



UNISONIC TECHNOLOGIES CO., LTD

12N70

Power MOSFET

12 Amps, 700 Volts N-CHANNEL MOSFET

DESCRIPTION

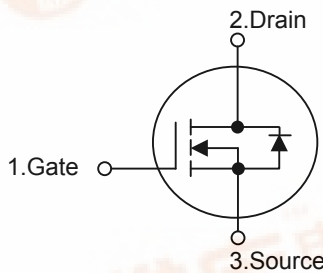
The UTC **12N70** are N-Channel enhancement mode power field effect transistors (MOSFET) which are produced using UTC's proprietary, planar stripe, DMOS technology.

These devices are suited for high efficiency switch mode power supply. To minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode the advanced technology has been especially tailored.

FEATURES

- * $R_{DS(ON)} = 0.7\Omega @ V_{GS} = 10V$
- * Ultra low gate charge (typical 42 nC)
- * Low reverse transfer capacitance ($C_{RSS} =$ typical 25 pF)
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

SYMBOL

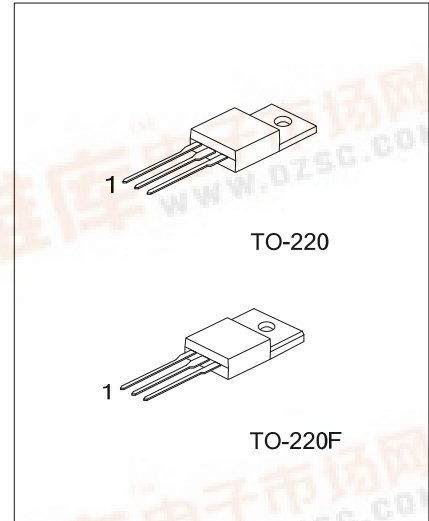


ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Normal	Lead Free Plating		1	2	3	
12N70-TA3-T	12N70L-TA3-T	TO-220	G	D	S	Tube
12N70-TF3-T	12N70L-TF3-T	TO-220F	G	D	S	Tube

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

<p>12N70L-TA3-T</p>	<p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Lead Plating</p>	<p>(1) T: Tube</p> <p>(2) TA3: TO-220, TF3: TO-220F</p> <p>(3) L: Lead Free Plating, Blank: Pb/Sn</p>
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*Pb-free plating product number:12N70L

12N70

Power MOSFET

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

PARAMETER	SYMBOL	RATINGS	UNIT	
Drain-Source Voltage	V_{DSS}	700	V	
Gate-Source Voltage	V_{GSS}	± 30	V	
Avalanche Current (Note 1)	I_{AR}	12	A	
Continuous Drain Current	I_D	12	A	
Pulsed Drain Current (Note 1)	I_{DM}	48	A	
Avalanche Energy	Single Pulsed (Note 2)	E_{AS}	790	mJ
	Repetitive (Note 1)	E_{AR}	24	mJ
Peak Diode Recovery dv/dt (Note 3)	dv/dt	4.5	V/ns	
Junction Temperature	T_J	+150	$^\circ\text{C}$	
Operating Temperature	T_{OPR}	-55 ~ +150	$^\circ\text{C}$	
Storage Temperature	T_{STG}	-55 ~ +150	$^\circ\text{C}$	

Note: 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.

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	700			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$			10	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$			± 100	nA
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D = 250\ \mu\text{A}$, Referenced to 25°C		0.7		$\text{V}/^\circ\text{C}$
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 6.0\text{ A}$		0.55	0.7	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		1480	1900	pF
Output Capacitance	C_{OSS}		200	270	pF	
Reverse Transfer Capacitance	C_{RSS}		25	35	pF	
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD} = 300\text{ V}, I_D = 12\text{ A}, R_G = 25\ \Omega$ (Note 4, 5)		30	70	ns
Turn-On Rise Time	t_R		115	240	ns	
Turn-Off Delay Time	$t_{D(OFF)}$		95	200	ns	
Turn-Off Fall Time	t_F		85	180	ns	
Total Gate Charge	Q_G	$V_{DS} = 480\text{ V}, I_D = 12\text{ A}, V_{GS} = 10\text{ V}$ (Note 4, 5)		42	54	nC
Gate-Source Charge	Q_{GS}		8.6		nC	
Gate-Drain Charge	Q_{GD}		21		nC	
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 12\text{ A}$			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I_S				12	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				48	A
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, I_S = 12\text{ A},$		380		ns
Reverse Recovery Charge	Q_{RR}	$di/dt = 100\text{ A}/\mu\text{s}$ (Note 4)		3.5		μC

