



## UT200N04M

### POWER MOSFET

## 200A, 40V N-CHANNEL POWER MOSFET

### DESCRIPTION

The UTC **UT200N04M** is a N-channel Power MOSFET, it uses UTC's advanced technology to provide the customers with low  $R_{DS(ON)}$  characteristic by high cell density trench technology.

The UTC **UT200N04M** is suitable for high efficiency synchronous rectification in SMPS, UPS, hard switched and high frequency circuits.

### FEATURES

#### TO-220/TO-220F1

\*  $R_{DS(ON)} \leq 2.8 \text{ m}\Omega @ V_{GS}=10\text{V}, I_D=50\text{A}$

$R_{DS(ON)} \leq 3.5 \text{ m}\Omega @ V_{GS}=4.5\text{V}, I_D=50\text{A}$

#### TO-247

\*  $R_{DS(ON)} \leq 2.0 \text{ m}\Omega @ V_{GS}=10\text{V}, I_D=50\text{A}$

$R_{DS(ON)} \leq 2.5 \text{ m}\Omega @ V_{GS}=4.5\text{V}, I_D=50\text{A}$

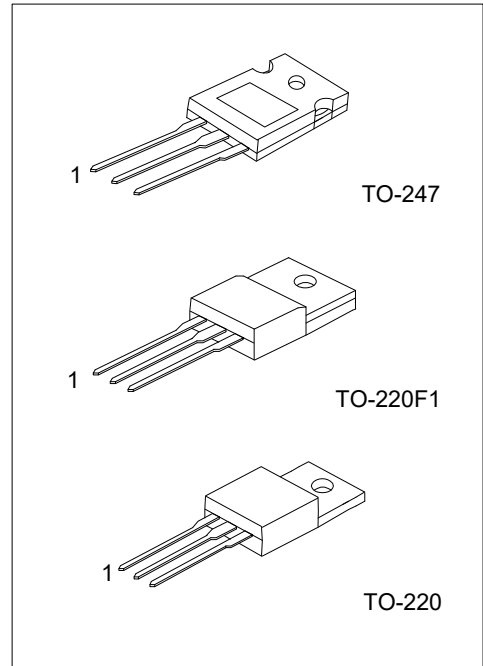
\* Low capacitance

\* Low gate charge

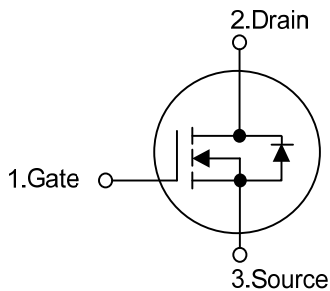
\* High Switching Speed

\* Fast switching capability

\* Avalanche energy specified



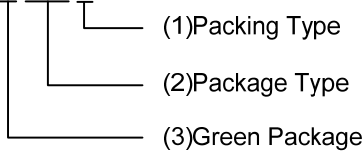
### SYMBOL



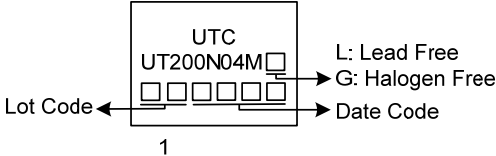
### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
UT200N04ML-TA3-T	UT200N04MG-TA3-T	TO-220	G	D	S	Tube
UT200N04ML-TF1-T	UT200N04MG-TF1-T	TO-220F1	G	D	S	Tube
UT200N04ML-T47-T	UT200N04MG-T47-T	TO-247	G	D	S	Tube

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

<p>UT200N04MG-TA3-T</p>  <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube (2) TA3: TO-220, TF1: TO-220F1, T47: TO-247 (3) G: Halogen Free and Lead Free L: Lead Free</p>
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MARKING



