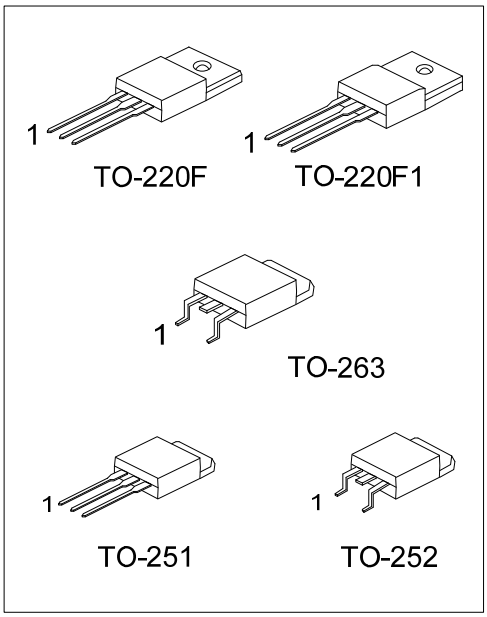
8NM60A

Power MOSFET

8.0A, 600V N-CHANNEL POWER MOSFET



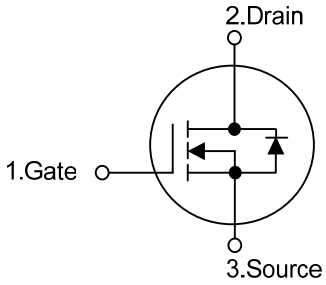
■ DESCRIPTION

The UTC **8NM60A** is a high voltage super junction MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in switching power supplies and adaptors.

■ FEATURES

* $R_{DS(ON)} \leq 0.65\ \Omega$ @ V_{GS}=10V, I_D=4.0A
* Fast Switching Capability
* Improved dv/dt Capability, High Ruggedness

■ SYMBOL



■ ORDERING INFORMATION

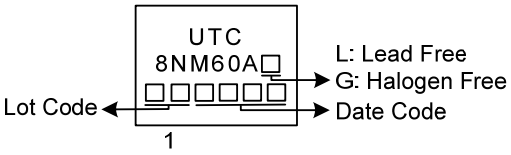
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
8NM60AL-TF1-T	8NM60AG-TF1-T	TO-220F1	G	D	S	Tube
8NM60AL-TF3-T	8NM60AG-TF3-T	TO-220F	G	D	S	Tube
8NM60AL-TM3-T	8NM60AG-TM3-T	TO-251	G	D	S	Tube
8NM60AL-TN3-R	8NM60AG-TN3-R	TO-252	G	D	S	Tape Reel
8NM60AL-TQ2-T	8NM60AG-TQ2-T	TO-263	G	D	S	Tube
8NM60AL-TQ2-R	8NM60AG-TQ2-R	TO-263	G	D	S	Tape Reel

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

8NM60AG-TF1-T
(1)Packing Type
(2)Package Type
(3)Green Package

(1) T: Tube, R: Tape Reel
(2) TF1: TO-220F1, TF3: TO-220F, TM3: TO-251, TN3: TO-252, TQ2: TO-263
(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



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

PARAMETER			SYMBOL	RATINGS	UNIT
Drain-Source Voltage			V_{DSS}	600	V
Gate-Source Voltage			V_{GSS}	±30	V
Drain Current	Continuous	T_C=25°C	I_D	8.0	A
		T_C=100°C		5.2	A
	Pulsed (Note 2)		I_{DM}	24	A
Avalanche Energy	Single Pulsed (Note 3)		E_{AS}	51.2	mJ
Peak Diode Recovery dv/dt (Note 4)			dv/dt	6.5	V/ns
Power Dissipation	TO-263		P_D	80	W
	TO-220F/TO-220F1			28	W
	TO-251/TO-252			54	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=10mH, I_{AS}=3.2A, V_{DD}=50V, R_G=25 Ω, Starting T_J = 25°C
4. I_{SD} ≤ 8.0A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-263/TO-220F TO-220F1	θ_{JA}	62.5	°C/W
	TO-251/TO-252		110	°C/W
Junction to Case	TO-263	θ_{JC}	1.56	°C/W
	TO-220F/TO-220F1		4.46	°C/W
	TO-251/TO-252		2.31 (Note)	°C/W

