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-2.0A, -500V   P-CHANNEL POWER MOSFET
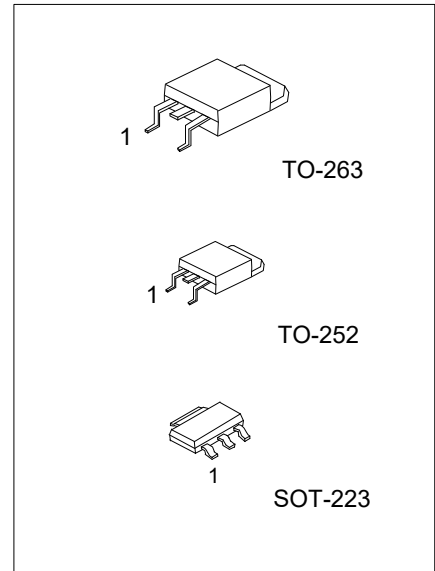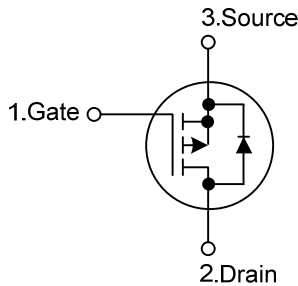
■ **DESCRIPTION**

The UTC **2P50** is a P-channel MOS Field Effect Transistor. it uses UTC's advanced technology to provide the customers with high switching speed and a minimum on-state resistance.

The UTC **2P50** is suitable for high voltage switching applications.

■ **FEATURES**

* $R_{DS(ON)}$ ≤ 8.5 Ω @ V_{GS}=-10V, I_D=-1.0A
* High switching speed
* Low input capacitance

TO-263

TO-252
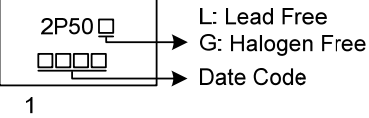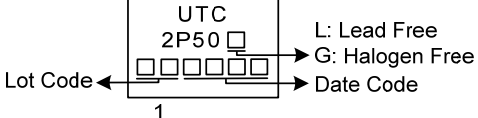
SOT-223

■ **SYMBOL**

3.Source

1.Gate

2.Drain

■ **ORDERING INFORMATION**

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
2P50L-AA3-R	2P50G-AA3-R	SOT-223	G	D	S	Tape Reel
2P50L-TN3-R	2P50G-TN3-R	TO-252	G	D	S	Tape Reel
2P50L-TQ2-T	2P50G-TQ2-T	TO-263	G	D	S	Tube
2P50L-TQ2-R	2P50G-TQ2-R	TO-263	G	D	S	Tape Reel

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

2P50G-AA3-R

  (1)Packing Type

  (2)Package Type

  (3)Green Package

(1) R: Tape Reel, T: Tube

(2) AA3: SOT-223, TN3: TO-252, TQ2: TO-263

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

QW-R210-064.E

■ **MARKING**

SOT-223	TO-252 / TO-263
2P50☐ ☐☐☐☐ 1 → L: Lead Free G: Halogen Free Date Code	UTC 2P50☐ Lot Code ← ☐☐☐☐☐☐ 1 → L: Lead Free G: Halogen Free Date Code

2P50

■ **ABSOLUTE MAXIMUM RATING** (T_A=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	-500	V
Gate-Source Voltage		V_{GSS}	±30	V
Drain Current	DC	$I_{D(DC)}$	-2	A
	Pulsed (Note 2)	$I_{D(pulse)}$	-6	A
Single Avalanche Energy (Note 3)		E_{AS}	150	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	16.5	V/ns
Power Dissipation (T_C=25°C)	SOT-223	P_D	6.9	W
	TO-252		35	W
	TO-263		65	W
Junction Temperature		T_J	+150	°C
Storage Temperature Range		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=88mH, I_{AS}=-1.85A, V_{DD}= -50V, R_G=25Ω, 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	θ_{JA}	150	°C/W
	TO-252		110	°C/W
	TO-263		62.5	°C/W
Junction to Case	SOT-223	θ_{JC}	18	°C/W
	TO-252		3.5	°C/W
	TO-263		1.9	°C/W

