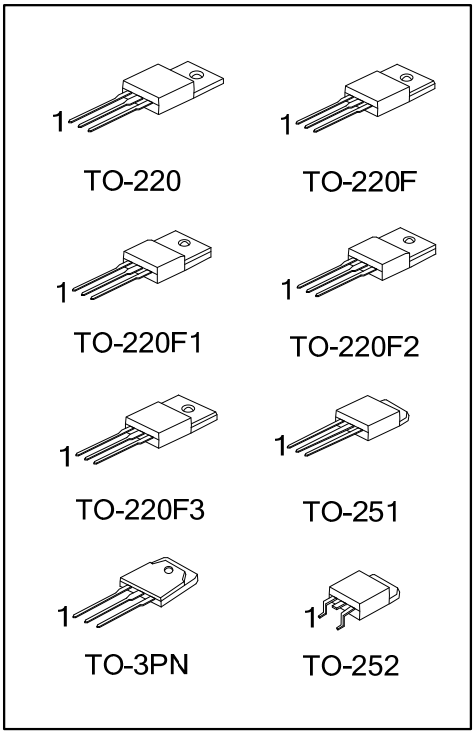
4N90

Power MOSFET

4.0A, 900V N-CHANNEL POWER MOSFET



■ DESCRIPTION

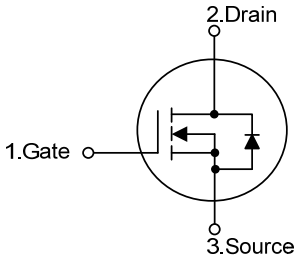
The UTC **4N90** is a N-channel enhancement MOSFET adopting UTC's advanced technology to provide customers with DMOS, planar stripe technology. This technology is designed to meet the requirements of the minimum on-state resistance and perfect switching performance. It also can withstand high energy pulse in the avalanche and communication mode.

The UTC **4N90** is particularly applied in high efficiency switch mode power supplies.

■ FEATURES

* $R_{DS(ON)} \leq 4.2\ \Omega$ @ V_{GS}=10V, I_D=2.0A
* High switching speed
* 100% avalanche tested
* Improved dv/dt capability

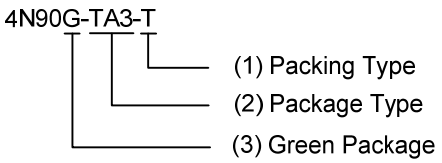
■ SYMBOL



■ ORDERING INFORMATION

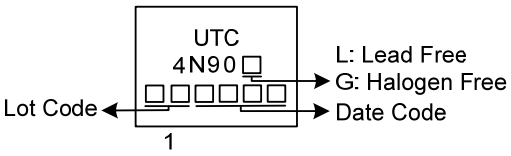
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
4N90L-TA3-T	4N90G-TA3-T	TO-220	G	D	S	Tube
4N90L-TF3-T	4N90G-TF3-T	TO-220F	G	D	S	Tube
4N90L-TF1-T	4N90G-TF1-T	TO-220F1	G	D	S	Tube
4N90L-TF2-T	4N90G-TF2-T	TO-220F2	G	D	S	Tube
4N90L-TF3T-T	4N90G-TF3T-T	TO-220F3	G	D	S	Tube
4N90L-TM3-T	4N90G-TM3-T	TO-251	G	D	S	Tube
4N90L-TN3-R	4N90G-TN3-R	TO-252	G	D	S	Tape Reel
4N90L-T3N-T	4N90G-T3N-T	TO-3PN	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
TF2: TO-220F2, TF3T: TO-220F3, TM3: TO-251
TN3: TO-252, T3N: TO-3PN
(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 to Source Voltage		V_{DSS}	900	V
Gate to Source Voltage		V_{GSS}	±30	V
Avalanche Current (Note 2)		I_{AR}	4	A
Continuous Drain Current	Continuous	I_D	4	A
	Pulsed (Note 2)	I_{DM}	16	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	570	mJ
	Repetitive (Note 2)	E_{AR}	14	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation (T_C=25°C)	TO-220	P_D	120	W
	TO-220F/TO-220F1 TO-220F3		34	W
	TO-220F2		40	W
	TO-251/TO-252		54	W
	TO-3PN		208	W
Derate above 25°C	TO-220		0.96	W/°C
	TO-220F/TO-220F1 TO-220F3		0.272	W/°C
	TO-220F2		0.32	W/°C
	TO-251/TO-252		0.43	W/°C
	TO-3PN		1.66	W/°C
Operating 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=67mH, I_{AS}=4A, V_{DD}=50V, R_G=25Ω, Starting T_J=25°C
4. I_{SD} ≤4A, di/dt ≤200A/μs, V_{DD} ≤BV_{DSS}, Starting T_J=25°C

