



12N60

Power MOSFET

12 Amps, 600/650 Volts N-CHANNEL MOSFET

DESCRIPTION

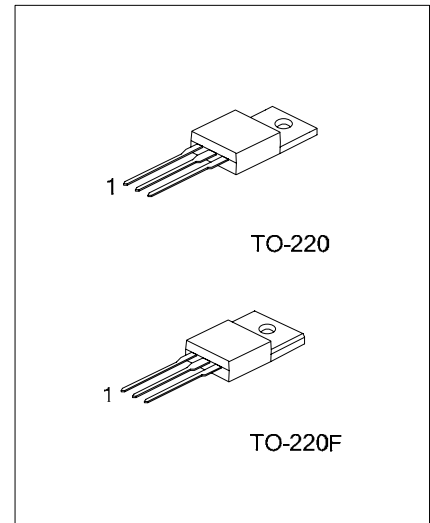
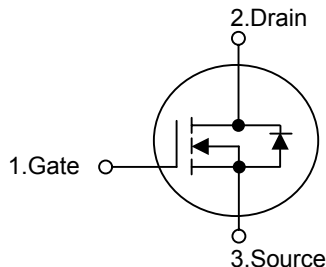
The UTC **12N60** are N-Channel enhancement mode power field effect transistors (MOSFET) which are produced using UTC's proprietary, planar stripe, DMOS technology.

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

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage	12N60-A	V_{DS}	600	V
	12N60-B		650	V
Gate-Source Voltage		V_{GS}	± 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	12N60-A	BV _{DSS}	V _{GS} = 0 V, I _D = 250 μA	600			V
	12N60-B			650			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} = 600 V, V _{GS} = 0 V			10	μA
Gate-Source Leakage Current		I _{GSS}	V _{GS} = ±30 V, V _{DS} = 0 V			±100	nA
Breakdown Voltage Temperature Coefficient		ΔBV _{DSS} /ΔT _J	I _D = 250 μA, Referenced to 25°C		0.7		V/°C
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 = 6.0A		0.55	0.7	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{DS} = 25 V, V _{GS} = 0 V, f = 1MHz		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} = 300V, I _D = 12A, R _G = 25Ω (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} = 480V,I _D = 12A, V _{GS} = 10 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 V, I _S = 12A			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 V, I _S = 12A,		380		ns
Reverse Recovery Charge		Q _{RR}	dl _F /dt = 100 A/μs (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