2P50

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

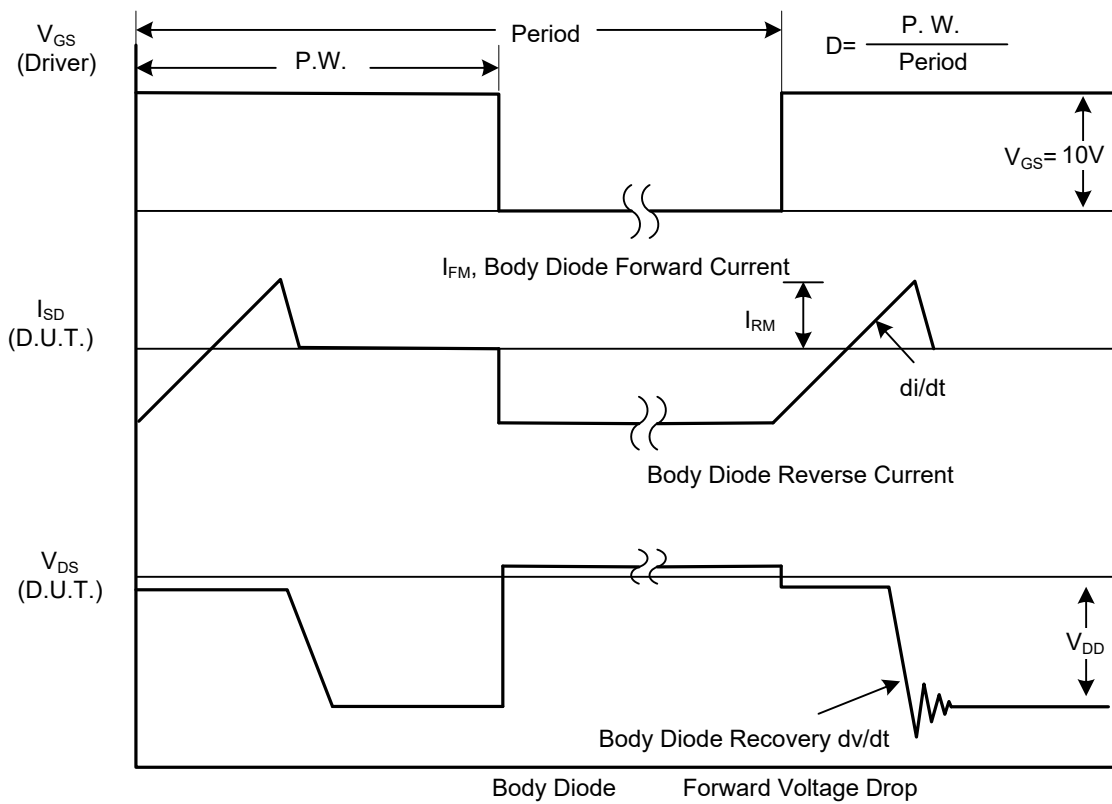| PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Leakage Current		I_{DSS}	V_{DS}=-500V, V_{GS}=0V			-10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=+30V, V_{DS}=0V			+100	nA
	Reverse		V_{GS}=-30V, V_{DS}=0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}= V_{GS}, I_D=-250μA	-2.0		-4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=-10V, I_D=-1.0A			8.5	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=-25V, f=1.0MHz		343		pF
Output Capacitance		C_{OSS}			59		pF
Reverse Transfer Capacitance		C_{RSS}			9		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q_G	V_{DS}=-100V, V_{GS}=-10V, I_D=-2A , I_G=-1mA (Note 1, 2)		11.5		nC
Gate to Source Charge		Q_{GS}			2.8		nC
Gate to Drain Charge		Q_{GD}			3.2		nC
Turn-ON Delay Time		$t_{D(ON)}$	V_{DD}=-100V, V_{GS}=-10V, I_D=-2A, R_G=-25Ω (Note 1, 2)		6.4		ns
Rise Time		t_R			16		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			37		ns
Fall-Time		t_F			25		ns
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				-2	A
Maximum Body-Diode Pulsed Current		I_{SM}				-6	A
Diode Forward Voltage		V_{SD}	I_F=-2A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time		t_{rr}	I_F=-2A, V_{GS}=0V, di/dt=100A/μs		200		ns
Body Diode Reverse Recovery Charge		Q_{rr}			1800		nC

