

■ PRODUCT CHARACTERISTICS

VDSS	500
$R_{DS(on)max}(@V_{GS}=10V)$	0.52Ω
Qg@type	43nC
ID	13A

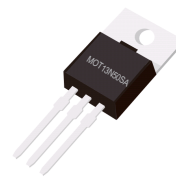
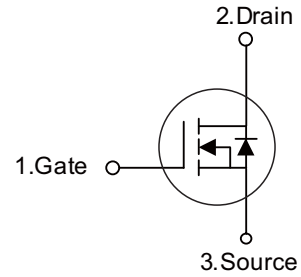
■ APPLICATIONS

- High efficiency switch mode power supplies
- Electronic ballasts
- LED power supply

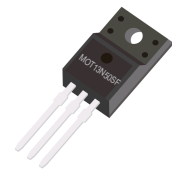
■ FEATURES

- * $R_{DS(ON)} \leq 0.45\Omega @ V_{GS}=10V$
- * High Switching Speed
- * 100% Avalanche Tested

Symbol



TO-220



TO-220F

■ ORDER INFORMATION

Order codes		Package	Packing
Halogen-Free	Halogen		
N/A	MOT13N50SF	TO-220F	50 pieces/Tube
N/A	MOT13N50SA	TO-220	50 pieces/Tube

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

PARAMETER	SYMBOL	RATINGS	UNIT
Drain-Source Voltage	V_{DSS}	500	V
Gate-Source Voltage	V_{GSS}	±30	V
Continuous Drain Current	I_D	13	A
Pulsed Drain Current (Note 2)	I_{DM}	52	A
Avalanche Current (Note 2)	I_{AR}	13	A
Single Pulsed Avalanche Energy (Note 3)	E_{AS}	860	mJ
Repetitive Avalanche Energy (Note 2)	E_{AR}	19.5	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
Power Dissipation ($T_C=25^\circ C$)	TO-220	195	W
	TO-220F	48	W
Junction Temperature	T_J	+150	°C
Storage Temperature	T_{STG}	-55~+150	°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. $L = 6.0$, $I_{AS} = 13A$, $V_{DD} = 50V$, $R_G = 25\Omega$, Starting $T_J = 25^\circ C$

4. $I_{SD} \leq 13.A$, $di/dt \leq 200A/\mu s$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ C$



■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} = 0V, I _D = 250μA	500			V	
Drain-Source Leakage Current	I _{DSS}	V _{DS} = 500V, V _{GS} = 0V			1	μA	
Gate-Source Leakage Current	I _{GSS}	V _{GS} = 30V, V _{DS} = 0V			100	nA	
		V _{GS} = -30V, V _{DS} = 0V			-100	nA	
Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D = 250μA Referenced to 25°C		0.5		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 = 6.5A		0.48	0.52	Ω	
DYNAMIC CHARACTERISTICS							
Input Capacitance	C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz		1580	2055	pF	
Output Capacitance	C _{OSS}				180	235	pF
Reverse Transfer Capacitance	C _{RSS}				20	25	pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time	t _{D(ON)}	V _{DD} =250V, I _D =13A R _G =25Ω (Note 1,2)		25	60	nS	
Turn-On Rise Time	t _R			100	210	nS	
Turn-Off Delay Time	t _{D(OFF)}			130	270	nS	
Turn-Off Fall Time	t _F			100	210	nS	
Total Gate Charge	Q _G	V _{DS} =400V, I _D =13A, V _{GS} =10 V (Note 1, 2)		43	56	nC	
Gate-Source Charge	Q _{GS}			7.5		nC	
Gate-Drain Charge	Q _{GD}			18.5		nC	

■ ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} = 0V, I _S = 13 A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I _S				13	A
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				52	A
Reverse Recovery Time	t _{RR}	V _{GS} = 0V, I _S = 13A,		410		nS
Reverse Recovery Charge	Q _{RR}	dI _F / dt = 100A/μs (Note 1)		4.5		μC

Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%

2. Essentially independent of operating ambient temperature

■ TEST CIRCUITS AND WAVEFORMS

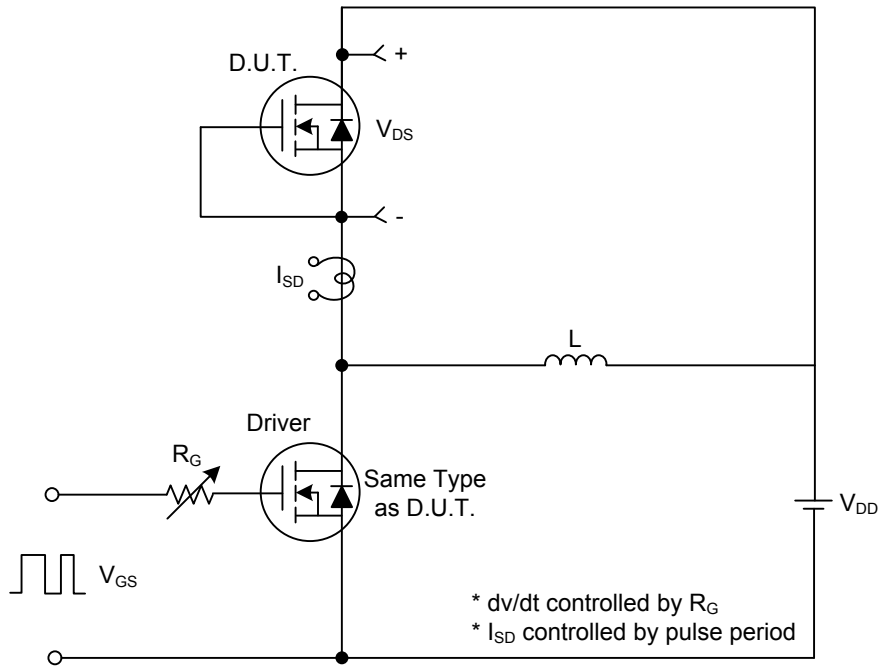


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

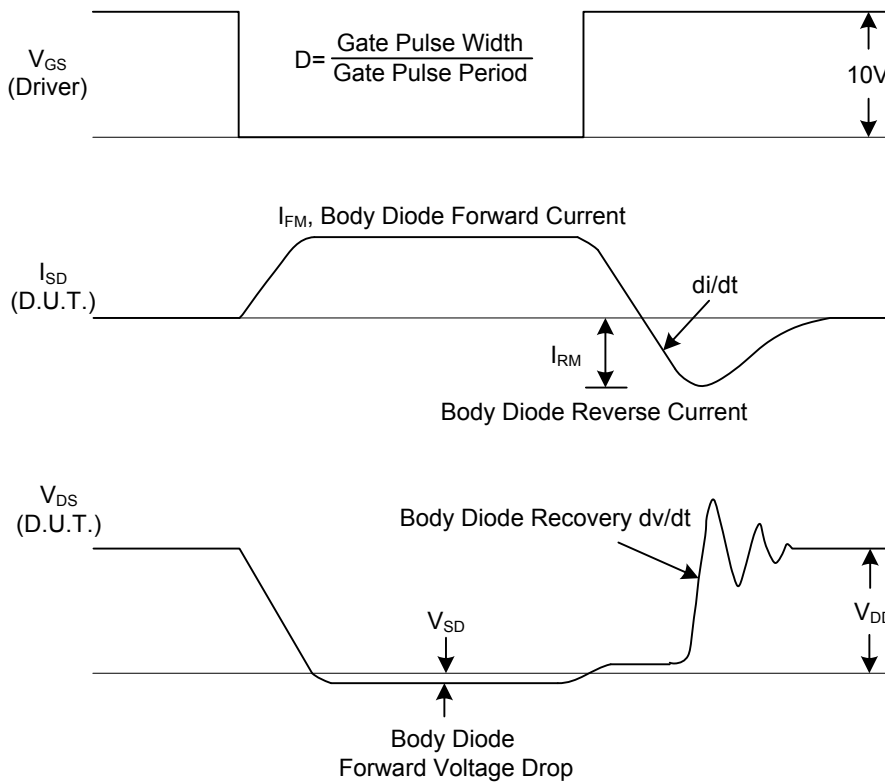


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS(Cont.)

