



Features

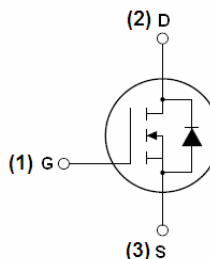
- Low Gate Charge
- Low ON Resistance
- Improved dv/dt Capability
- 100% Avalanche Tested
- RoHS compliant

Applications

- Switching Mode Power Supplies (SMPS)
- PWM Motor Controls
- AC to DC Converters
- LED Lighting
- Adapter

Product Summary

V_{DS}	650	V
$R_{DS(on), Typ @ V_{GS}=10 V}$	0.65	Ω
I_D	12	A



ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise noted)

Parameter	Symbol	Limit	Unit
		TO-220F	
Drain to Source Voltage	V_{DS}	650	V
Continuous Drain Current (@ $T_C=25^\circ\text{C}$)	I_D	12 ⁽¹⁾	A
Continuous Drain Current (@ $T_C=100^\circ\text{C}$)		7.5 ⁽¹⁾	A
Drain current pulsed ⁽²⁾	I_{DM}	48 ⁽¹⁾	A
Gate to 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 (@ $T_C=25^\circ\text{C}$)	P_D	24	W
Derating Factor above 25 $^\circ\text{C}$		0.19	W/ $^\circ\text{C}$
Operating Junction Temperature & Storage Temperature	T_{STG}, T_J	-55 to + 150	$^\circ\text{C}$
Maximum lead temperature for soldering purpose	T_L	260	$^\circ\text{C}$

Notes

1. Drain current is limited by maximum junction temperature.
2. Repetitive rating : pulse width limited by junction temperature.
3. $L = 8\text{mH}$, $I_{AS} = 12\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting at $T_J = 25^\circ\text{C}$
4. $I_{SD} \leq I_D$, $di/dt = 100\text{A/us}$, $V_{DD} \leq BV_{DSS}$, Starting at $T_J = 25^\circ\text{C}$

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
		TO-220F	
Thermal resistance, Junction to case (Maximum)	R_{thjc}	2.1	$^\circ\text{C/W}$
Thermal resistance, Junction to ambient (Maximum)	R_{thja}	62	$^\circ\text{C/W}$



ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise specified)						
Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain to source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	650	--	--	V
Breakdown voltage temperature coefficient	$\Delta BV_{DSS} / \Delta T_J$	$I_D=250\mu A$, referenced to 25°C	--	0.65	--	$V/^\circ\text{C}$
Drain to source leakage current	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$	--	--	1	μA
		$V_{DS}=520V, T_C=125^\circ\text{C}$	--	--	50	μA
Gate to source leakage current, forward	I_{GSS}	$V_{GS}=30V, V_{DS}=0V$	--	--	100	nA
Gate to source leakage current, reverse		$V_{GS}=-30V, V_{DS}=0V$	--	--	-100	nA
On Characteristics						
Gate threshold voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5	3.5	4.5	V
Drain to source on state resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=6A$	--	0.65	0.8	Ω
Forward Transconductance	G_{fs}	$V_{DS}=30V, I_D=6A$	--	9.6	--	S
Dynamic Characteristics						
Input capacitance	C_{iss}	$V_{GS}=0V, V_{DS}=25V, f=1\text{MHz}$	--	1890	--	pF
Output capacitance	C_{oss}		--	144	--	
Reverse transfer capacitance	C_{rss}		--	9.9	--	
Turn on delay time	$t_{d(on)}$	$V_{DS}=325V, I_D=12A, R_G=25\Omega, V_{GS}=10V$	--	33	--	ns
Rising time	t_r		--	41	--	
Turn off delay time	$t_{d(off)}$		--	102	--	
Fall time	t_f		--	37	--	
Total gate charge	Q_g	$V_{DS}=520V, V_{GS}=10V, I_D=12A$	--	38	--	nC
Gate-source charge	Q_{gs}		--	9	--	
Gate-drain charge	Q_{gd}		--	13	--	
Gate Resistance	R_g	$V_{DS}=0V$, Scan F mode	--	1.4	--	Ω
SOURCE TO DRAIN DIODE RATINGS CHARACTERISTICS						
Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Unit
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}	$I_S=12A, V_{GS}=0V$	--	--	1.3	V
Reverse recovery time	T_{rr}	$I_S=12A, V_{GS}=0V, dI_F/dt=100A/\mu s$	--	480	--	ns
Reverse recovery Charge	Q_{rr}		--	4.5	--	μC
Peak Reverse Recovery Current	I_{rrm}	$I_S=12A, dI_F/dt=100A/\mu s$	--	18.5	--	A

