

■ PRODUCT CHARACTERISTICS

VDSS	500
$R_{DS(on)Typ}(V_{GS}=10V)$	0.39Ω
Qg@type	43nC
ID	13A

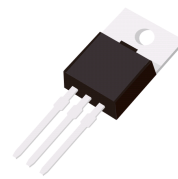
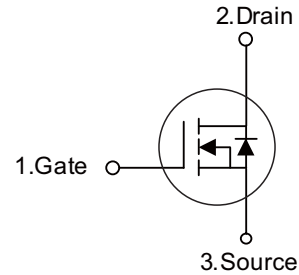
■ APPLICATIONS

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

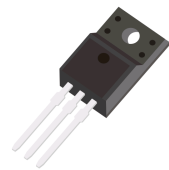
■ FEATURES

- * High Switching Speed
- * 100% Avalanche Tested

Symbol



TO-220



TO-220F

■ ORDER INFORMATION

Order codes		Package	Packing
Halogen-Free	Halogen		
N/A	SPF13N50	TO-220F	50 pieces/Tube
N/A	SPT13N50	TO-220	50 pieces/Tube

■ ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, 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 ($T_C=25^\circ\text{C}$)	TO-220	195	W
	TO-220F	48	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. $L = 6.0$, $I_{AS} = 13A$, $V_{DD} = 50V$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
4. $I_{SD} \leq 13A$, $di/dt \leq 200A/\mu s$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ 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		0.39	0.45	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
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, dI _F / dt = 100A/μs (Note 1)		410		nS
Reverse Recovery Charge	Q _{RR}			4.5		μC