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

■ **TEST CIRCUITS AND WAVEFORMS**

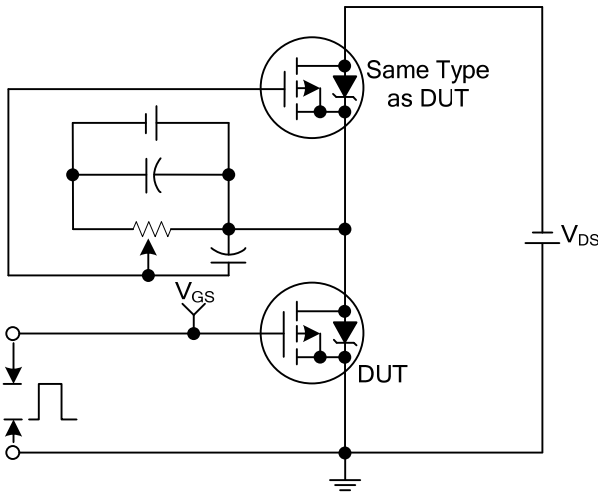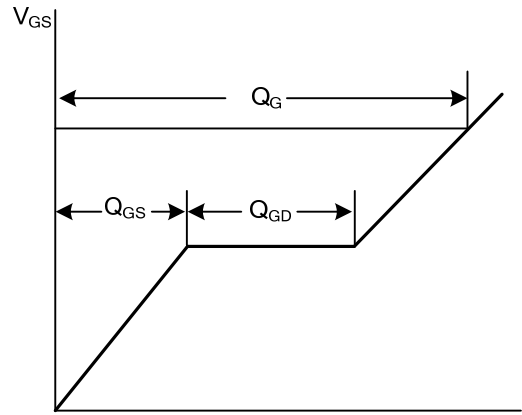**Peak Diode Recovery dv/dt Test Circuit**

* dv/dt controlled by R_G
* I_{SD} controlled by pulse period
* D.U.T.-Device Under Test
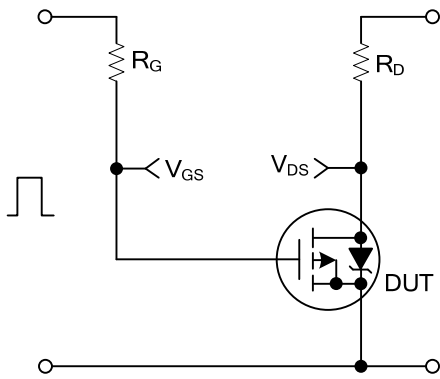

