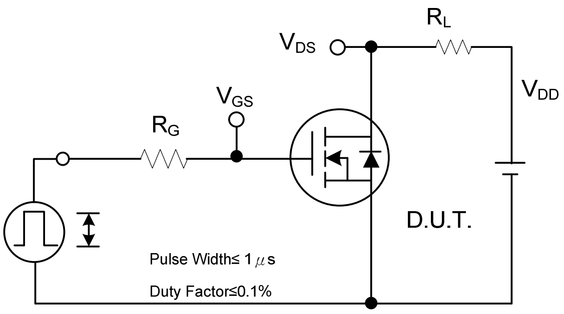


Peak Diode Recovery dv/dt Test Circuit

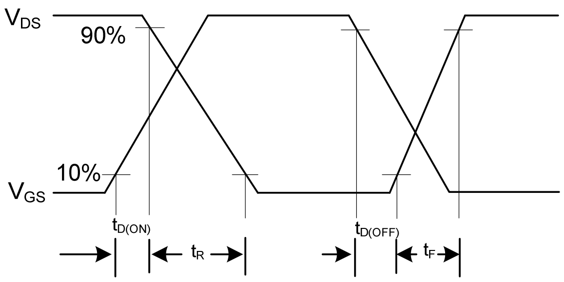


Peak Diode Recovery dv/dt Waveforms

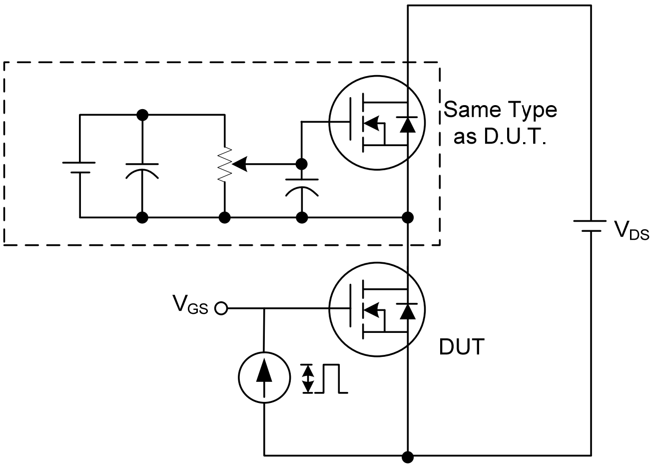
■ TEST CIRCUITS AND WAVEFORMS



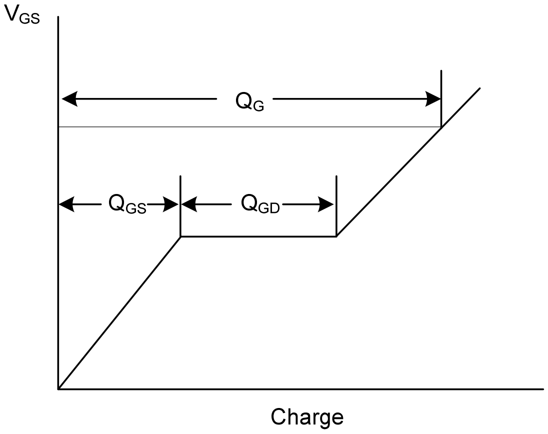
Switching Test Circuit



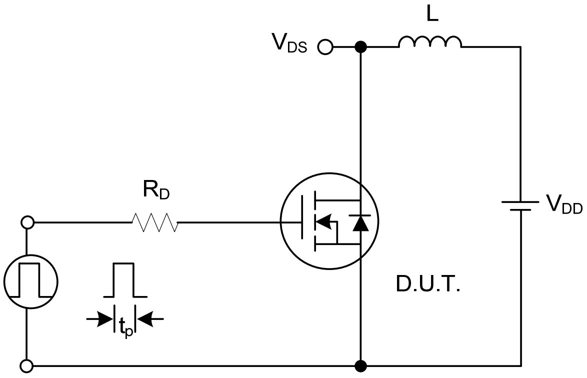
Switching Waveforms



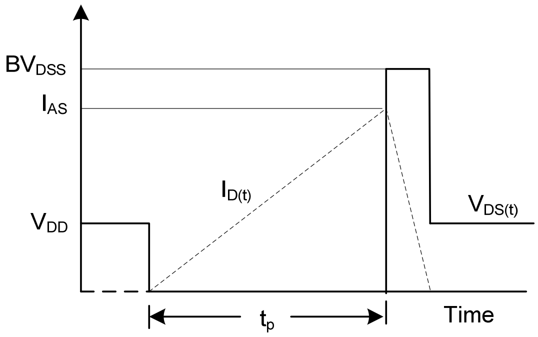