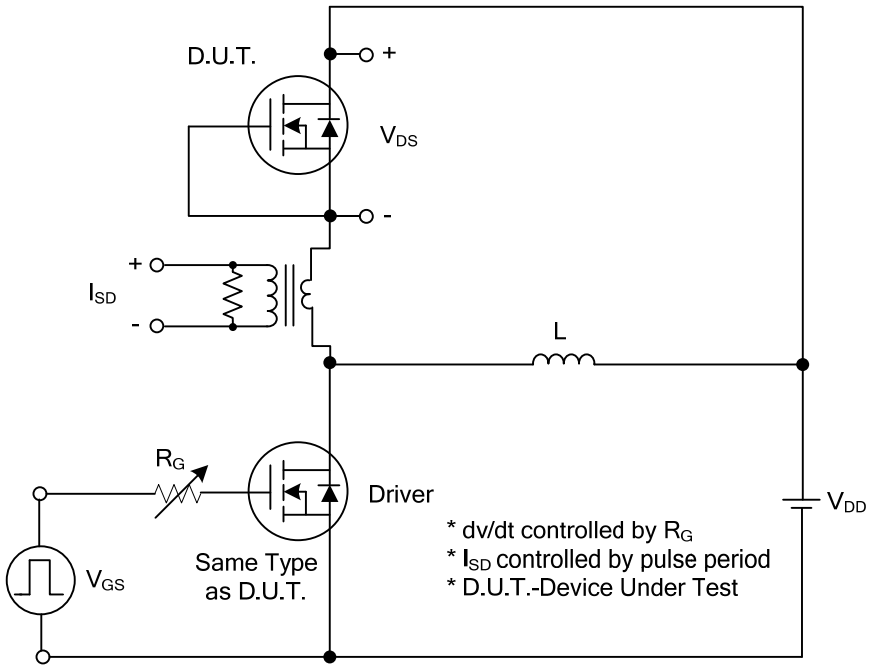
Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

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

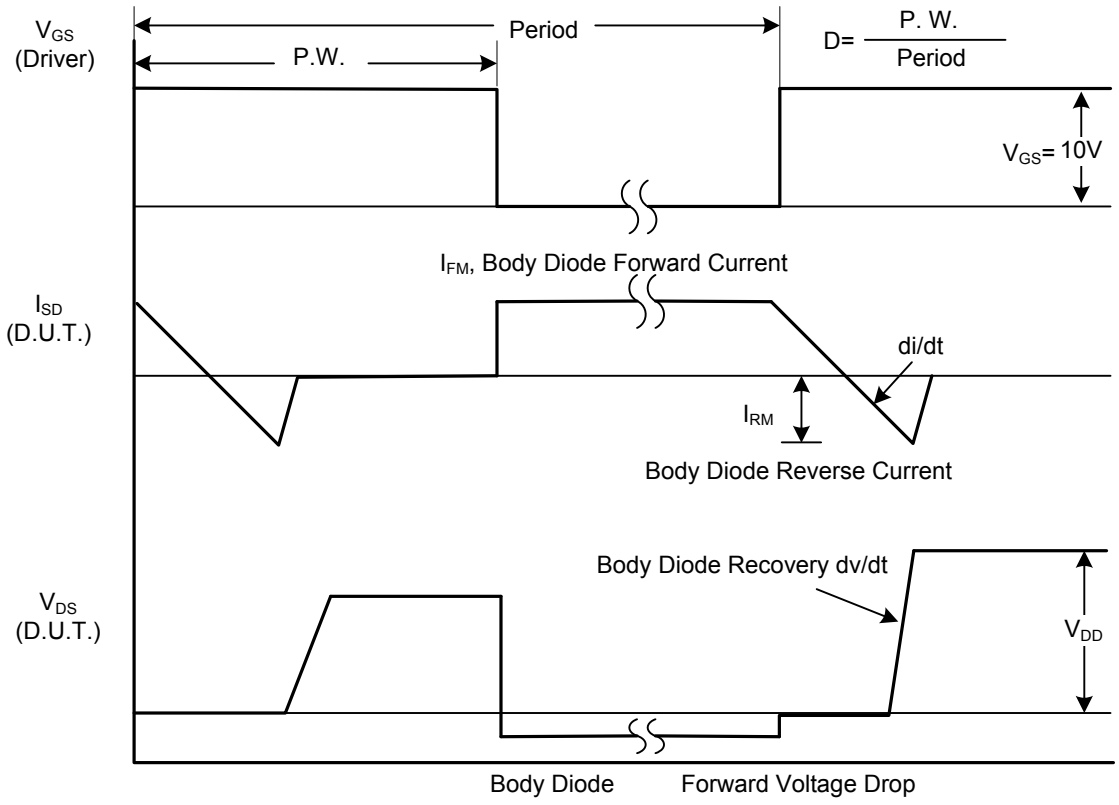
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA	600			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=600V, V_{GS}=0V			10	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=30V, V_{DS}=0V			100	nA
	Reverse		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=4.0A			0.65	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{DS}=50V, V_{GS}=0V, f=1.0 MHz		490		pF
Output Capacitance		C_{OSS}			70		pF
Reverse Transfer Capacitance		C_{RSS}			4.5		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=480V, V_{GS}=10V, I_D=8.0A, (Note 1, 2)		20		nC
Gate to Source Charge		Q_{GS}			4		nC
Gate to Drain Charge		Q_{GD}			7		nC
Turn-on Delay Time (Note 1)		$t_{D(ON)}$	V_{DD}=100V, V_{GS}=10V, I_D=8.0A, R_G =25Ω (Note 1, 2)		7.2		ns
Rise Time		t_R			22		ns
Turn-off Delay Time		$t_{D(OFF)}$			57		ns
Fall-Time		t_F			35		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Pulsed Current		I_S				8	A
Drain-Source Diode Forward Voltage (Note 1)		I_{SM}				24	A
Maximum Body-Diode Continuous Current		V_{SD}	I_S=8.0A, V_{GS}=0V			1.4	V
Reverse Recovery Time (Note 1)		t_{rr}	I_S=8.0A, V_{GS}=0V		346		ns
Reverse Recovery Charge		Q_{rr}	dI_F/dt=100A/μs		4.1		μC

