



12N60

Power MOSFET

12 Amps, 600/650 Volts N-CHANNEL MOSFET

DESCRIPTION

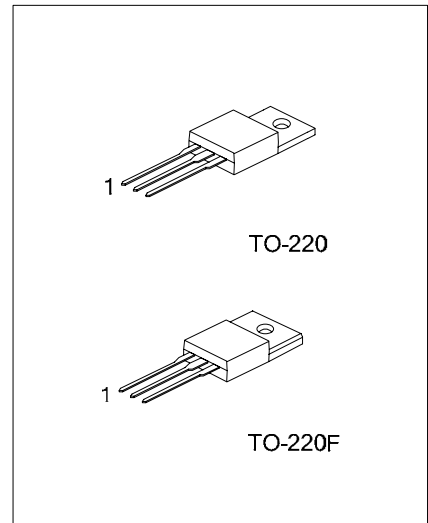
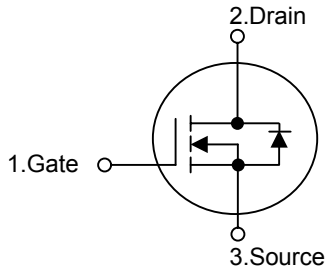
The UTC **12N60** are N-Channel enhancement mode power field effect transistors (MOSFET) which are produced using UTC's proprietary, planar stripe, DMOS technology.

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



*Pb-free plating product number:12N60L

ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Normal	Lead Free Plating		1	2	3	
12N60-x-TA3-T	12N60L-x-TA3-T	TO-220	G	D	S	Tube
12N60-x-TF3-T	12N60L-x-TF3-T	TO-220F	G	D	S	Tube

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

<p>12N60L-x-TA3-T</p> <p>(1)Packing Type (2)Package Type (3)Drain-Source Voltage (4)Lead Plating</p>	<p>(1) T: Tube (2) TA3: TO-220, TF3: TO-220F (3) A: 600V, B: 650V (4) L: Lead Free Plating, Blank: Pb/Sn</p>
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■ ABSOLUTE MAXIMUM RATINGS ($T_C = 25$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage	12N60-A	V_{DSS}	600	V
	12N60-B		650	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	
Operating Temperature		T_{OPR}	-55 ~ +150	
Storage Temperature		T_{STG}	-55 ~ +150	

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 ($T_C = 25$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage	12N60-A	BV_{DSS}	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	600			V
	12N60-B			650			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		BV_{DSS}/T_J	$I_D = 250\ \mu\text{A}$, Referenced to 25°C		0.7		V/°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			42	54	nC
Gate-Source Charge		Q_{GS}	$V_{DS} = 480\text{ V}, I_D = 12\text{ A}, V_{GS} = 10\text{ V}$ (Note 4, 5)		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

