



4N100-FCQ

Power MOSFET

4A, 1000V N-CHANNEL POWER MOSFET

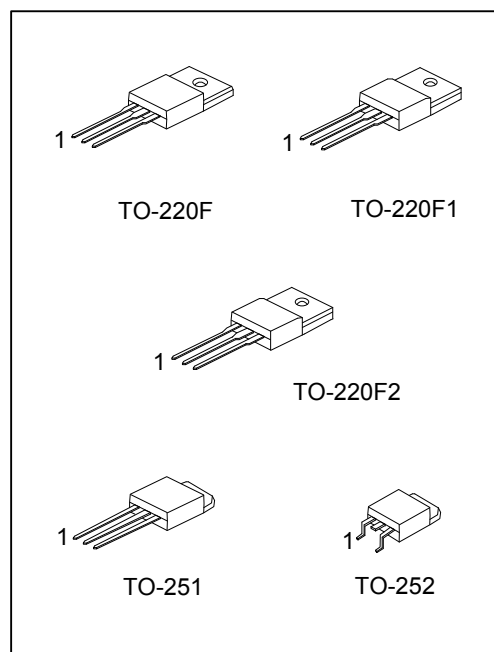
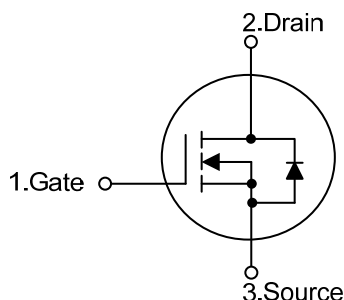
DESCRIPTION

The UTC 4N100-FCQ provide excellent $R_{DS(ON)}$, low gate charge and operation with low gate voltages. This device is suitable for use as a load switch or in PWM applications.

FEATURES

- * $R_{DS(ON)} \leq 7.5 \Omega$ @ $V_{GS}=10V$, $I_D=2.0A$
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

SYMBOL



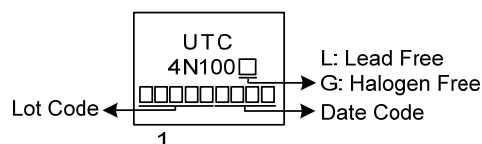
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
4N100L-TF1-T	4N100G-TF1-T	TO-220F1	G	D	S	Tube
4N100L-TF2-T	4N100G-TF2-T	TO-220F2	G	D	S	Tube
4N100L-TF3-T	4N100G-TF3-T	TO-220F	G	D	S	Tube
4N100L-TM3-T	4N100G-TM3-T	TO-251	G	D	S	Tube
4N100L-TN3-R	4N100G-TN3-R	TO-252	G	D	S	Tape Reel

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

4N100G-TF1-T (1) Packing Type (2) Package Type (3) Green Package	(1) T: Tube, R: Tape Reel (2) TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2 TM3: TO-251, TN3: TO-252 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING



■ **ABSOLUTE MAXIMUM RATINGS** ($T_C=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	1000	V
Gate-Source Voltage		V_{GSS}	± 30	V
Continuous Drain Current		I_D	4	A
Pulsed Drain Current (Note 2)		I_{DM}	8	A
Avalanche Energy (Note 3)	Single Pulsed	E_{AS}	101	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.7	V/ns
Power Dissipation	TO-220F/TO-220F1	P_D	23	W
	TO-220F2			
	TO-251/TO-252		45	W
Junction Temperature		T_J	+150	$^{\circ}\text{C}$
Storage Temperature		T_{STG}	-55 ~ +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. $L=30\text{mH}$, $I_{AS}=2.6\text{A}$, $V_{DD}=100\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 4.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220F/TO-220F1	θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
	TO-220F2			
	TO-251/TO-252		110	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220F/TO-220F1	θ_{JC}	5.43	$^{\circ}\text{C}/\text{W}$
	TO-220F2			
	TO-251/TO-252		2.7 (Note)	$^{\circ}\text{C}/\text{W}$