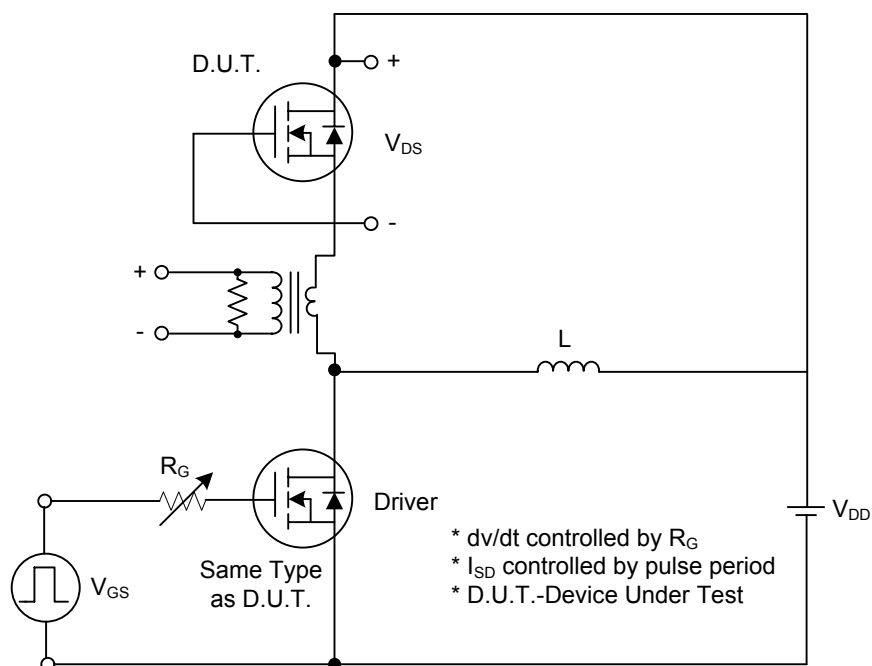


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

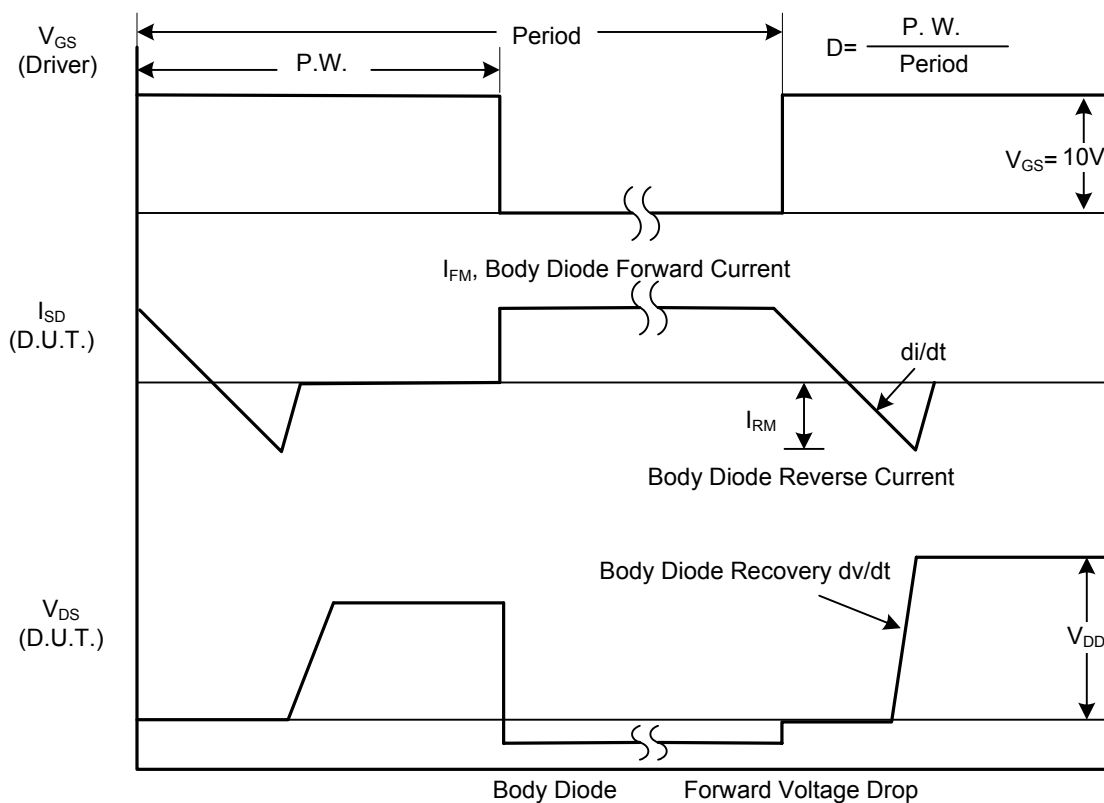


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

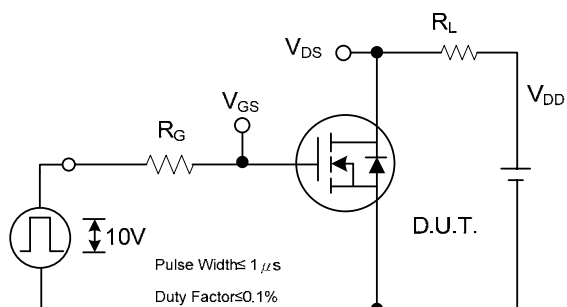


Fig. 2A Switching Test Circuit