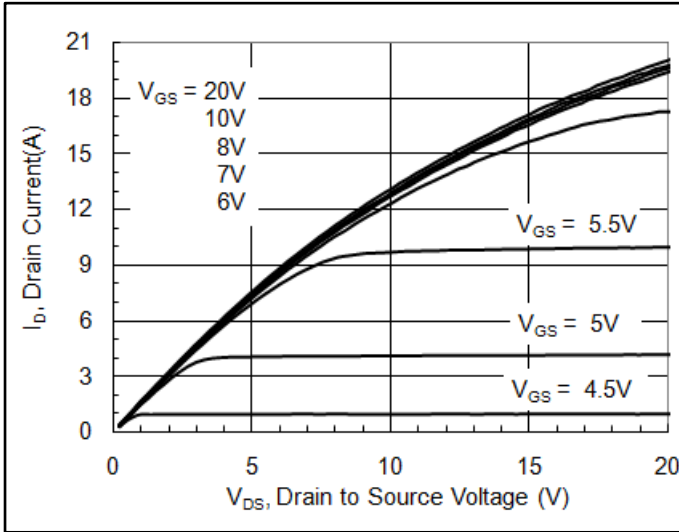


Fig1. Output characteristics

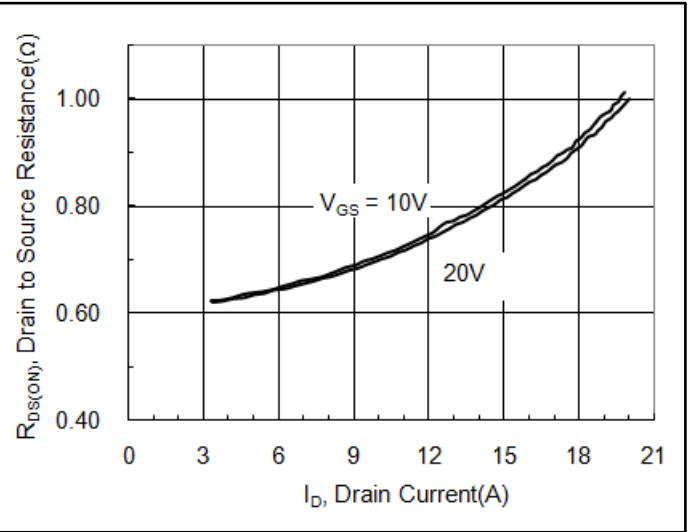


Fig2. Drain-source on-state resistance

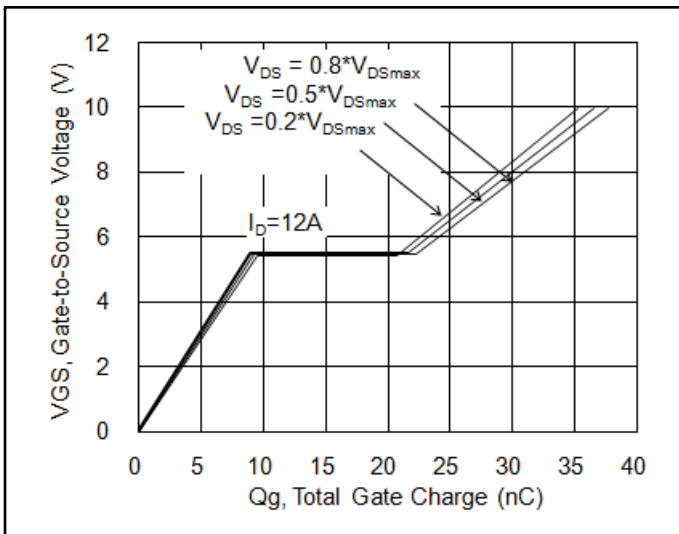


Fig3. Gate charge characteristics