Gate Charge Test Circuit



Gate Charge Waveform



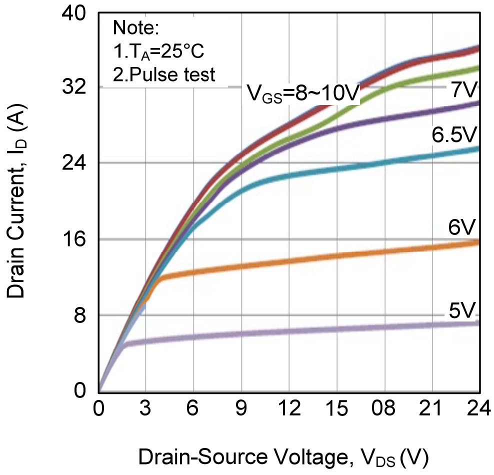
Unclamped Inductive Switching Test Circuit



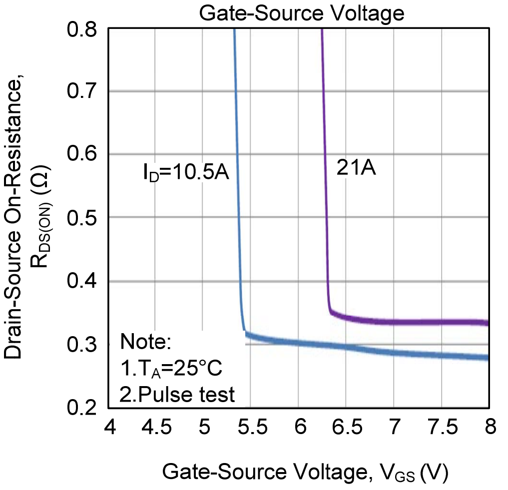
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

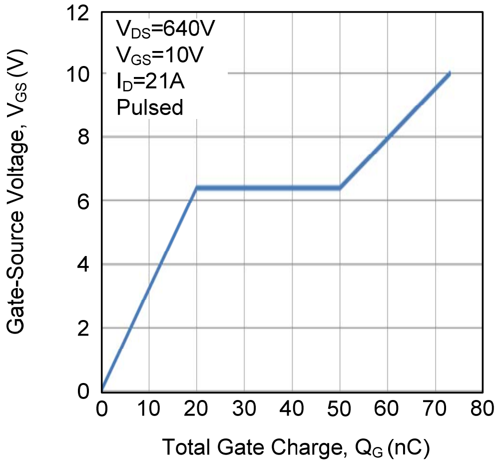
Drain Current vs. Drain-Source Voltage



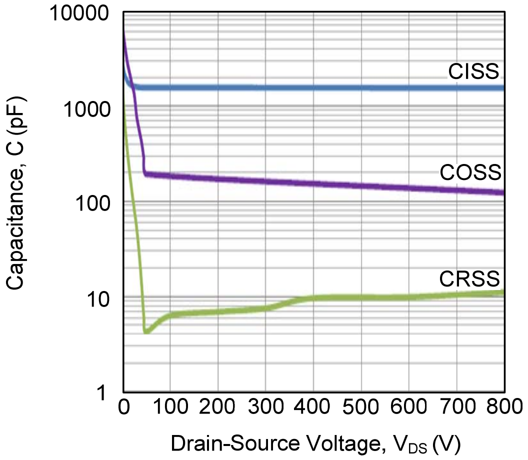
Drain-Source On-Resistance vs. Gate-Source Voltage