■ ABSOLUTE MAXIMUM RATING ( $T_c=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	40	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	Continuous	$I_D$	200	A
	Pulsed (Note 2)	$I_{DM}$	400	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	480	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.4	V/ns
Power Dissipation	TO-220	$P_D$	250	W
	TO-220F1		48	W
	TO-247		310	W
Junction Temperature		$T_J$	+150	$^\circ\text{C}$
Storage Temperature Range		$T_{STG}$	-20 ~ +150	$^\circ\text{C}$

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.  $L = 0.1\text{mH}$ ,  $I_{AS} = 98\text{A}$ ,  $V_{DD} = 25\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 30\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F1	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-247		50	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220	$\theta_{JC}$	0.5	$^\circ\text{C}/\text{W}$
	TO-220F1		2.6	$^\circ\text{C}/\text{W}$
	TO-247		0.4	$^\circ\text{C}/\text{W}$

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

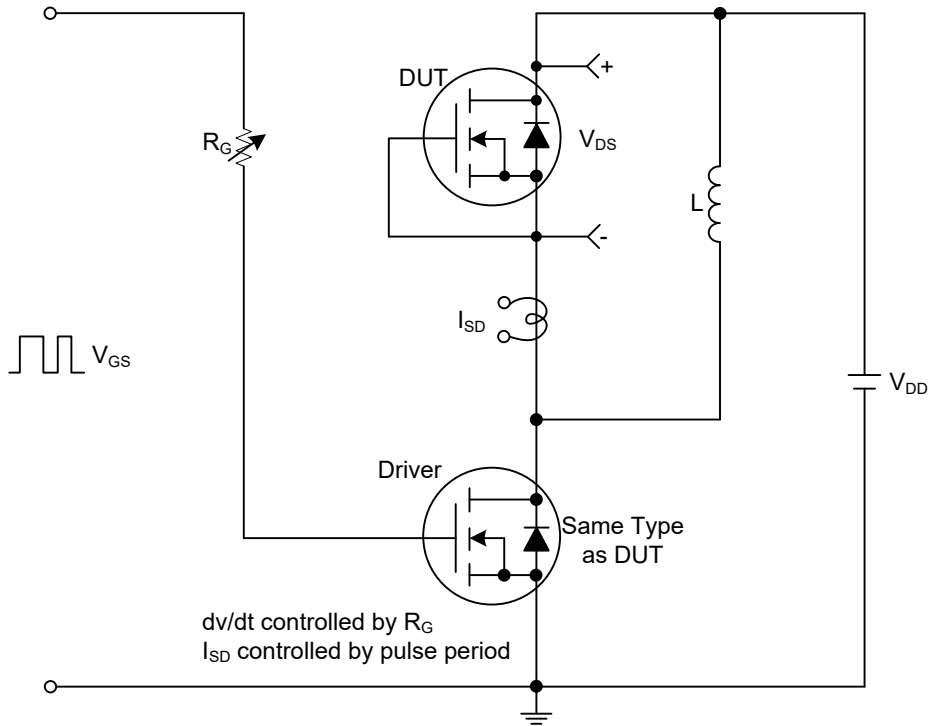
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	40			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=40\text{V}$ , $V_{GS}=0\text{V}$			1	$\mu\text{A}$
Gate-Source Leakage Current	Forward	$V_{GS}=+20\text{V}$ , $V_{DS}=0\text{V}$			+100	nA
	Reverse	$V_{GS}=-20\text{V}$ , $V_{DS}=0\text{V}$			-100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	1.0		3.0	V
Static Drain-Source On-State Resistance	TO-220 TO-220F1	$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=50\text{A}$		2.8	$\text{m}\Omega$
			$V_{GS}=4.5\text{V}$ , $I_D=50\text{A}$		3.5	$\text{m}\Omega$
	TO-247	$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=50\text{A}$		2.0	$\text{m}\Omega$
			$V_{GS}=4.5\text{V}$ , $I_D=50\text{A}$		2.5	$\text{m}\Omega$
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=0\text{V}$ , $V_{GS}=25\text{V}$ , $f=1.0\text{MHz}$		14		nF
Output Capacitance	$C_{OSS}$			1785		pF
Reverse Transfer Capacitance	$C_{RSS}$			1515		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge (Note 1)	$Q_G$	$V_{DS}=32\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=200\text{A}$ (Note 1, 2)		369		nC
Gate to Source Charge	$Q_{GS}$			55		nC
Gate to Drain Charge	$Q_{GD}$			106		nC
Turn-on Delay Time (Note 1)	$t_{D(ON)}$	$V_{DD}=20\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=200\text{A}$ , $R_G=3.3\Omega$ (Note 1, 2)		24		ns
Rise Time	$t_R$			33		ns
Turn-off Delay Time	$t_{D(OFF)}$			190		ns
Fall-Time	$t_F$			130		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	$I_S$				200	A
Maximum Body-Diode Pulsed Current	$I_{SM}$				400	A
Drain-Source Diode Forward Voltage (Note 1)	$V_{SD}$	$I_S=200\text{A}$ , $V_{GS}=0\text{V}$			1.4	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F=30\text{A}$ , $V_{GS}=0\text{V}$ , $di/dt=100\text{A}/\mu\text{s}$		92		ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			222		nC