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

2. Essentially independent of operating ambient temperature

■ TEST CIRCUITS AND WAVEFORMS

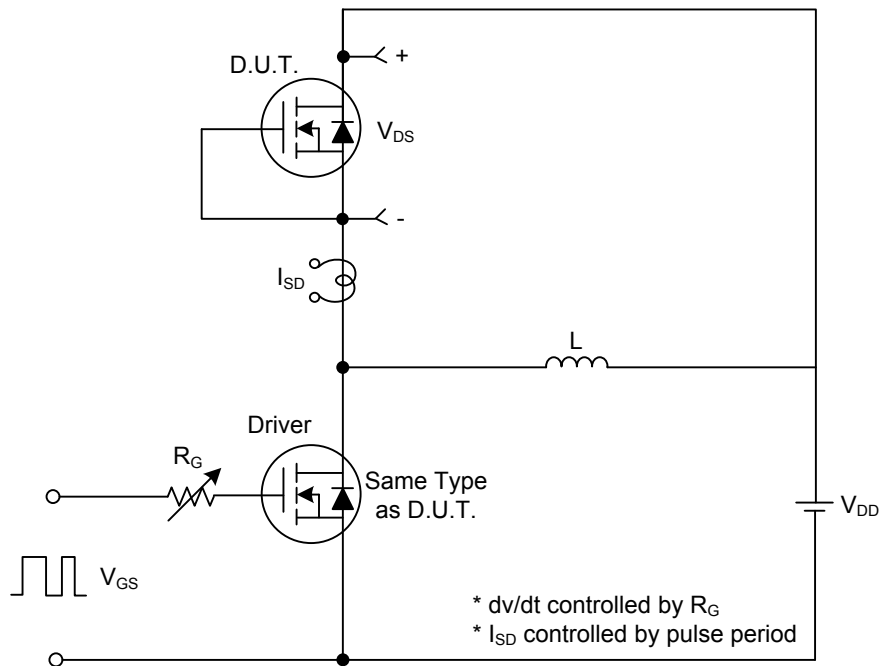


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

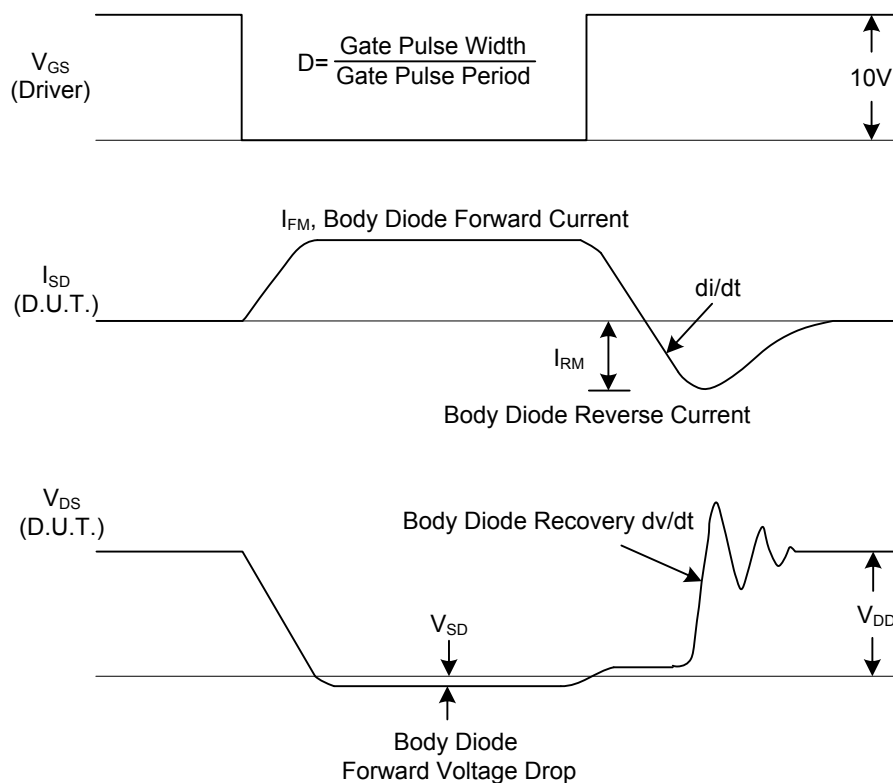


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS(Cont.)

