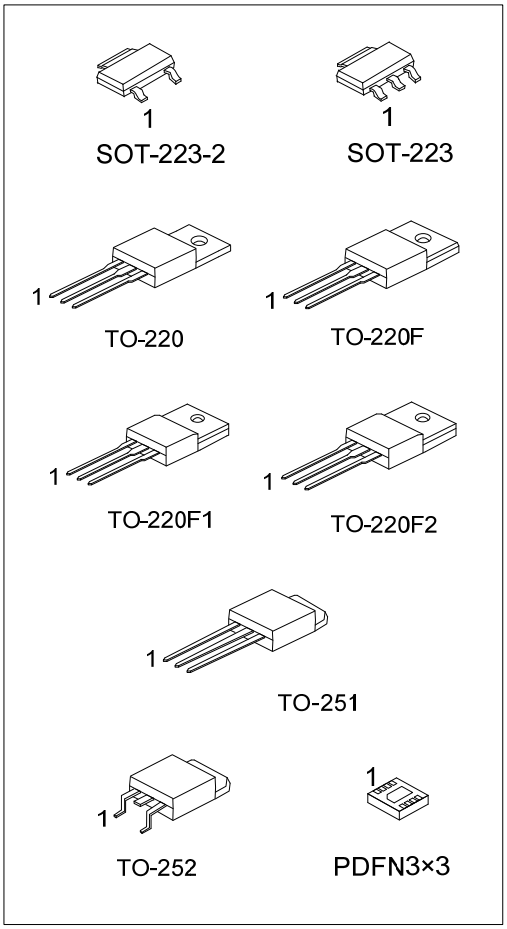
2NM70

Power MOSFET

2.0A, 700V N-CHANNEL SUPER-JUNCTION MOSFET



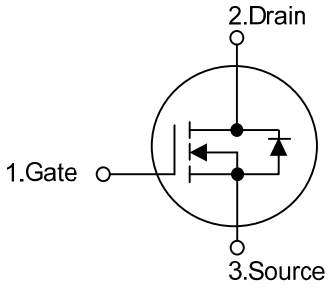
■ DESCRIPTION

The UTC **2NM70** is an Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient AC to DC converters and bridge circuits.

■ FEATURES

* $R_{DS(ON)} \leq 3.0\ \Omega$ @ V_{GS}=10V, I_D=1.0A
* Fast switching capability
* Avalanche energy specified
* Improved dv/dt capability, high ruggedness

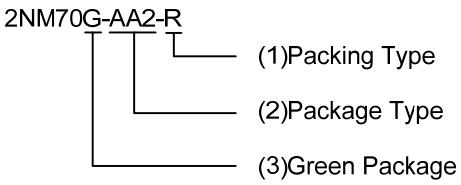
■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
2NM70L-AA2-R	2NM70G-AA2-R	SOT-223-2	G	D	S	-	-	-	-	-	Tape Reel
2NM70L-AA3-R	2NM70G-AA3-R	SOT-223	G	D	S	-	-	-	-	-	Tape Reel
2NM70L-TA3-T	2NM70G-TA3-T	TO-220	G	D	S	-	-	-	-	-	Tube
2NM70L-TF1-T	2NM70G-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	Tube
2NM70L-TF2-T	2NM70G-TF2-T	TO-220F2	G	D	S	-	-	-	-	-	Tube
2NM70L-TF3-T	2NM70G-TF3-T	TO-220F	G	D	S	-	-	-	-	-	Tube
2NM70L-TM3-T	2NM70G-TM3-T	TO-251	G	D	S	-	-	-	-	-	Tube
2NM70L-TN3-R	2NM70G-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
2NM70L-P3030-R	2NM70G-P3030-R	PDFN3×3	S	S	S	G	D	D	D	D	Tape Reel

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

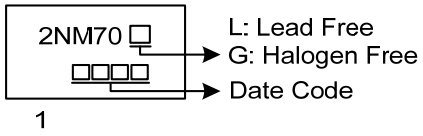
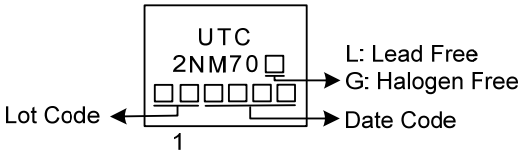
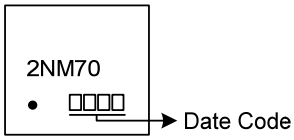