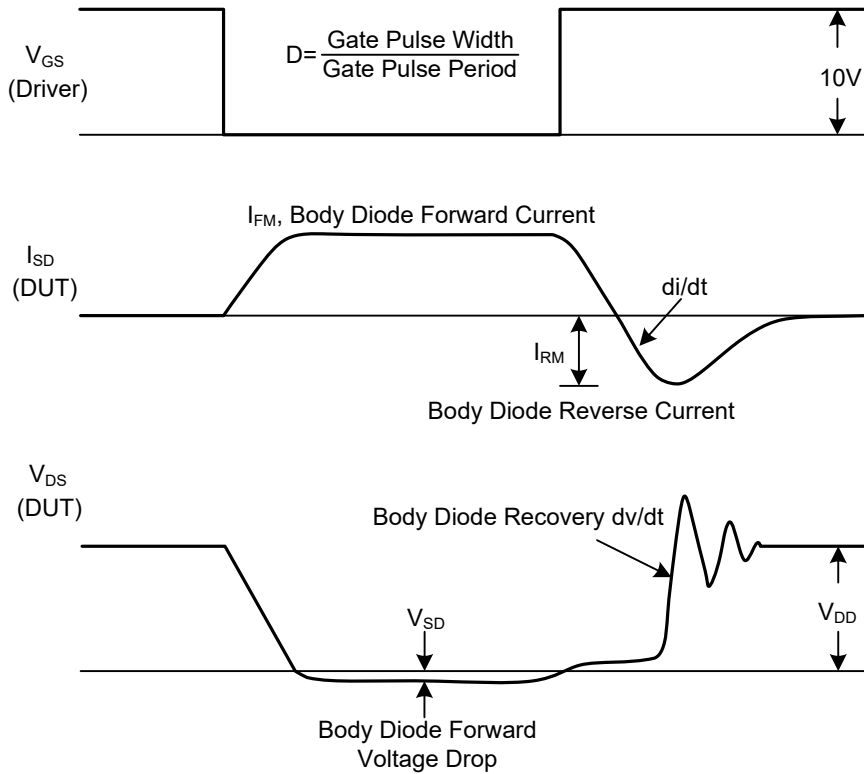
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS



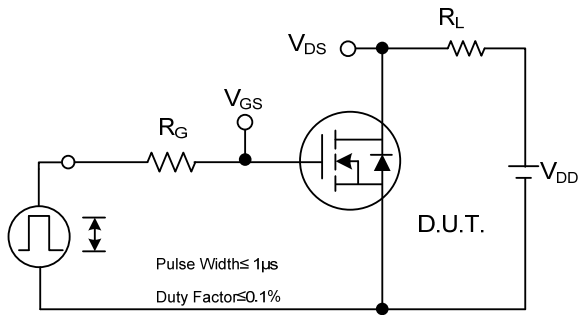
Peak Diode Recovery dv/dt Test Circuit



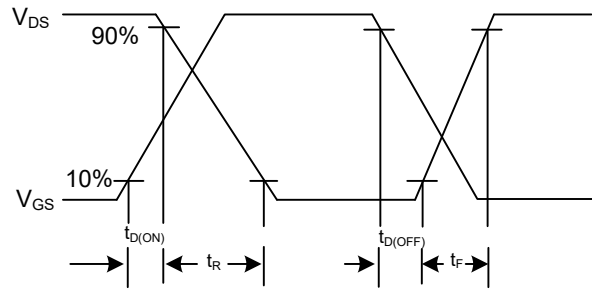
Peak Diode Recovery dv/dt Test Circuit and Waveforms