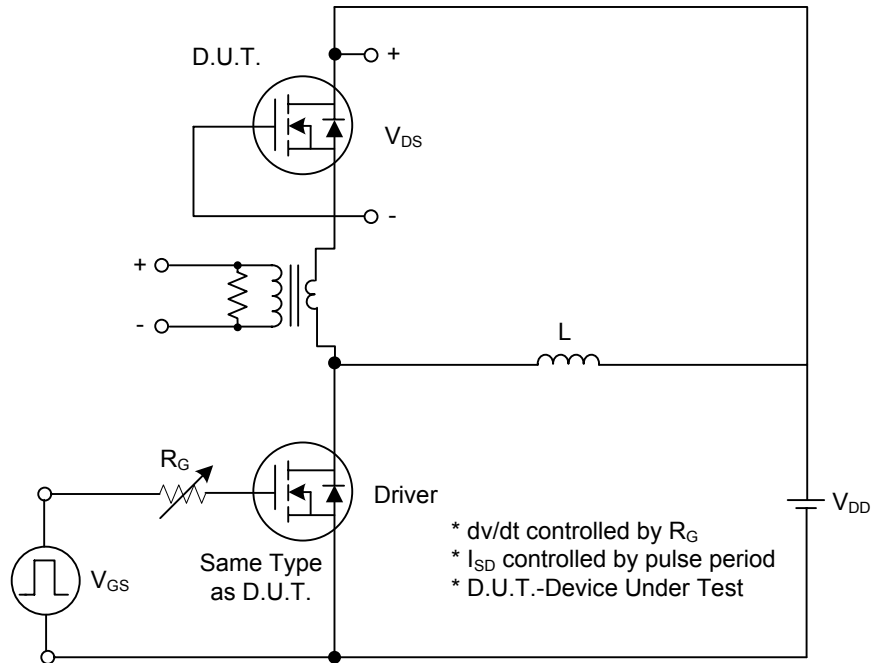


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

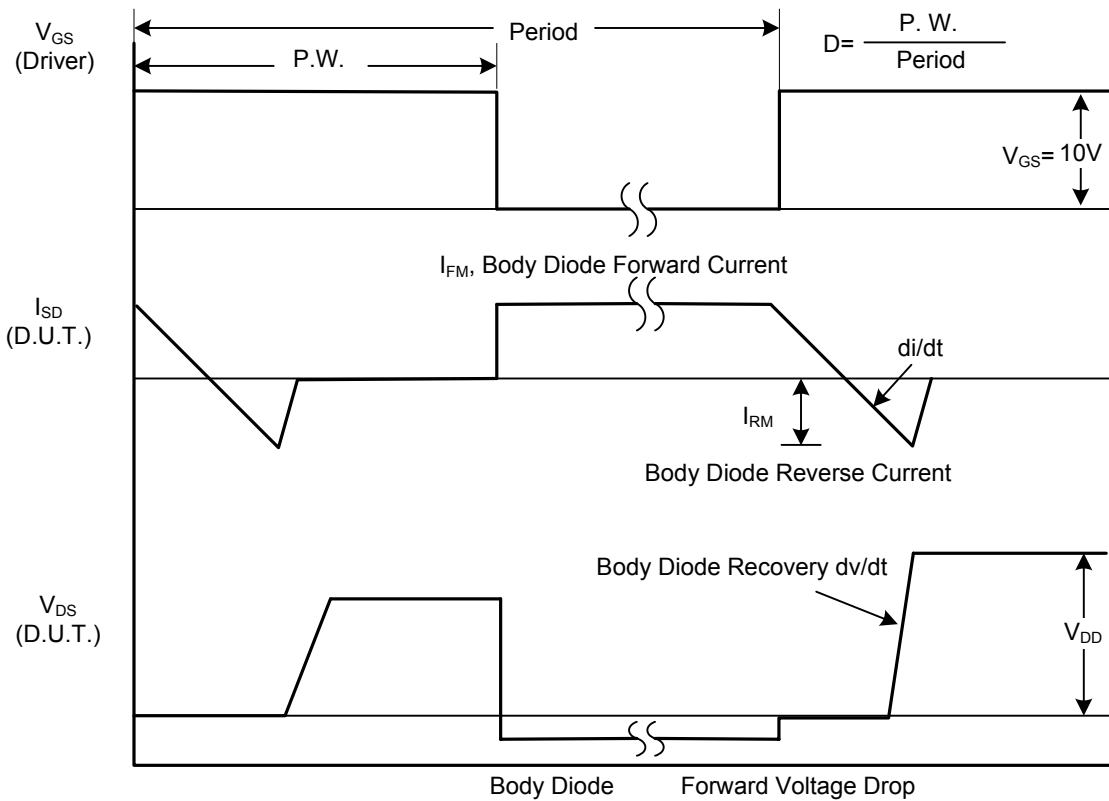


Fig. 1B Peak Diode Recovery dv/dt Waveforms

TEST CIRCUITS AND WAVEFORMS (Cont.)

