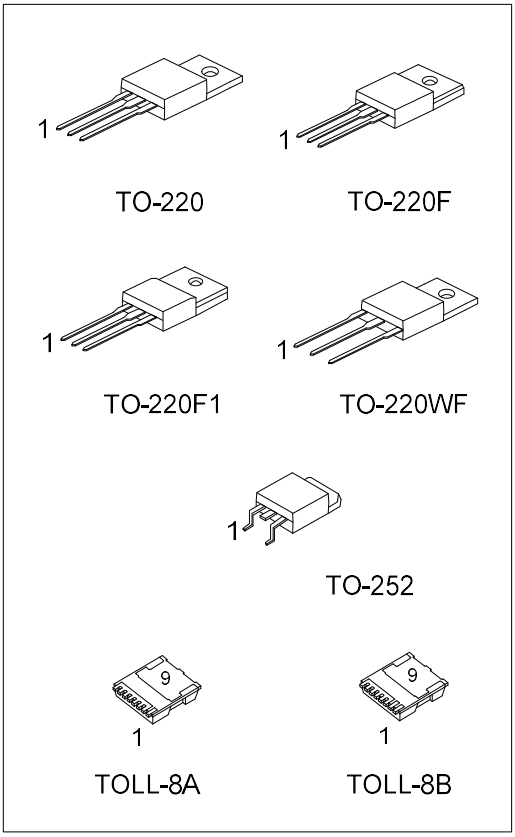
USJ65R200

Power MOSFET

20A, 650V N-CHANNEL SUPER-JUNCTION MOSFET



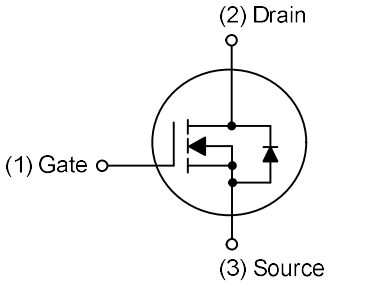
■ DESCRIPTION

The **UTC USJ65R200** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at AC-DC converters for power applications.

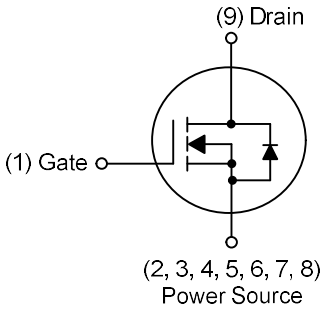
■ FEATURES

* $R_{DS(ON)} \leq 200\ m\Omega$ @ $V_{GS} = 10V$, $I_D = 5.0A$
* Fast switching capability
* Avalanche energy tested
* Improved dv/dt capability, high ruggedness

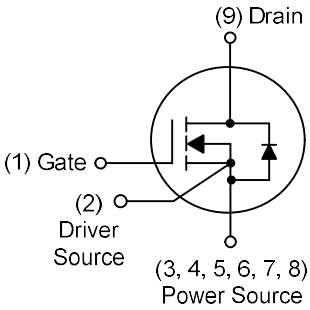
■ SYMBOL



TO-220 / TO-220F
TO-220F1 / TO-220WF / TO-252



TOLL-8A



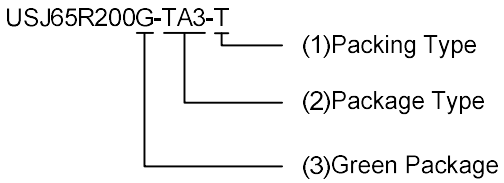
TOLL-8B

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■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment									Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	9	
USJ65R200L-TA3-T	USJ65R200G-TA3-T	TO-220	G	D	S	-	-	-	-	-	-	Tube
USJ65R200L-TF1-T	USJ65R200G-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	-	Tube
USJ65R200L-TF3-T	USJ65R200G-TF3-T	TO-220F	G	D	S	-	-	-	-	-	-	Tube
USJ65R200L-TW1-T	USJ65R200G-TW1-T	TO-220WF	G	D	S	-	-	-	-	-	-	Tube
USJ65R200L-TN3-R	USJ65R200G-TN3-R	TO-252	G	D	S	-	-	-	-	-	-	Tape Reel
USJ65R200L-T8A-R	USJ65R200G-T8A-R	TOLL-8A	G	S	S	S	S	S	S	S	D	Tape Reel
USJ65R200L-T8B-R	USJ65R200G-T8B-R	TOLL-8B	G	S	S	S	S	S	S	S	D	Tape Reel