Peak Diode Recovery dv/dt Waveforms

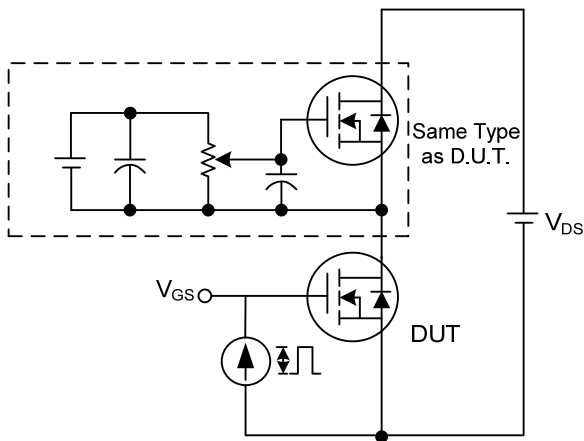
## TEST CIRCUITS AND WAVEFORMS



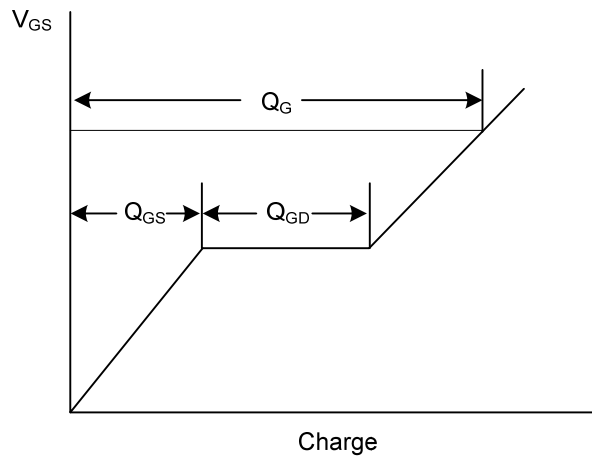
Switching Test Circuit



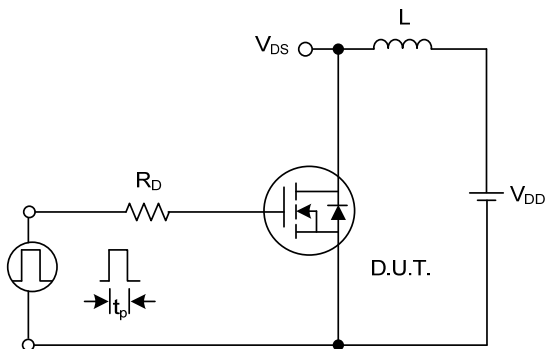
Switching Waveforms



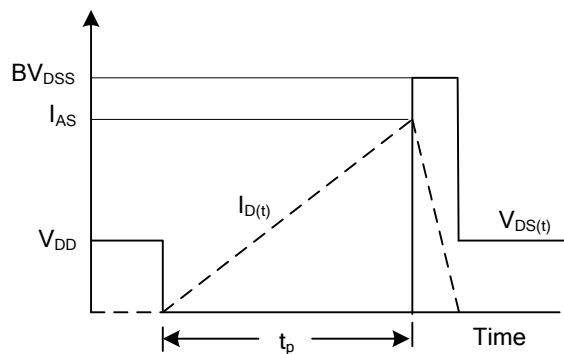