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

■ TEST CIRCUITS AND WAVEFORMS

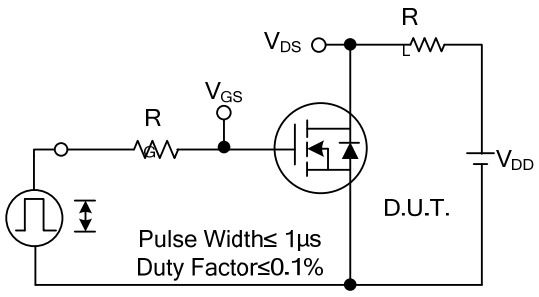


Peak Diode Recovery dv/dt Test Circuit

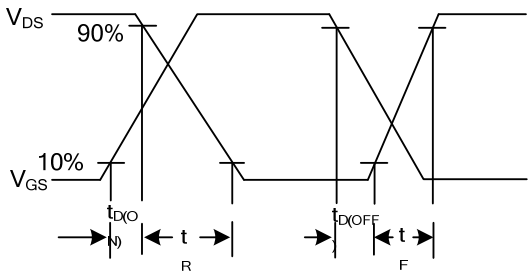


Peak Diode Recovery dv/dt Waveforms

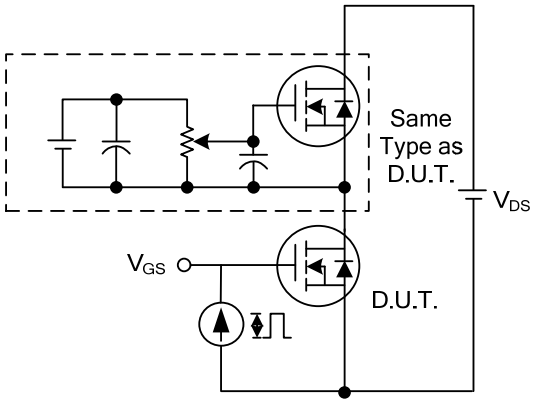
■ TEST CIRCUITS AND WAVEFORMS



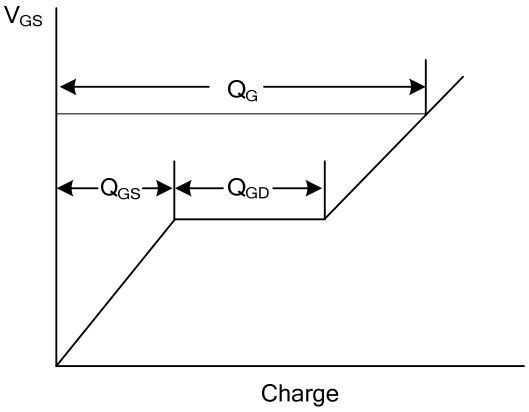
Switching Test Circuit



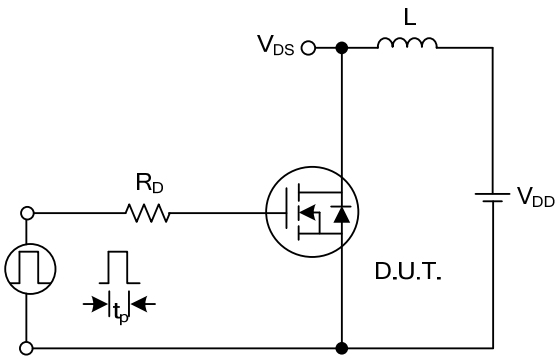
Switching Waveforms



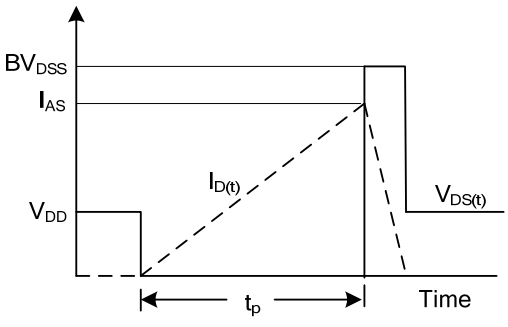
Gate Charge Test Circuit



Gate Charge Waveform



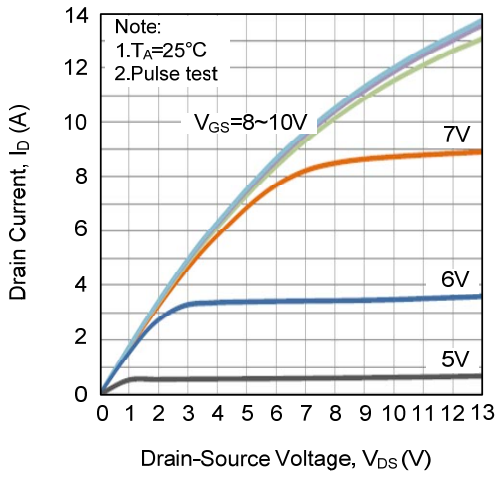
Unclamped Inductive Switching Test Circuit



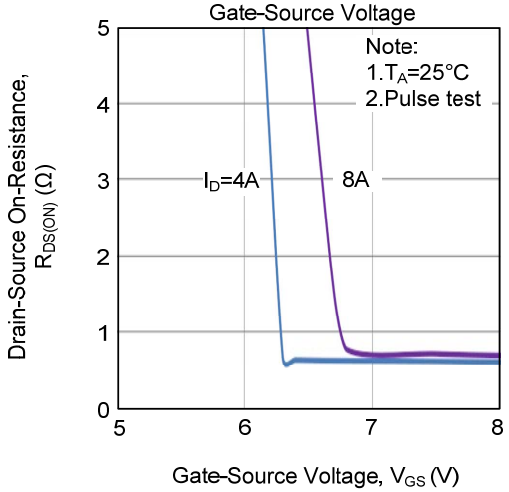
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