Peak Diode Recovery dv/dt Waveforms
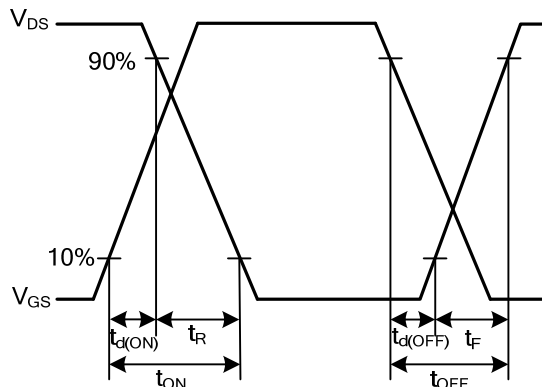
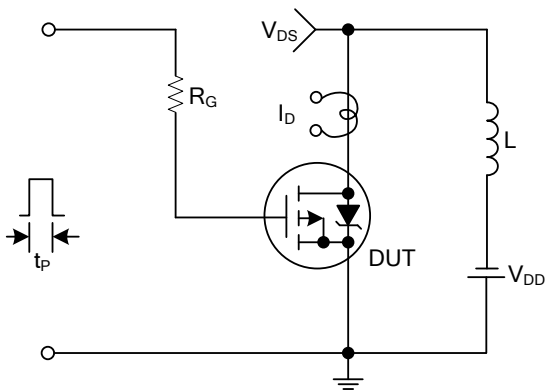## ◼ TEST CIRCUITS AND WAVEFORMS
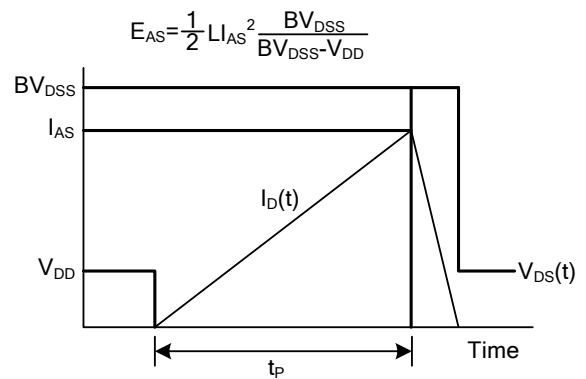

