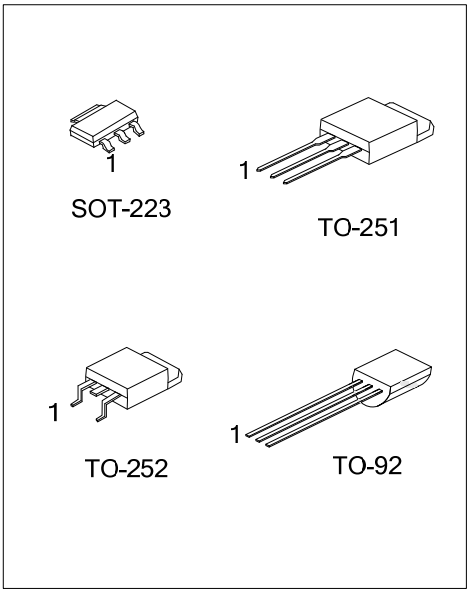
1N65A

Power MOSFET

0.5A, 650V N-CHANNEL POWER MOSFET



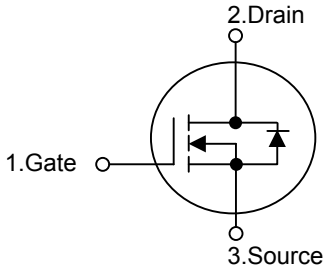
■ DESCRIPTION

The UTC **1N65A** is a high voltage power MOSFET 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 in high speed switching applications at power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

■ FEATURES

* $R_{DS(ON)}$ <15.5Ω@ V_{GS} = 10V, I_D = 0.5A
* Ultra Low gate charge (typical 8.0nC)
* Low reverse transfer capacitance (C_{RSS} = 3.0 pF(max))
* Fast switching capability
* Avalanche energy specified
* Improved dv/dt capability, high ruggedness

■ SYMBOL



■ ORDERING INFORMATION

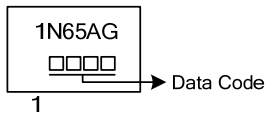
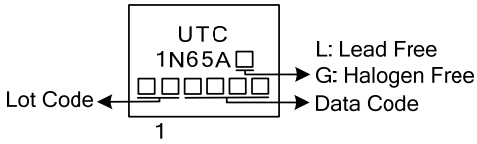
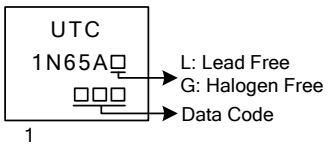
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
-	1N65AG-AA3-R	SOT-223	G	D	S	Tape Reel
1N65AL-TM3-T	1N65AG-TM3-T	TO-251	G	D	S	Tube
1N65AL-TN3-R	1N65AG-TN3-R	TO-252	G	D	S	Tape Reel
1N65AL-T92-B	1N65AG-T92-B	TO-92	G	D	S	Tape Box
1N65AL-T92-K	1N65AG-T92-K	TO-92	G	D	S	Bulk

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

1N65AG-AA3-R
(1)Packing Type
(2)Package Type
(3)Green Package

(1) B: Tape Box, K: Bulk, T: Tube, R: Tape Reel
(2) AA3: SOT-223, TM3: TO-251, TN3: TO-252
T92: TO-92
(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

PACKAGE	MARKING
SOT-223	
TO-251 / TO-252	
TO-92	

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	650	V
Gate-Source Voltage		V_{GSS}	±30	V
Continuous Drain Current		I_D	0.5	A
Pulsed Drain Current (Note 2)		I_{DM}	2	A
Avalanche Energy	Single Pulse(Note 3)	E_{AS}	50	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation (T_C=25°C)	SOT-223	P_D	8.9	W
	TO-251/TO-252		27.6	W
	TO-92		1.42	W
Derate above 25°C	SOT-223		0.07	mW/°C
	TO-251/TO-252		0.22	mW/°C
	TO-92		0.011	mW/°C
Junction Temperature		T_J	+150	°C
Operating Temperature		T_{OPR}	-55 ~ +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=92mH, I_{AS}=0.8A, V_{DD}=50V, R_G=0Ω, Starting T_J=25°C
4. I_{SD}≤1.0A, di/dt≤100A/μs, V_{DD}≤BV_{DSS}, Starting T_J=25°C

