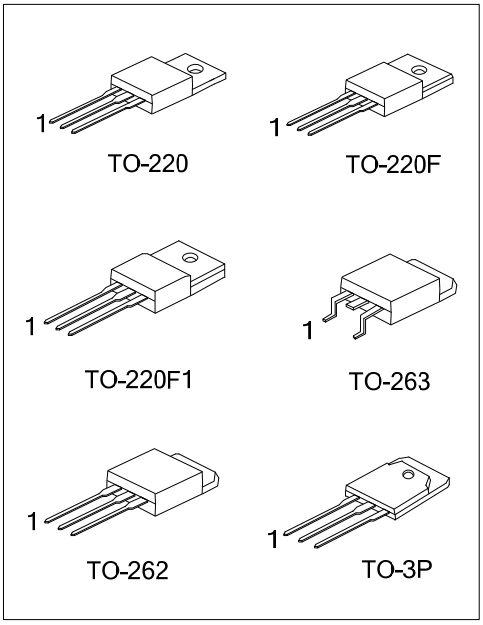
5.0A, 900V N-CHANNEL POWER MOSFET



■ DESCRIPTION

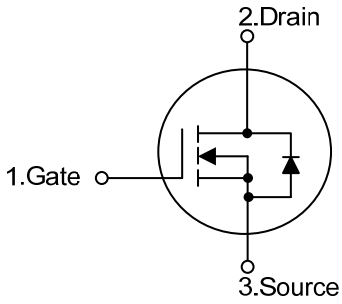
The UTC **5N90** is a N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology specialized in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **5N90** is universally applied in high efficiency switch mode power supply.

■ FEATURES

* $R_{DS(ON)} \leq 2.8\ \Omega$ @ V_{GS}=10V, I_D=2.5A
* High switching speed
* Improved dv/dt capability
* 100% avalanche tested

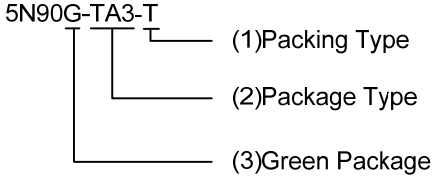
■ SYMBOL



■ ORDERING INFORMATION

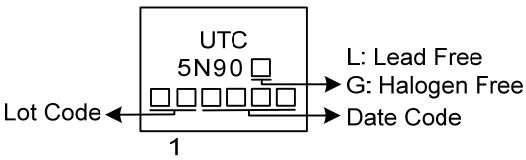
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5N90L-TA3-T	5N90G-TA3-T	TO-220	G	D	S	Tube
5N90L-TF3-T	5N90G-TF3-T	TO-220F	G	D	S	Tube
5N90L-TF1-T	5N90G-TF1-T	TO-220F1	G	D	S	Tube
5N90L-T2Q-T	5N90G-T2Q-T	TO-262	G	D	S	Tube
5N90L-TQ2-T	5N90G-TQ2-T	TO-263	G	D	S	Tube
5N90L-TQ2-R	5N90G-TQ2-R	TO-263	G	D	S	Tape Reel
5N90L-T3P-T	5N90G-T3P-T	TO-3P	G	D	S	Tube

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



(1) T: Tube, R: Tape Reel
(2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1
T2Q: TO-262, TQ2: TO-263, T3P: TO-3P
(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}	900	V
Gate-Source Voltage		V_{GSS}	±30	V
Drain Current	Continuous	I_D	5	A
	Pulsed (Note 2)	I_{DM}	10	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	331	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.2	V/ns
Power Dissipation	TO-220/TO-262/TO-263	P_D	125	W
	TO-220F/TO-220F1		37	W
	TO-3P		220	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=30mH, I_{AS}=4.7A, V_{DD}= 90V, R_G=25Ω, Starting T_J=25°C
4. I_{SD} ≤5.0A, di/dt ≤200A/μs, V_{DD} ≤BV_{DSS}, Starting T_J=25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-262 TO-263	θ_{JA}	62.5	°C/W
	TO-3P		40	
Junction to Case	TO-220/TO-262 TO-263	θ_{JC}	1	°C/W
	TO-220F/TO-220F1		3.38	
	TO-3P		0.56	