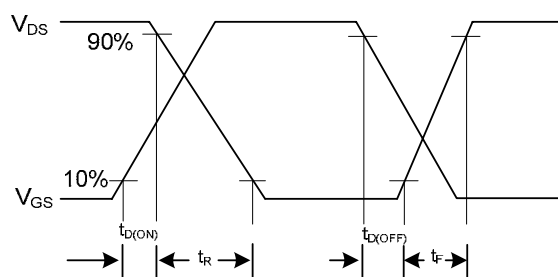


Fig. 2B Switching Waveforms

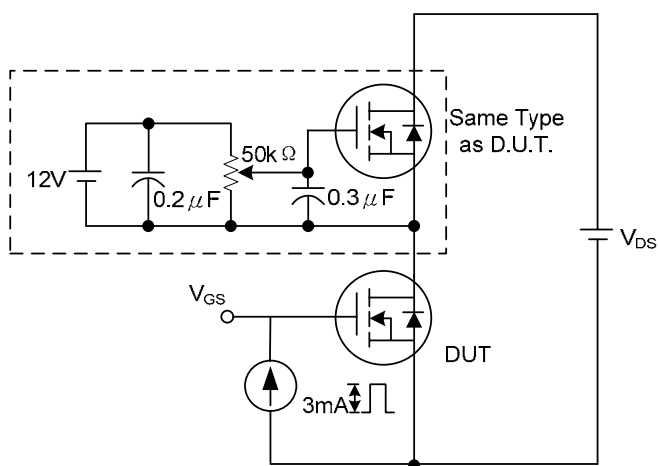


Fig. 3A Gate Charge Test Circuit

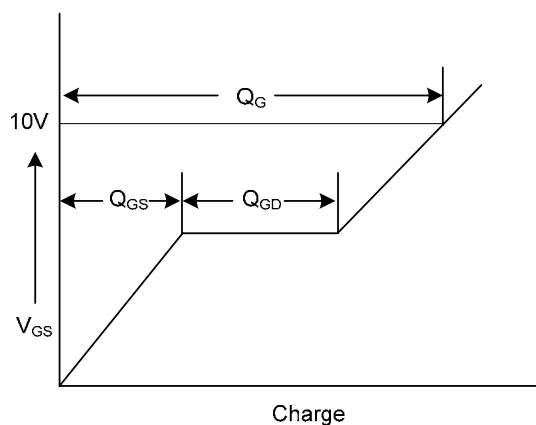


Fig. 3B Gate Charge Waveform

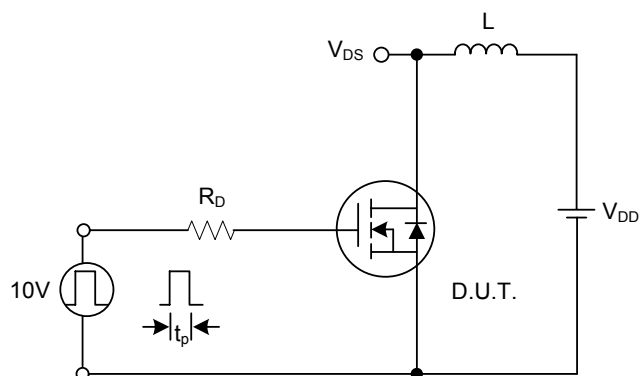


