

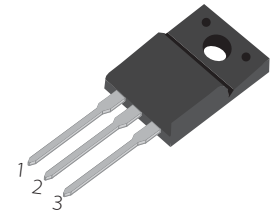
FEATURES

- | Low Gate Charge

- | Low ON Resistance

- | Improved dv/dt Capability

- | 100% Avalanche Tested


TO-220F

APPLICATION

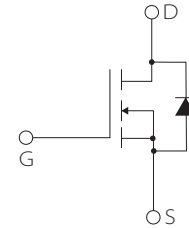
- | Switching Mode Power Supplies (SMPS)

- | PWM Motor Controls

- | AC to DC Converters

- | LED Lighting

- | Adapter


Schematic Symbol

APPROVALS

RoHS	Compliance with 2011/65/EU
HF	Compliance with IEC61249-2-21:2003

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V _{DSS}	650	V
Continuous Drain Current	I _D	T _C =25°C	12 ⁽¹⁾
		T _C =100°C	7.5 ⁽¹⁾
Drain current pulsed ⁽²⁾	I _{DM}	40 ⁽¹⁾	A
Gate-Source Voltage	V _{GS}	±30	V
Single pulsed Avalanche Energy ⁽³⁾	E _{AS}	576	mJ
Peak diode Recovery dv/dt ⁽⁴⁾	dv/dt	5	V/ns
Total power dissipation (@T _C =25°C)	P _D	24	W
Derating Factor above 25°C	P _D	0.19	W/°C
Operating Junction Temperature & Storage Temperature	T _{STG} , T _J	-55 to +150	°C
Maximum lead temperature for soldering purpose	T _L	260	°C
Thermal resistance, Junction to case (Maximum)	R _{thjc}	5.1	°C/W
Thermal resistance, Junction to ambient (Maximum)	R _{thja}	62	°C/W

Notes

1. Drain current is limited by maximum junction temperature.
 3. L = 12mH, I_{AS} = 3A, V_{DD} = 50V, R_G = 25Ω, Starting at T_J = 25°C

2. Repetitive rating : pulse width limited by junction temperature.
 4. I_{SD} ≤ I_D, di/dt = 100A/us, V_{DD} ≤ BV_{DSS}, Starting at T_J = 25°C

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Off Characteristics							
Drain-source Breakdown Voltage	V _{(BR)DSS}	V _{GS} =0V, I _D =250μA	650			V	
Breakdown voltage temperature coefficient	ΔBV _{DSS} / ΔT _J	I _D =250uA, referenced to 25°C		0.65		V/°C	
Zero Gate Voltage Drain current	I _{DSS}	V _{DS} =650V, V _{GS} =0V			1	uA	
		V _{DS} =520V, T _C =125°C			50	uA	
Gate Leakage Current	I _{GSS}	V _{GS} =30V, V _{DS} =0V			100	nA	
		V _{GS} =-30V, V _{DS} =0V			-100	nA	
Off Characteristics							
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2.5	3.5	4.5	V	
Drain-Source On-Resistance (note2)	R _{DS(on)}	V _{GS} =10V, I _D =2A		0.65	0.8	Ω	
Forward Tran conductance	gFS	V _{DS} =10V, I _D =2A		9.6		S	
Dynamic Characteristics							
Input capacitance	C _{ISS}	V _{DS} = 25V, V _{GS} = 0V, f=1MHz		1890		pF	
Output capacitance	C _{OSS}				144		pF
Reverse Transfer capacitance	C _{rss}				9.9		pF
Turn-on Delay Time	td(on)	V _{DS} =325V, I _D =4A, R _G =25Ω V _{GS} =10V		33		ns	
Rising time	tf				41		ns
Turn-off Delay Time	td(off)				102		ns
Input capacitance	tf				37		ns
Total gate charge	Q _g	V _{DS} =325V, I _D =4A, V _{GS} =10V		38		nC	
Gate-source charge	Q _{gs}				9		nC
Gate-drain charge	Q _{gd}				13		nC
Gate Resistance	R _g	V _{DS} =0V, Scan F mode		1.4		Ω	
Continuous source current	I _S	Integral reverse p-n Junction diode in the MOSFET			12	A	
Pulsed source current	I _{SM}				48		A
Diode forward voltage drop.	V _{SD}	I _S =4A, V _{GS} =0V			1.3	V	
Reverse recovery time	Trr	I _S =4A, V _{GS} =0V, di _f /dt=100A/us		480		ns	
Reverse recovery Charge	Qrr				4.5		uC
Peak Reverse Recovery Current	Irrm	I _S =7A, di _f /dt=100A/us		18.5		A	