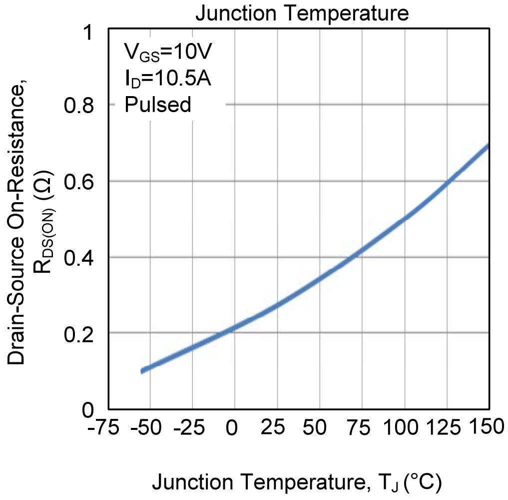
Gate Charge Characteristics



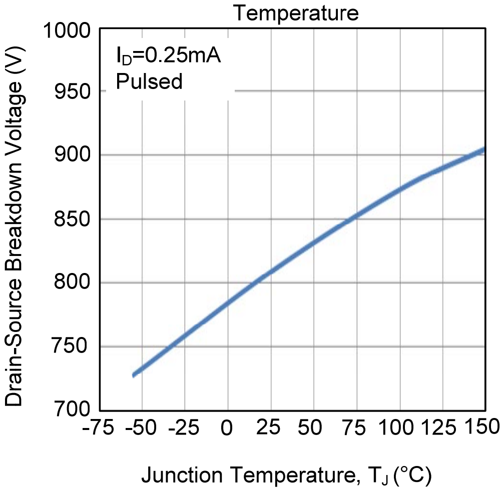
Capacitance Characteristics



Drain-Source On-Resistance vs. Junction Temperature

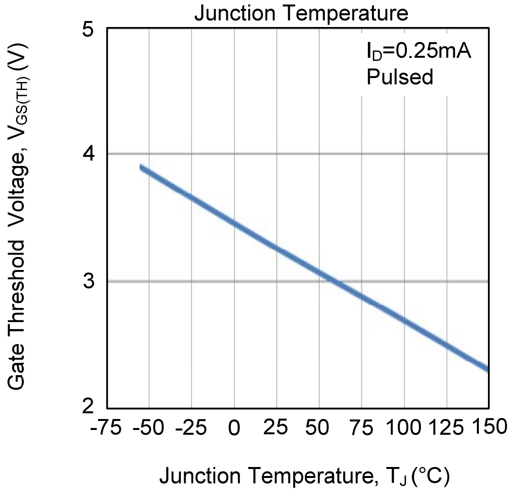


Breakdown Voltage vs. Junction Temperature

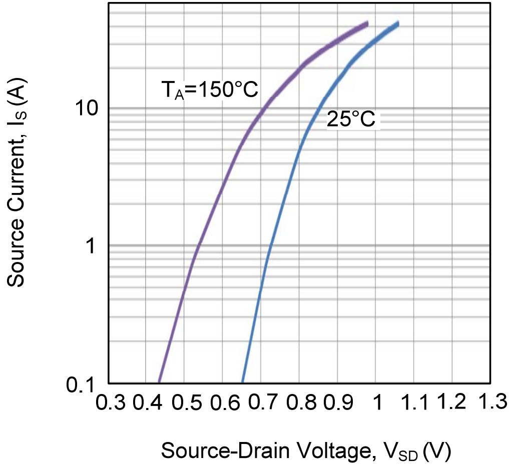


■ TYPICAL CHARACTERISTICS (Cont.)