Notes: 1. Repetitive Rating : Pulse width limited by maximum junction temperature

2. $L = 10\text{ mH}, I_{AS} = 12\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

3. $I_{SD} \leq 12\text{ A}, di/dt \leq 200\text{ A/s}, V_{DD} \leq BV_{DSS}$ Starting $T_J = 25^\circ\text{C}$

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

5. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

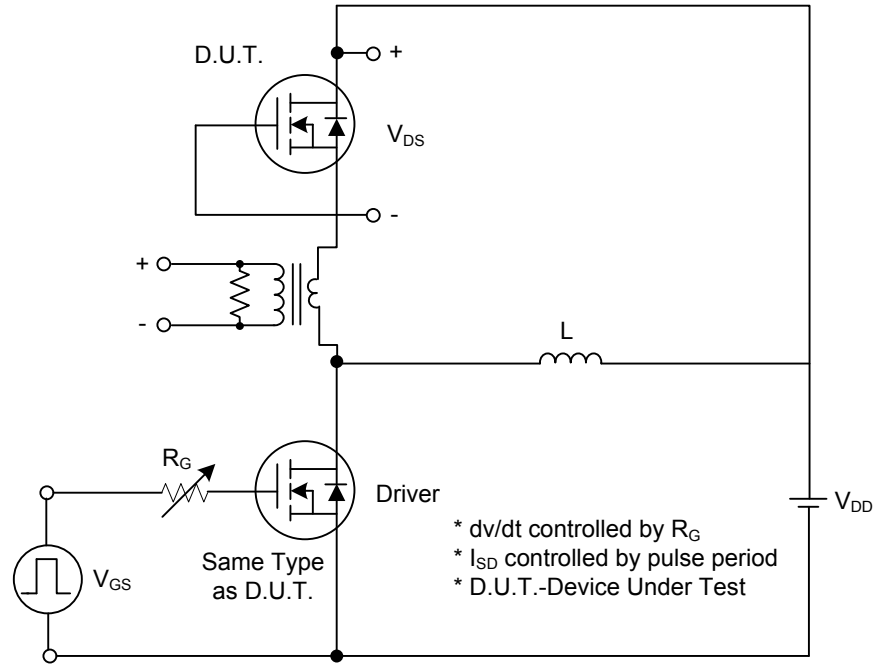


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

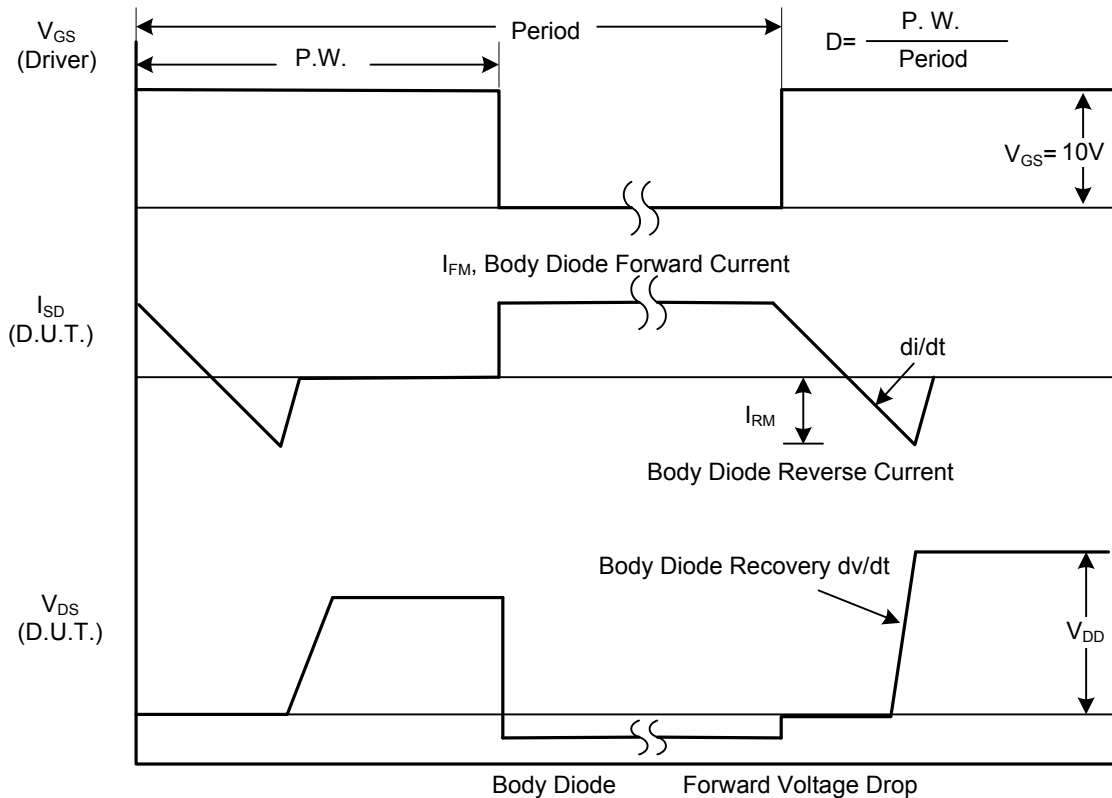


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