■ THERMAL DATA

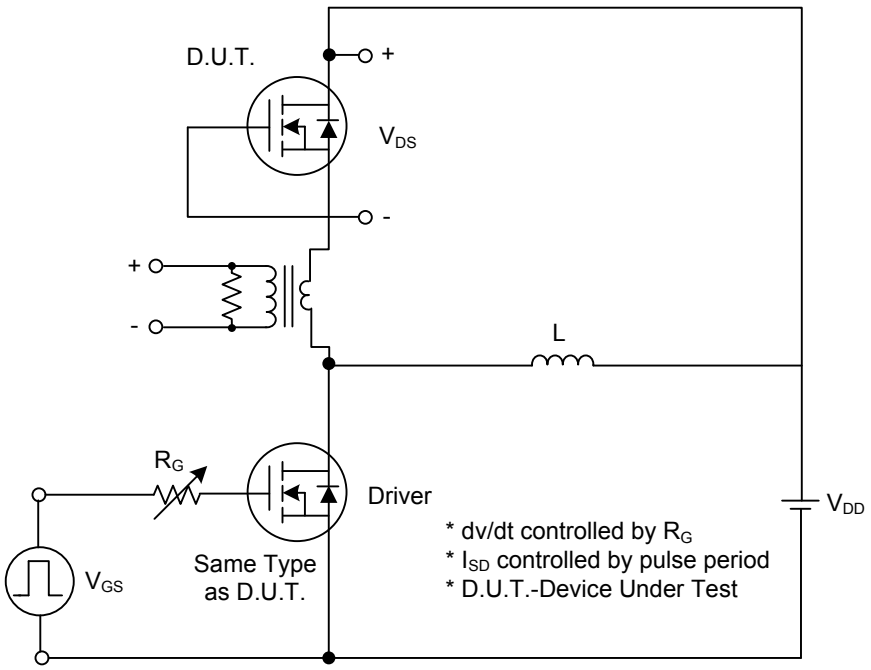
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	150	°C/W
	TO-251/TO-252		110	°C/W
	TO-92		180	°C/W
Junction to Case	SOT-223	θ_{JC}	14	°C/W
	TO-251/TO-252		4.53	°C/W
	TO-92		88	°C/W