CHARACTERISTIC CURVES

Fig.1 Output characteristics

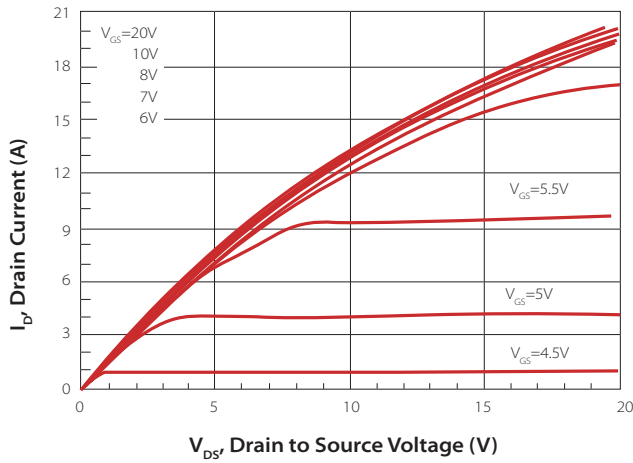


Fig.2 Reverse Characteristics

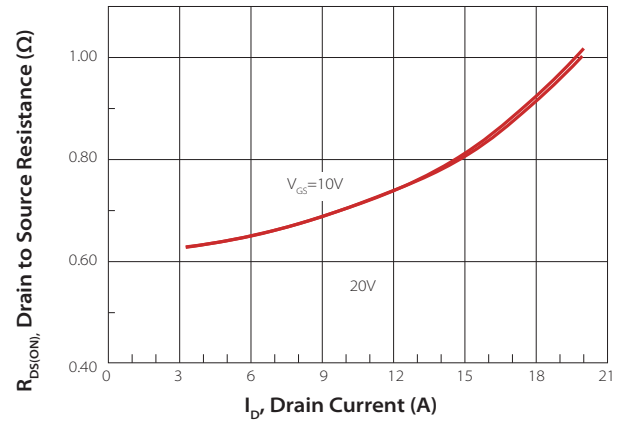


Fig.3 Gate charge characteristics

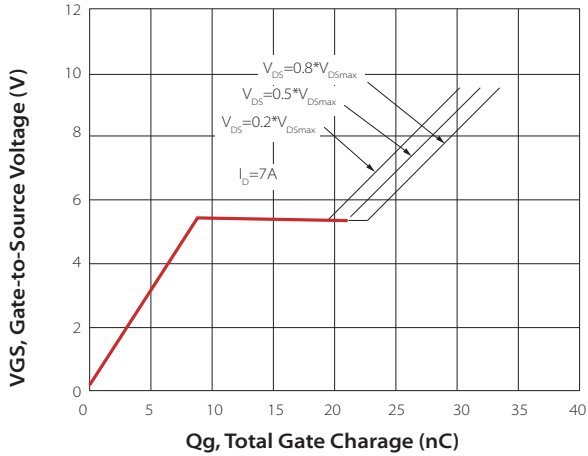


Fig.4 Capacitance Characteristics

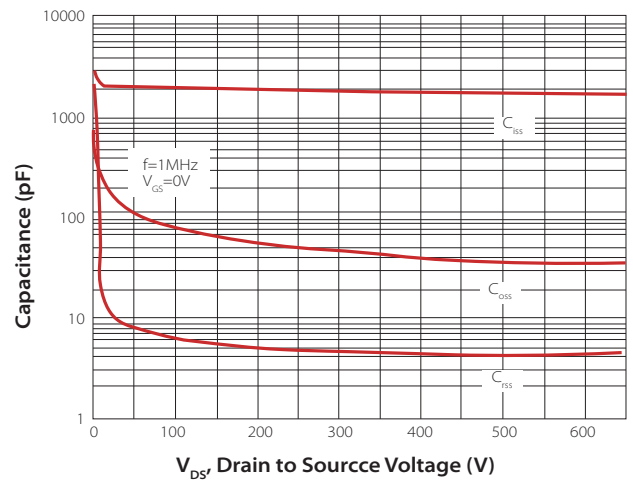