■ THERMAL DATA

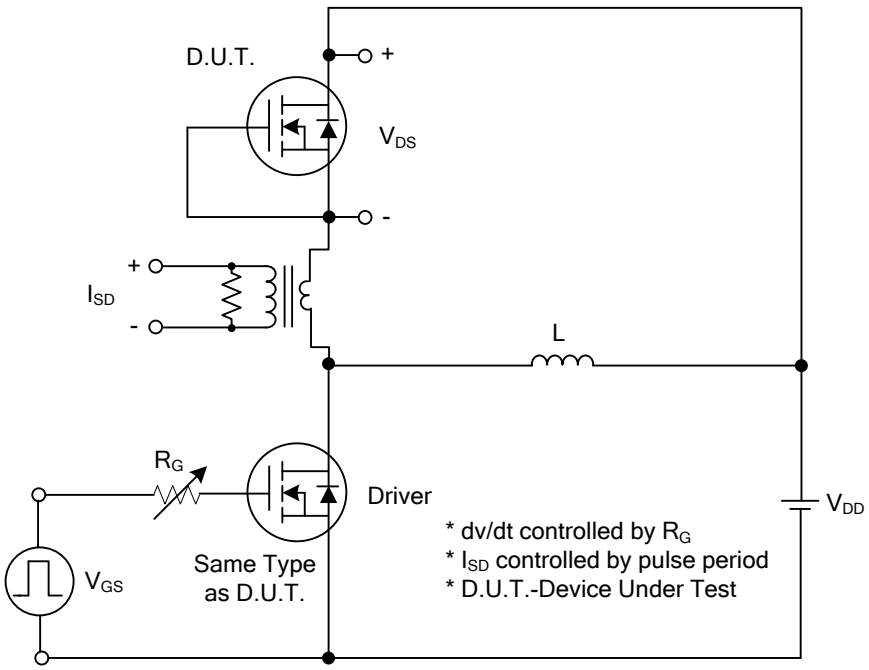
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2 TO-220F3	θ_{JA}	62.5	°C/W
	TO-251/TO-252		110	°C/W
	TO-3PN		40	°C/W
Junction to Case	TO-220	θ_{JC}	1.04	°C/W
	TO-220F/TO-22F1 TO-22F3		3.67	°C/W
	TO-220F2		3.12	°C/W
	TO-251/TO-252		2.3	°C/W
	TO-3PN		0.6	°C/W