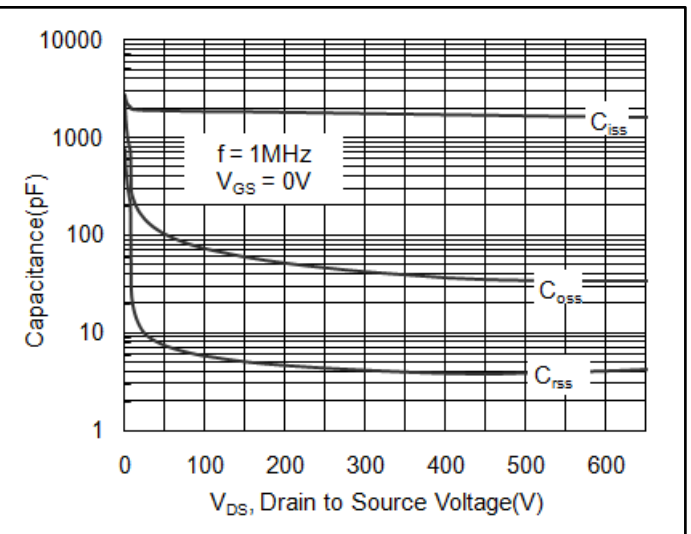


Fig4. Capacitance Characteristics

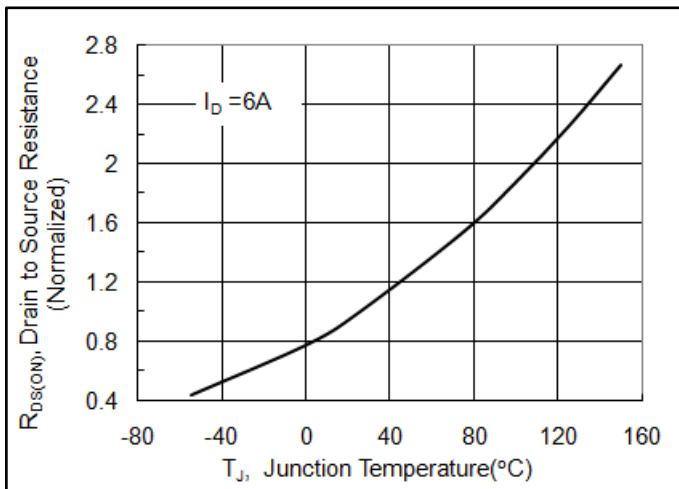


Fig5. $R_{DS(ON)}$ vs junction temperature

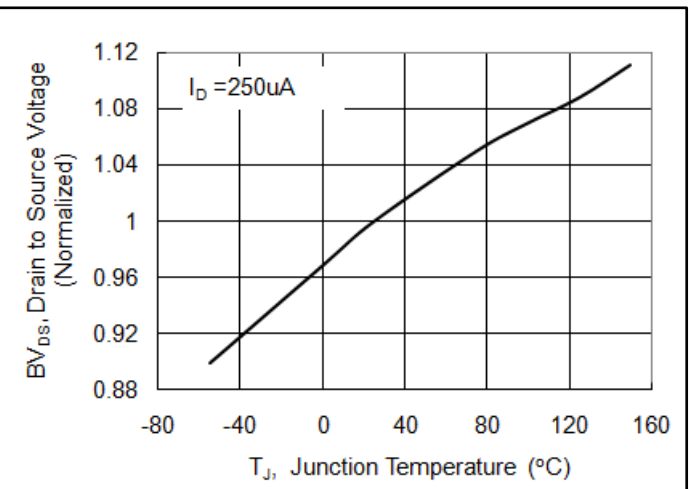


Fig6. BV_{DS} vs junction temperature