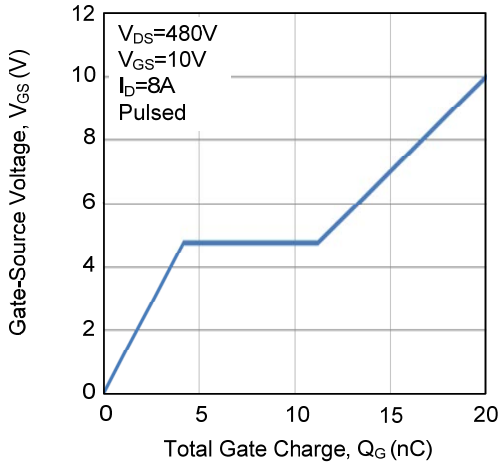
Drain Current vs. Drain-Source Voltage



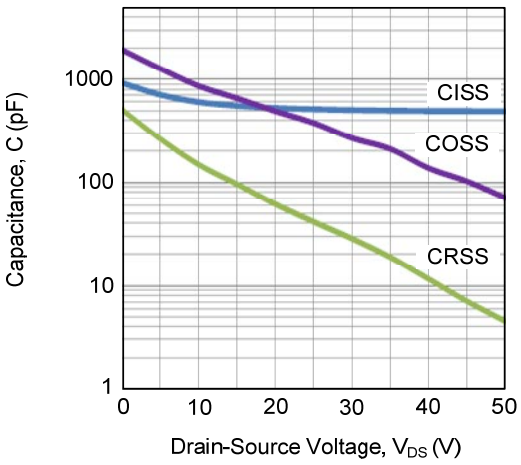
Drain-Source On-Resistance vs. Gate-Source Voltage



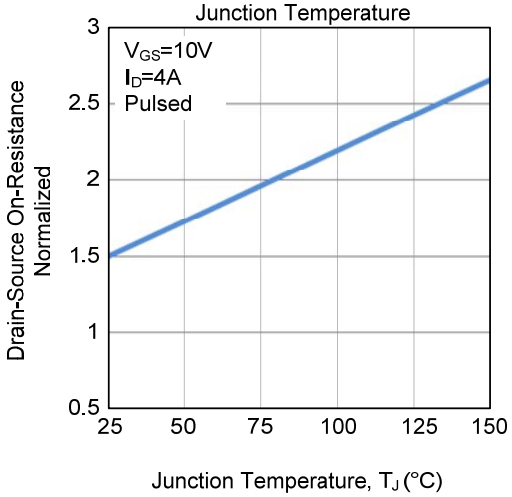
Gate Charge Characteristics



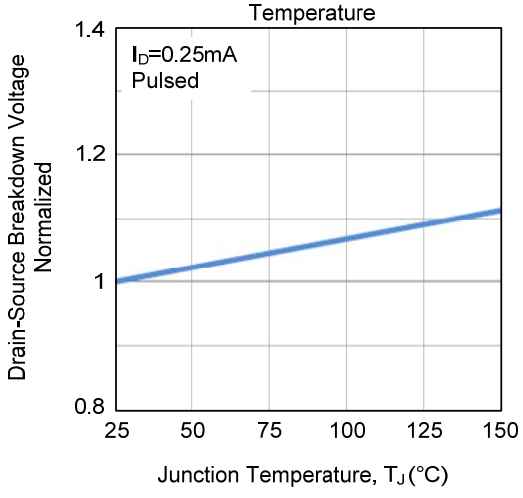
Capacitance Characteristics



Drain-Source On-Resistance vs. Junction Temperature

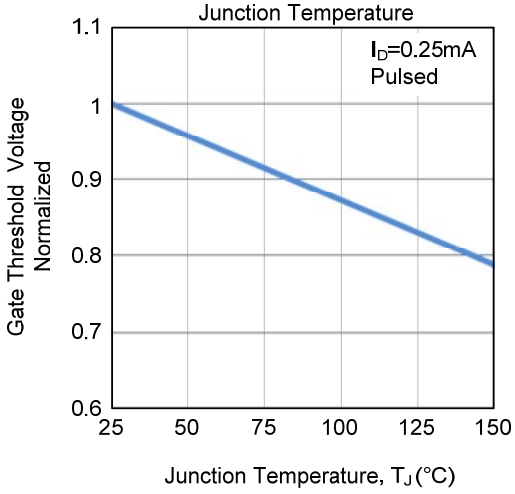


Breakdown Voltage vs. Junction Temperature

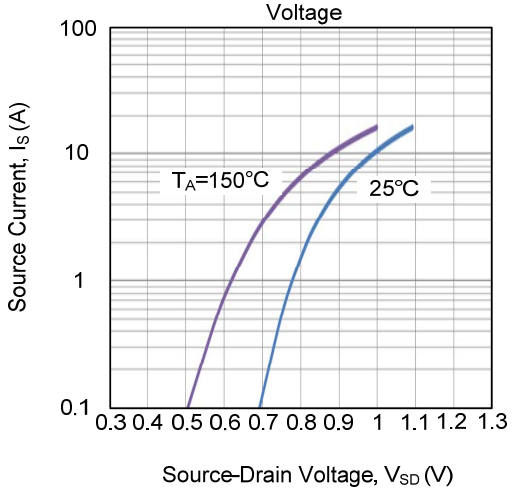


■ TYPICAL CHARACTERISTICS (Cont.)