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

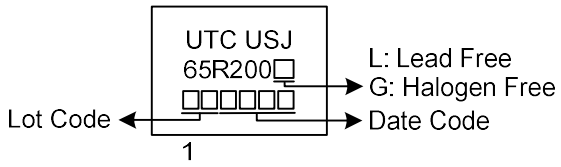
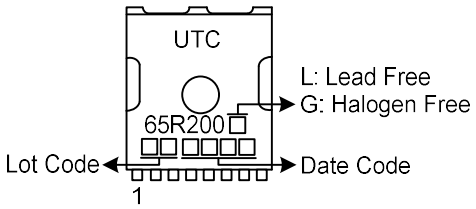


(1) T: Tube, R: Tape Reel

(2) TA3: TO-220, TF1: TO-220F1, TF3: TO-220F, TW1: TO-220WF, TN3: TO-252, T8A: TOLL-8A T8B: TOLL-8B

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

■ MARKING

TO-220 / TO-220F TO-220F1 / TO-220WF / TO-252	TOLL-8A / TOLL-8B
	

■ 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
Drain Current	Continuous	I_D	20	A
	Pulsed (Note 2)	I_{DM}	60	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	98	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.8	V/ns
Power Dissipation	TO-220	P_D	92	W
	TO-220F/TO-220F1 TO-220WF		29	W
	TO-252		64	W
	TOLL-8A/TOLL-8B		195	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 = 100mH, I_{AS} = 1.4A, V_{DD} = 50V, R_G = 25 Ω Starting T_J = 25°C.
4. I_{SD} ≤ 20A, 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-220WF	θ_{JA}	62.5	°C/W
	TO-252		110	°C/W
	TOLL-8A/TOLL-8B		35 (Note)	°C/W
Junction to Case	TO-220	θ_{JC}	1.35	°C/W
	TO-220F/TO-220F1 TO-220WF		4.31	°C/W
	TO-252		1.95 (Note)	°C/W
	TOLL-8A/TOLL-8B		0.64 (Note)	°C/W

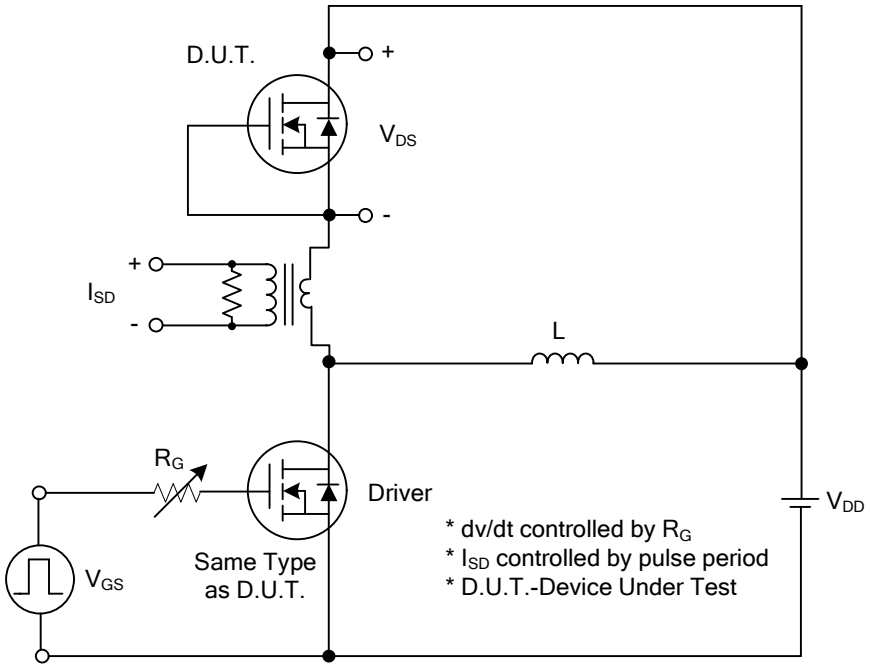
Note: Device mounted on FR-4 substrate P_C board, 2oz copper, with 1inch square copper plate.