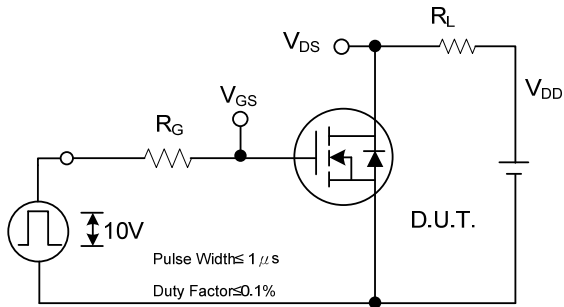


Fig. 2A Switching Test Circuit

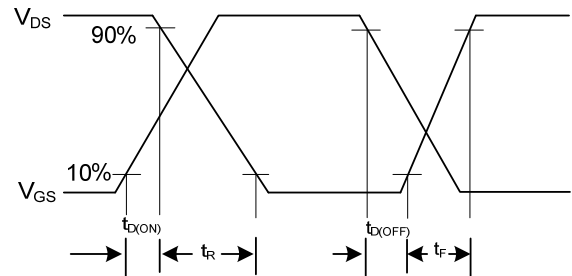


Fig. 2B Switching Waveforms

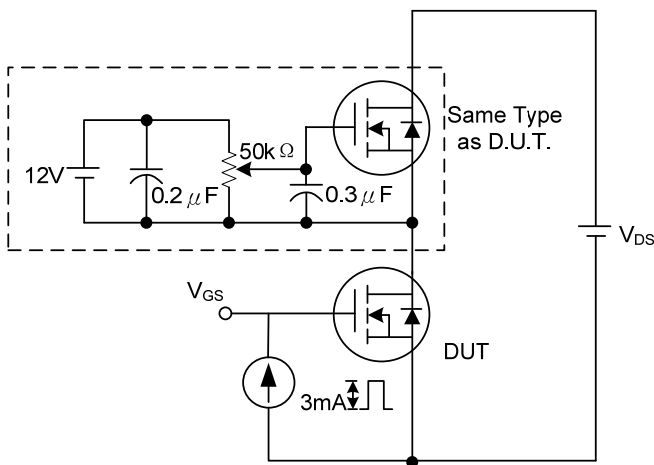


Fig. 3A Gate Charge Test Circuit

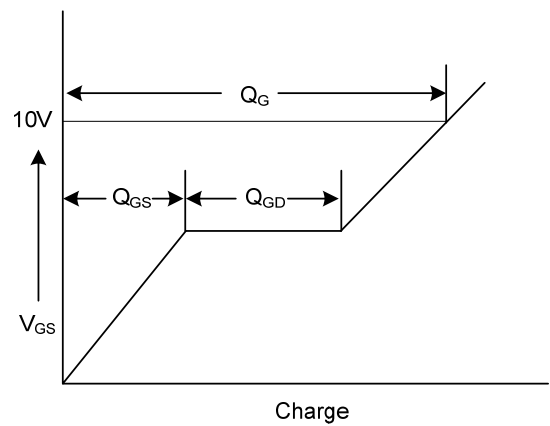


