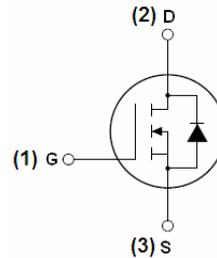
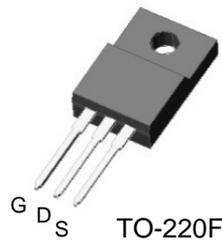


**650V N-Channel Super-Junction MOSFET**
**Features**

- Super-Junction MOSFET
- Low ON Resistance
- Improved dv/dt Capability
- 100% Avalanche Tested
- RoHS compliant

**Application**

- Switching Mode Power Supplies (SMPS)
- PWM Motor Controls
- LED Lighting
- Adapter


**Product Summary**


$V_{DS}$	650	V
$R_{DS(on), Typ @ V_{GS} = 10V}$	105	mΩ
$I_D$	25	A

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

Parameter	Symbol	Limit	Unit
		TO-220F	
Drain to Source Voltage	$V_{DSS}$	650	V
Continuous Drain Current (@ $T_C=25^\circ C$ )	$I_D$	25 <sup>(1)</sup>	A
Continuous Drain Current (@ $T_C=100^\circ C$ )		15.7 <sup>(1)</sup>	A
Drain current pulsed <sup>(2)</sup>	$I_{DM}$	100 <sup>(1)</sup>	A
Gate to Source Voltage	$V_{GS}$	$\pm 30$	V
Single pulsed Avalanche Energy <sup>(3)</sup>	$E_{AS}$	750	mJ
MOSFET dv/dt Ruggedness( $V_{DS}=0\sim 400V$ )	dv/dt	40	V/ns
Peak diode Recovery dv/dt <sup>(4)</sup>	dv/dt	15	V/ns
Total power dissipation (@ $T_C=25^\circ C$ )	$P_D$	47	W
Derating Factor above $25^\circ C$		0.38	W/ $^\circ C$
Operating Junction Temperature & Storage Temperature	$T_{STG}, T_J$	-55 to + 150	$^\circ C$
Maximum lead temperature for soldering purpose	$T_L$	260	$^\circ C$

**THERMAL CHARACTERISTICS**

Parameter	Symbol	Value	Unit
		TO-220F	
Thermal resistance, Junction to case (Maximum)	$R_{thjc}$	2.65	$^\circ C/W$
Thermal resistance, Junction to ambient(Maximum)	$R_{thja}$	66	$^\circ C/W$

**Notes**

1. Drain current is limited by maximum junction temperature.
2. Repetitive rating : pulse width limited by junction temperature.
3.  $L = 60mH, I_{AS} = 5A, V_{DD} = 50V, R_G = 25\Omega$ , Starting at  $T_J = 25^\circ C$
4.  $I_{SD} \leq I_D, di/dt = 100A/us, V_{DD} \leq 400V$ , Starting at  $T_J = 25^\circ C$

**650V N-Channel Super-Junction MOSFET**

<b>ELECTRICAL CHARACTERISTICS ( T<sub>C</sub> = 25°C unless otherwise specified )</b>						
Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
Drain to source breakdown voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	650	--	--	V
Breakdown voltage temperature coefficient	ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	I <sub>D</sub> =250uA, referenced to 25°C	--	0.7	--	V/°C
Drain to source leakage current	I <sub>DSS</sub>	V <sub>DS</sub> =650V, V <sub>GS</sub> =0V	--	--	1	uA
		V <sub>DS</sub> =520V, T <sub>C</sub> =125°C	--	--	10	uA
Gate to source leakage current, forward	I <sub>GSS</sub>	V <sub>GS</sub> =30V, V <sub>DS</sub> =0V	--	--	100	nA
Gate to source leakage current, reverse		V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V	--	--	-100	nA
<b>On Characteristics</b>						
Gate threshold voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	2.5	3.0	4.5	V
Drain to source on state resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =12.5A	--	105	130	mΩ
Forward Transconductance	G <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =12.5A	--	24.2	--	S
<b>Dynamic Characteristics</b>						
Input capacitance	C <sub>iss</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =100V, f=1MHz	--	2897	--	pF
Output capacitance	C <sub>oss</sub>		--	126	--	
Reverse transfer capacitance	C <sub>rss</sub>		--	1	--	
Turn on delay time	t <sub>d(on)</sub>		V <sub>DS</sub> =325V, I <sub>D</sub> =25A , R <sub>G</sub> =25Ω, V <sub>GS</sub> =10V	--	40	--
Rising time	t <sub>r</sub>	--		53	--	
Turn off delay time	t <sub>d(off)</sub>	--		191	--	
Fall time	t <sub>f</sub>	--		41	--	
Total gate charge	Q <sub>g</sub>	V <sub>DS</sub> =325V, V <sub>GS</sub> =10V, I <sub>D</sub> =25A	--	49.4	--	nC
Gate-source charge	Q <sub>gs</sub>		--	10.8	--	
Gate-drain charge	Q <sub>gd</sub>		--	18.8	--	
Gate Resistance	R <sub>g</sub>	V <sub>DS</sub> =0V, Scan F mode	--	6.3	--	Ω