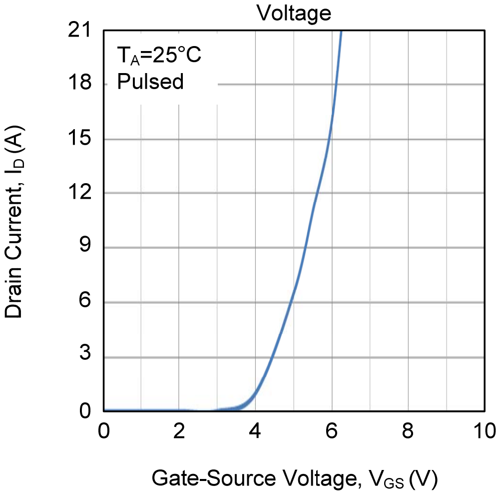
Gate Threshold Voltage vs. Junction Temperature



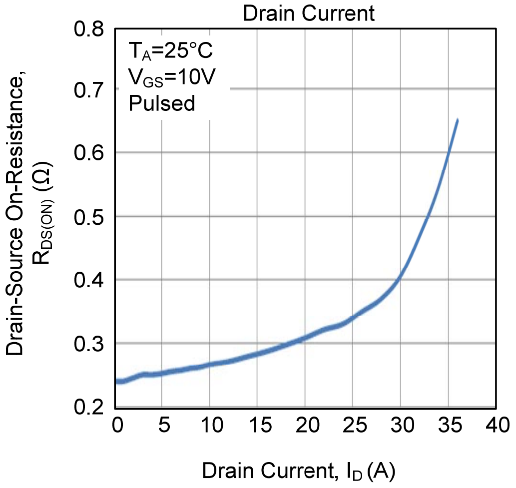
Source Current vs. Source-Drain Voltage



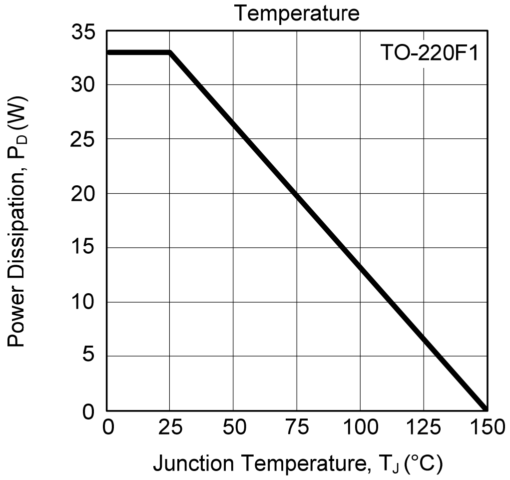
Drain Current vs. Gate-Source Voltage



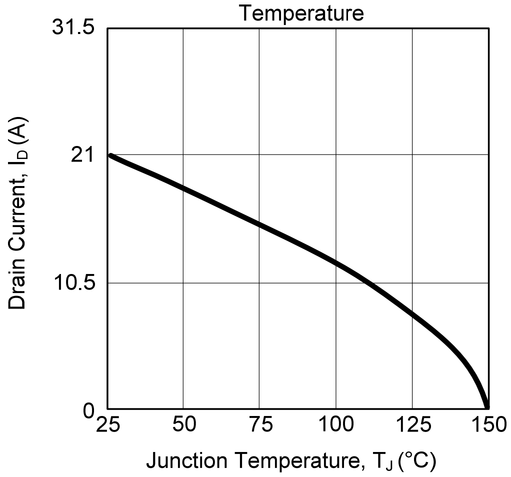
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature



Drain Current vs. Junction Temperature



■ TYPICAL CHARACTERISTICS (Cont.)