Gate Charge Test Circuit

Gate Charge Waveforms

Resistive Switching Test Circuit

Resistive Switching Waveforms

Unclamped Inductive Switching Test Circuit

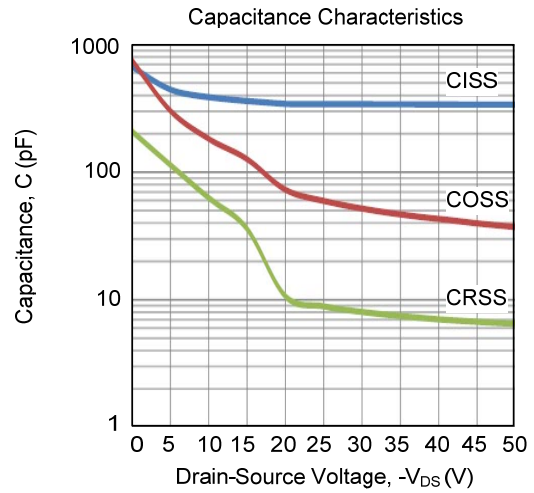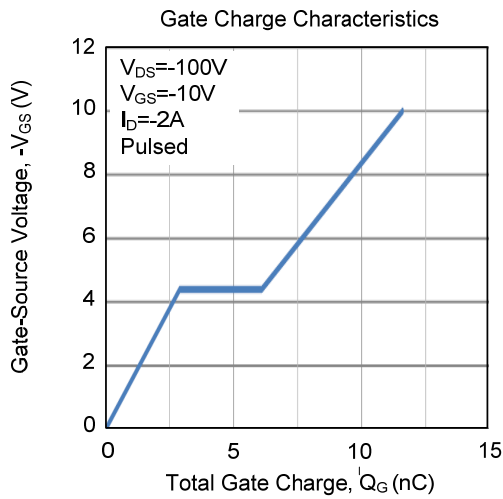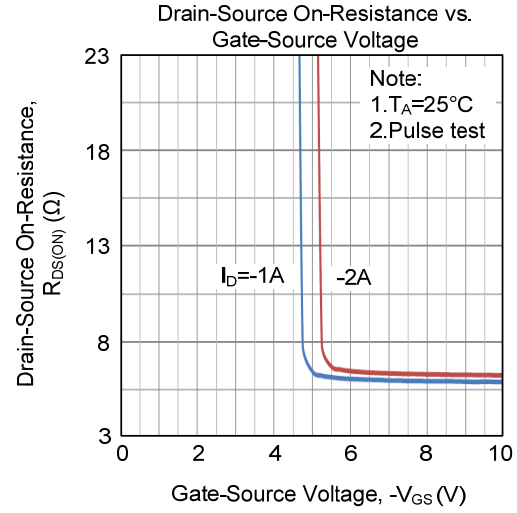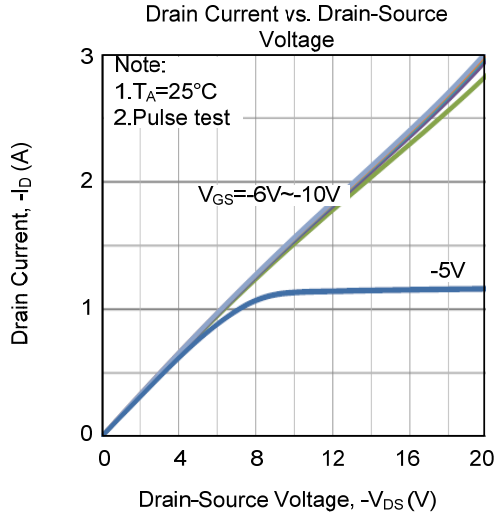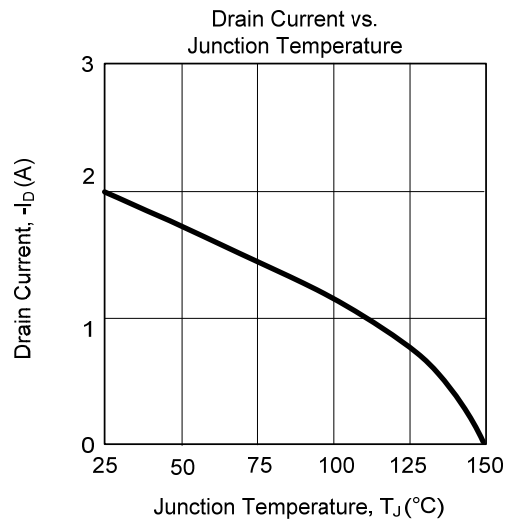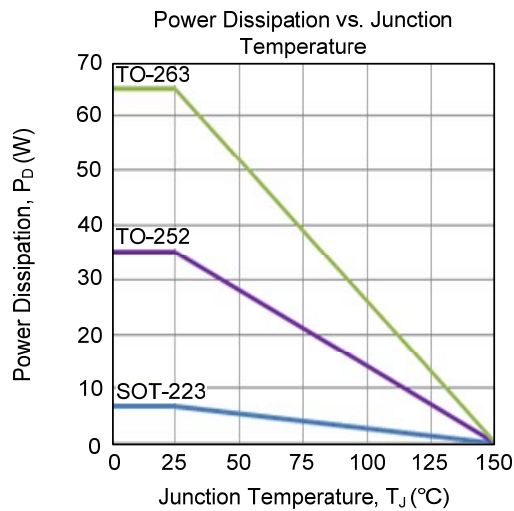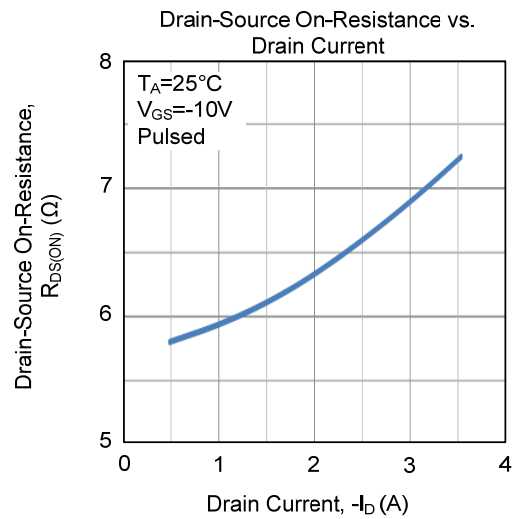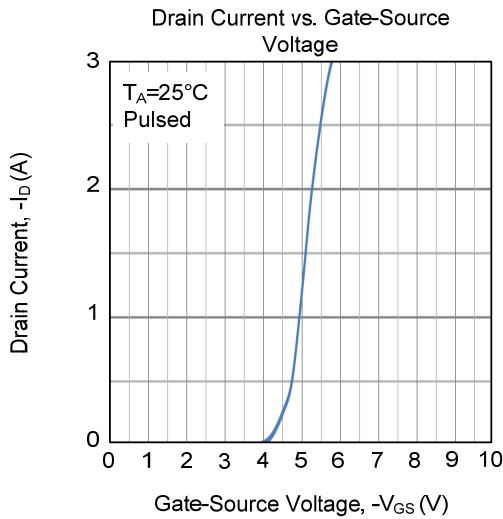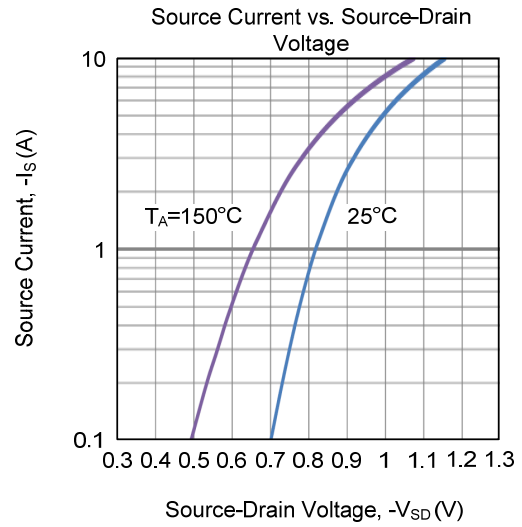$$E_{AS} = \frac{1}{2} L I_{AS}^{2} \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