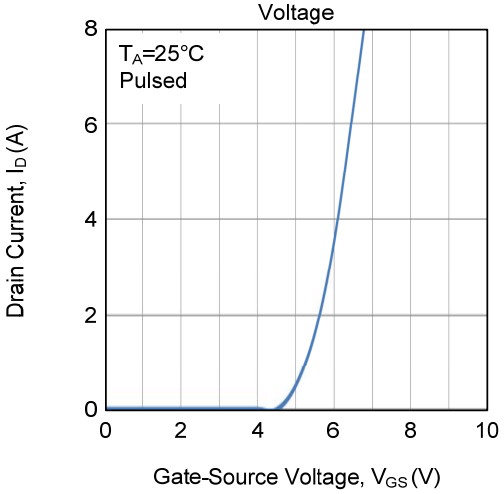
Gate Threshold Voltage vs. Junction Temperature



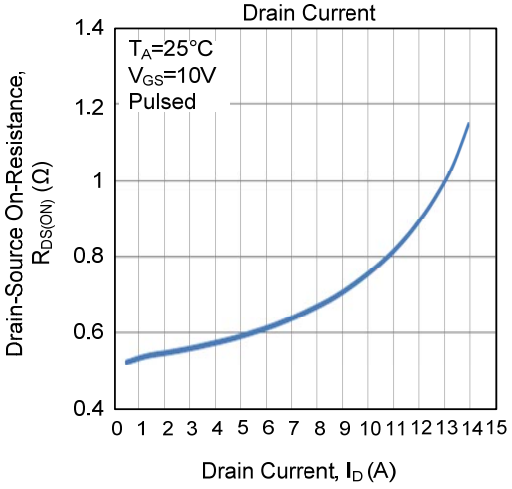
Source Current vs. Source-Drain Voltage



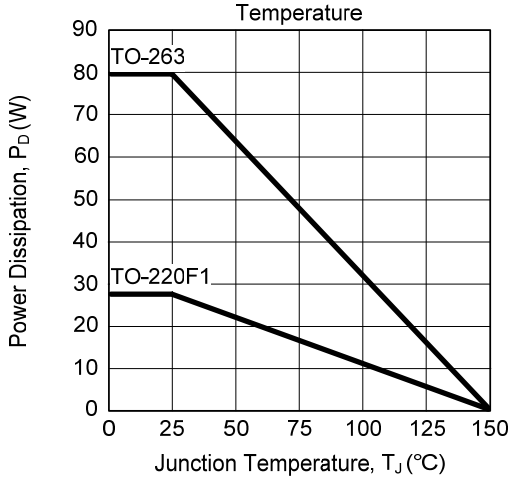
Drain Current vs. Gate-Source Voltage



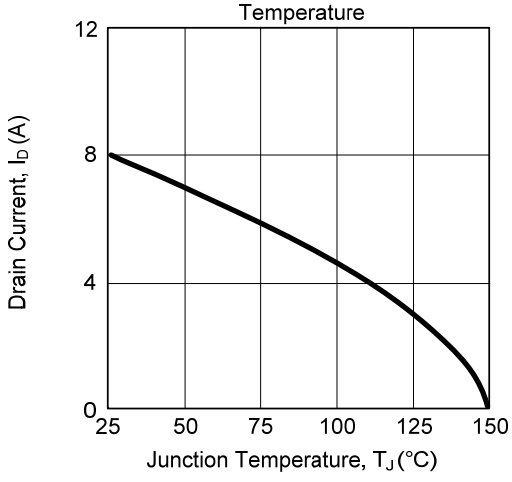
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature



Drain Current vs. Junction Temperature



■ TYPICAL CHARACTERISTICS (Cont.)