<b>SOURCE TO DRAIN DIODE RATINGS CHARACTERISTICS</b>						
Parameter	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous source current	I <sub>S</sub>	Integral reverse p-n Junction diode in the MOSFET	--	--	25	A
Pulsed source current	I <sub>SM</sub>		--	--	100	A
Diode forward voltage drop.	V <sub>SD</sub>	I <sub>S</sub> =25A, V <sub>GS</sub> =0V	--	0.9	1.3	V
Reverse recovery time	T <sub>rr</sub>	I <sub>S</sub> =25A, V <sub>GS</sub> =0V, di <sub>f</sub> /dt=100A/us	--	331	--	ns
Reverse recovery Charge	Q <sub>rr</sub>		--	5.3	--	uC

650V N-Channel Super-Junction MOSFET

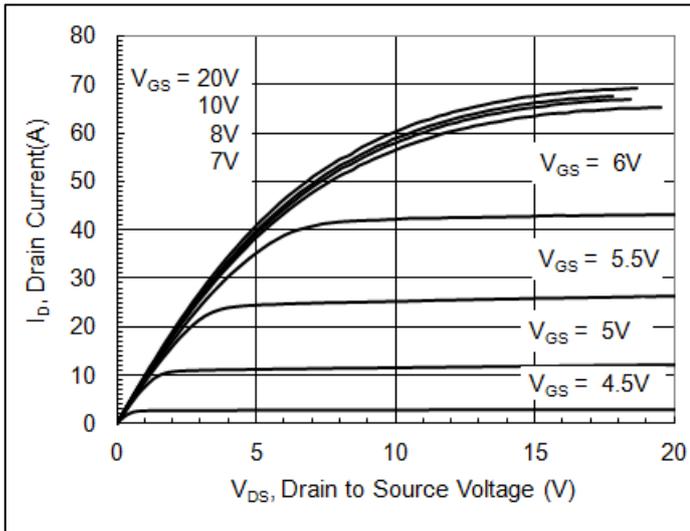


Fig1. Output characteristics

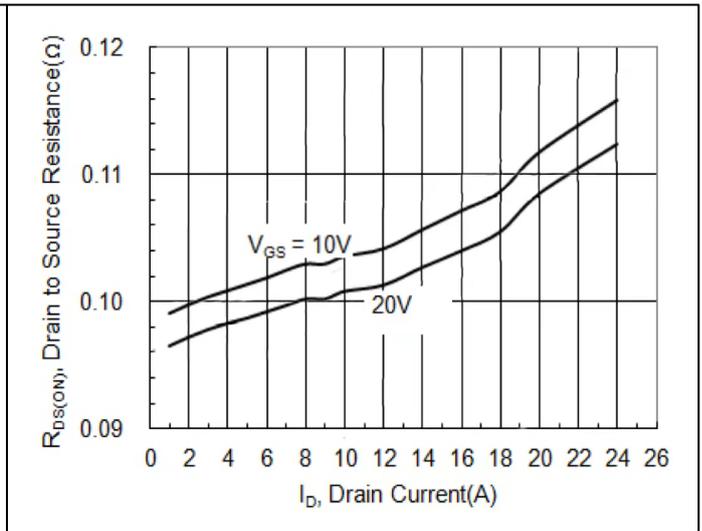


Fig2. Drain-source on-state resistance

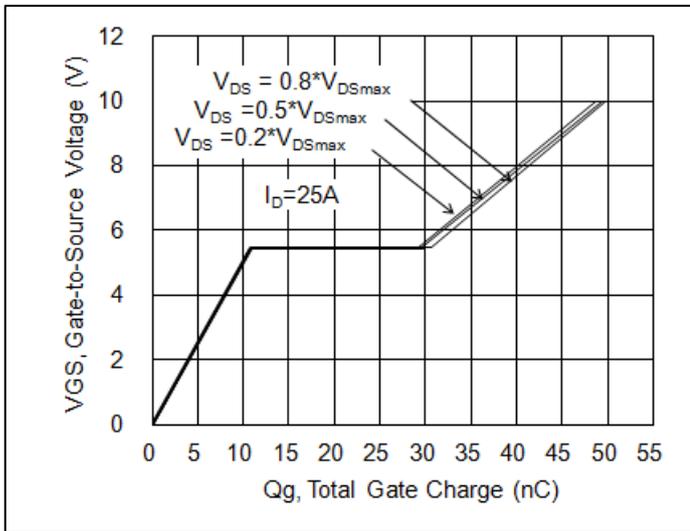