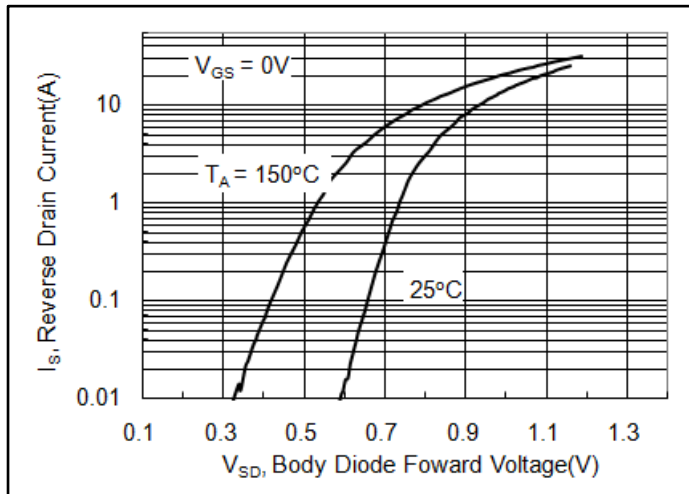


Fig 7. Forward characteristics of reverse diode

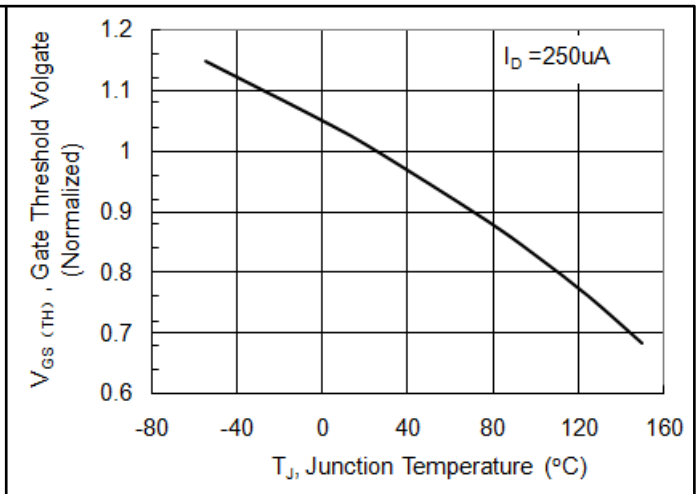


Fig 8. $V_{GS(TH)}$ vs junction temperature

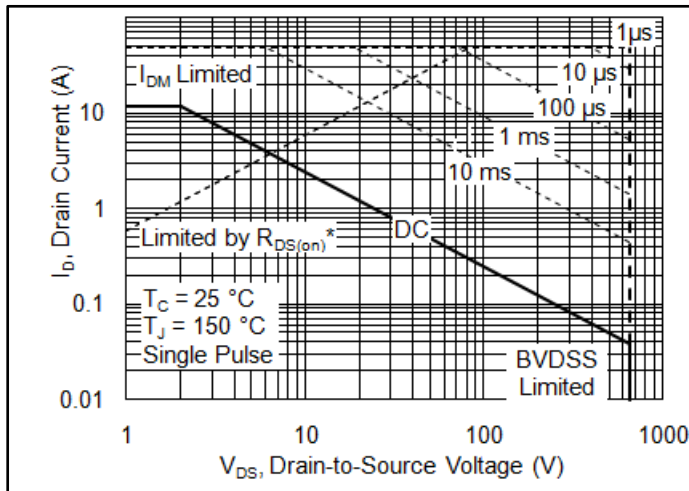


Fig 9. Safe operating area (TO-220F)