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

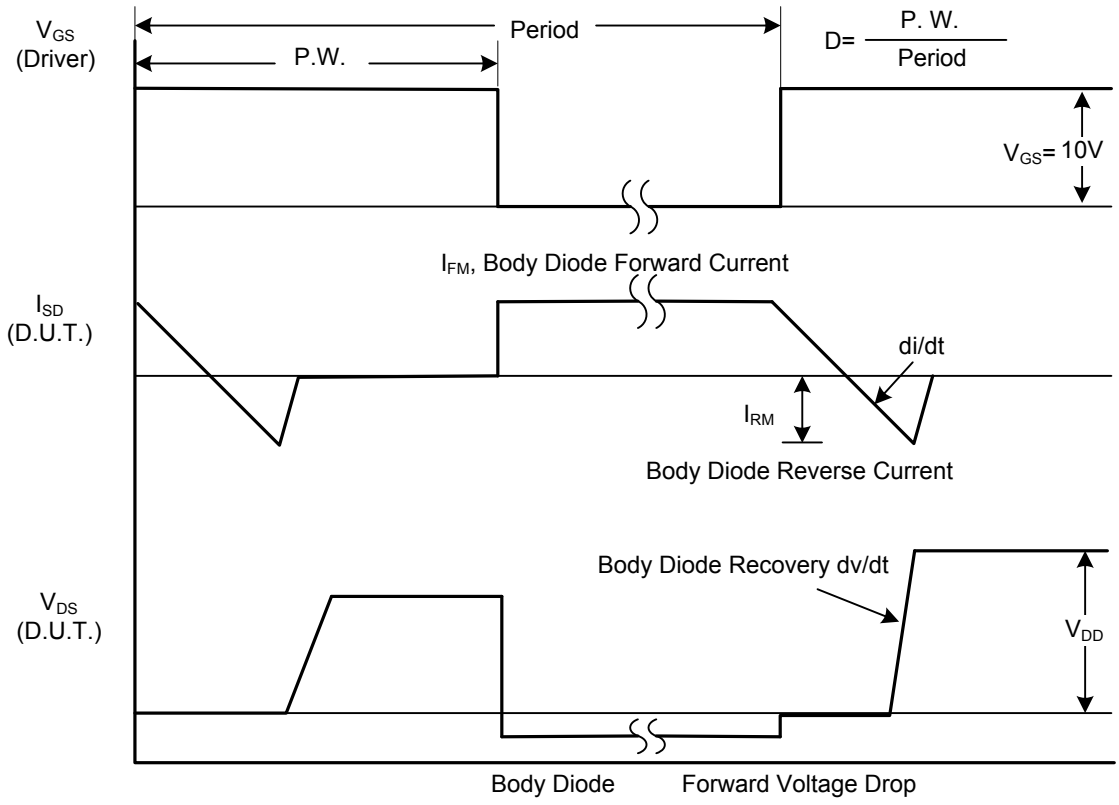
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V,I_D=250μA	900			V
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	I_D=250μA, Referencedto25°C		1.05		V/°C
Drain-Source Leakage Current		I_{DSS}	V_{DS}=900V,V_{GS}=0V			10	μA
			V_{DS}=720V,T_C=125°C			100	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=+30V, V_{DS}=0V			+100	nA
	Reverse	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	3.0		5.0	V
Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=2.0A			4.2	Ω
Forward Transconductance		g_{FS}	V_{DS}=10V, I_D=2.0A	3.5			S
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{DS}=25V,V_{GS}=0V,f=1.0MHz		1094		pF
Output Capacitance		C_{OSS}			101		pF
Reverse Transfer Capacitance		C_{RSS}			13.3		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q_G	V_{DS}=250V, V_{GS}=10V, I_D=4.0A (Note 1,2)		39		nC
Gate-Source Charge		Q_{GS}			12		nC
Gate-Drain Charge		Q_{GD}			9.7		nC
Turn-ON Delay Time		$t_{D(ON)}$	V_{DD}=100V, I_D=4.0A, R_G=25Ω (Note 1,2)		14		ns
Turn-ON Rise Time		t_R			18.8		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			82.4		ns
Turn-OFF Fall Time		t_F			35.5		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				4	A
Maximum Body-Diode Pulsed Current		I_{SM}				16	A
Drain-Source Diode Forward Voltage		V_{SD}	I_S=4.0A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t_{rr}	I_S=4.0A, V_{GS}=0V, dI_F/dt=100A/μs		440		nS
Body Diode Reverse Recovery Charge		Q_{rr}			5.2		μC