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
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} = 0V, I _D = 250μA	1000			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} = 1000V, 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	3.0		5.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} = 10V, I _D =2.0A			7.5	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f =1MHz		520		pF
Output Capacitance		C _{OSS}			45		pF
Reverse Transfer Capacitance		C _{RSS}			1.5		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge		Q _G	V _{DS} =800V, V _{GS} =10V, I _D =4A, I _G =1mA (Note 1, 2)		13		nC
Gate-Source Charge		Q _{GS}			6		nC
Gate-Drain Charge		Q _{GD}			1.5		nC
Turn-On Delay Time		t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =4A, R _G =25Ω (Note 1, 2)		9		ns
Turn-On Rise Time		t _R			15		ns
Turn-Off Delay Time		t _{D(OFF)}			20		ns
Turn-Off Fall Time		t _F			30		ns
DRAIN-SOURCE DIODE CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				4	A
Continuous Drain-Source Current		I _{SD}				8	A
Drain-Source Diode Forward Voltage		V _{SD}	I _S =4A, V _{GS} =0V			1.4	V
Reverse Recovery Time		t _{rr}	I _F =4A, di/dt = 100A/μs		550		ns
Reverse Recovery Charge		Q _{rr}			8		μC

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

2. Essentially independent of operating temperature.

D.U.T.

V_{DS}

I_{SD}

L

V_{DD}

R_G

Driver

V_{GS}

Same Type as D.U.T.

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

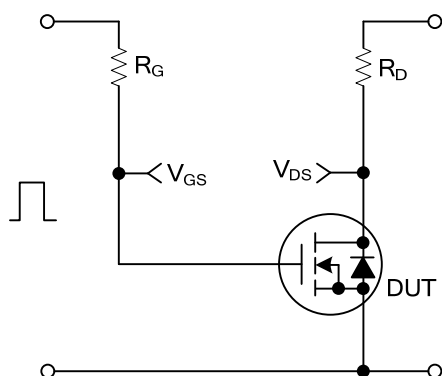
The diagram illustrates the timing relationship between the gate-source voltage (V_{GS}), the drain-source current (I_{SD}), and the drain-source voltage (V_{DS}) during a switching event. The horizontal axis represents time.

- V_{GS} (Driver):** A square wave pulse. The pulse width is labeled **P.W.**, and the total time for one pulse is labeled **Period**. The duty cycle is given by $D = \frac{P.W.}{Period}$. The peak voltage is indicated as $V_{GS} = 10V$.
- I_{SD} (D.U.T.):** The drain-source current. During the **Body Diode Forward Conduction** phase, it is labeled I_{FM} , **Body Diode Forward Current**. The slope of the rising current is labeled di/dt . During the **Body Diode Reverse Conduction** phase, it is labeled I_{RM} , **Body Diode Reverse Current**.
- V_{DS} (D.U.T.):** The drain-source voltage. It shows the **Body Diode Recovery** phase where the voltage rises from zero. The slope of this recovery is labeled dv/dt . The final steady-state voltage is labeled V_{DD} .

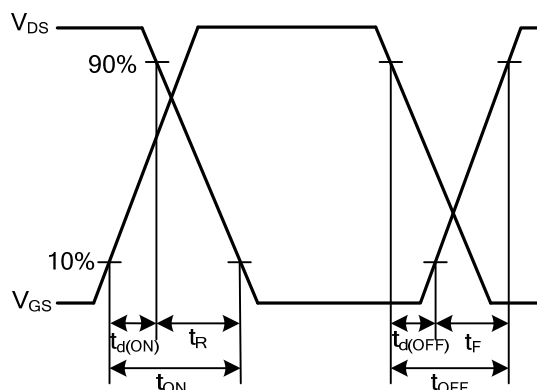
Labels at the bottom of the diagram indicate the regions: **Body Diode Forward Conduction**, **Body Diode Reverse Conduction**, and **Body Diode Recovery**.