(1) T: Tube, R: Tape Reel

(2) AA2: SOT-223-2, AA3: SOT-223, TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TM3: TO-251, TN3: TO-252, P3030: PDFN3×3

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

■ MARKING

PACKAGE	MARKING
SOT-223-2 / SOT-223	
TO-220 / TO-220F TO-220F1 / TO-220F2 TO-251 / TO-252	
PDFN3×3	

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	700	V
Gate-Source Voltage		V_{GSS}	±30	V
Drain Current	Continuous	I_D	2	A
	Pulsed (Note 2)	I_{DM}	4	A
Avalanche Current (Note 2)		I_{AR}	1	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	33	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3.6	V/ns
Power Dissipation	SOT-223-2/SOT-223	P_D	8	W
	TO-220		65	W
	TO-220F/TO-220F1 TO-220F2		22	W
	TO-251/TO-252		30	W
	PDFN3×3		15	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}=1.5A, V_{DD}=50V, R_G=25 Ω, Starting T_J = 25°C
4. I_{SD}≤2.0A, di/dt≤200A/μs, V_{DD}≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223-2/SOT-223	θ_{JA}	150	°C/W
	TO-220/TO-220F TO-220F1/TO-220F2		62.5	°C/W
	TO-251/TO-252		110	°C/W
	PDFN3×3		130	°C/W
Junction to Case	SOT-223-2/SOT-223	θ_{JC}	15.6	°C/W
	TO-220		1.92	°C/W
	TO-220F/TO-220F1 TO-220F2		5.68	°C/W
	TO-251/TO-252		4.24	°C/W
	PDFN3×3		8.3	°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	700			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=700V, 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=1.0A			3.0	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1MHz		150		pF
Output Capacitance		C_{OSS}			73		pF
Reverse Transfer Capacitance		C_{RSS}			12		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=560V, V_{GS}=10V, I_D=2.0A (Note 1, 2)		12		nC
Gate to Source Charge		Q_{GS}			5		nC
Gate to Drain Charge		Q_{GD}			3		nC
Turn-ON Delay Time (Note 1)		$t_{D(ON)}$	V_{DS}=100V, V_{GS}=10V, I_D=2.0A R_G=25Ω (Note 1, 2)		4		ns
Rise Time		t_R			17		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			22		ns
Fall-Time		t_F			28		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_{SD}				2	A
Maximum Body-Diode Pulsed Current		I_{SM}				4	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	I_S=2.0A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t_{rr}	I_S=2.0A, V_{GS}=0V, dI_F/dt=100A/μs		270		nS
Body Diode Reverse Recovery Charge		Q_{rr}			1140		nC