Gate Charge Test Circuit



Gate Charge Waveform

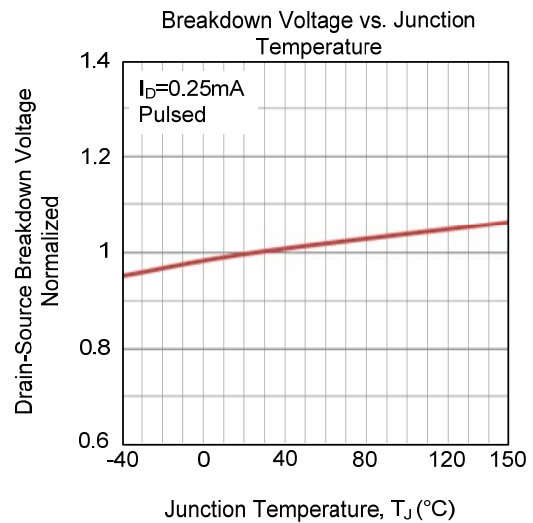
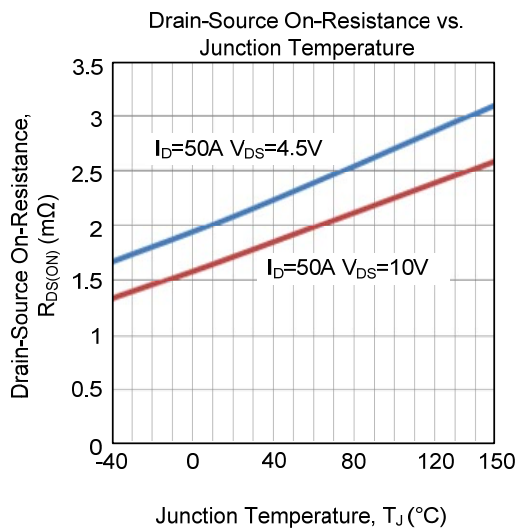
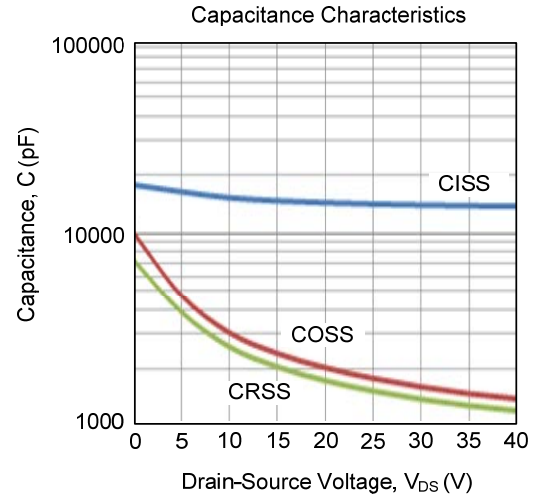
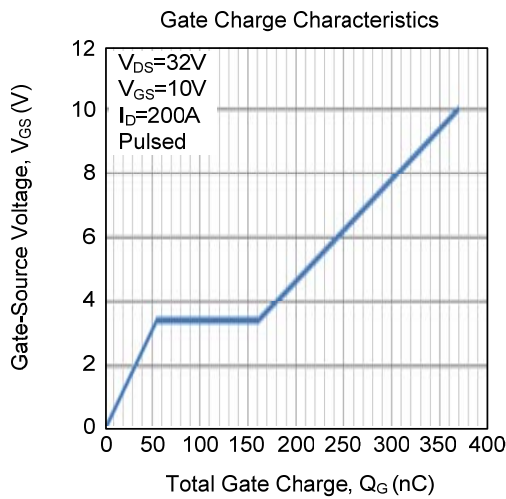
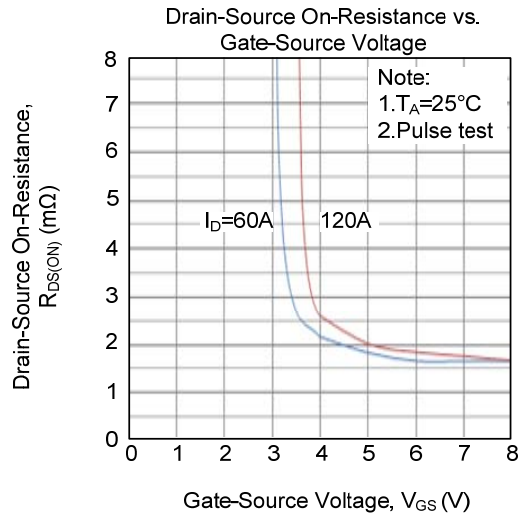
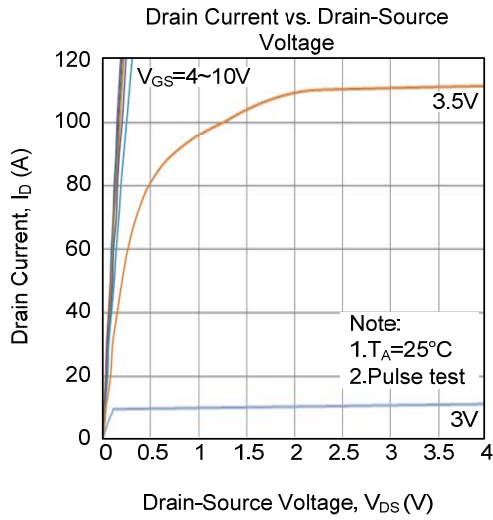