Drain Current vs. Drain-Source Voltage

Note:
1. T_A=25°C
2. Pulse test

V_{GS}=-6V~-10V

-5V

Drain Current, -I_D (A) vs. Drain-Source Voltage, -V_{DS} (V)

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

Note:
1. T_A=25°C
2. Pulse test

I_D=-1A   -2A

Drain-Source On-Resistance, $R_{DS(ON)}$ (Ω) vs. Gate-Source Voltage, -V_{GS} (V)

Gate Charge Characteristics

V_{DS}=-100V
V_{GS}=-10V
I_D=-2A
Pulsed

Gate-Source Voltage, -V_{GS} (V) vs. Total Gate Charge, Q_G (nC)

Capacitance Characteristics

CISS

COSS

CRSS

Capacitance, C (pF) vs. Drain-Source Voltage, -V_{DS} (V)

Drain-Source On-Resistance vs. Junction Temperature

V_{GS}=-10V
I_D=-1A
Pulsed

Drain-Source On-Resistance Normalized vs. Junction Temperature, T_J (°C)

Breakdown Voltage vs. Junction Temperature

I_D=-0.25mA
Pulsed

Drain-Source Breakdown Voltage Normalized vs. Junction Temperature, T_J (°C)

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■ **TYPICAL CHARACTERISTICS (Cont.)**

Gate Threshold Voltage vs. Junction Temperature

I_D=-0.25mA
Pulsed

Gate Threshold Voltage Normalized

Junction Temperature, T_J (°C)

Source Current vs. Source-Drain Voltage

T_A=150°C   25°C

Source Current, $-I_S$ (A)

Source-Drain Voltage, $-V_{SD}$ (V)

Drain Current vs. Gate-Source Voltage

T_A=25°C
Pulsed

Drain Current, $-I_D$ (A)

Gate-Source Voltage, $-V_{GS}$ (V)

Drain-Source On-Resistance vs. Drain Current

T_A=25°C
V_{GS}=-10V
Pulsed

Drain-Source On-Resistance, $R_{DS(ON)}$ (Ω)

Drain Current, $-I_D$ (A)

Power Dissipation vs. Junction Temperature

TO-263

TO-252

SOT-223

Power Dissipation, P_D (W)

Junction Temperature, T_J (°C)

Drain Current vs. Junction Temperature

Drain Current, $-I_D$ (A)

Junction Temperature, T_J (°C)

■ **TYPICAL CHARACTERISTICS (Cont.)**

Safe Operating Area — TO-252, T_J=150°C, T_C=25°C, Single Pulse

Safe Operating Area — TO-263, T_J=150°C, T_C=25°C, Single Pulse

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