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

■ TEST CIRCUITS AND WAVEFORMS

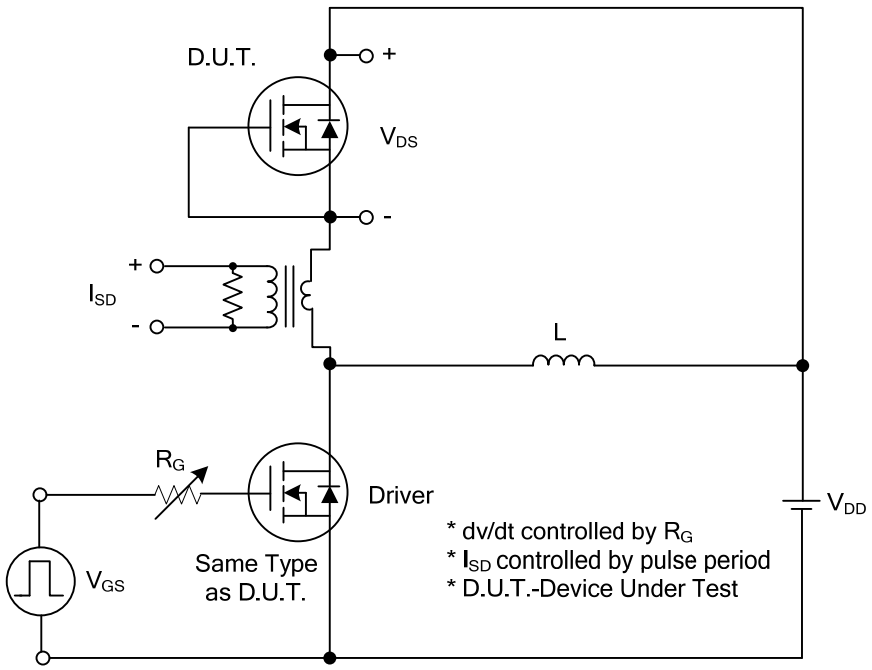


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

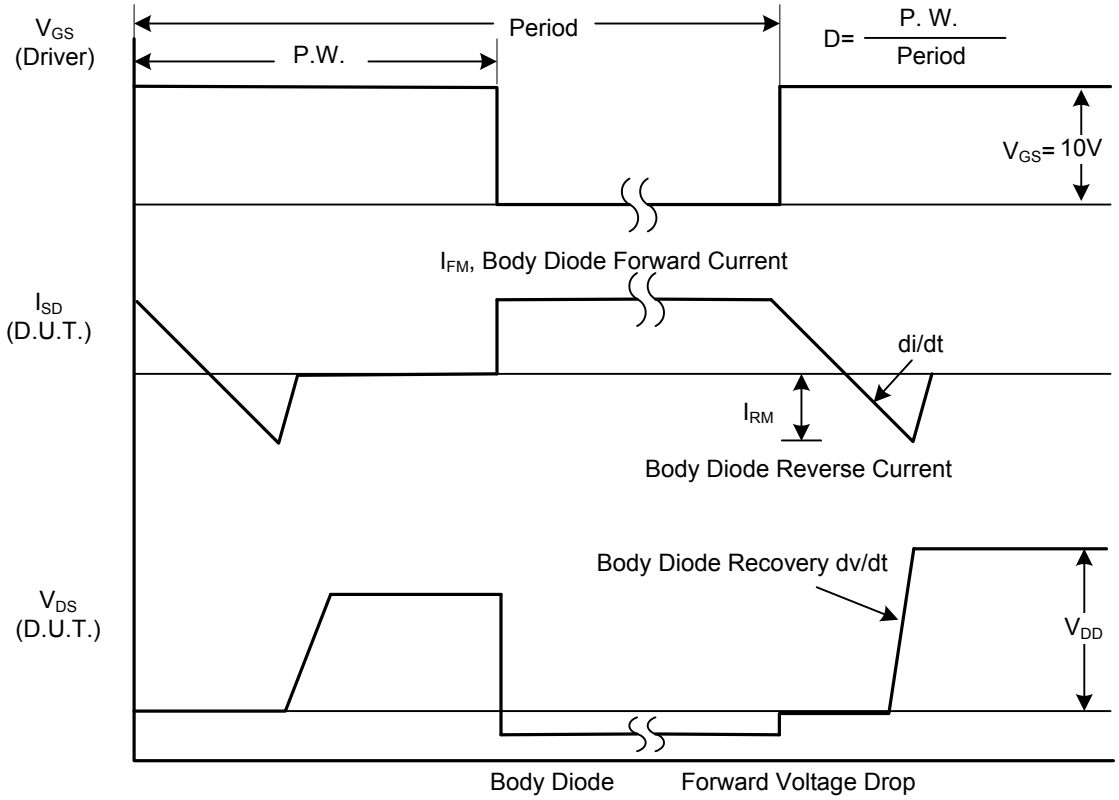


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS

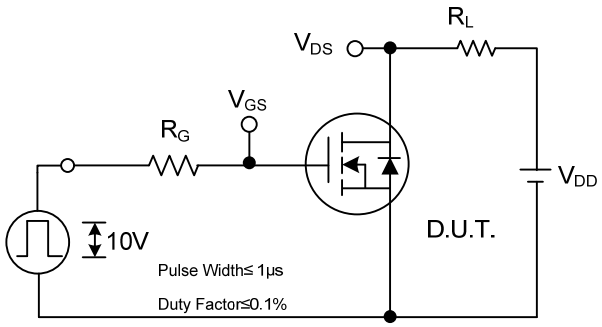


Fig. 2A Switching Test Circuit