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

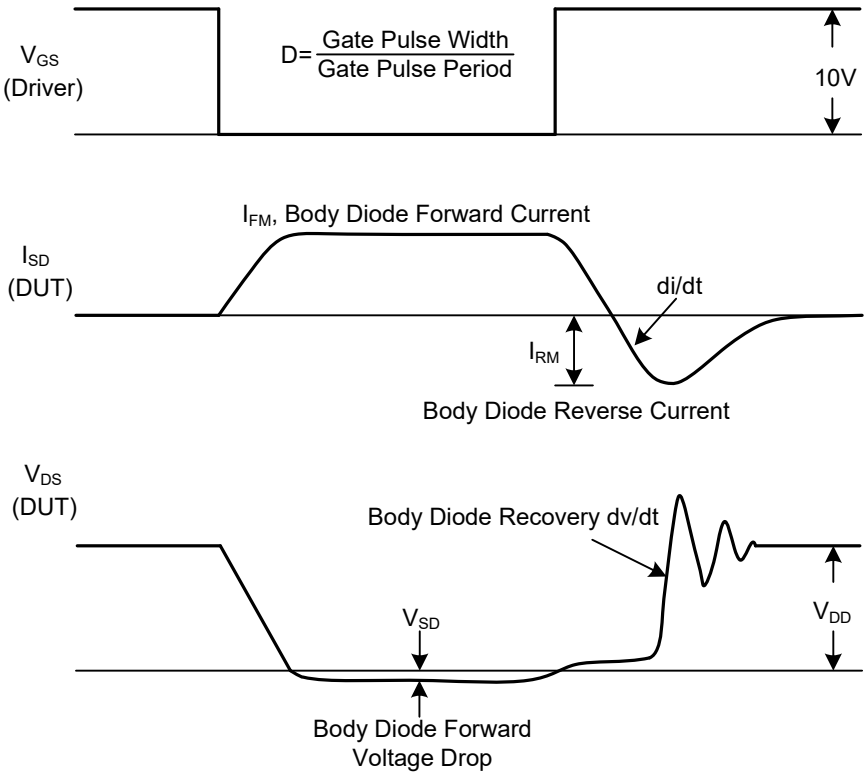
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA	650			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=650V, V_{GS}=0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{DS}=0V ,V_{GS}=30V			100	nA
	Reverse		V_{DS}=0V ,V_{GS}=-30V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	2.5		4.5	V
Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=5.0A			200	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=50V, f=1.0MHz		1234		pF
Output Capacitance		C_{OSS}			382		pF
Reverse Transfer Capacitance		C_{RSS}			19		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=480V, V_{GS}=10V, I_D=10A (Note 1, 2)		56		nC
Gate to Source Charge		Q_{GS}			11		nC
Gate to Drain Charge		Q_{GD}			24		nC
Internal Gate Input Resistance		R_G	V_{GS}=0V, f=1MHz		2.1		Ω
Turn-ON Delay Time (Note 1)		$t_{D(ON)}$	V_{DD}=100V, V_{GS}=10V, I_D=10A, R_G=25Ω (Note 1, 2)		20		ns
Rise Time		t_R			34		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			157		ns
Fall-Time		t_F			62		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I_S				20	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	I_S=20A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time(Note 1)		t_{rr}	I_S =20A, V_{GS}=0V, dI_F/dt=100A/μs		404		ns
Body Diode Reverse Recovery Charge		Q_{rr}			6.2		μC