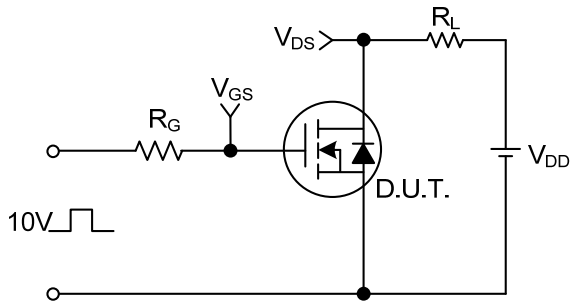


Fig. 2A Switching Test Circuit

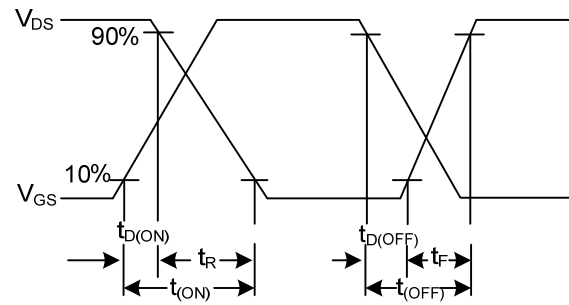


Fig.2B Switching Waveforms

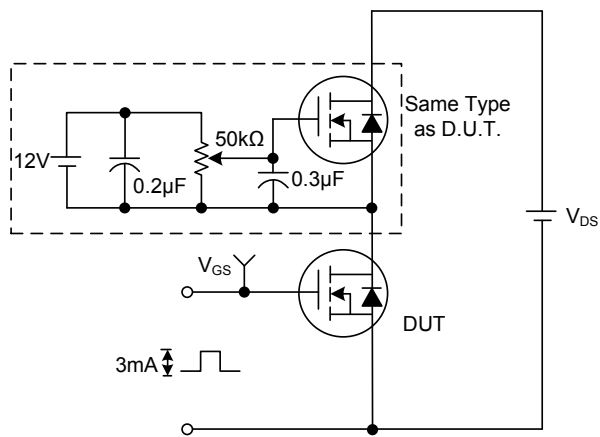


Fig. 3A Gate Charge Test Circuit

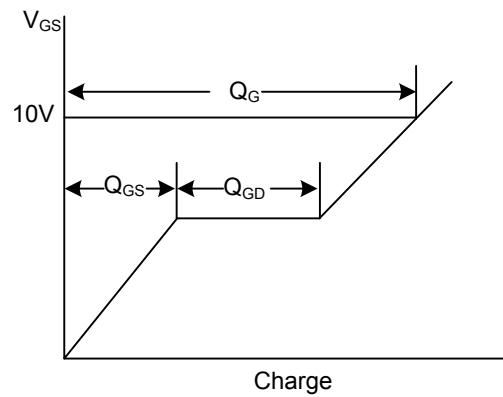


Fig. 3B Gate Charge Waveform

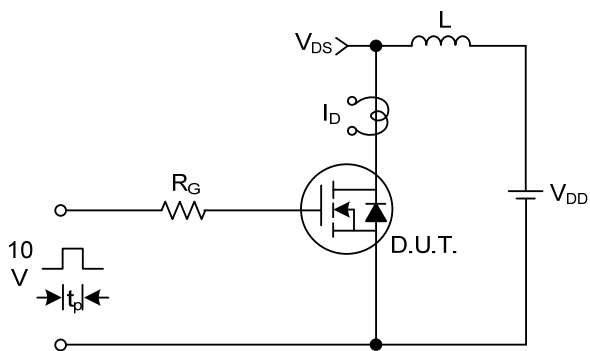


Fig. 4A Unclamped Inductive Switching Test Circuit

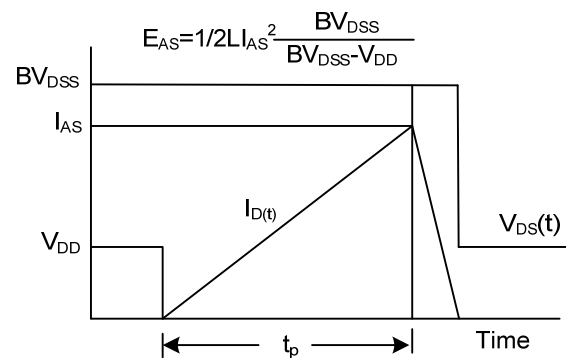


Fig. 4B Unclamped Inductive Switching Waveforms

Technical drawing of a mechanical part, showing front and side views with dimensions.

Front View Dimensions:

- Overall width: 10.06 ± 0.15
- Overall height: 15.87 ± 0.15
- Top flange width: 7.00 ± 0.15
- Top flange thickness: 3.30
- Central hole diameter: $3 - \varnothing 1.50 \pm 0.15$
- Central hole position from top edge: 6.10 ± 0.1
- Central hole position from bottom edge: 1.80 ± 0.1
- Bottom flange width: 8.0
- Bottom flange thickness: 4.90
- Bottom flange radius: $R0.5$
- Overall height including base: 12.93 ± 0.3
- Base width: $3 - 1.38 \pm 0.1$
- Base thickness: 0.80
- Base height: (9.75)
- Base width at bottom: 2.54
- Base width at top: 2.54
- Base height from top of base to bottom of part: (3.18)

Side View Dimensions:

- Overall width: 2.54 ± 0.15
- Overall height: 4.70 ± 0.1
- Top flange thickness: 6.68 ± 0.1
- Top flange width: $1.00 \times 45^\circ$
- Top flange radius: 5°
- Top flange position from top edge: 2.82 ± 0.1
- Top flange position from bottom edge: 0.50
- Top flange height from top edge: 5°
- Top flange height from bottom edge: 5°

■ TO-220-3L PACKAGE OUTLINE DIMENSIONS