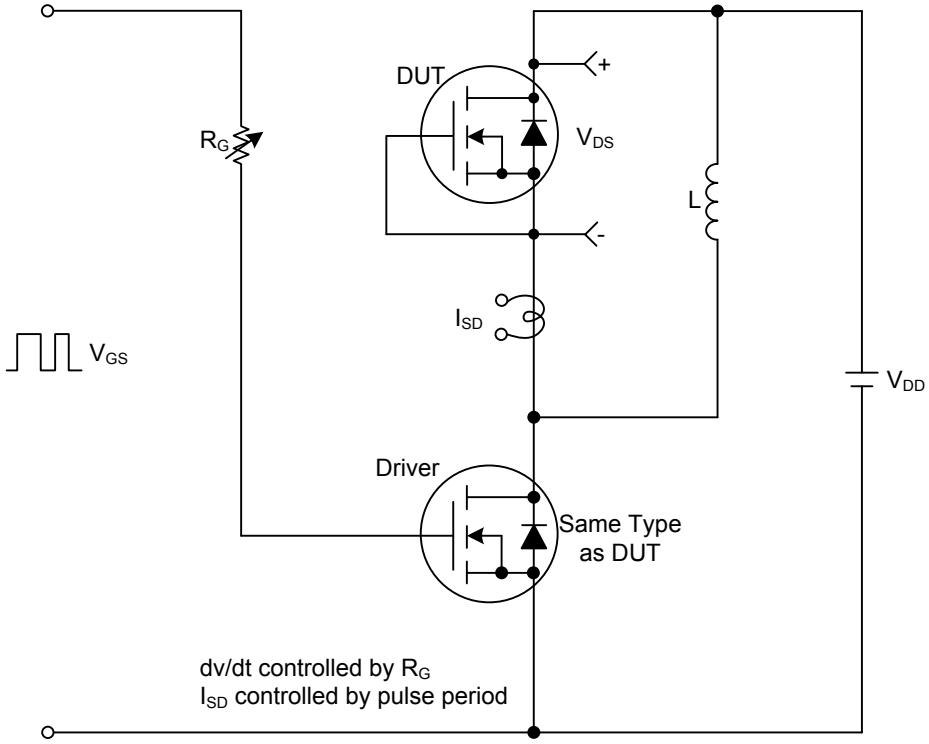
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

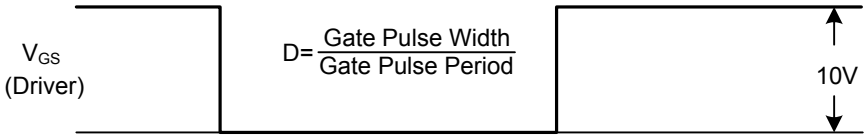
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA	900			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=900V, V_{GS}=0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{DS}=0V ,V_{GS}=30V			100	nA
	Reverse		V_{DS}=0V ,V_{GS}=-30V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	3.0		5.0	V
Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=2.5A			2.8	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{DS}=25V,V_{GS}=0V, f=1.0MHz		1190		pF
Output Capacitance		C_{OSS}			104.7		pF
Reverse Transfer Capacitance		C_{RSS}			14.1		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q_G	V_{DS}=720V, V_{GS}=10V, I_D=5A (Note 1,2)		45.4		nC
Gate-Source Charge		Q_{GS}			14.4		nC
Gate-Drain Charge		Q_{GD}			13		nC
Turn-ON Delay Time		$t_{D(ON)}$	V_{DD}=100V, I_D=5A, R_G=25Ω (Note 1,2)		18		ns
Turn-ON Rise Time		t_R			21		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			96		ns
Turn-OFF Fall Time		t_F			40		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				5	A
Maximum Body-Diode Pulsed Current		I_{SM}				10	A
Drain-Source Diode Forward Voltage		V_{SD}	I_S =5A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time		t_{rr}	V_{GS}=0V, I_S=5.0A, dI_F/dt=100A/μs (Note 1)		472		ns
Body Diode Reverse Recovery Charge		Q_{RR}			6		μC

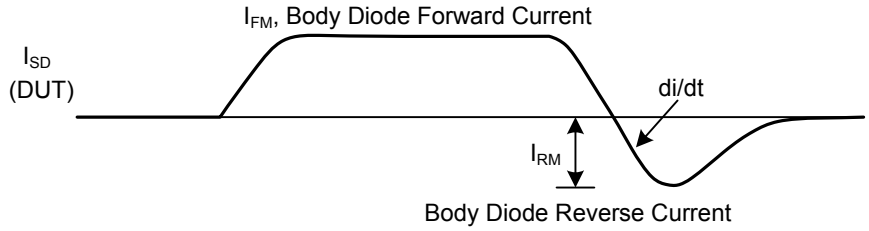
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%
2. Essentially independent of operating temperature.