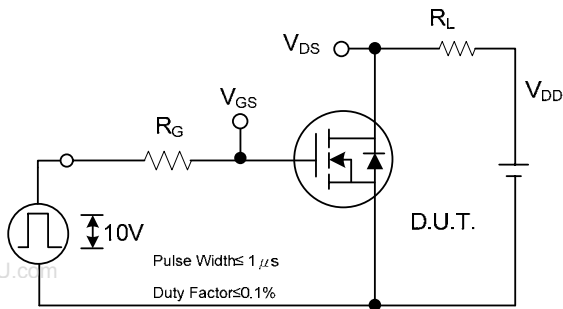


Fig. 2A Switching Test Circuit

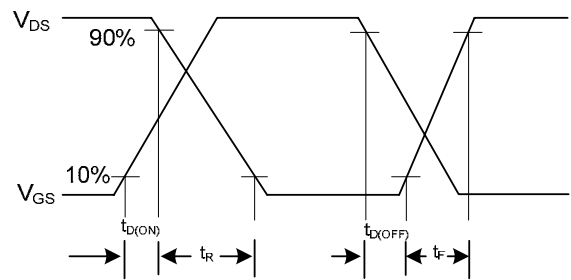


Fig. 2B Switching Waveforms

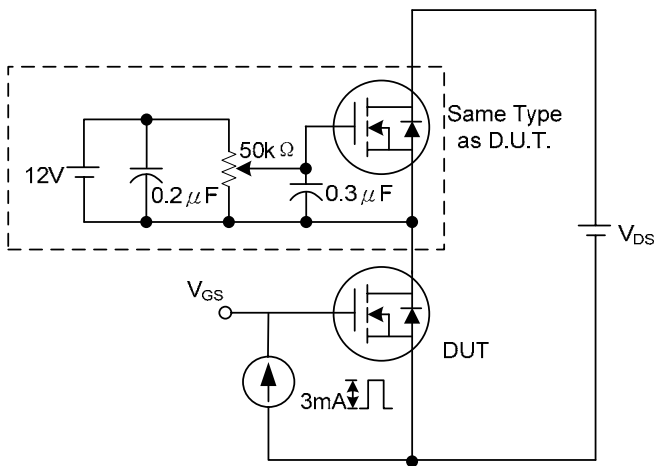


Fig. 3A Gate Charge Test Circuit

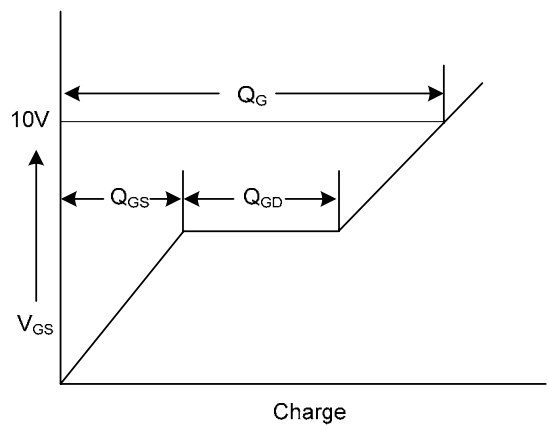


Fig. 3B Gate Charge Waveform