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

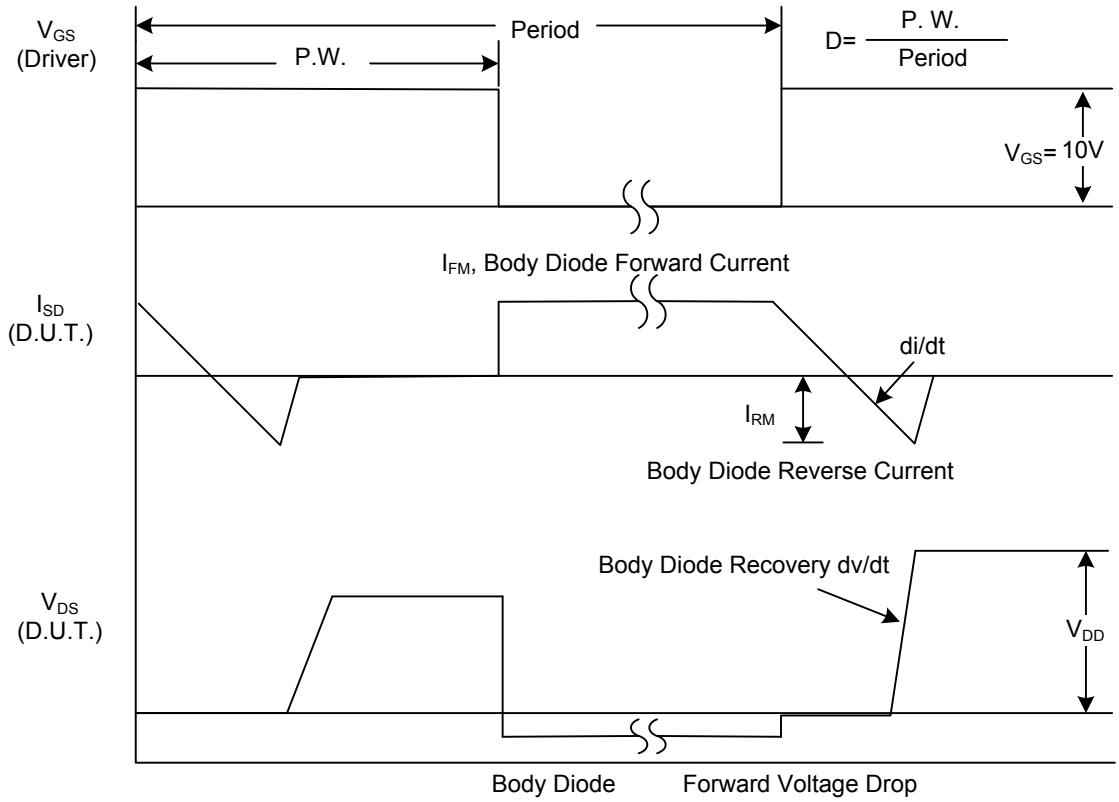
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS} = 0V, I_D = 250μA	650			V
Drain-Source Leakage Current		I_{DSS}	V_{DS} = 650V, V_{GS} = 0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS} = 20V, V_{DS} = 0V			100	nA
	Reverse		V_{GS} = -20V, V_{DS} = 0V			-100	nA
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_J$	I_D =250mA,referenced to 25°C		0.4		V/°C
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS} = V_{GS}, I_D = 250μA	2.0		4.5	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS} = 10V, I_D = 0.5A		11.5	15.5	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{DS}=25V, V_{GS}=0V, f=1MHz			100	pF
Output Capacitance		C_{OSS}				20	pF
Reverse Transfer Capacitance		C_{RSS}				3	pF
SWITCHING CHARACTERISTICS							
Total Gate Charge		Q_G	V_{DS}=520V, V_{GS}=10V, I_D=0.8A (Note 1,2)		8	10	nC
Gate-Source Charge		Q_{GS}			1.8		nC
Gate-Drain Charge		Q_{GD}			4.0		nC
Turn-On Delay Time		$t_{D\ (ON)}$	V_{DD}=325V, I_D=0.5A, R_G=5Ω (Note 1,2)		12	34	ns
Turn-On Rise Time		t_R			11	32	ns
Turn-Off Delay Time		$t_{D\ (OFF)}$			40	90	ns
Turn-Off Fall Time		t_F			18	46	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I_S				1.2	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				4.8	A
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_{SD} = 1.2A			1.6	V
Reverse Recovery Time		t_{rr}	V_{GS}=0V, I_{SD} = 1.2A di/dt = 100A/μs		136		ns
Reverse Recovery Charge		Q_{RR}			0.3		μC

Note: 1. Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%
2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

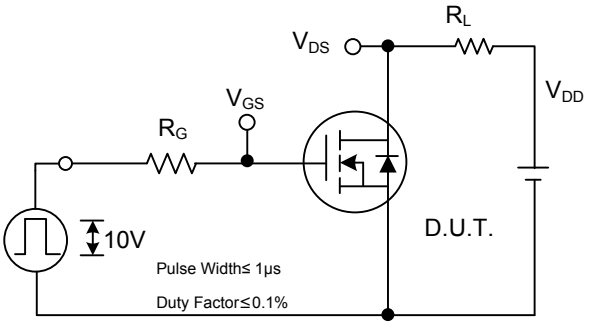


Peak Diode Recovery dv/dt Test Circuit

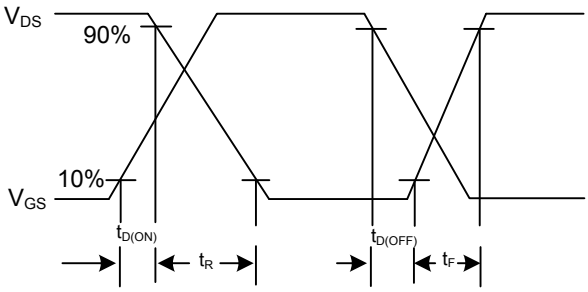


Peak Diode Recovery dv/dt Waveforms

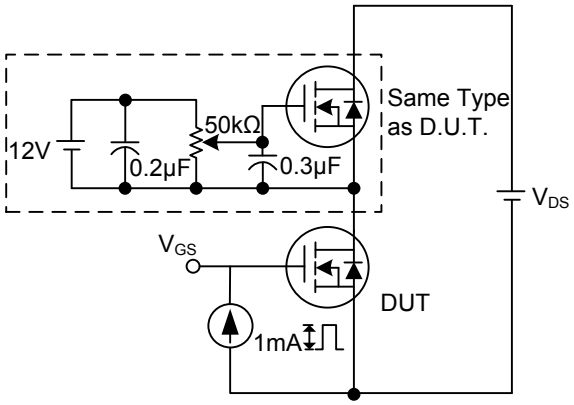
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