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QW-R205-618.C

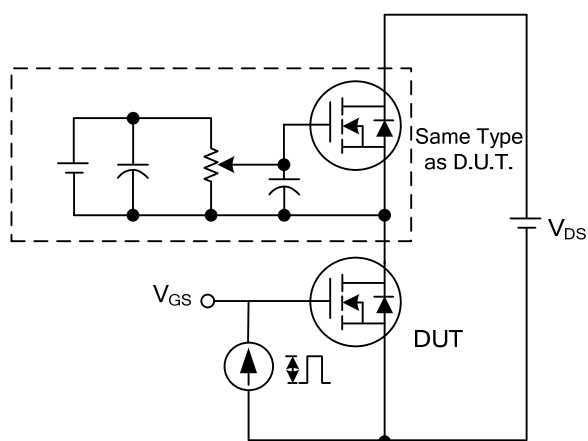
■ TEST CIRCUITS AND WAVEFORMS



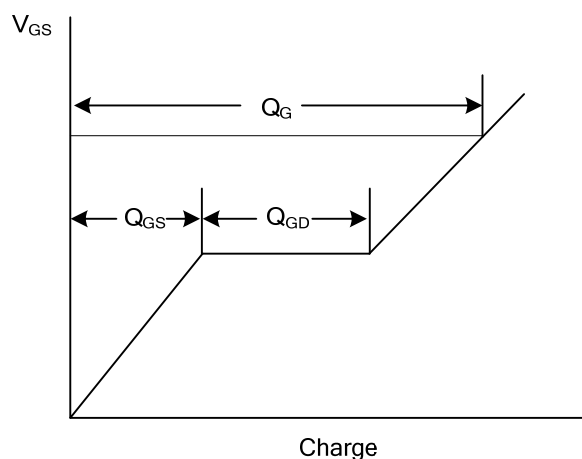
Switching Test Circuit



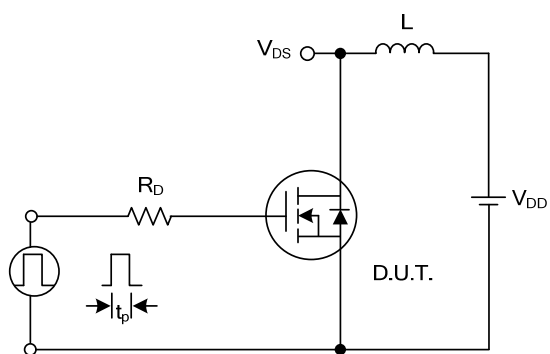
Switching Waveforms



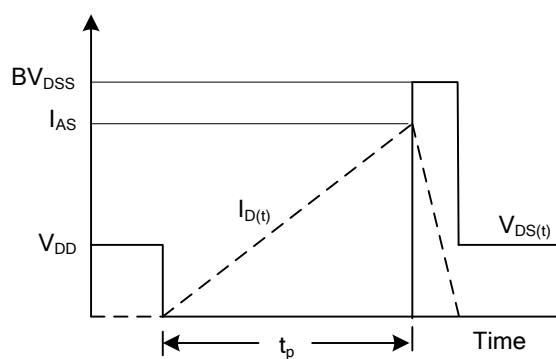