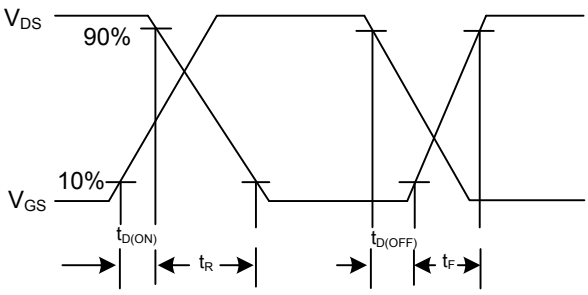


Fig. 2B Switching Waveforms

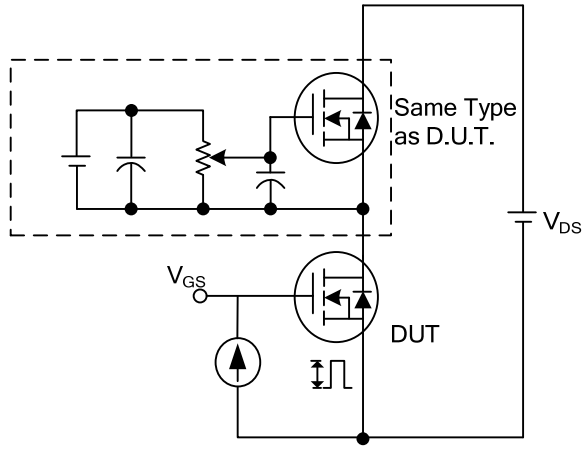


Fig. 3A Gate Charge Test Circuit

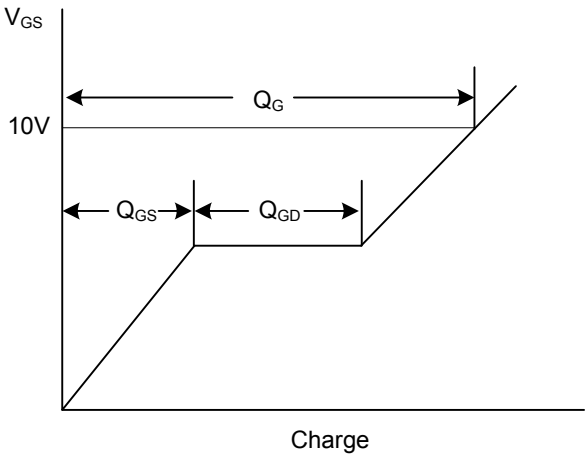


Fig. 3B Gate Charge Waveform

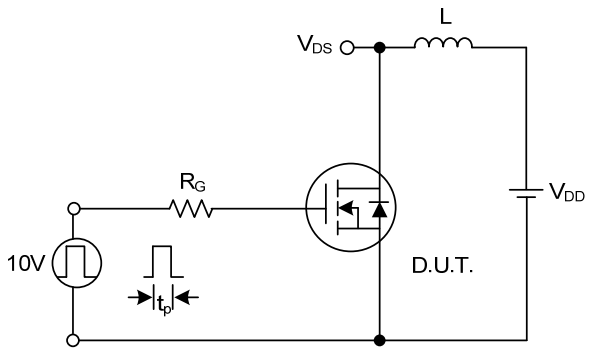


Fig. 4A Unclamped Inductive Switching Test Circuit

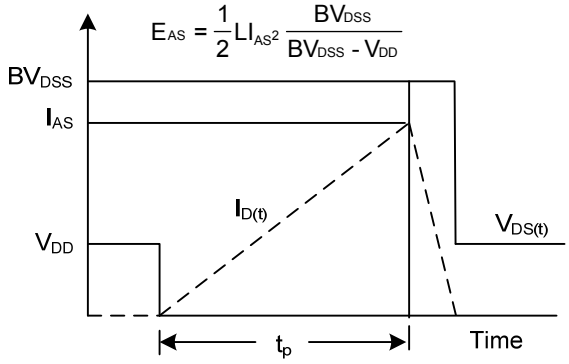
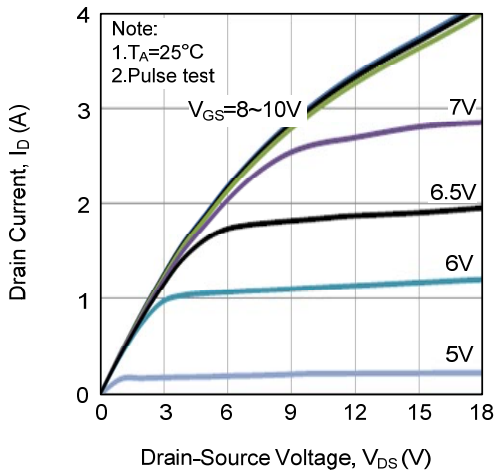