Fig.5 $R_{DS(ON)}$ vs junction temperature

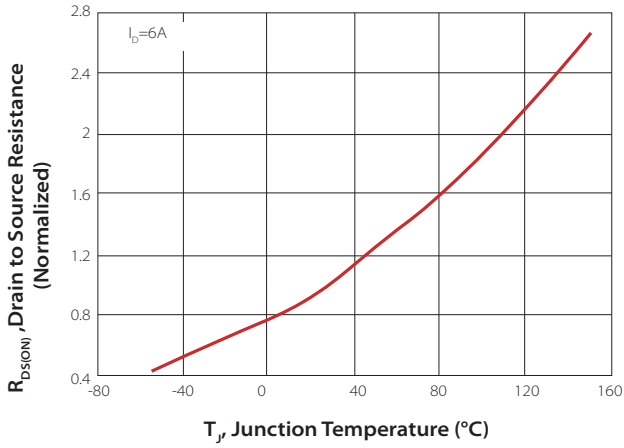


Fig. 6 BV_{DSS} vs junction temperature

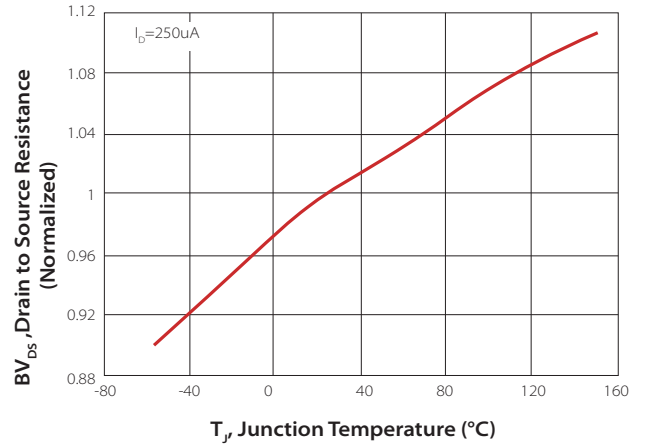


Fig.7 Forward characteristics of reverse diode

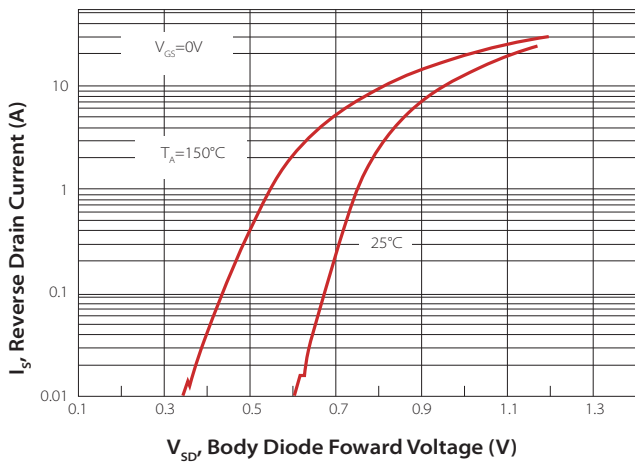


Fig.8 Transfer characteristics

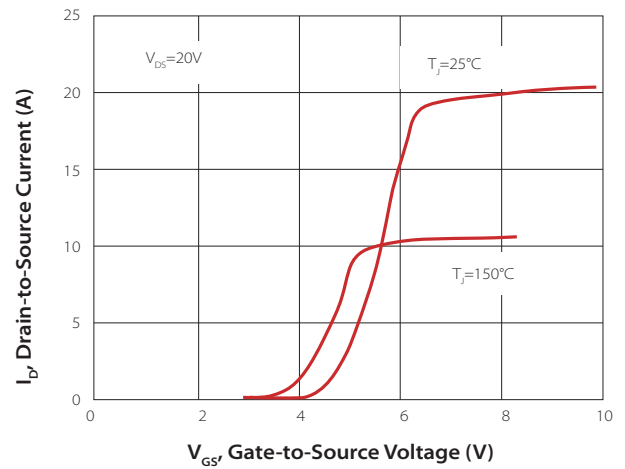