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

■ TEST CIRCUITS AND WAVEFORMS

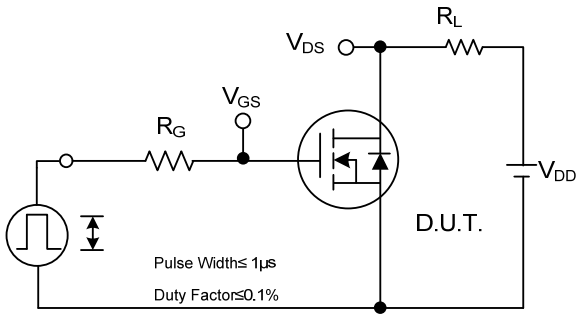


Peak Diode Recovery dv/dt Test Circuit

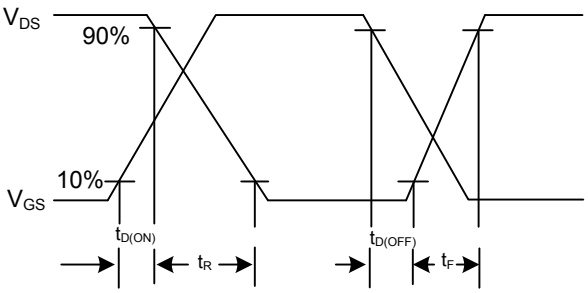


Peak Diode Recovery dv/dt Waveforms

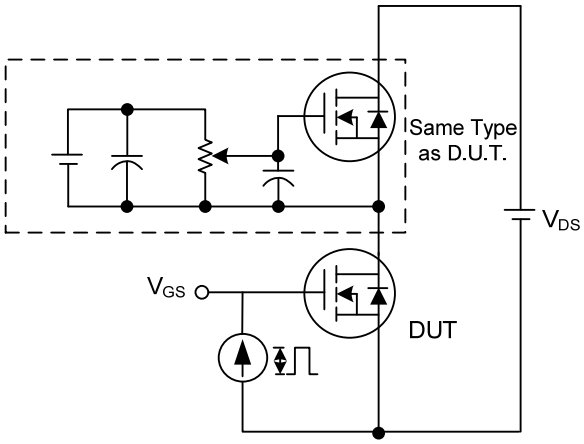
■ TEST CIRCUITS AND WAVEFORMS



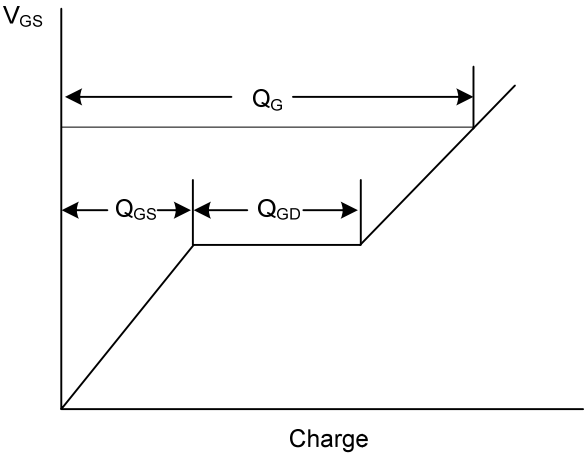
Switching Test Circuit



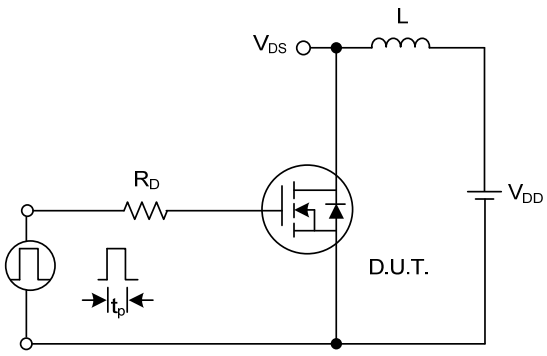
Switching Waveforms