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

■ TEST CIRCUITS AND WAVEFORMS

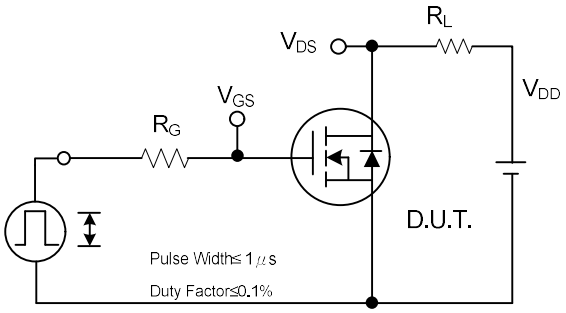


Peak Diode Recovery dv/dt Test Circuit

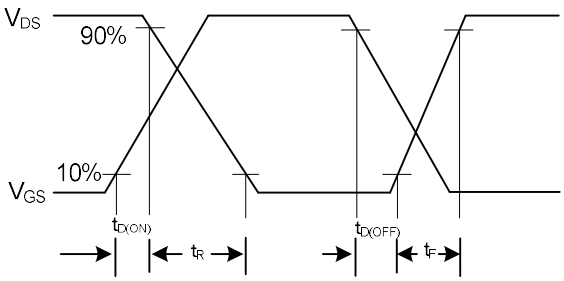


Peak Diode Recovery dv/dt Waveforms

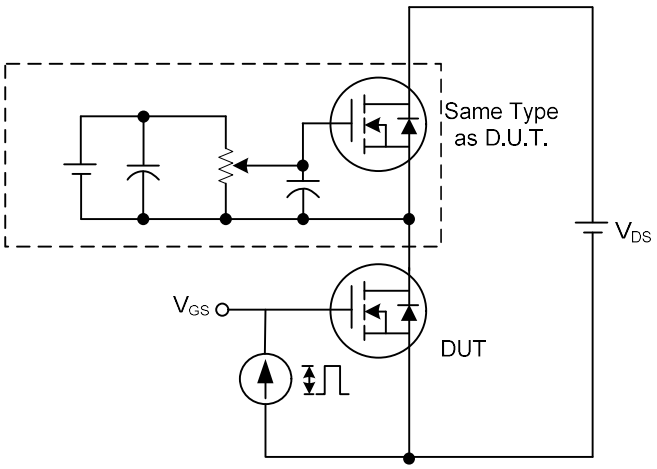
■ TEST CIRCUITS AND WAVEFORMS



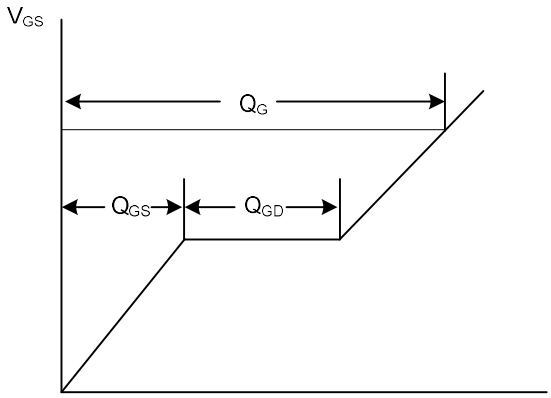
Switching Test Circuit



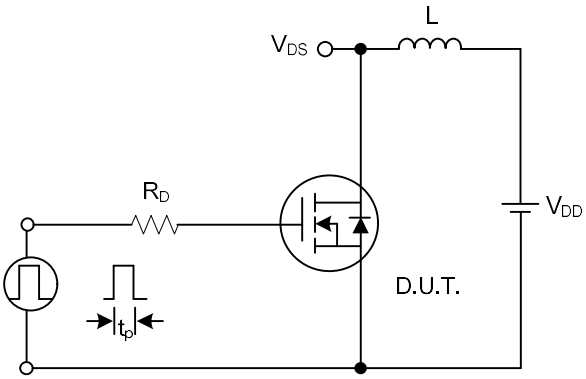
Switching Waveforms