Fig. 3B Gate Charge Waveform

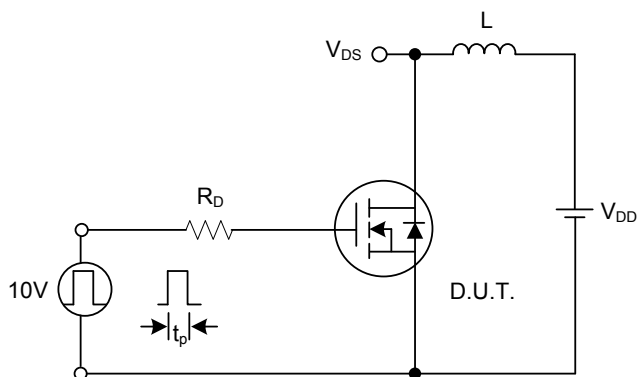


Fig. 4A Unclamped Inductive Switching Test Circuit

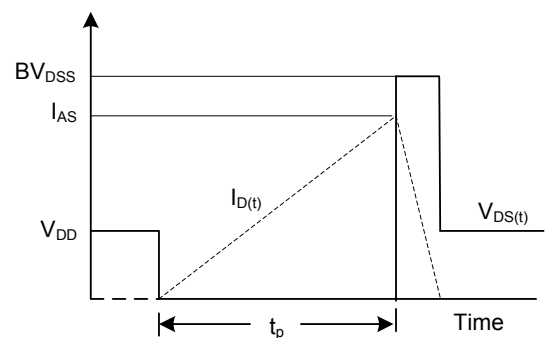
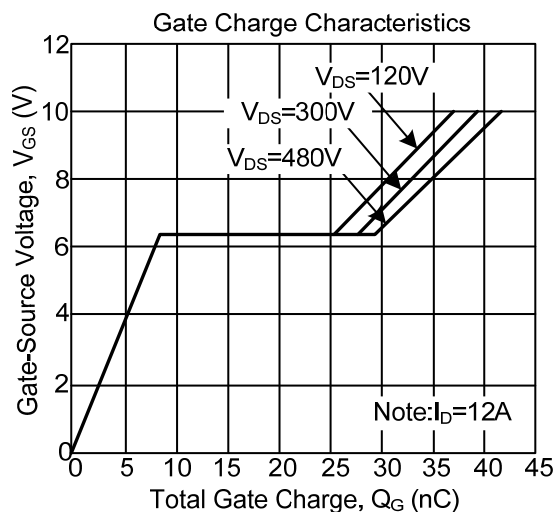
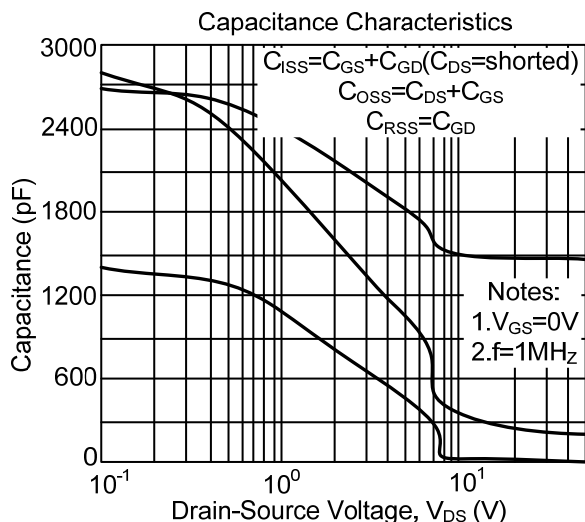
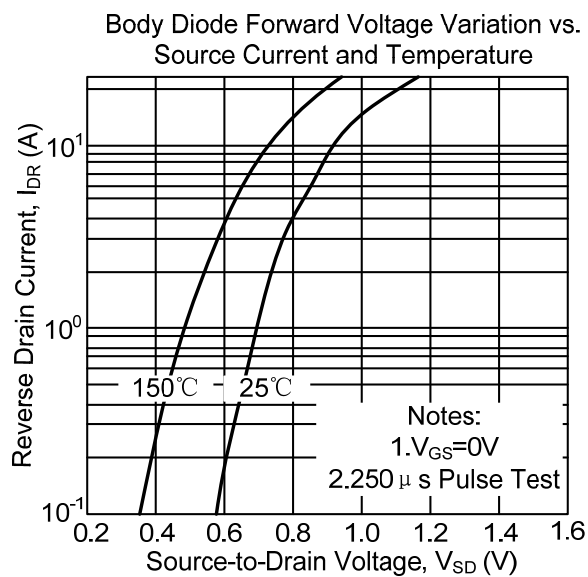