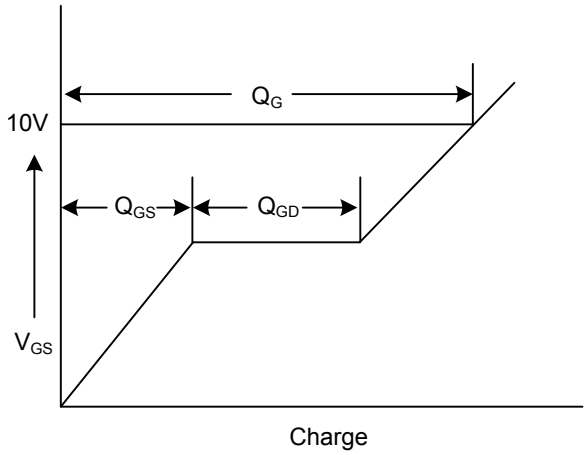
Switching Test Circuit



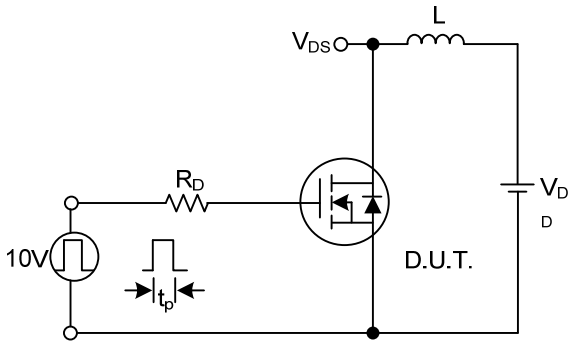
Switching Waveforms



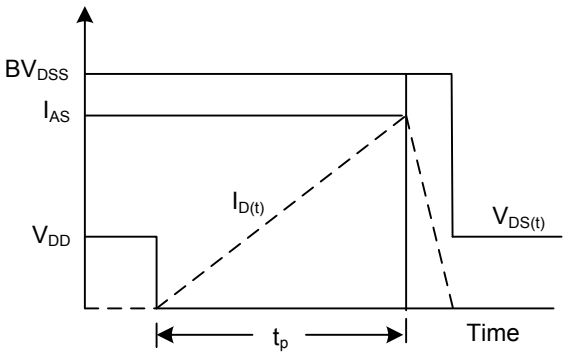
Gate Charge Test Circuit



Gate Charge Waveform



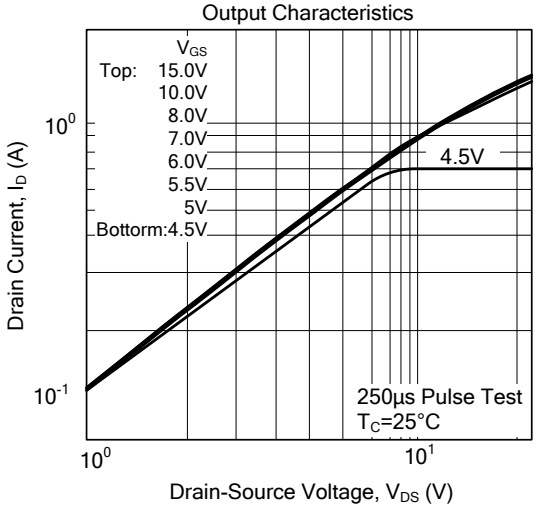
Unclamped Inductive Switching Test Circuit