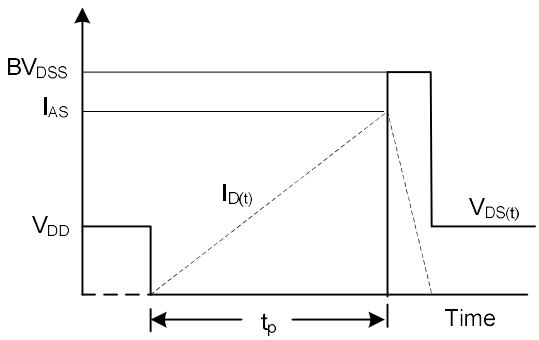
Gate Charge Test Circuit



Gate Charge Waveform



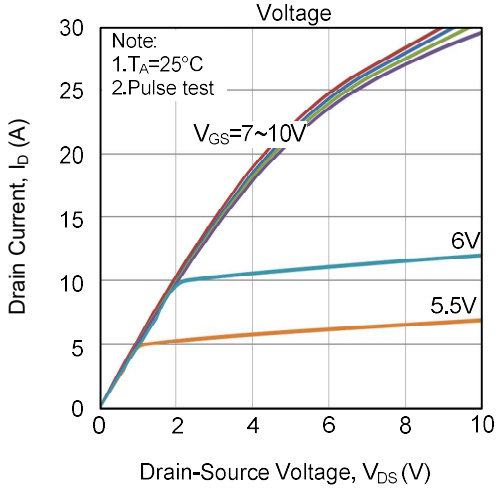
Unclamped Inductive Switching Test Circuit



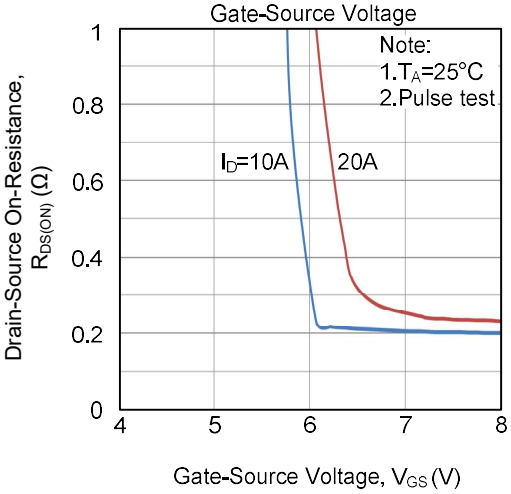
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

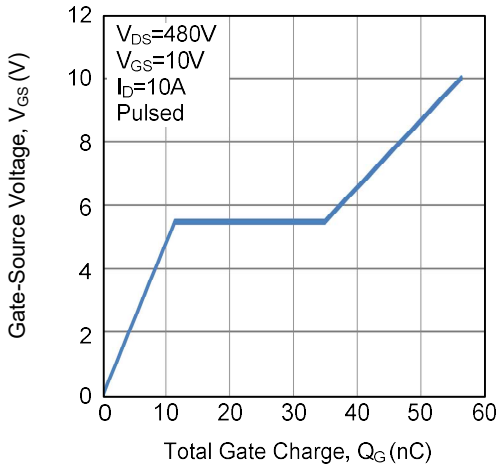
Drain Current vs. Drain-Source Voltage



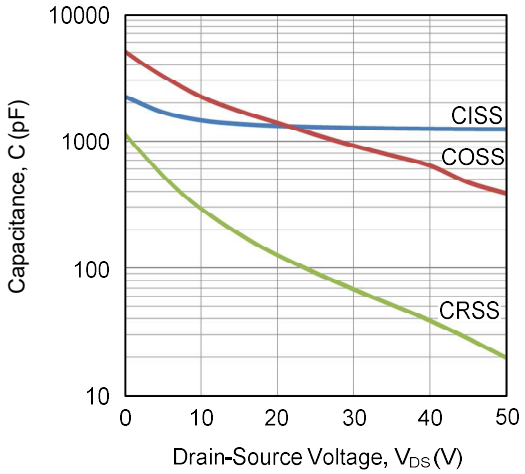
Drain-Source On-Resistance vs. Gate-Source Voltage