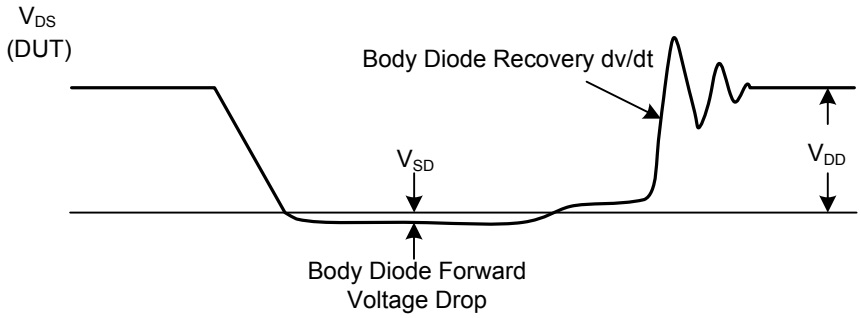
■ TEST CIRCUITS AND WAVEFORMS

Peak Diode Recovery dv/dt Test Circuit & Waveforms

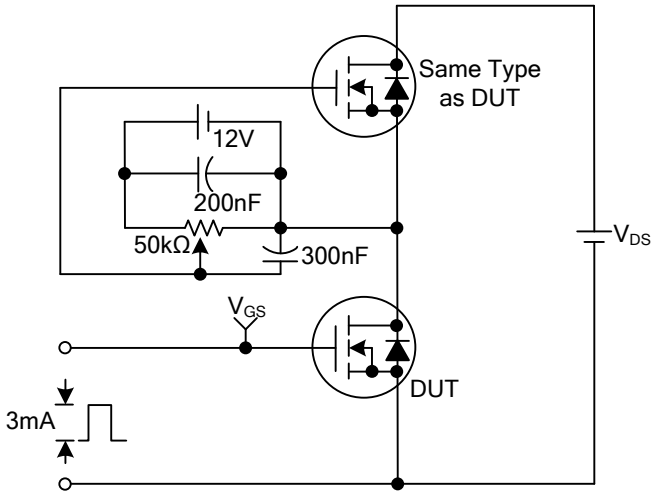




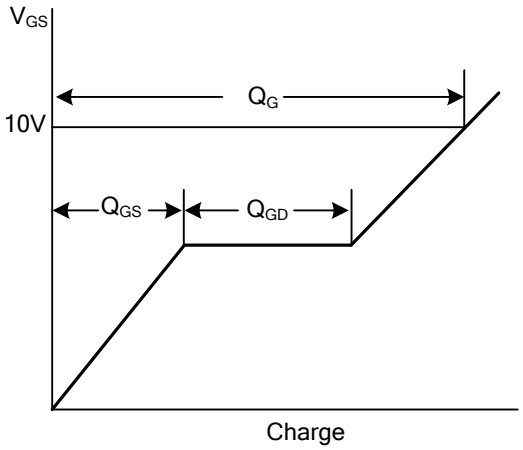




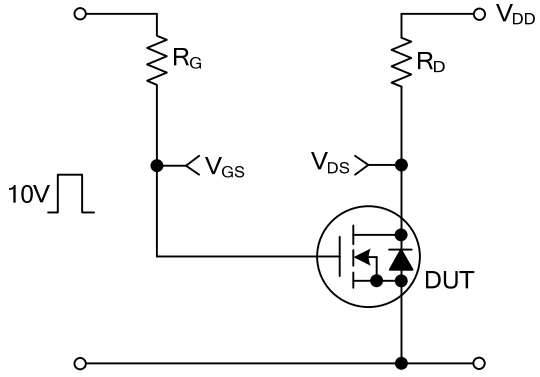
■ TEST CIRCUITS AND WAVEFORMS



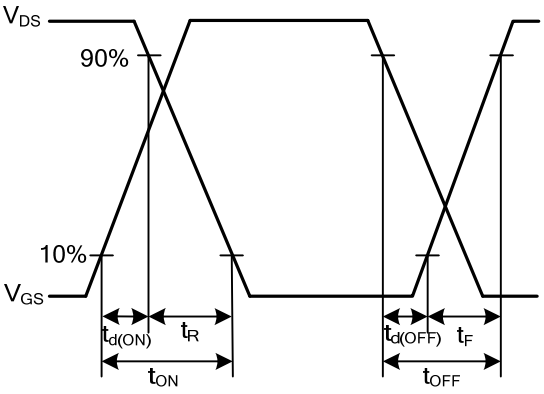
Gate Charge Test Circuit