Unclamped Inductive Switching Test Circuit

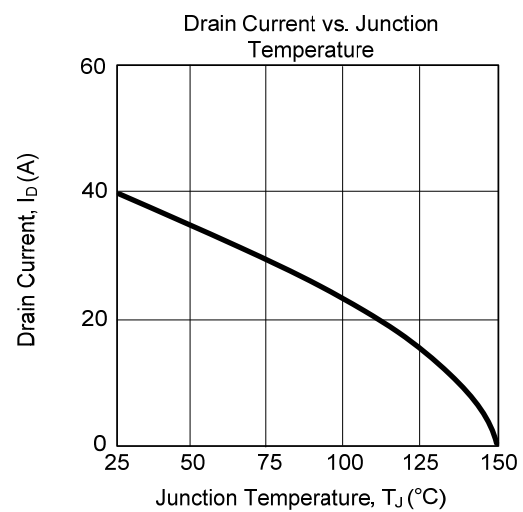
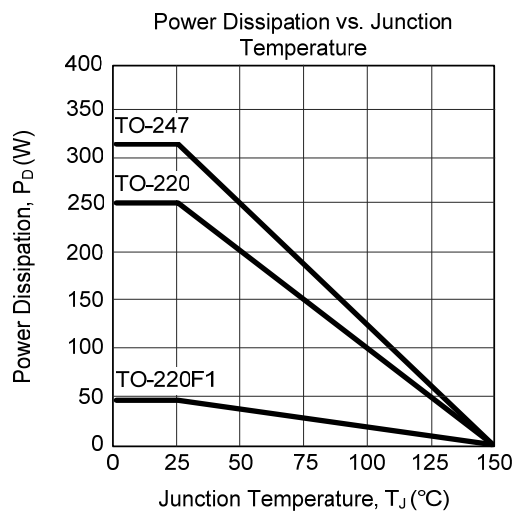
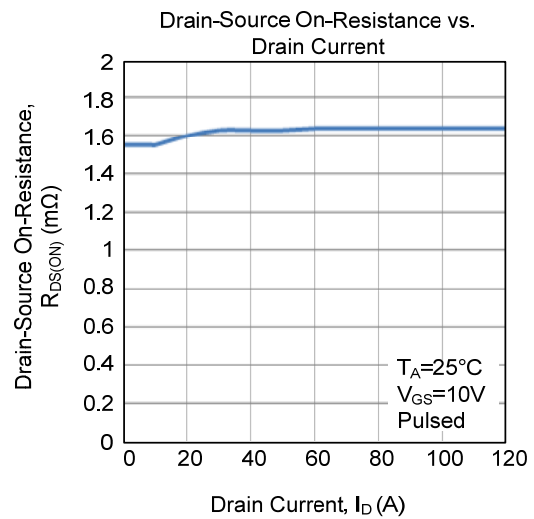
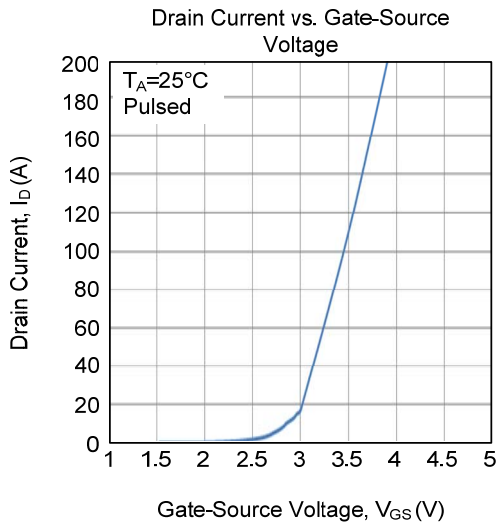
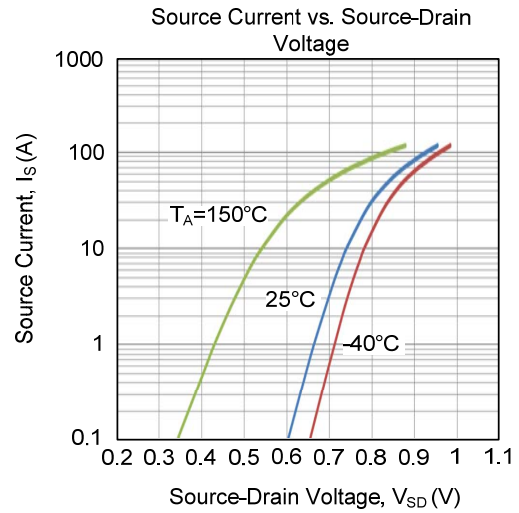
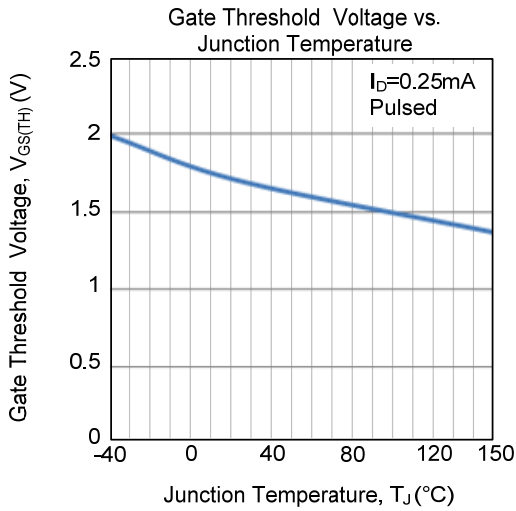


Unclamped Inductive Switching Waveforms

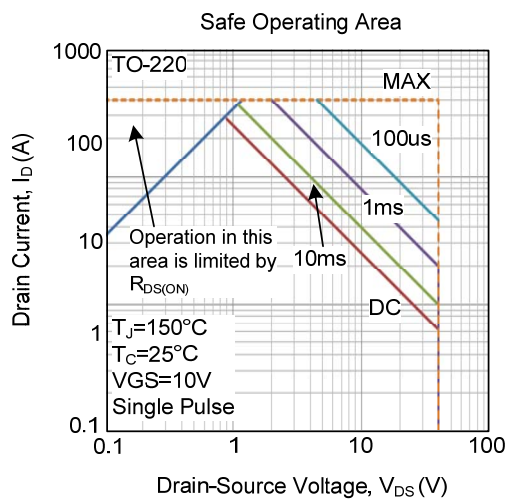
## TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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