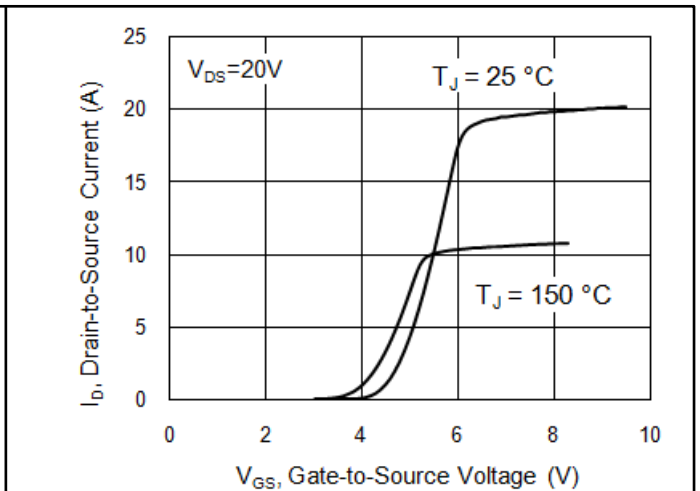


Fig 10. Transfer characteristics

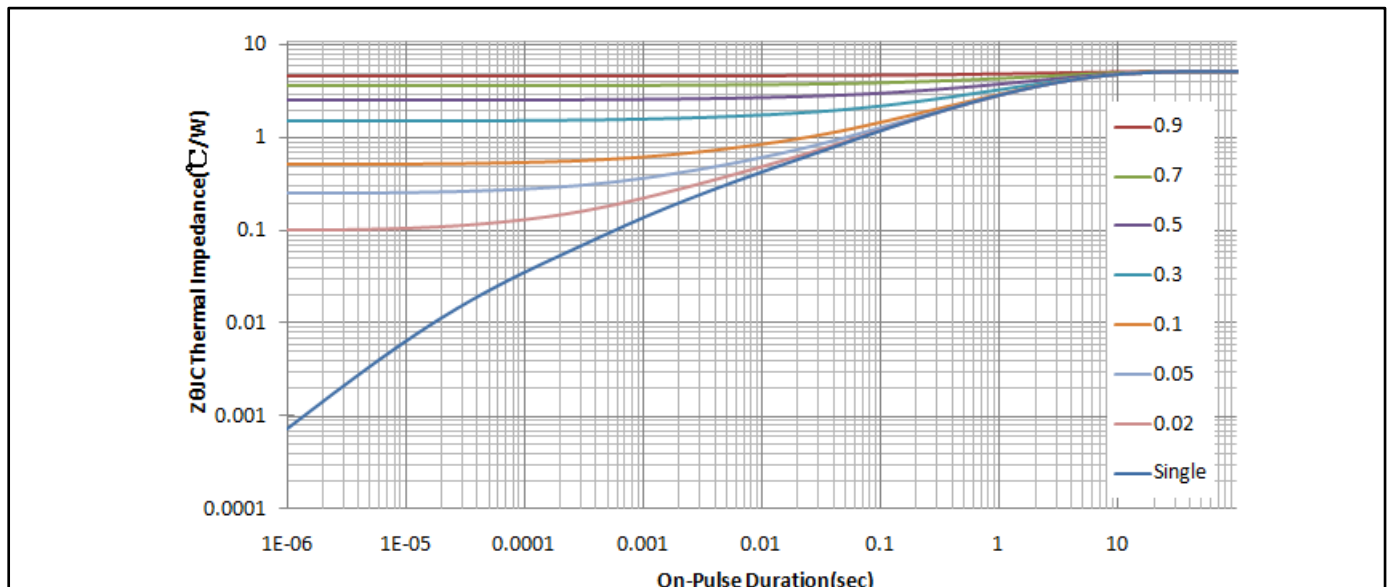


Fig 11. Transient thermal impedance (TO-220F)