Fig.9 $V_{GS(TH)}$ vs junction temperature

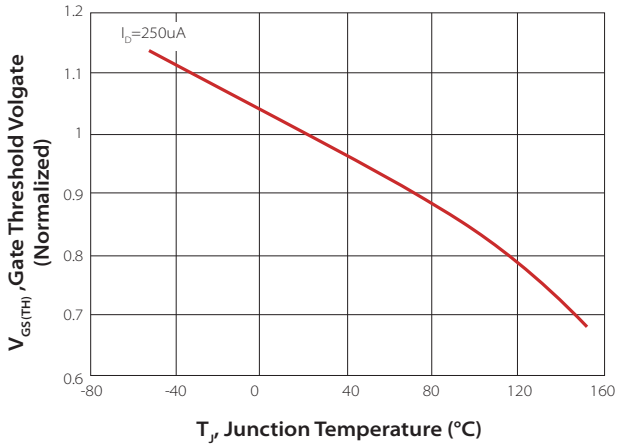


Fig. 10 Safe operating area

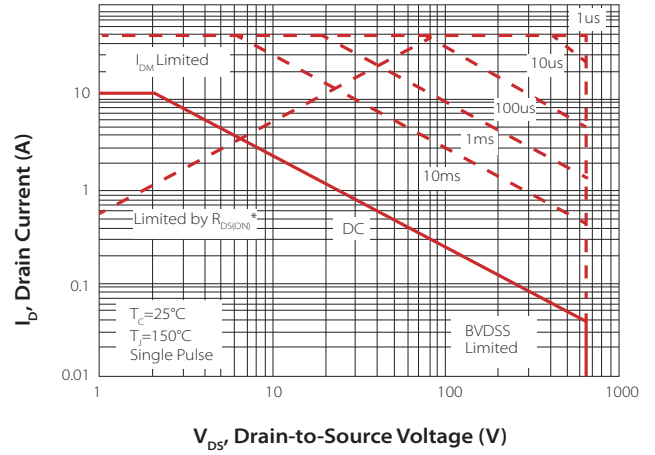


Fig.11 Transient thermal impedance

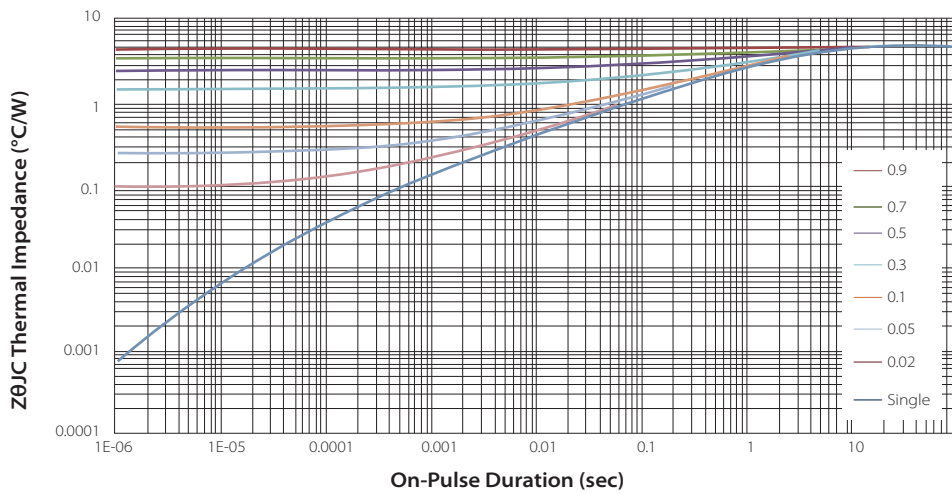


Fig.12 Gate charge test circuit & waveform

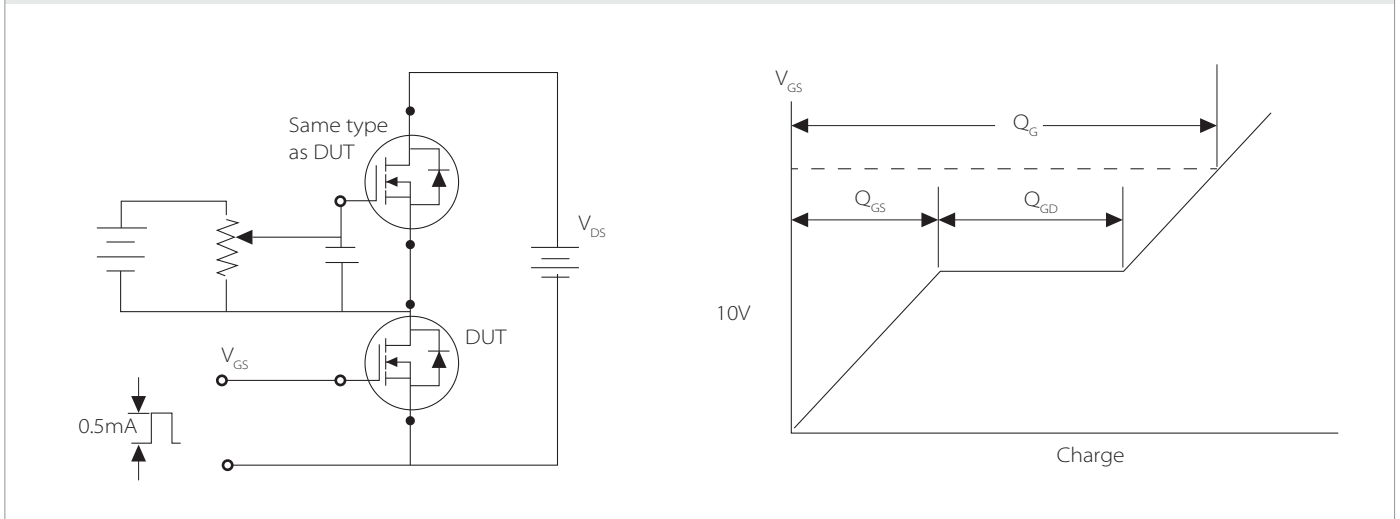