Gate Charge Test Circuit



Gate Charge Waveform

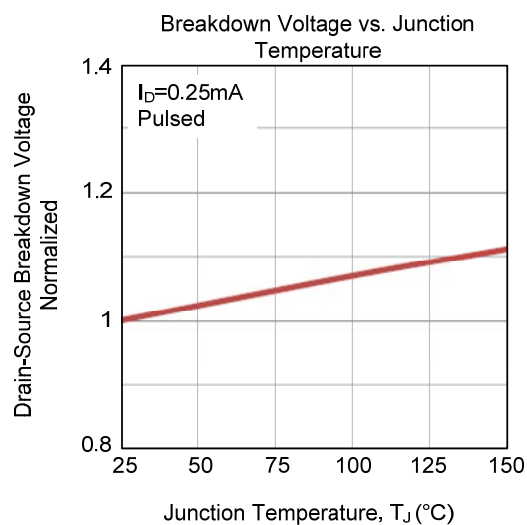
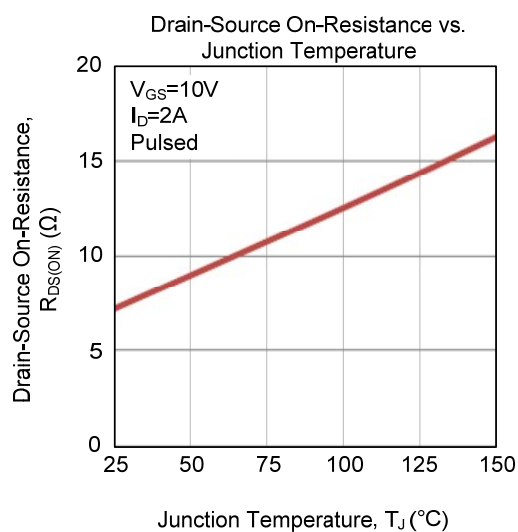
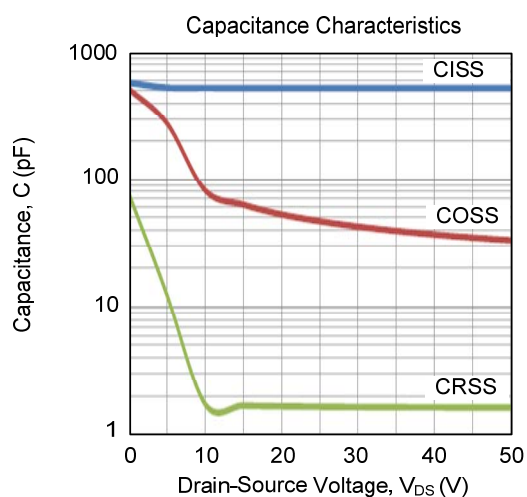
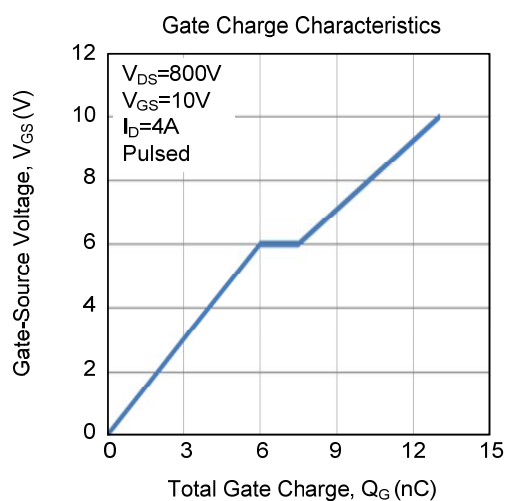
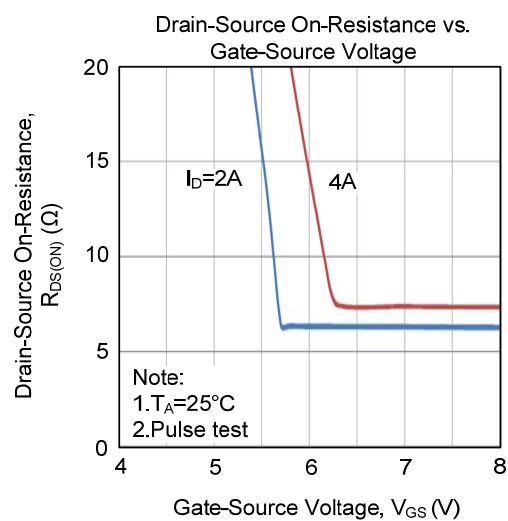
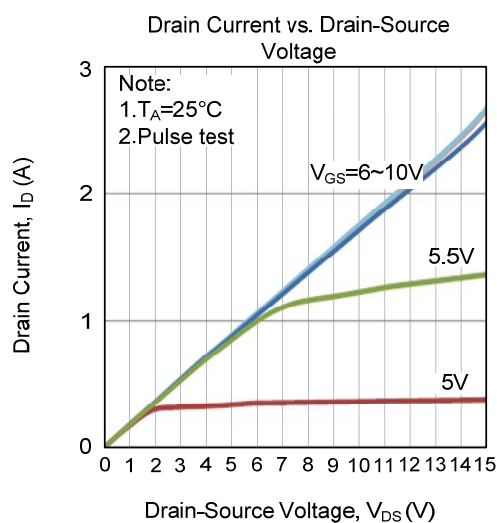