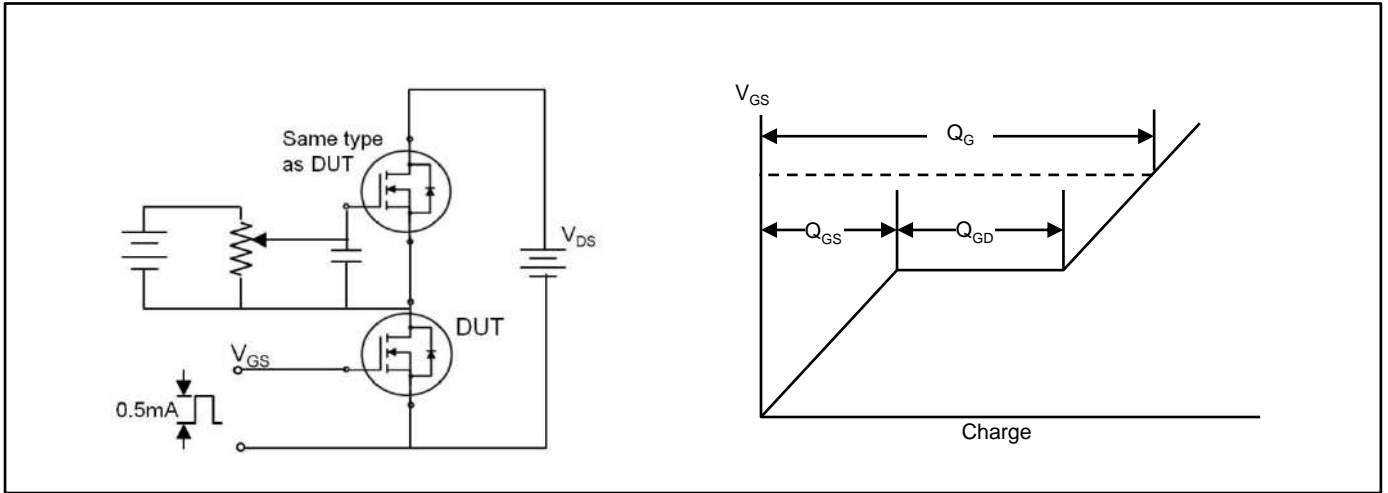


Fig 12. Gate charge test circuit & waveform

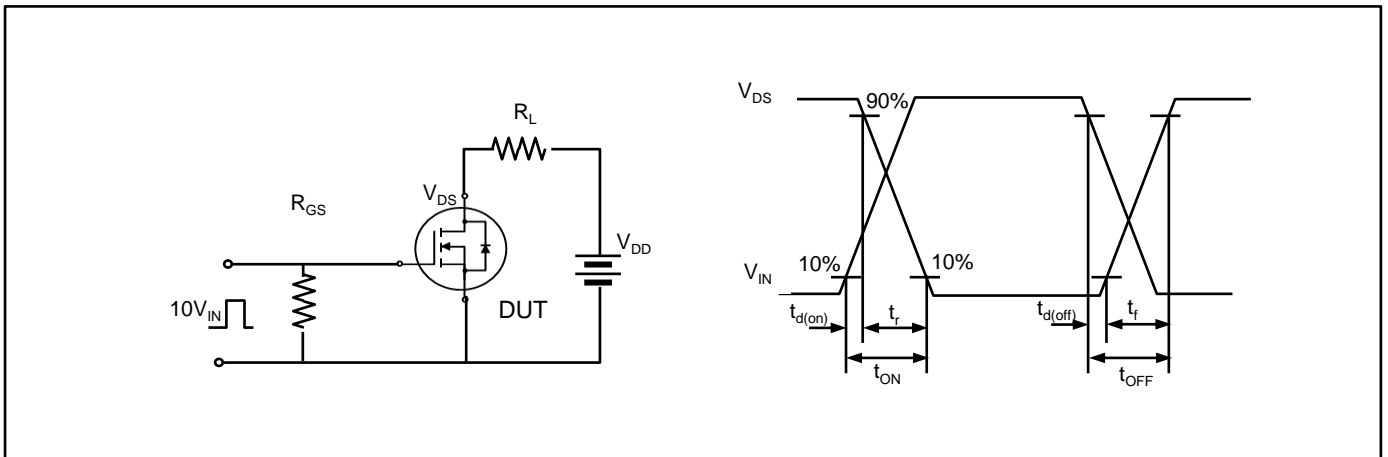


Fig 13. Switching time test circuit & waveform