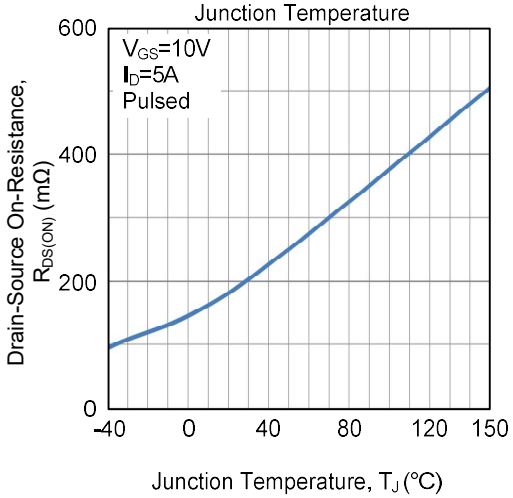
Gate Charge Characteristics



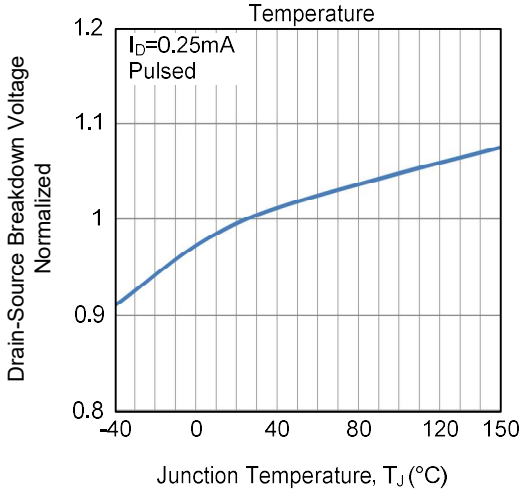
Capacitance Characteristics



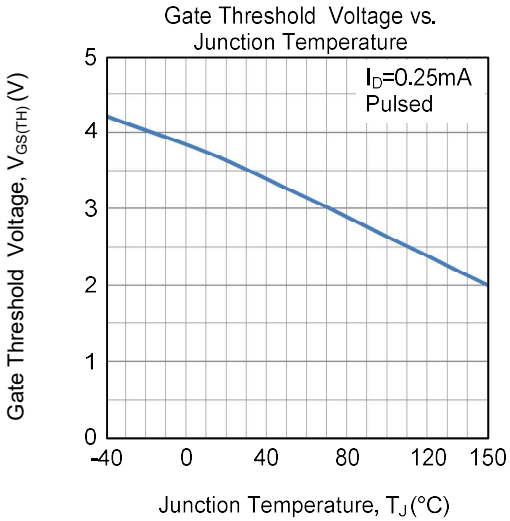
Drain-Source On-Resistance vs. Junction Temperature

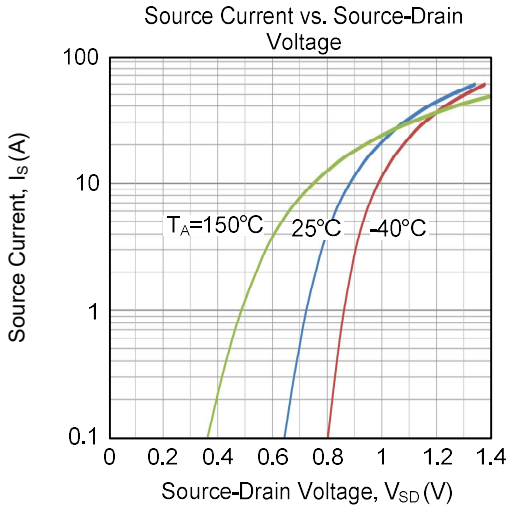


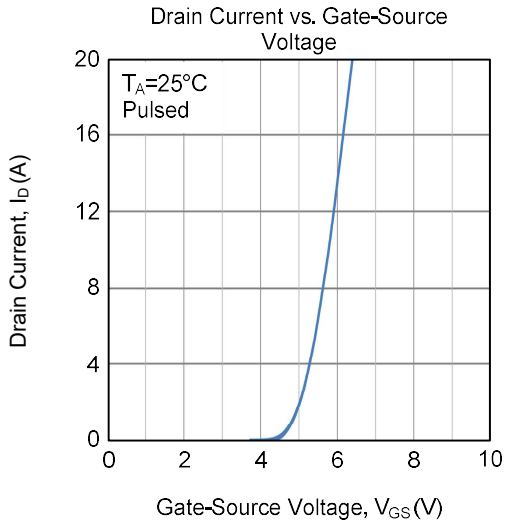
Breakdown Voltage vs. Junction Temperature