Fig. 4A Unclamped Inductive Switching Test Circuit

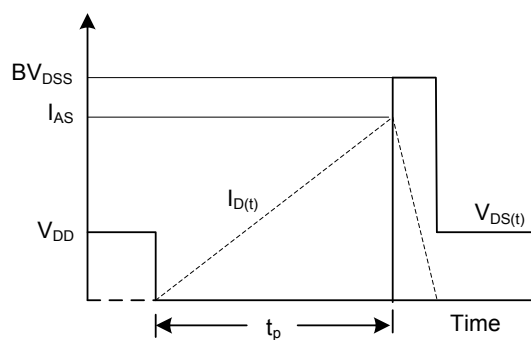
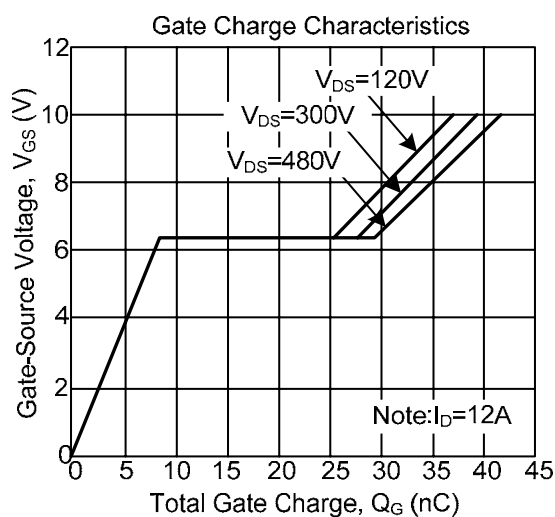
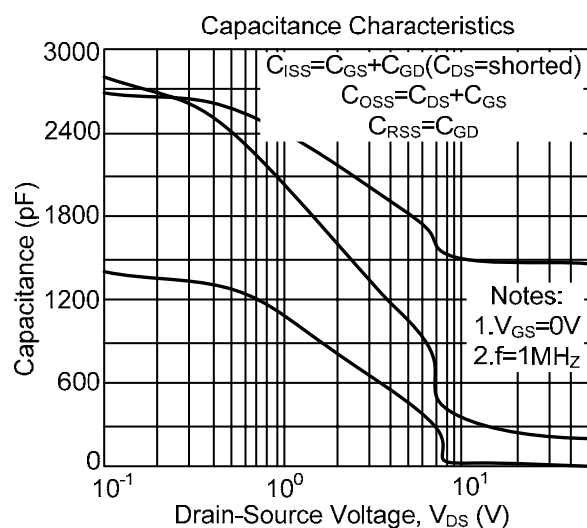
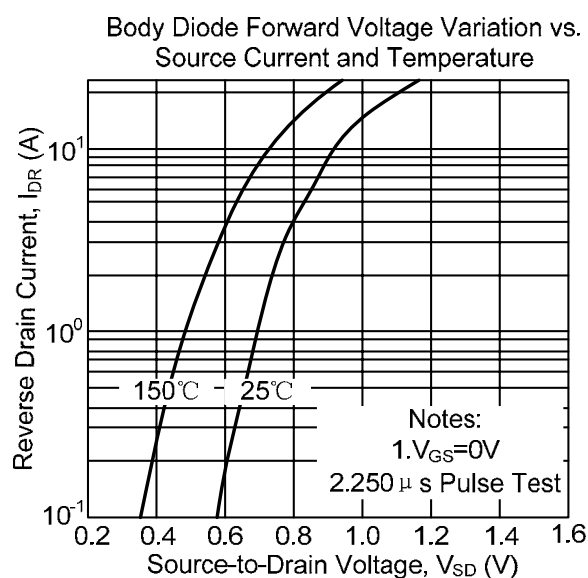
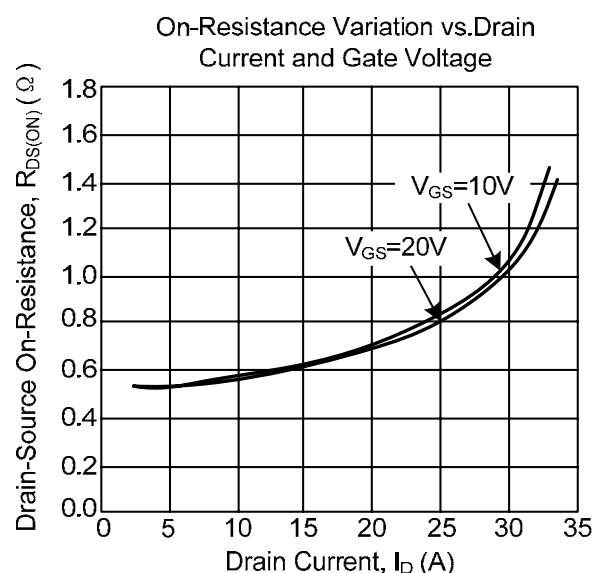
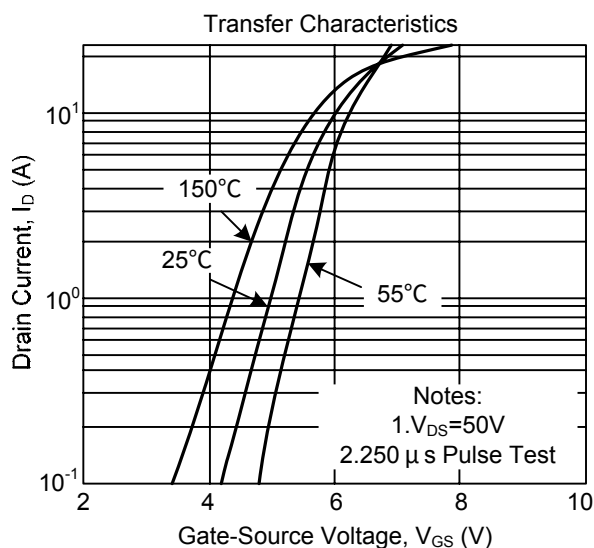