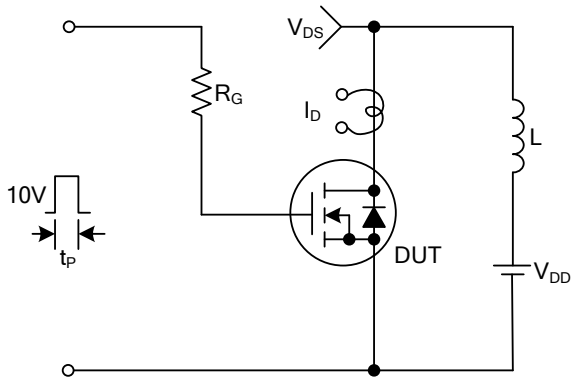
Gate Charge Waveforms



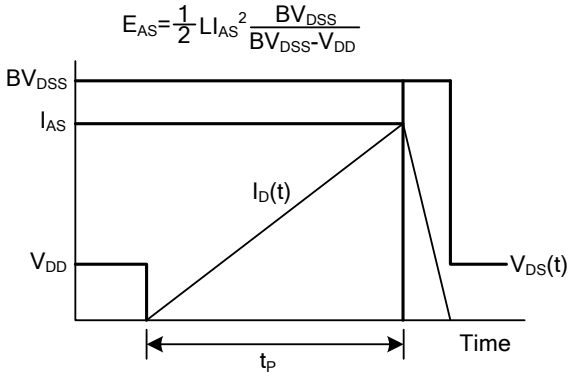
Resistive Switching Test Circuit



Resistive Switching Waveforms



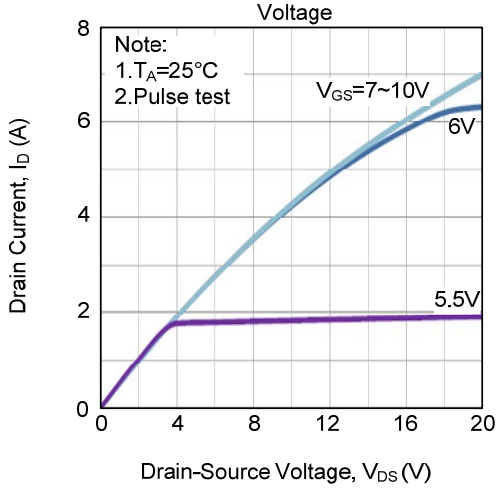
Unclamped Inductive Switching Test Circuit



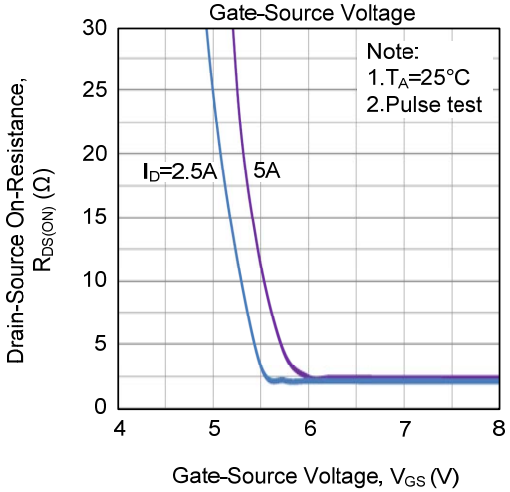
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