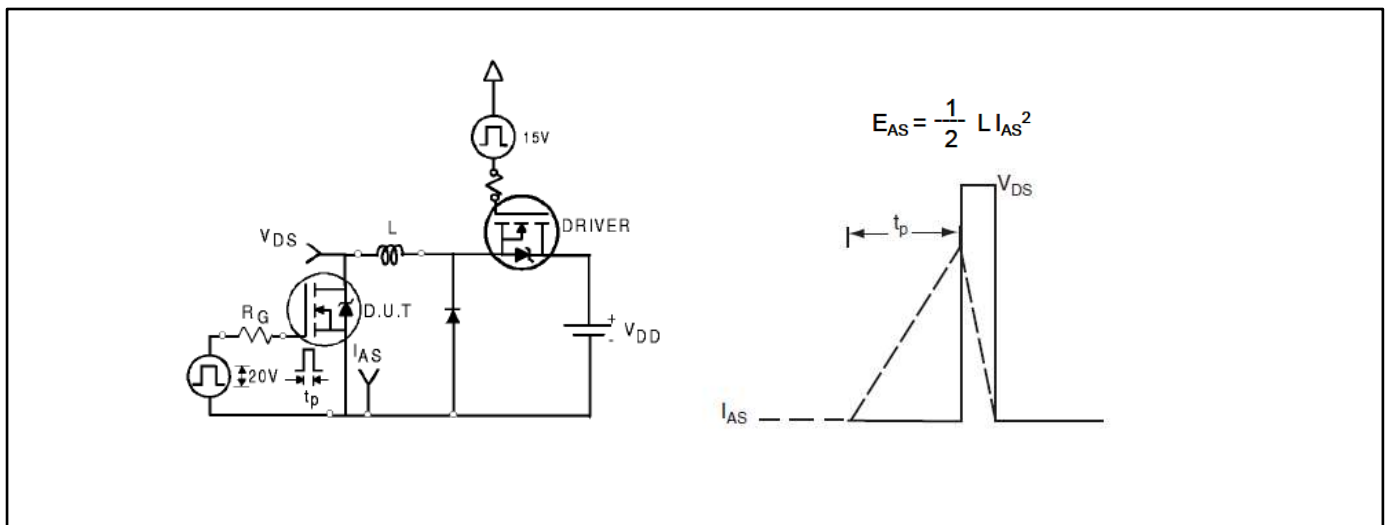


Fig 14. Unclamped Inductive switching test circuit & waveform

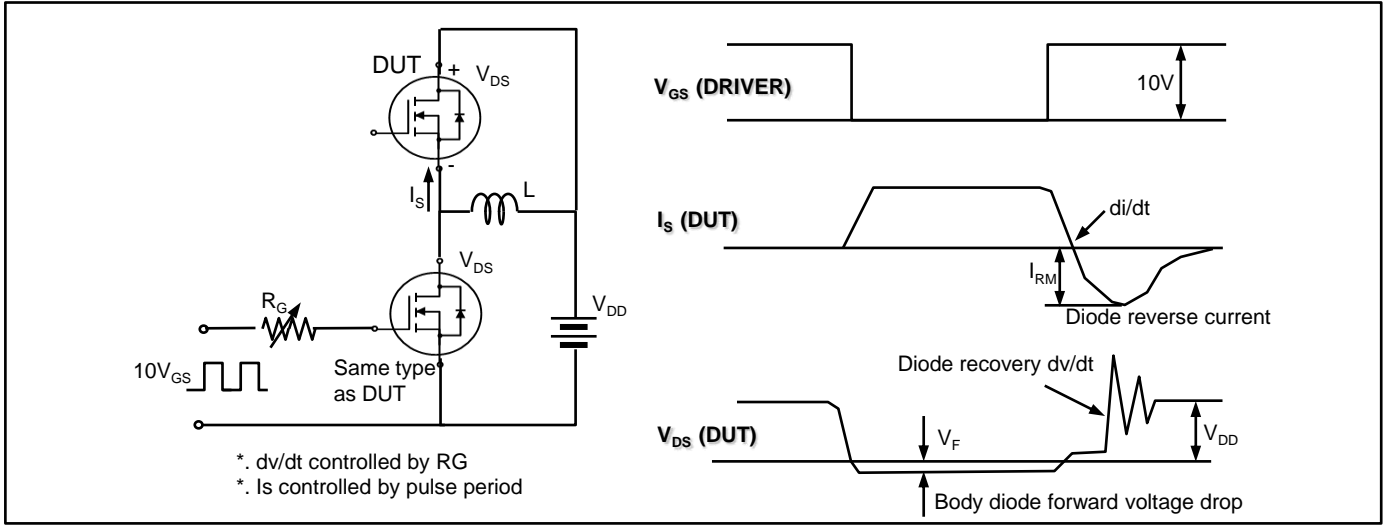
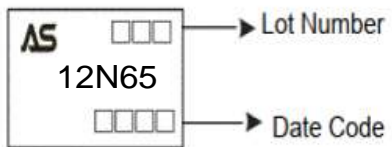