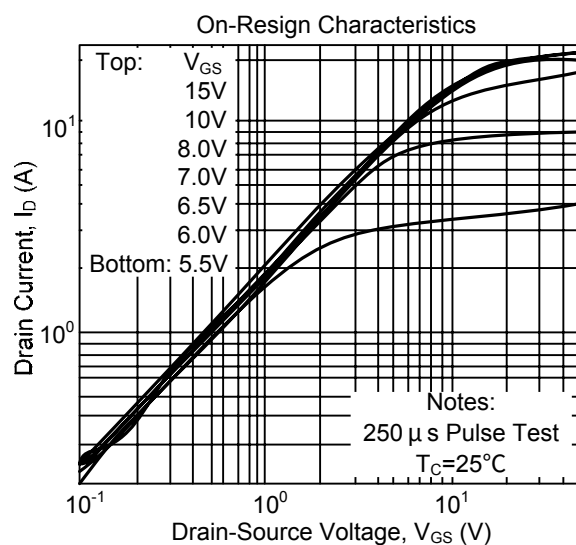
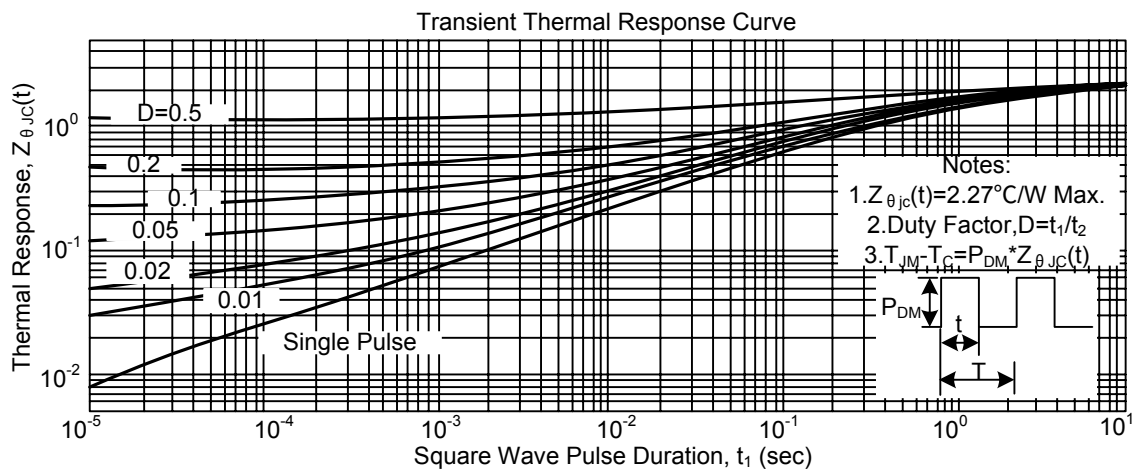
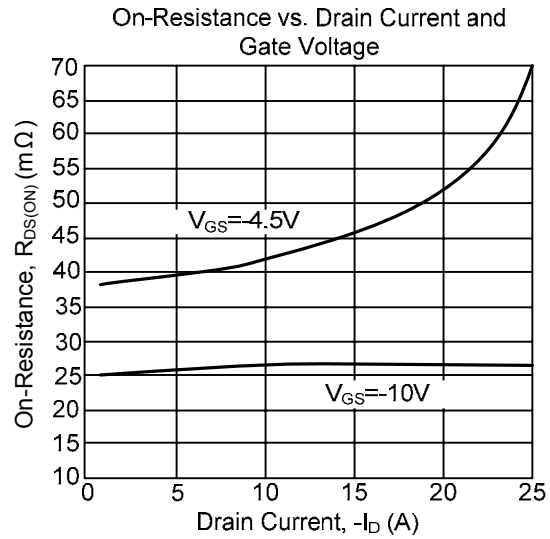
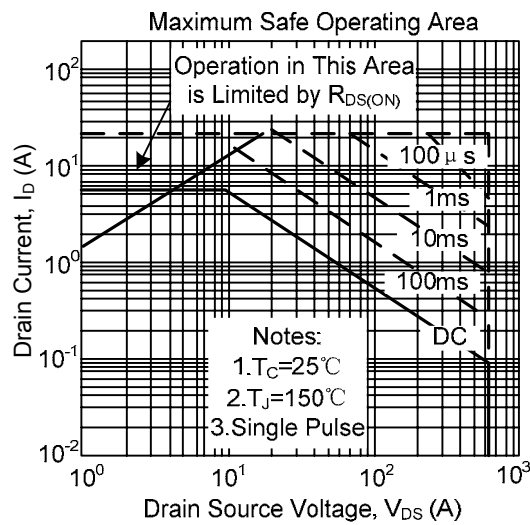


Fig. 4B Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS



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