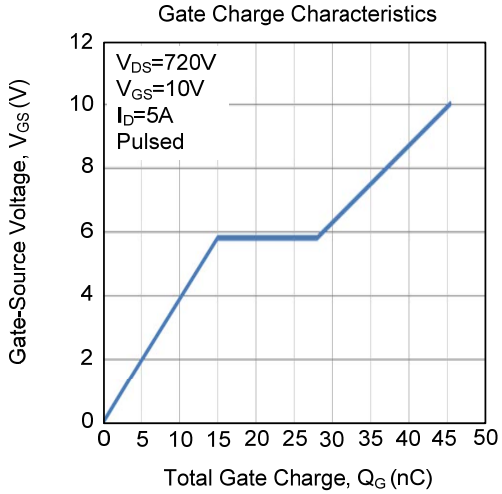
Drain Current vs. Drain-Source Voltage



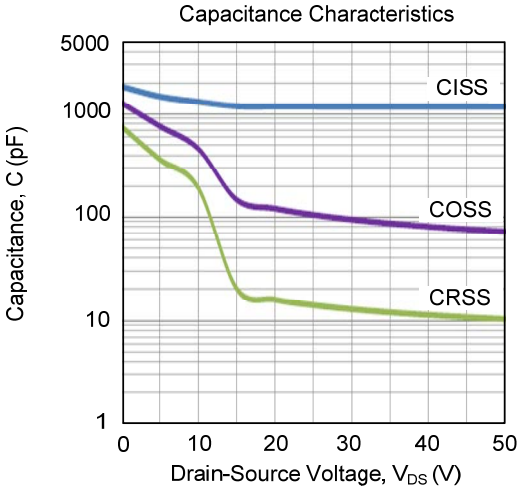
Drain-Source On-Resistance vs. Gate-Source Voltage



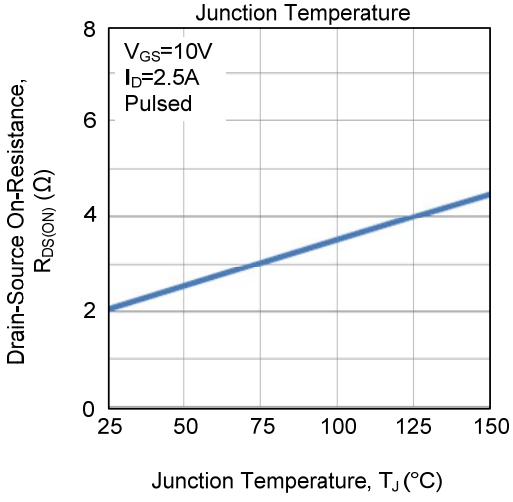
Gate Charge Characteristics



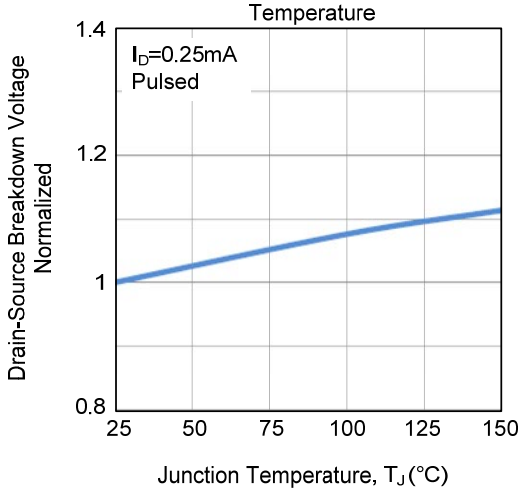
Capacitance Characteristics



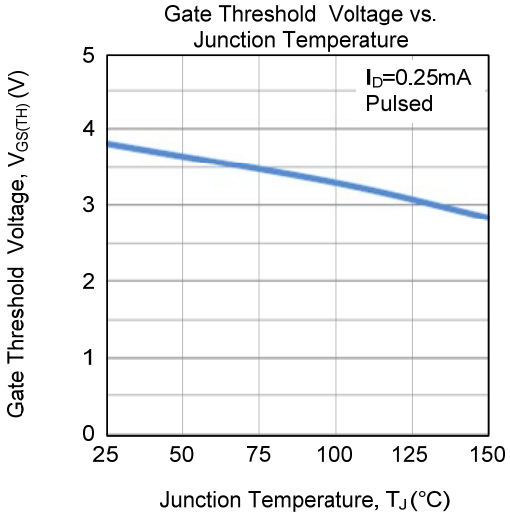
Drain-Source On-Resistance vs. Junction Temperature