Unclamped Inductive Switching Test Circuit

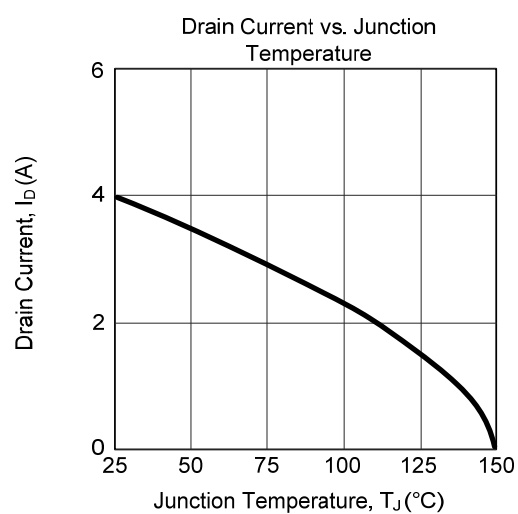
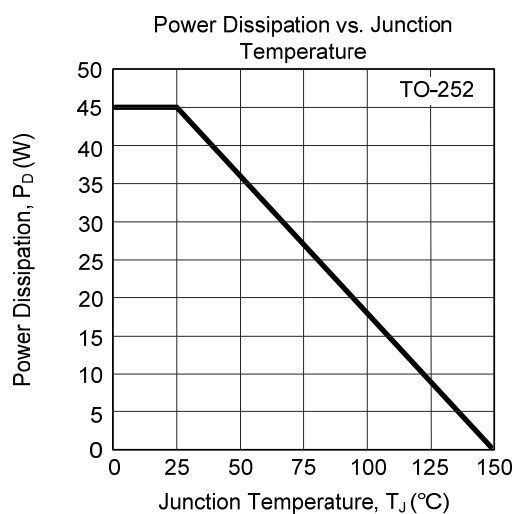
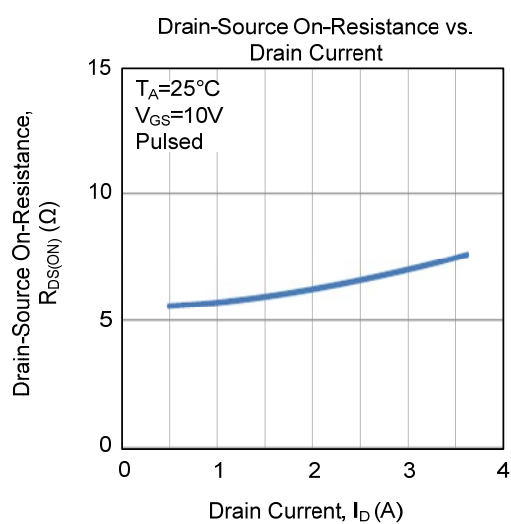
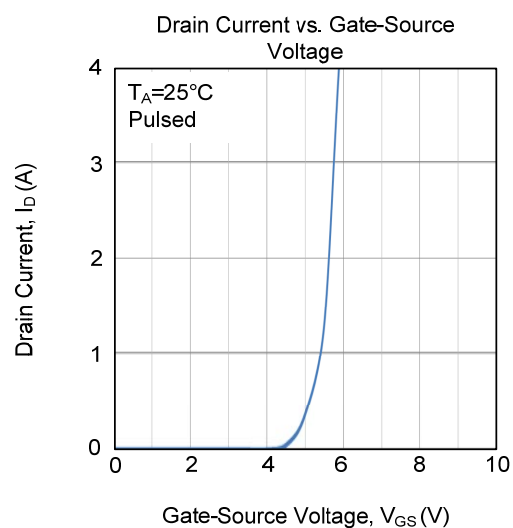
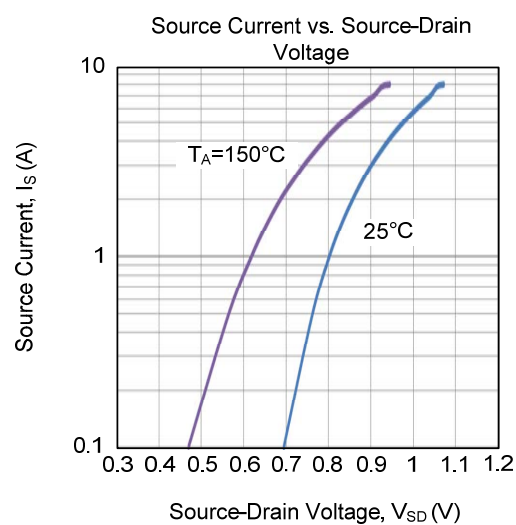
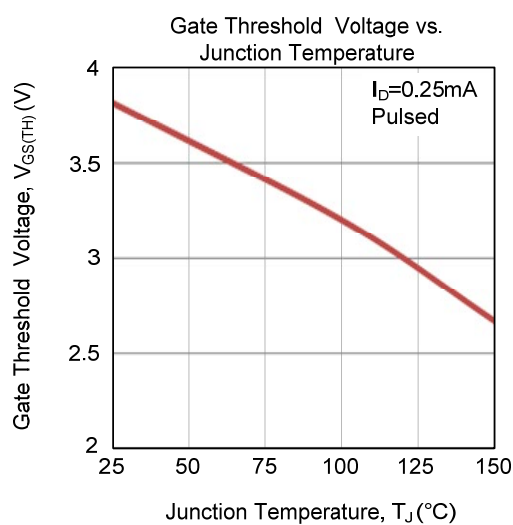


Unclamped Inductive Switching Waveforms

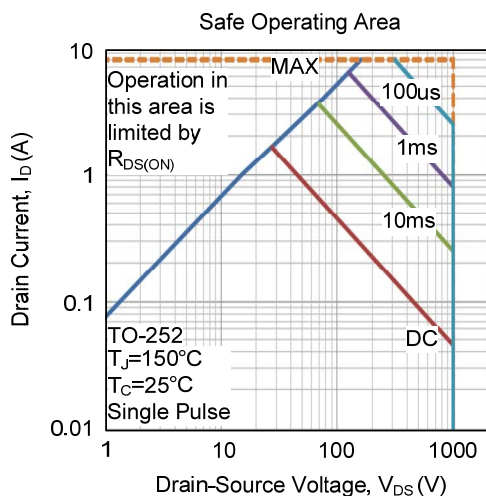
■ TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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