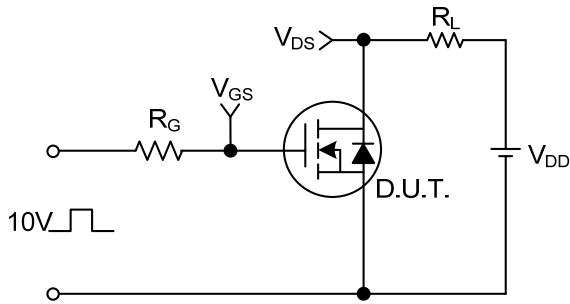


Fig. 2A Switching Test Circuit

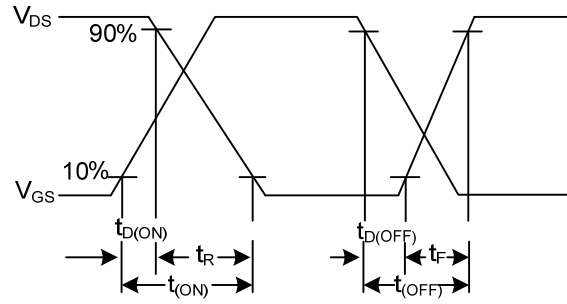


Fig.2B Switching Waveforms

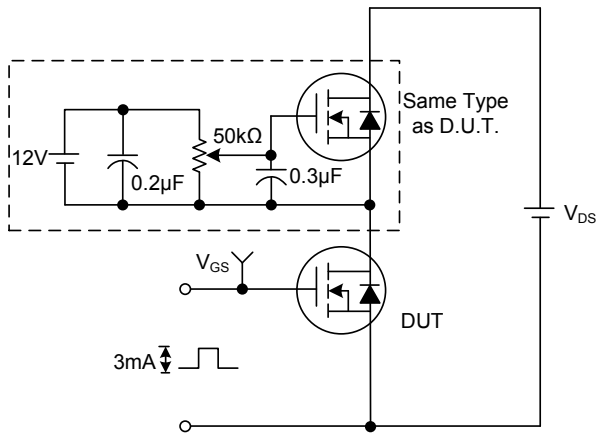


Fig. 3A Gate Charge Test Circuit

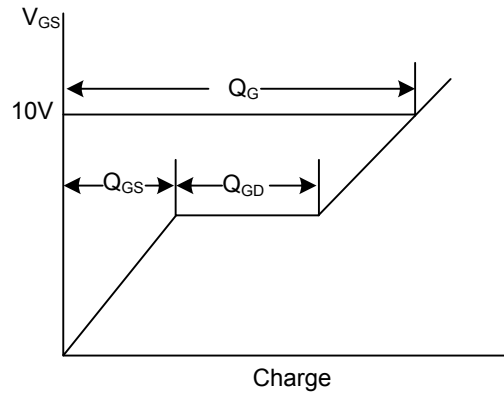


Fig. 3B Gate Charge Waveform