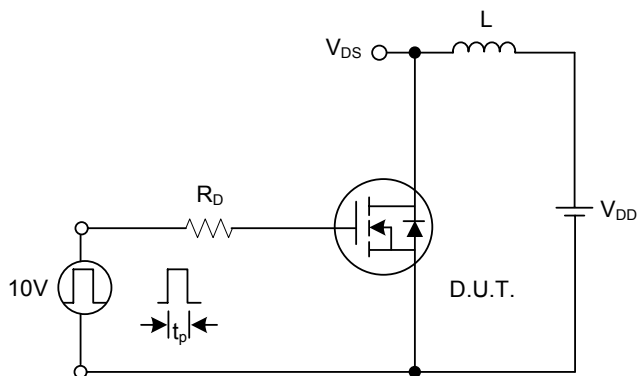


Fig. 4A Unclamped Inductive Switching Test Circuit

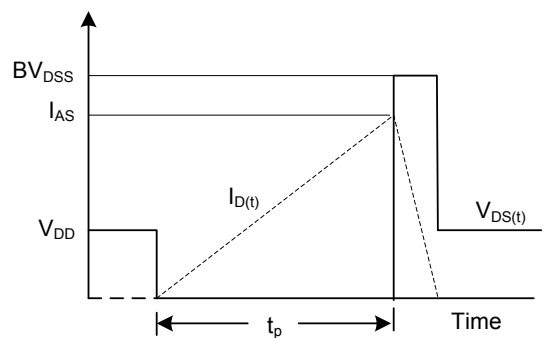
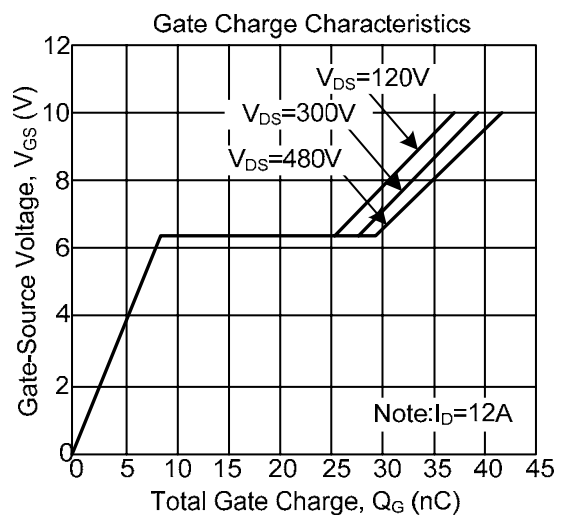
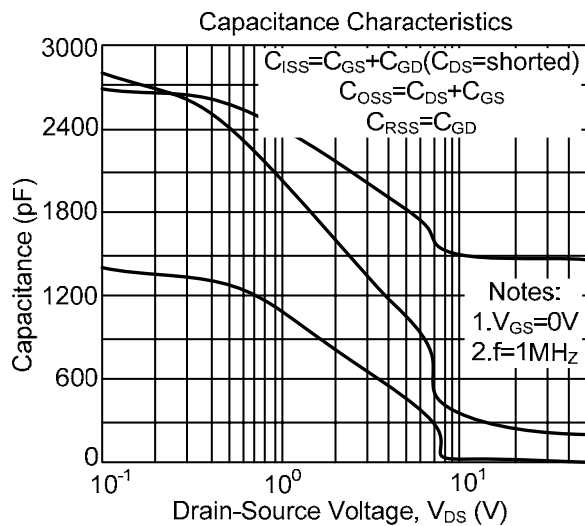
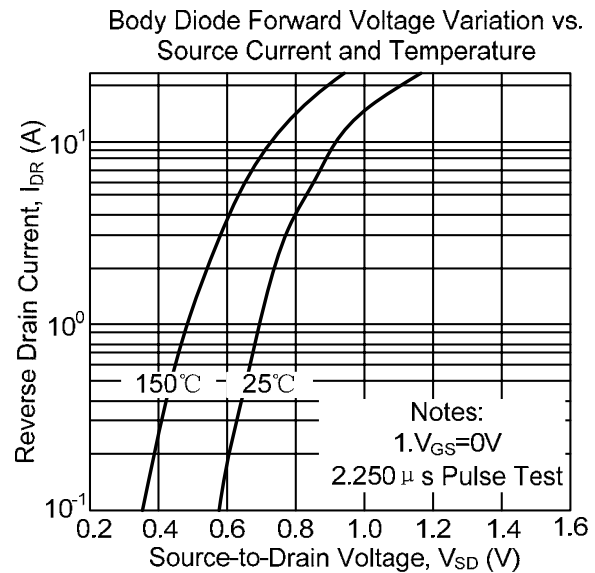
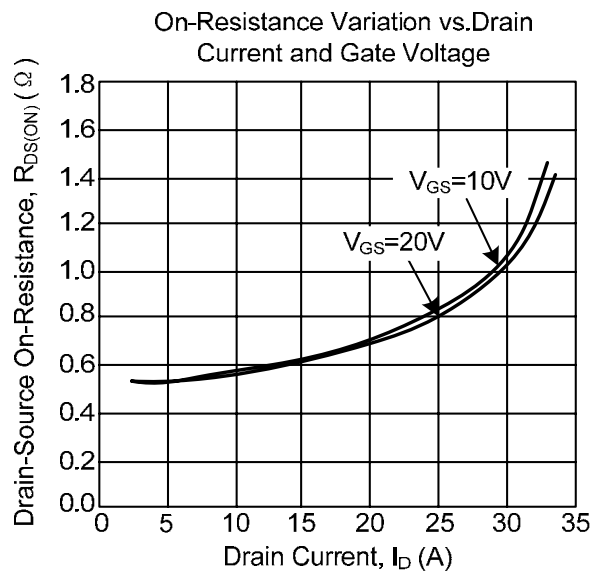