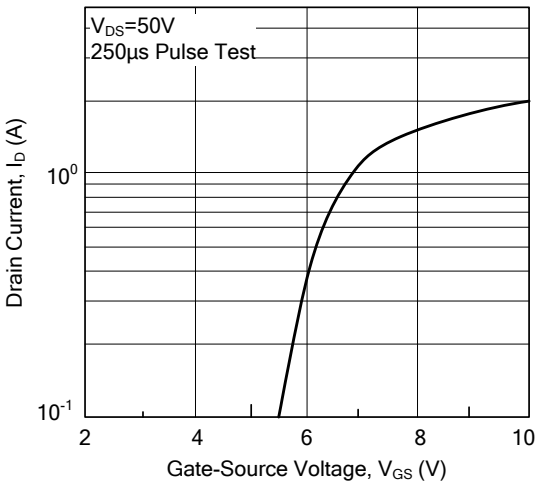
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

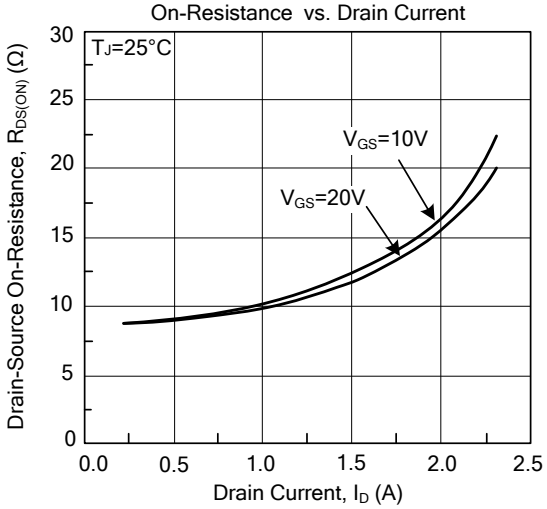
Output Characteristics



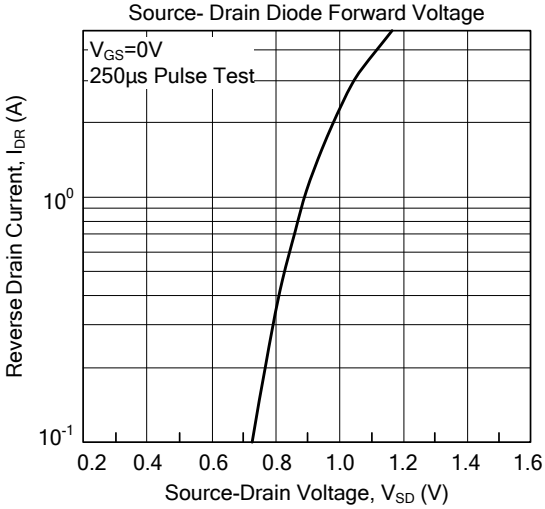
Transfer Characteristics



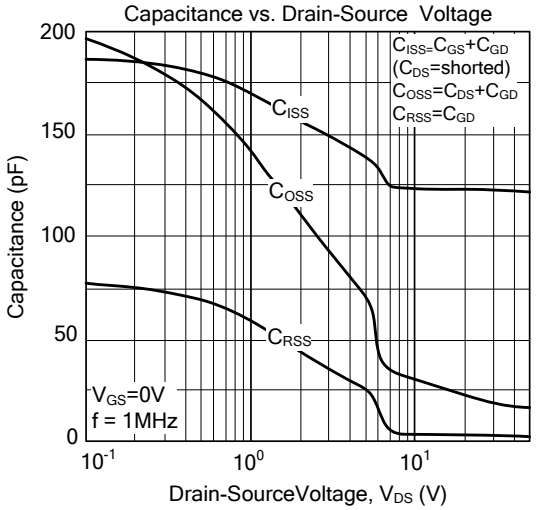
On-Resistance vs. Drain Current



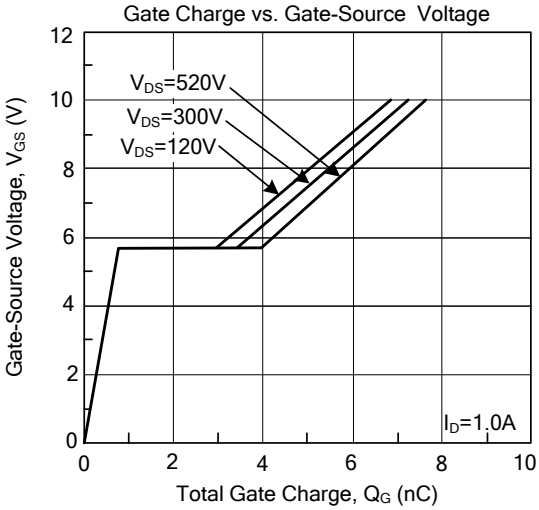
Source- Drain Diode Forward Voltage



Capacitance vs. Drain-Source Voltage