Fig 15. Peak diode recovery dv/dt test circuit & waveform

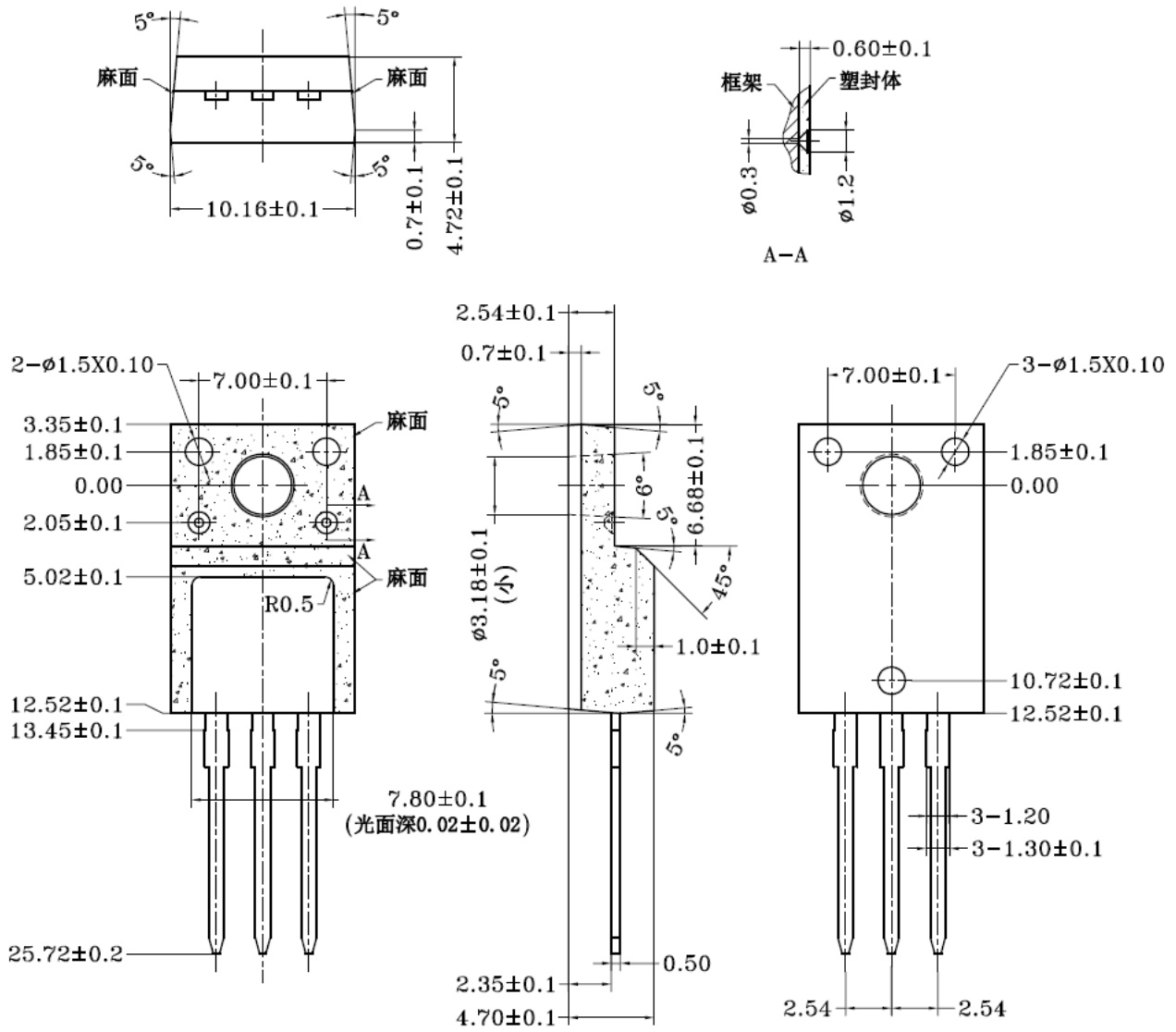
Ordering and Marking Information

Ordering Device No.	Marking	Package	Packing	Quantity
ASDM12N65F-T	12N65	TO-220F	Tube	50/Tube

PACKAGE	MARKING
TO-220F	 <p>The diagram shows a rectangular marking area on a TO-220F package. It contains the following elements from top to bottom: the 'AS' logo, two empty boxes representing the Lot Number, the part number '12N65', and four empty boxes representing the Date Code. Arrows point from the Lot Number and Date Code boxes to their respective labels.</p>

Package Dimensions

TO-220F





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