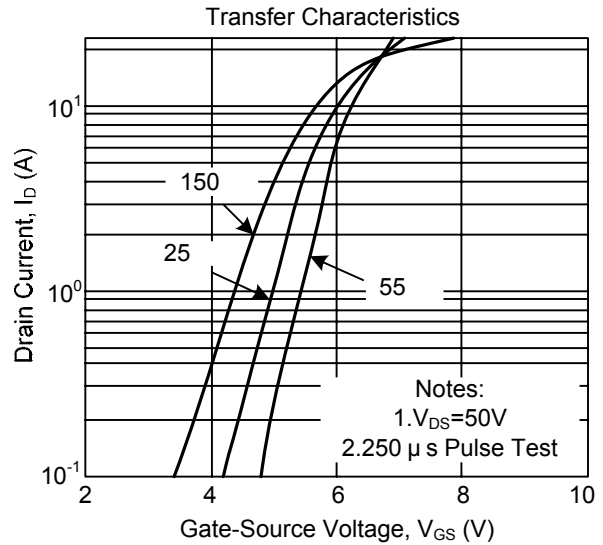
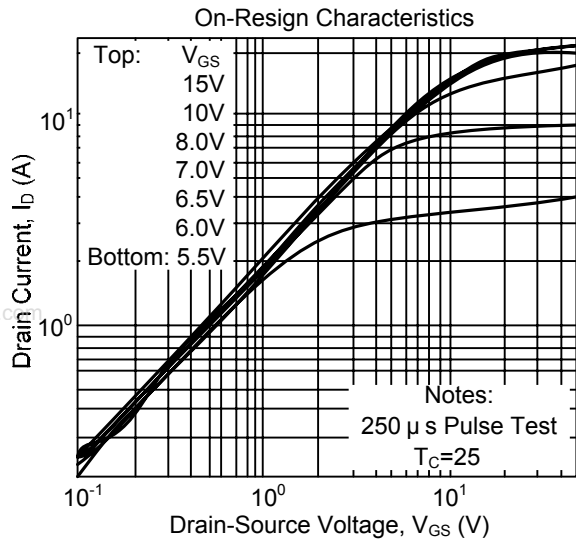
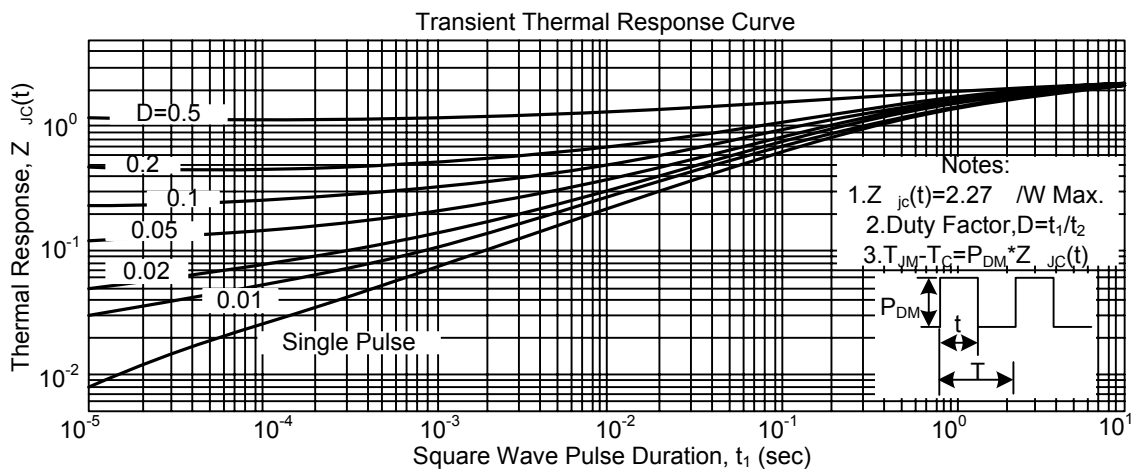
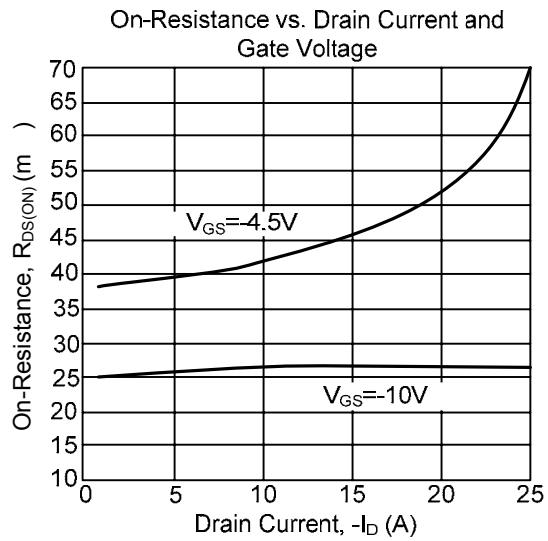
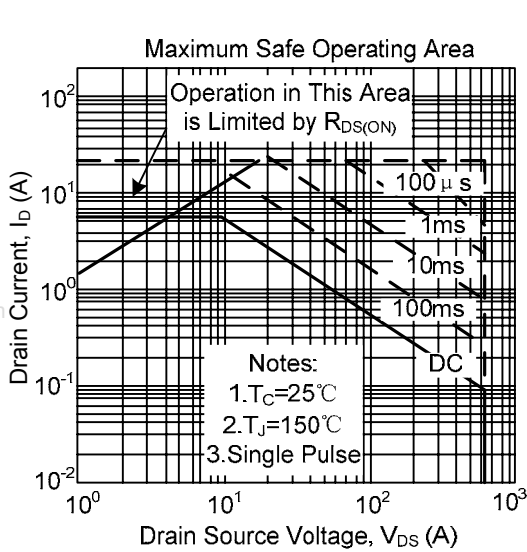


Fig. 4B Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS



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