Fig.13 Switching time test circuit & waveform

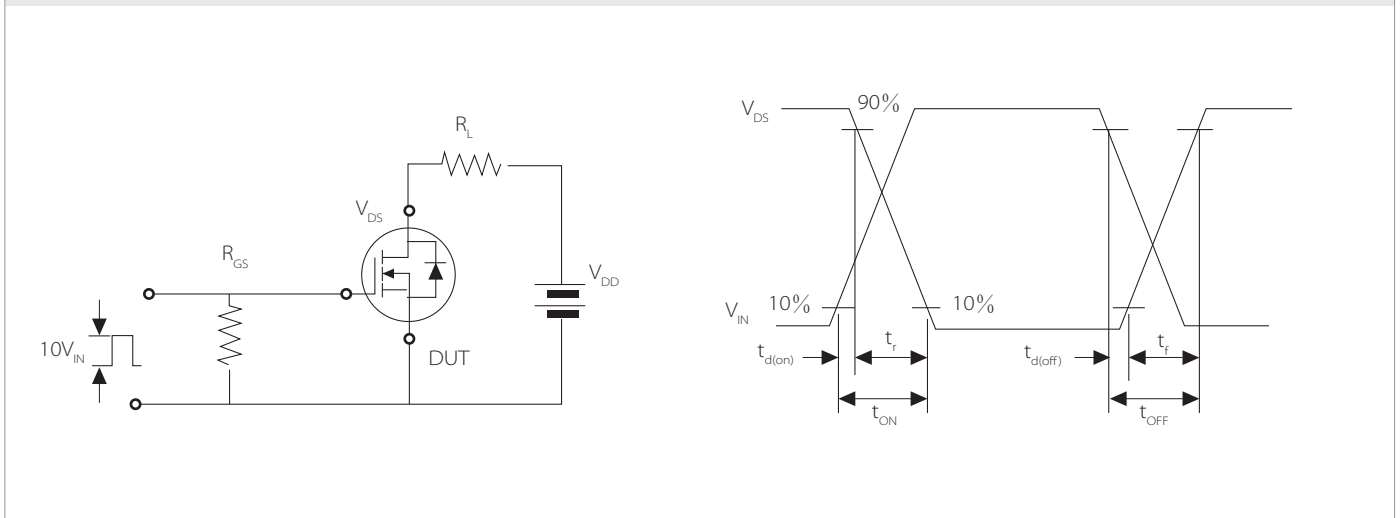


Fig.14 Unclamped Inductive switching test circuit & waveform

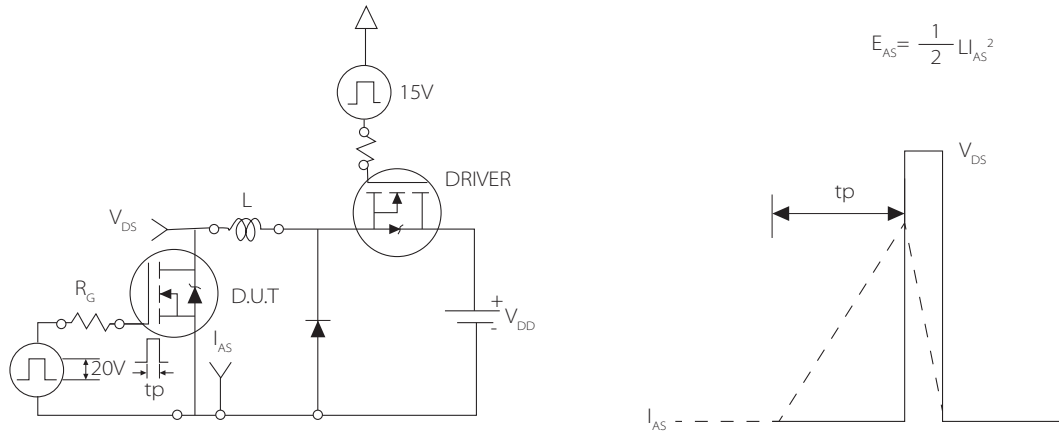
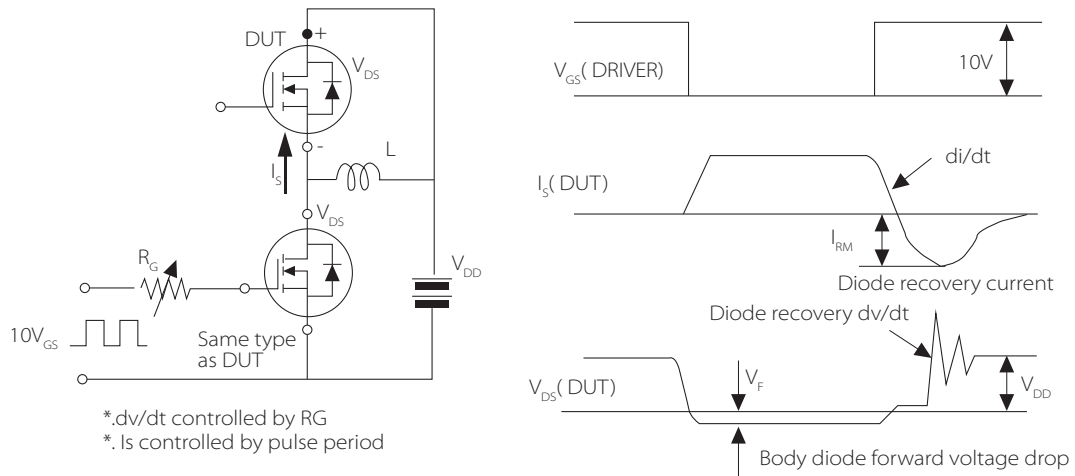
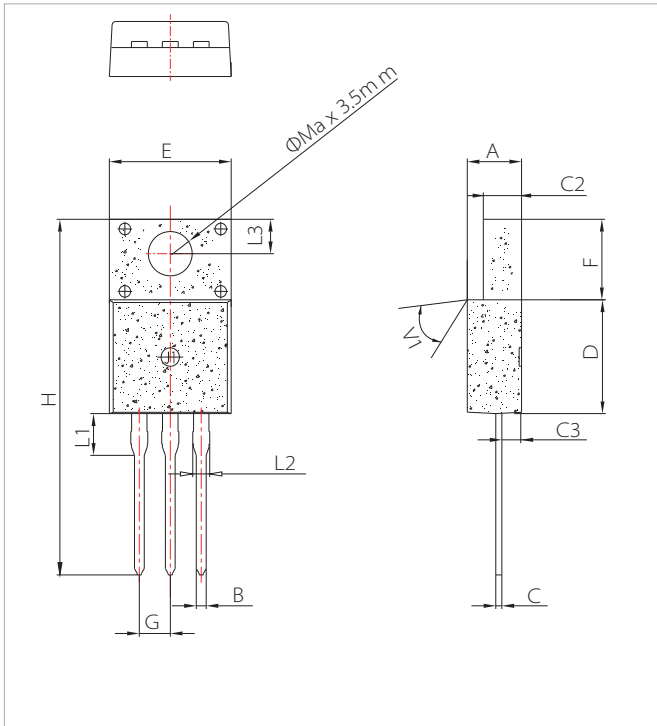


Fig.15 Peak diode recovery dv/dt test circuit & waveform



TO-220F PACKAGE MECHANICAL DATA



Ref.	Dimensions					
	Ref. Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.80	0.173		0.181
B	0.74	0.80	0.83	0.029		0.033
C	0.48		0.75	0.019		0.030
C2	2.40		2.70	0.094		0.106
C3	2.60		3.00	0.102		0.118
D	8.80		9.30	0.346		0.366
E	9.70		10.3	0.382		0.406
F	6.40		7.00	0.252		0.276
G		2.54			0.1	
H	28.0		29.8	1.102		1.173
L1		3.63			0.143	
L2	1.14		1.70	0.045		0.067
L3		3.30			0.130	
V1		45°			45°	

ORDERING INFORMATION

Part Number	Component Package	Marking	QTY/Tube	Box
SNMF12N65	TO-220F	PDI12N65P2	50PCS	1000PCS

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