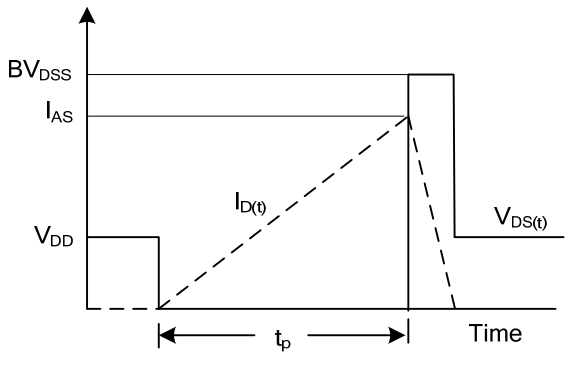
Gate Charge Test Circuit



Gate Charge Waveform



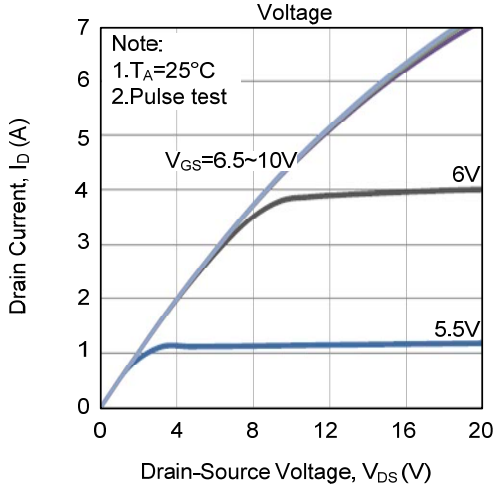
Unclamped Inductive Switching Test Circuit



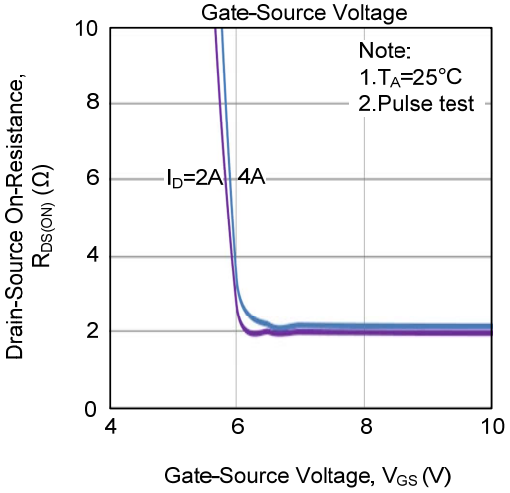
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

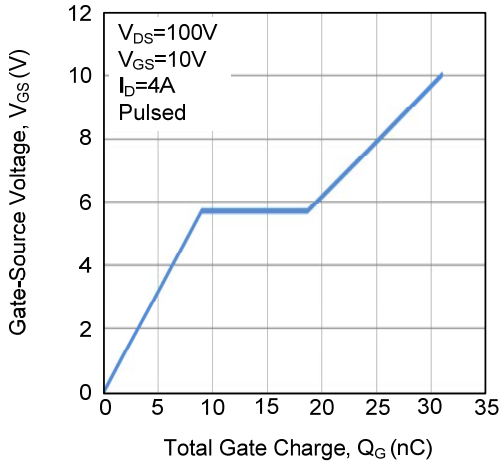
Drain Current vs. Drain-Source Voltage



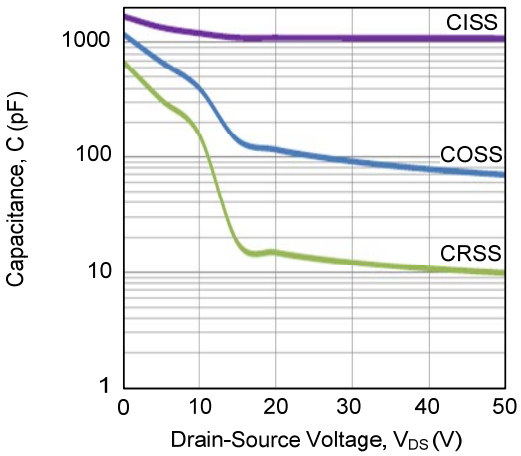
Drain-Source On-Resistance vs. Gate-Source Voltage