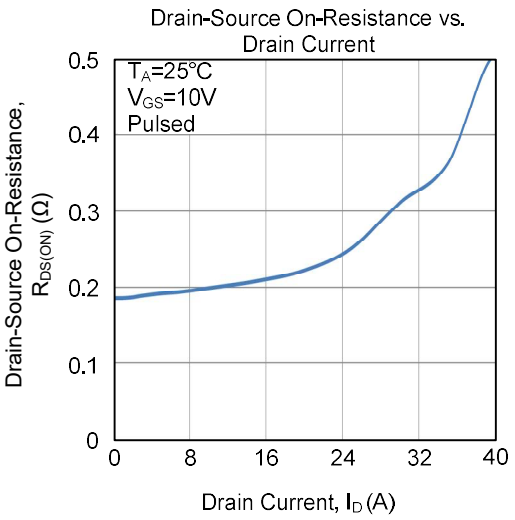


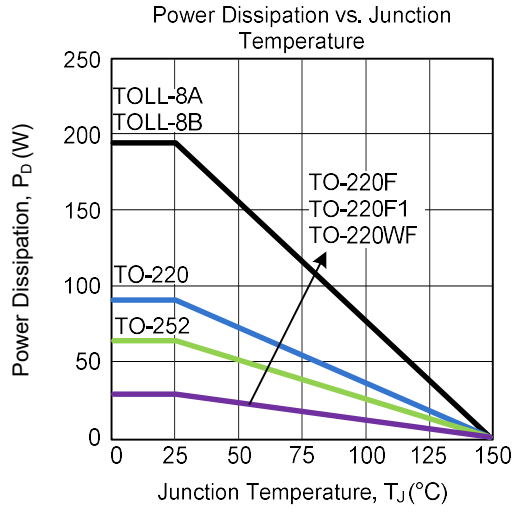
■ TYPICAL CHARACTERISTICS (Cont.)

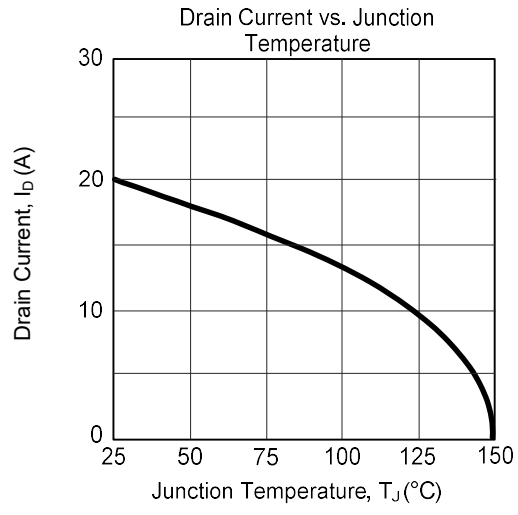




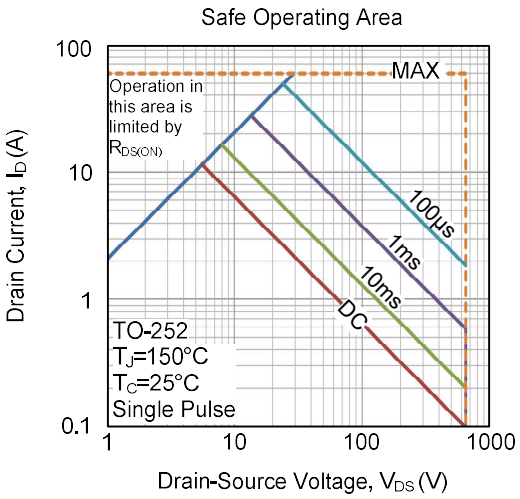








■ TYPICAL CHARACTERISTICS (Cont.)



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