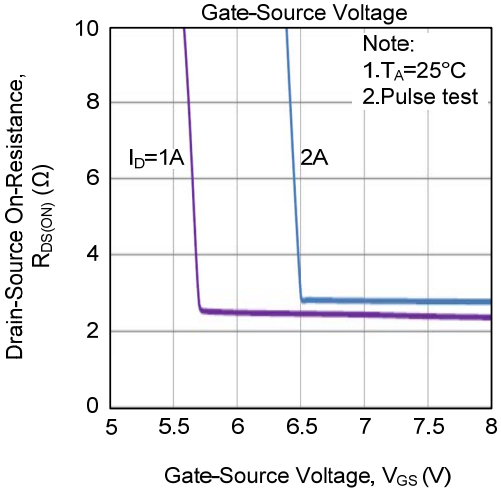
Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

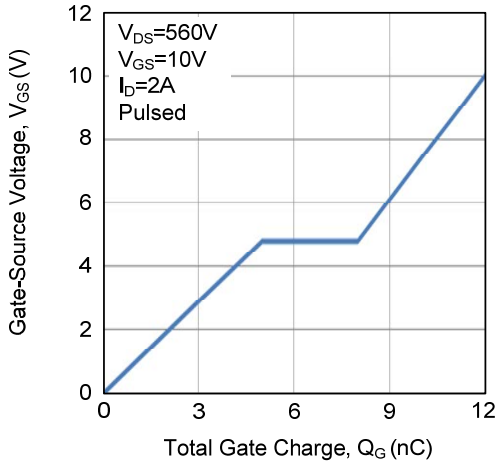
Drain Current vs. Drain-Source Voltage



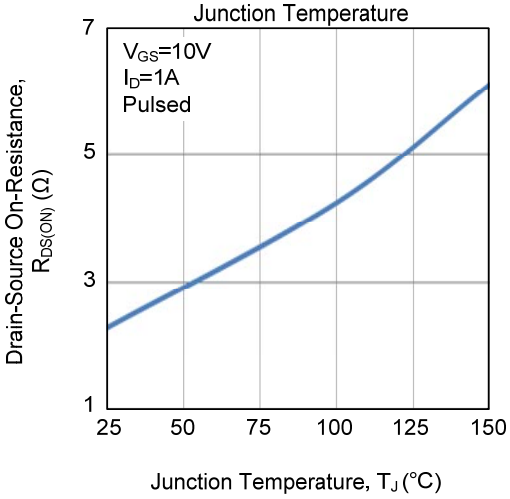
Drain-Source On-Resistance vs. Gate-Source Voltage



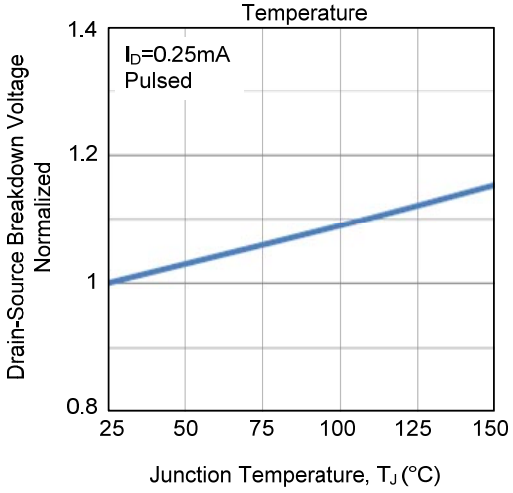
Gate Charge Characteristics



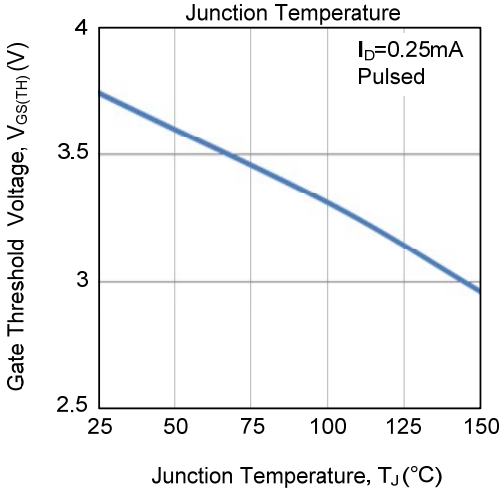
Drain-Source On-Resistance vs. Junction Temperature