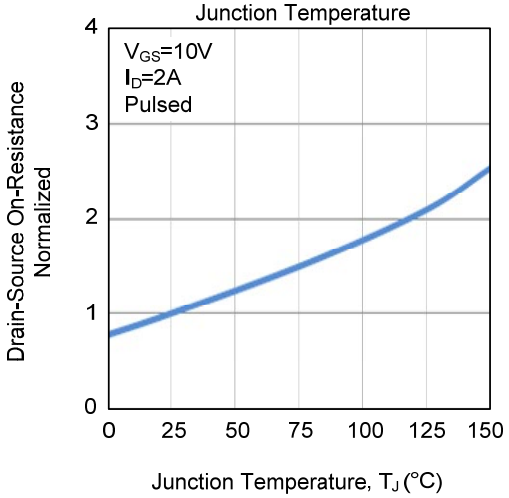
Gate Charge Characteristics



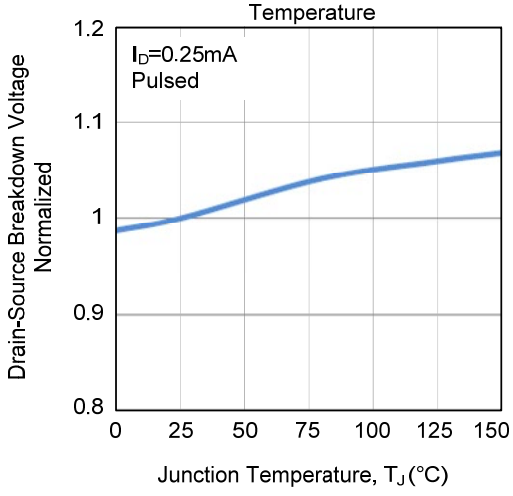
Capacitance Characteristics



Drain-Source On-Resistance vs. Junction Temperature

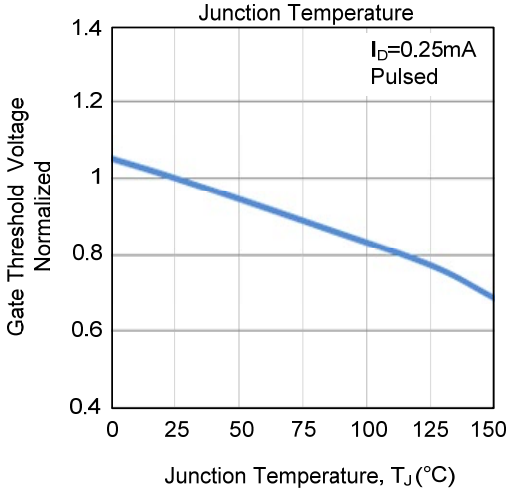


Breakdown Voltage vs. Junction Temperature

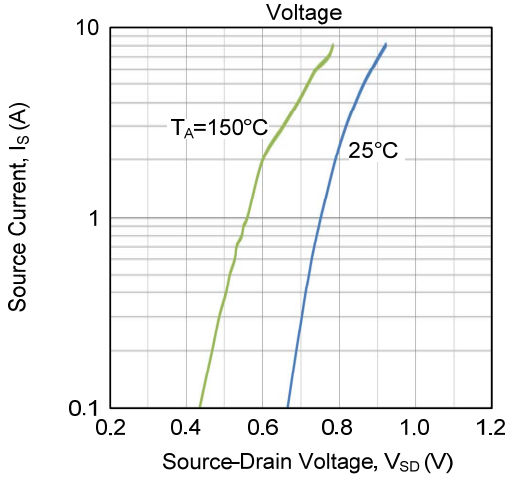


■ TYPICAL CHARACTERISTICS (Cont.)