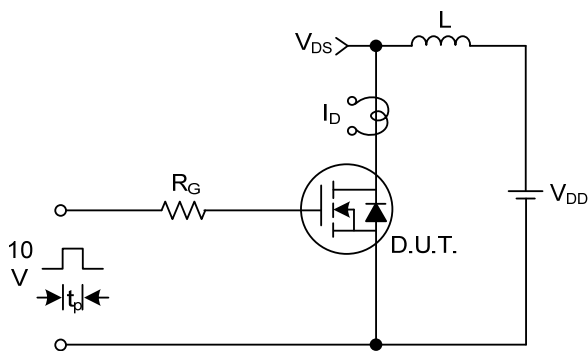


Fig. 4A Unclamped Inductive Switching Test Circuit

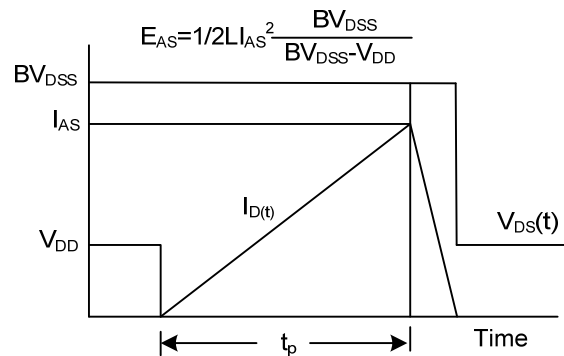
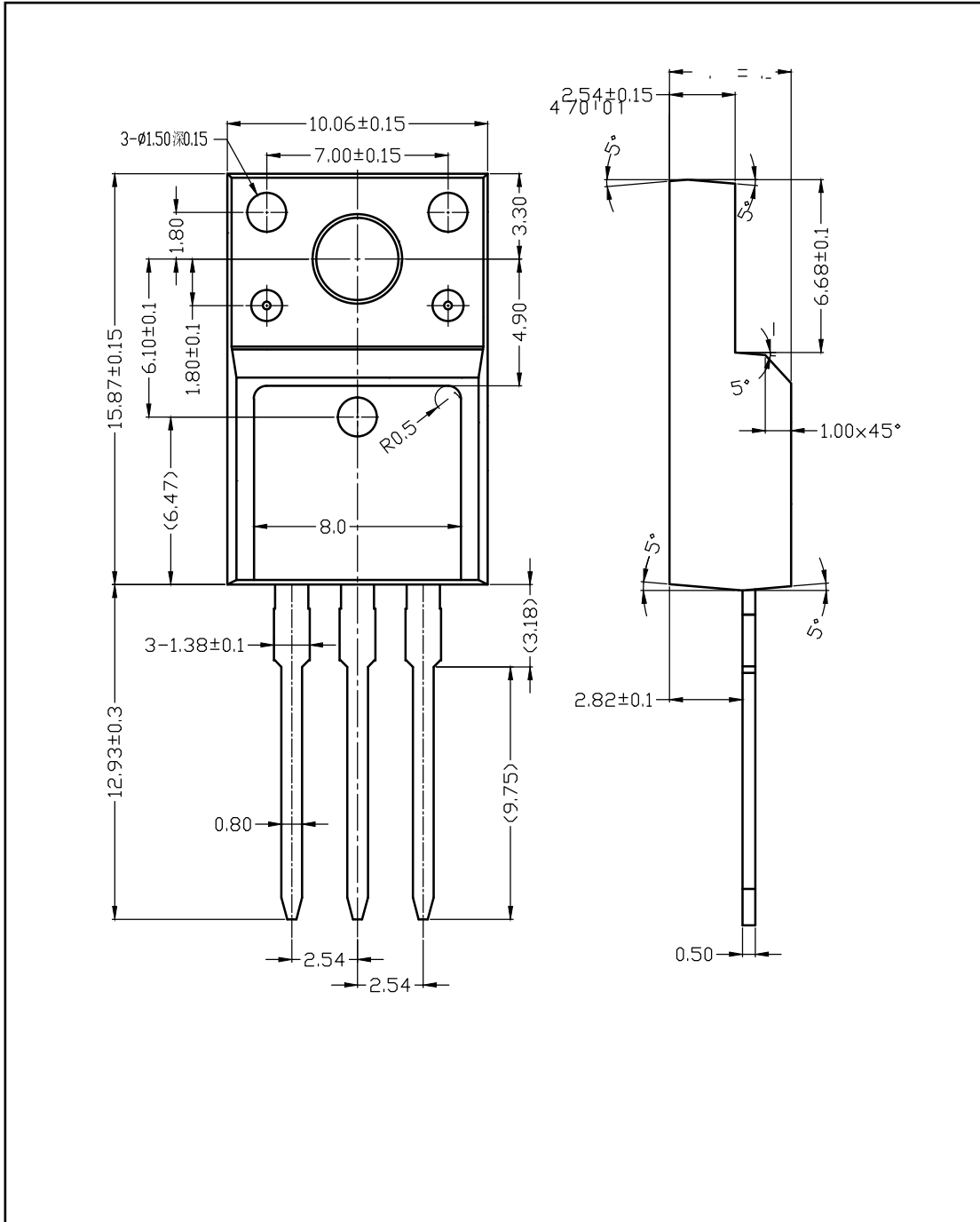


Fig. 4B Unclamped Inductive Switching Waveforms

■ TO-220F-3L PACKAGE OUTLINE DIMENSIONS



■ TO-220-3L PACKAGE OUTLINE DIMENSIONS