Breakdown Voltage vs. Junction Temperature

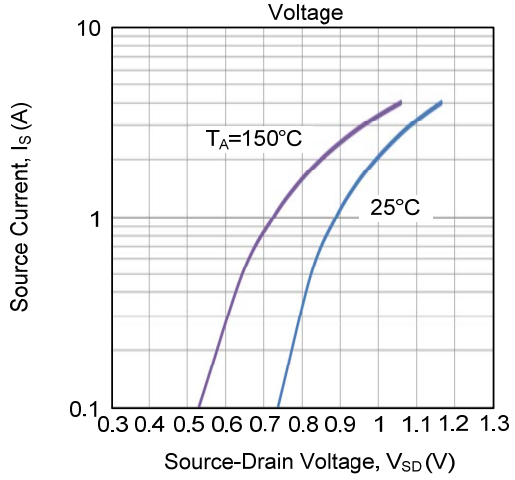


Gate Threshold Voltage vs. Junction Temperature

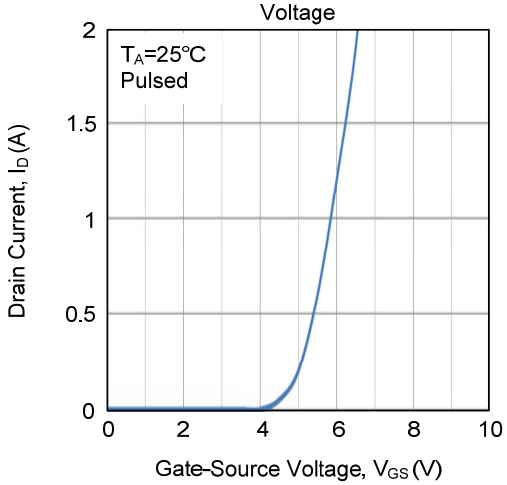


■ TYPICAL CHARACTERISTICS (Cont.)

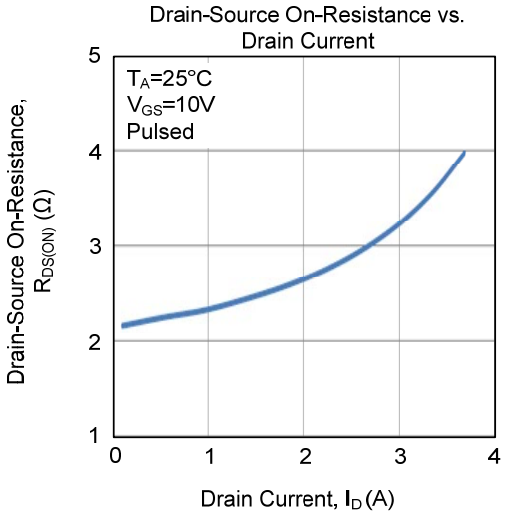
Source Current vs. Source-Drain Voltage



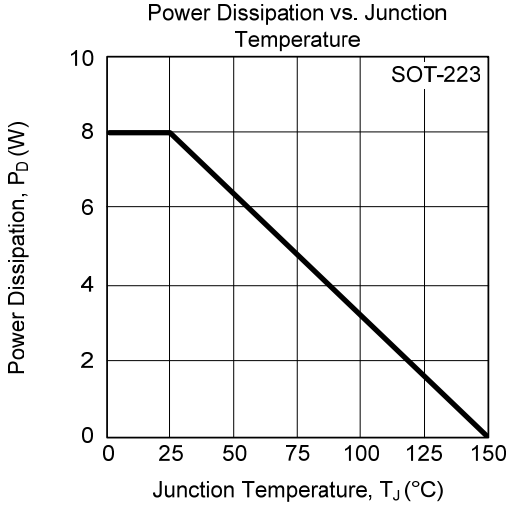
Drain Current vs. Gate-Source Voltage



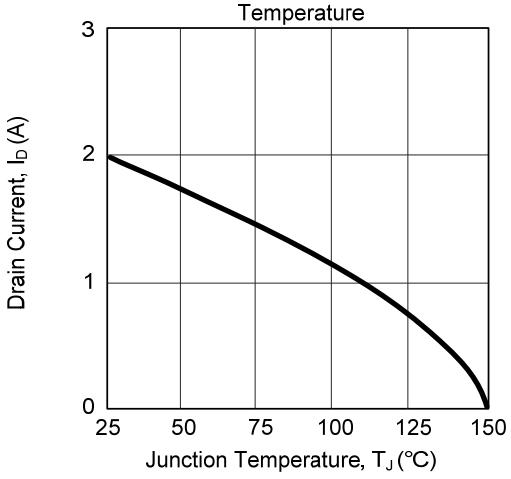
Drain-Source On-Resistance vs. Drain Current



Power Dissipation vs. Junction Temperature



Drain Current vs. Junction Temperature



Safe Operating Area