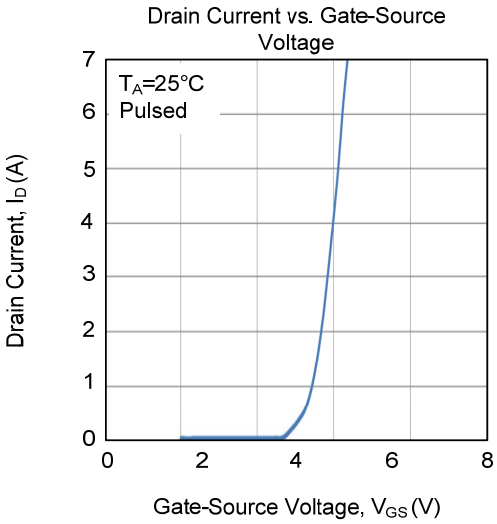
Gate Threshold Voltage vs. Junction Temperature



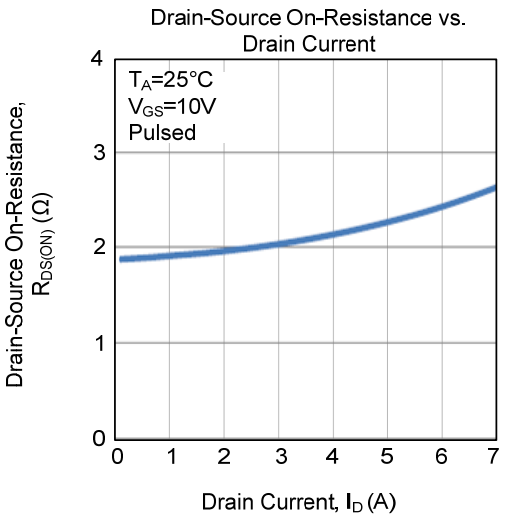
Source Current vs. Source-Drain Voltage



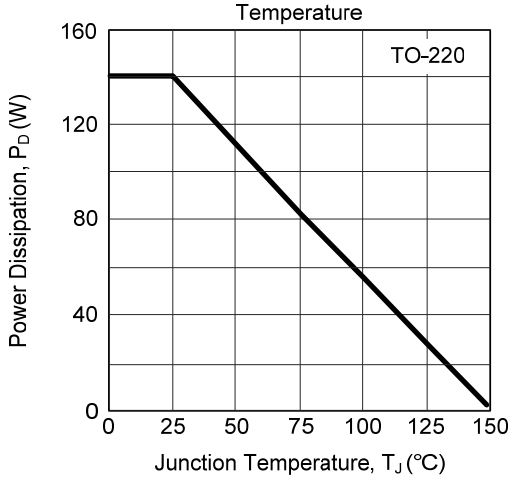
Drain Current vs. Gate-Source Voltage



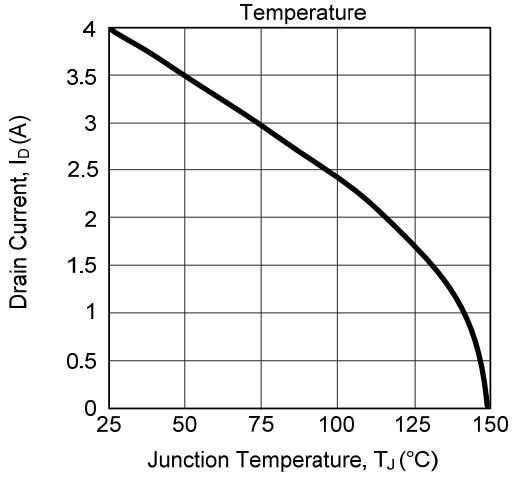
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature



Drain Current vs. Junction Temperature



■ TYPICAL CHARACTERISTICS (Cont.)