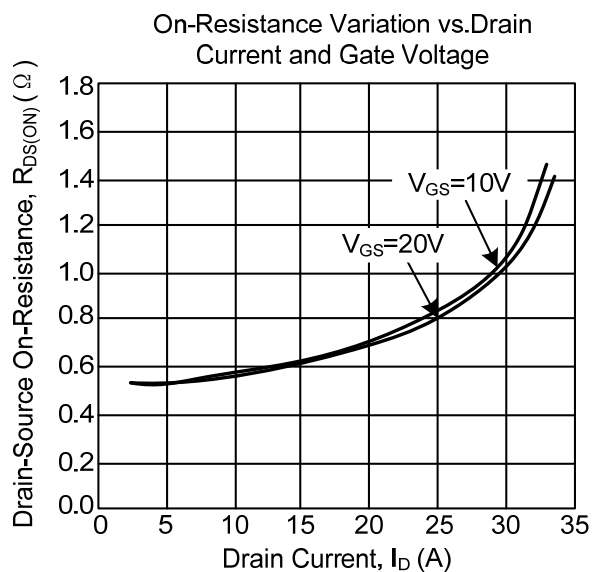
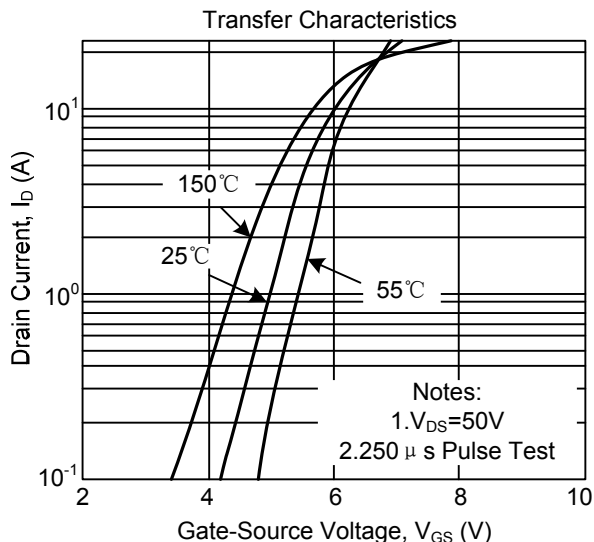
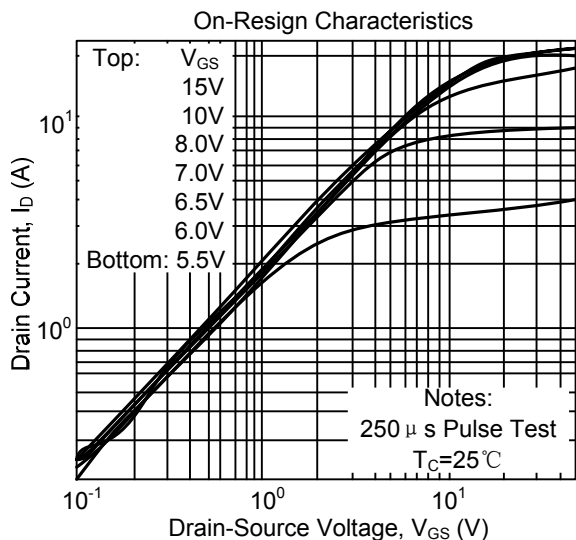
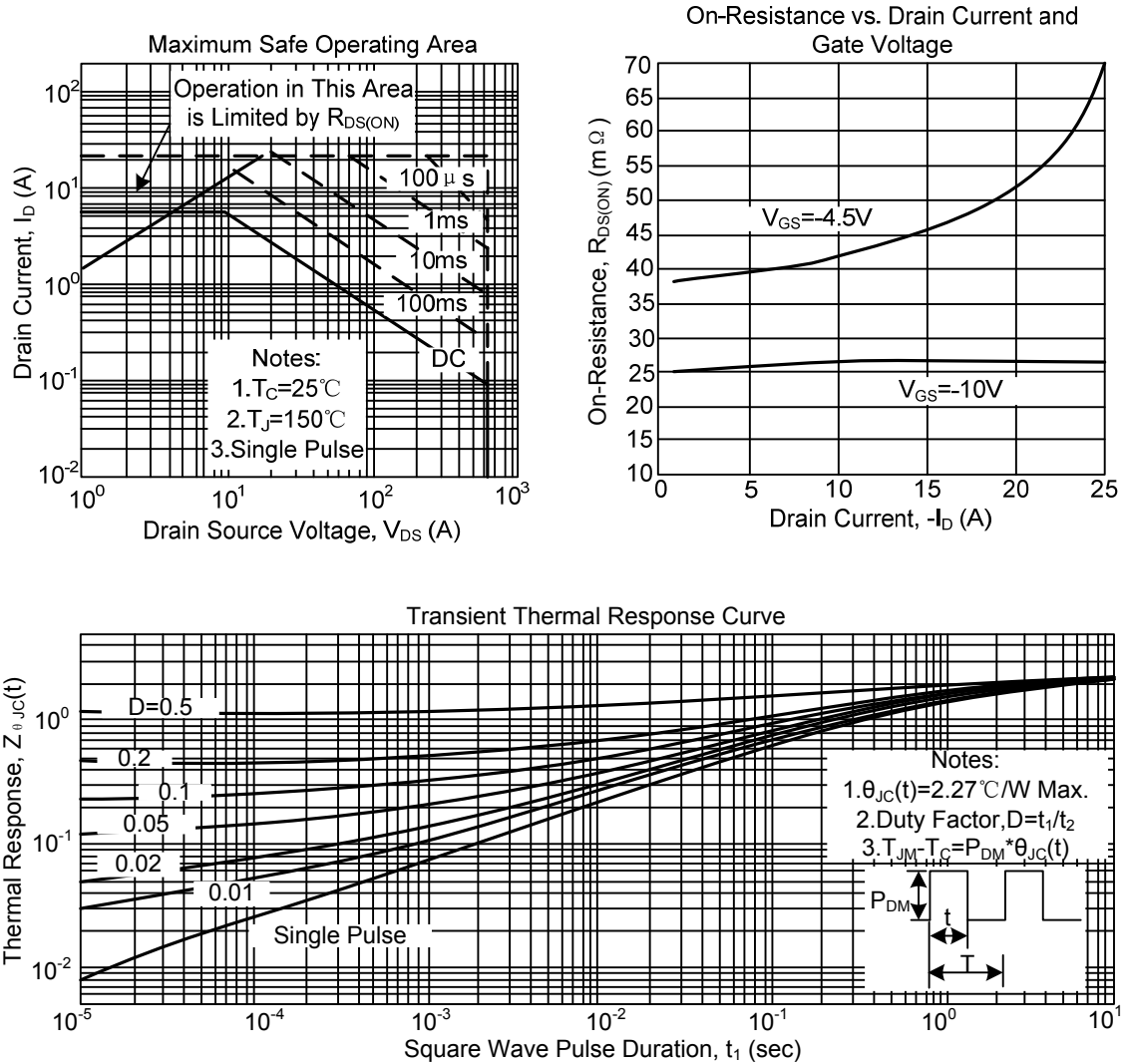


Fig. 4B Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS



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