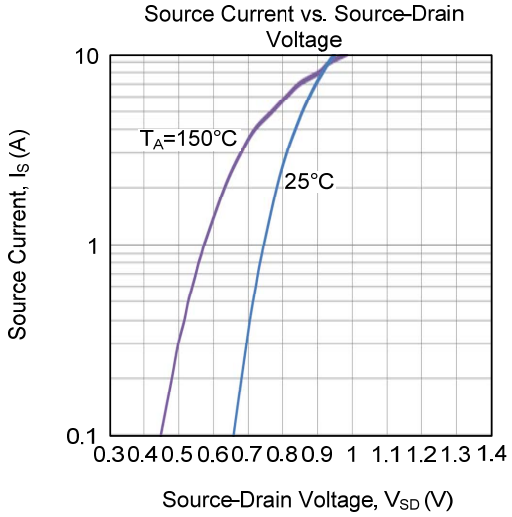


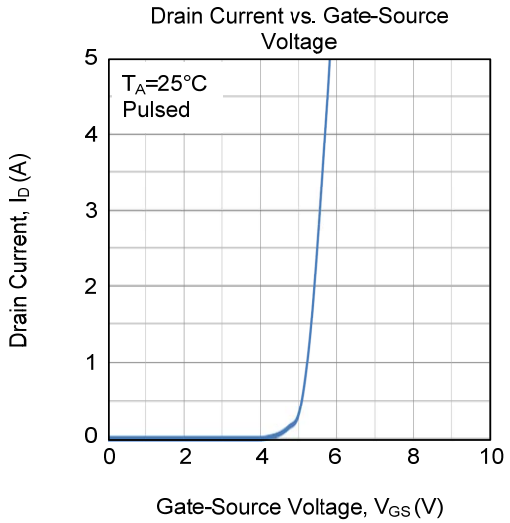
Breakdown Voltage vs. Junction Temperature

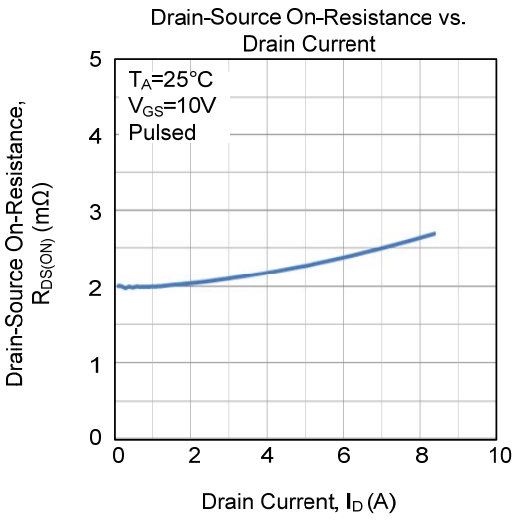


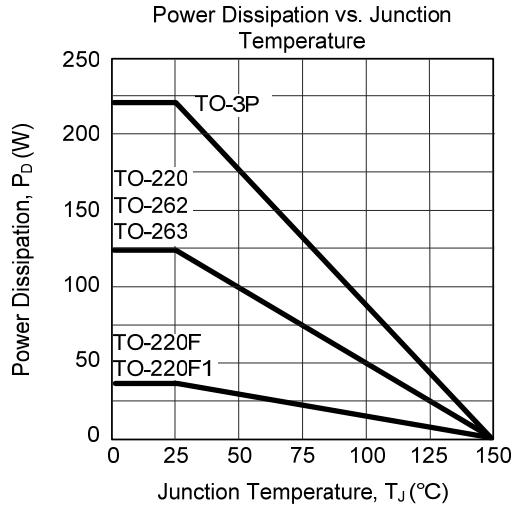
■ TYPICAL CHARACTERISTICS (Cont.)

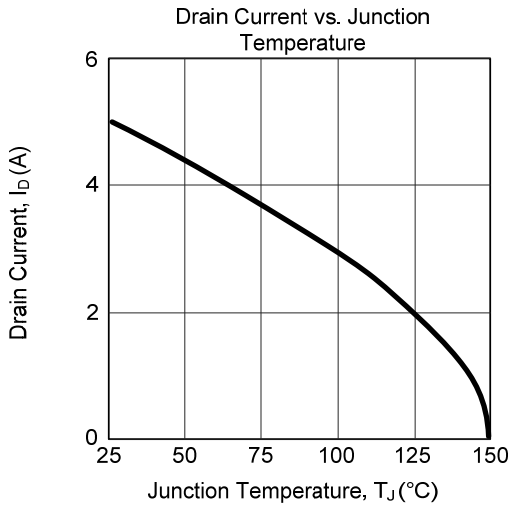












■ TYPICAL CHARACTERISTICS (Cont.)