Fig3. Gate charge characteristics

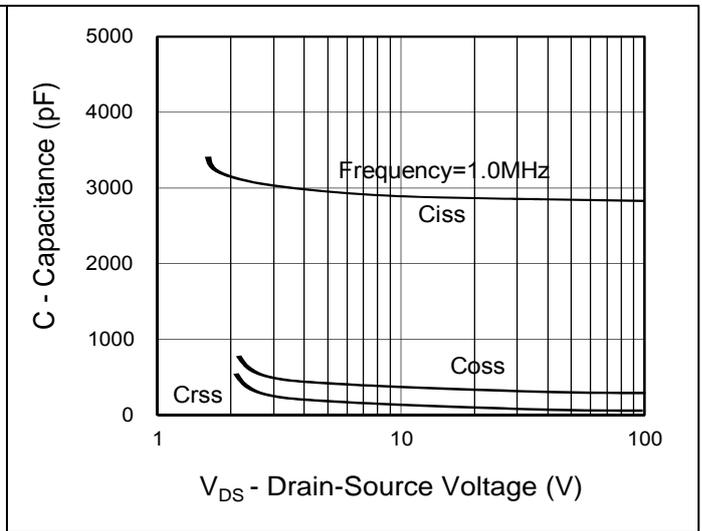


Fig4. Capacitance Characteristics

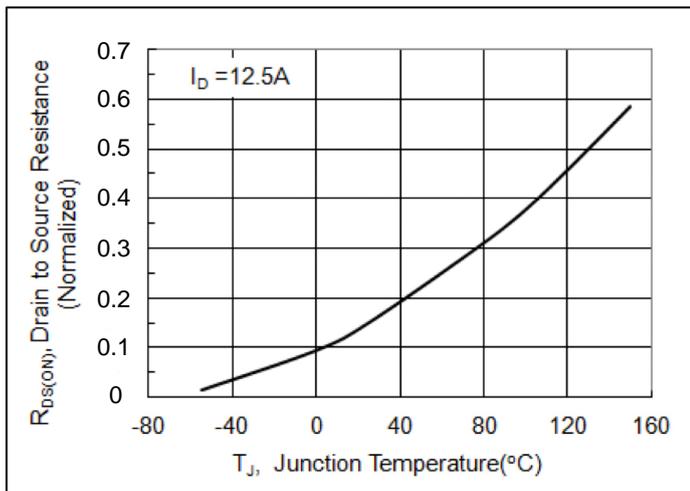


Fig5.  $R_{DS(ON)}$  vs junction temperature

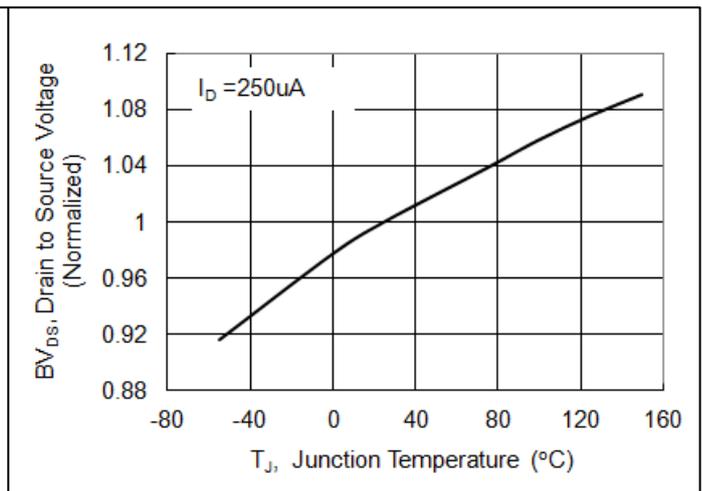


Fig6.  $BV_{DS}$  vs junction temperature

650V N-Channel Super-Junction MOSFET

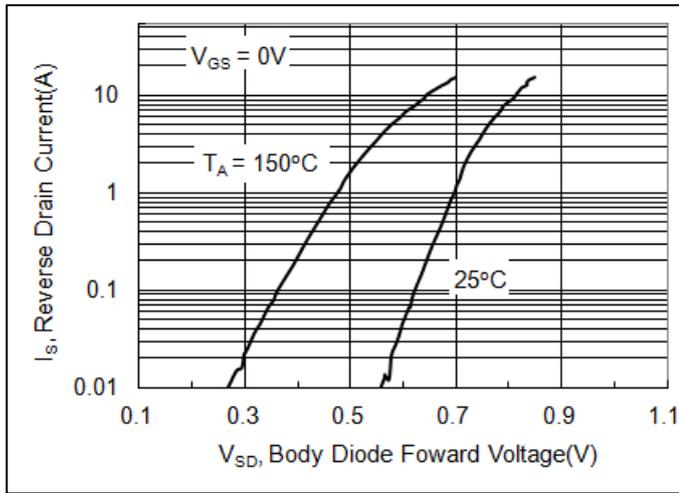