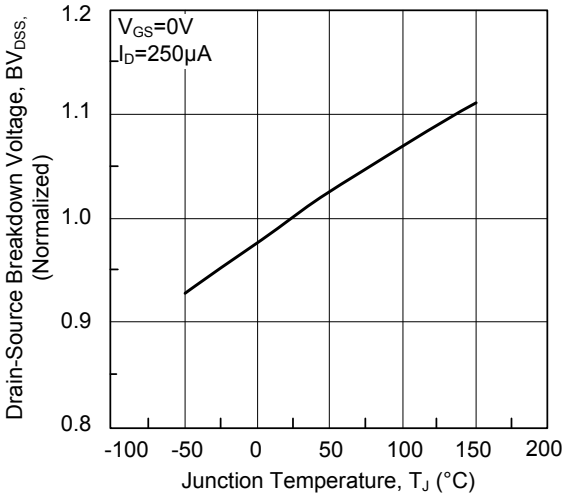


Gate Charge vs. Gate-Source Voltage

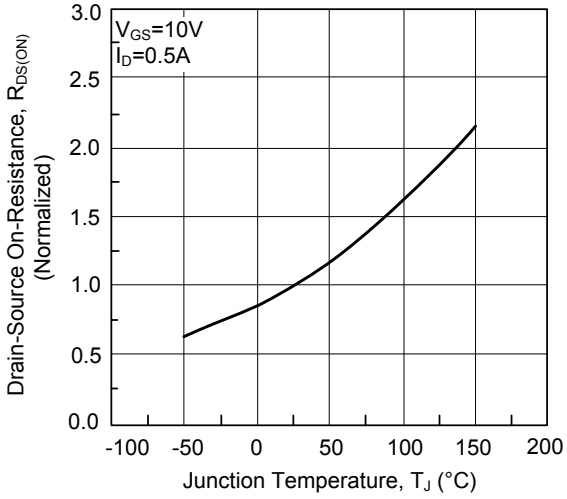


■ TYPICAL CHARACTERISTICS (Cont.)

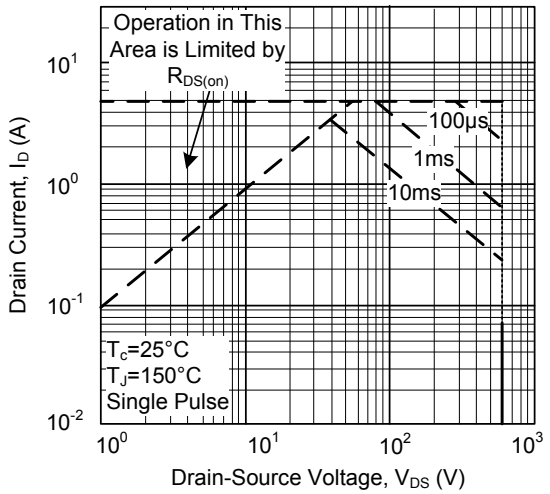
Breakdown Voltage vs. Temperature



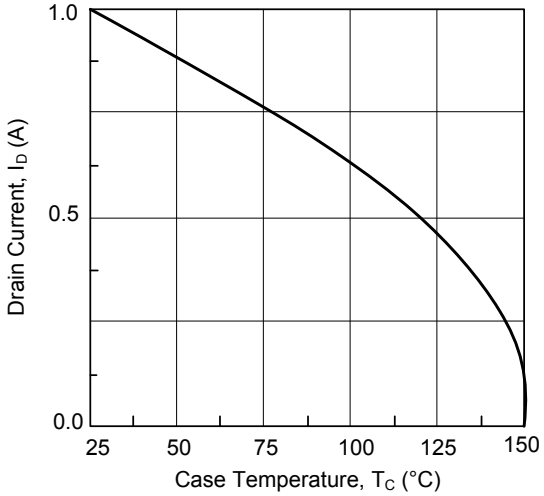
On-Resistance vs. Temperature



Max. Safe Operating Area



Max. Drain Current vs. Case Temperature



Thermal Response