Fig 7. Forward characteristics of reverse diode

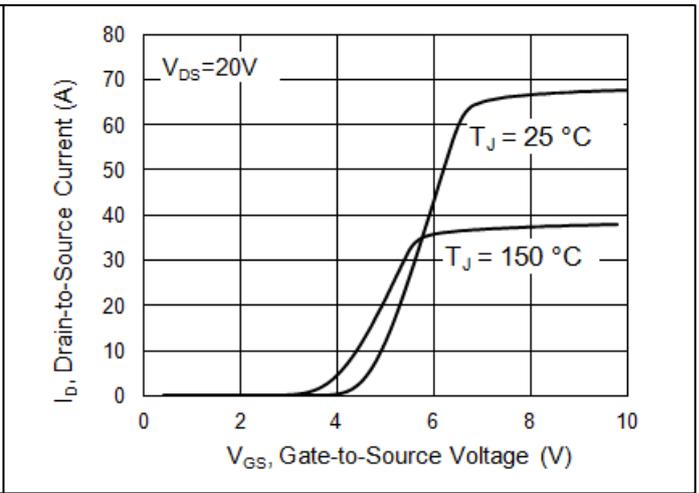


Fig 8. Transfer characteristics

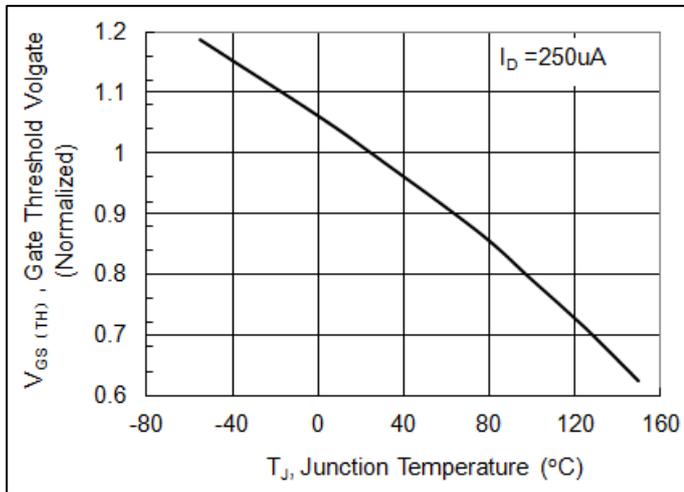


Fig 9.  $V_{GS(TH)}$  vs junction temperature

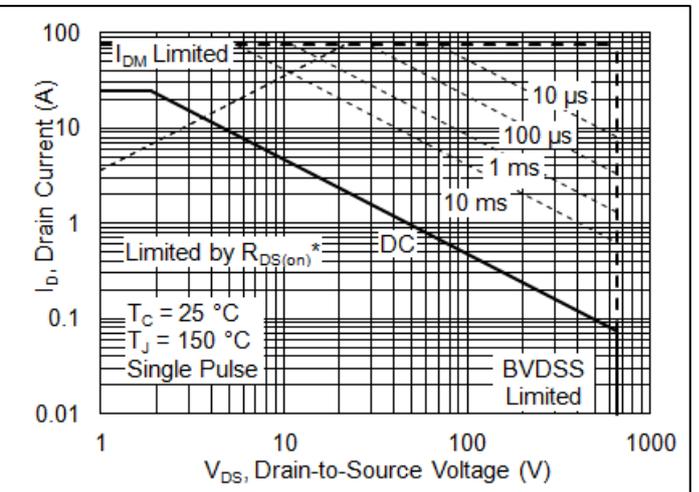


Fig 10. Safe operating area(TO-220F)

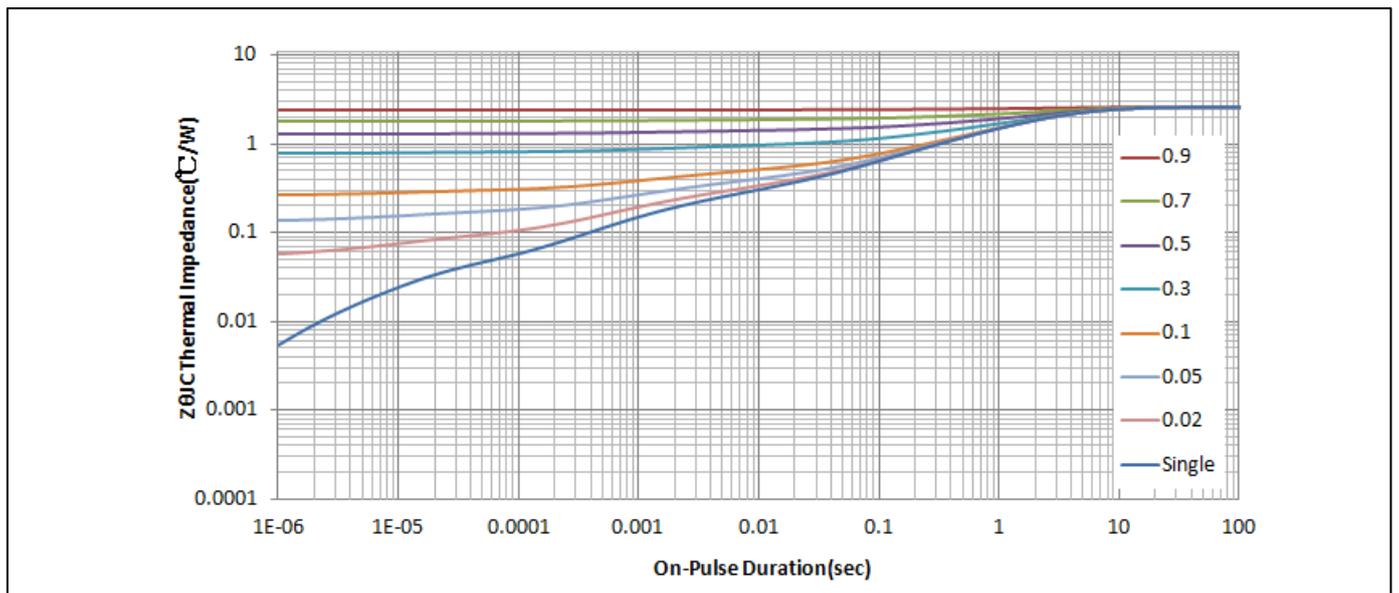


Fig 11. Transient thermal impedance (TO-220F)

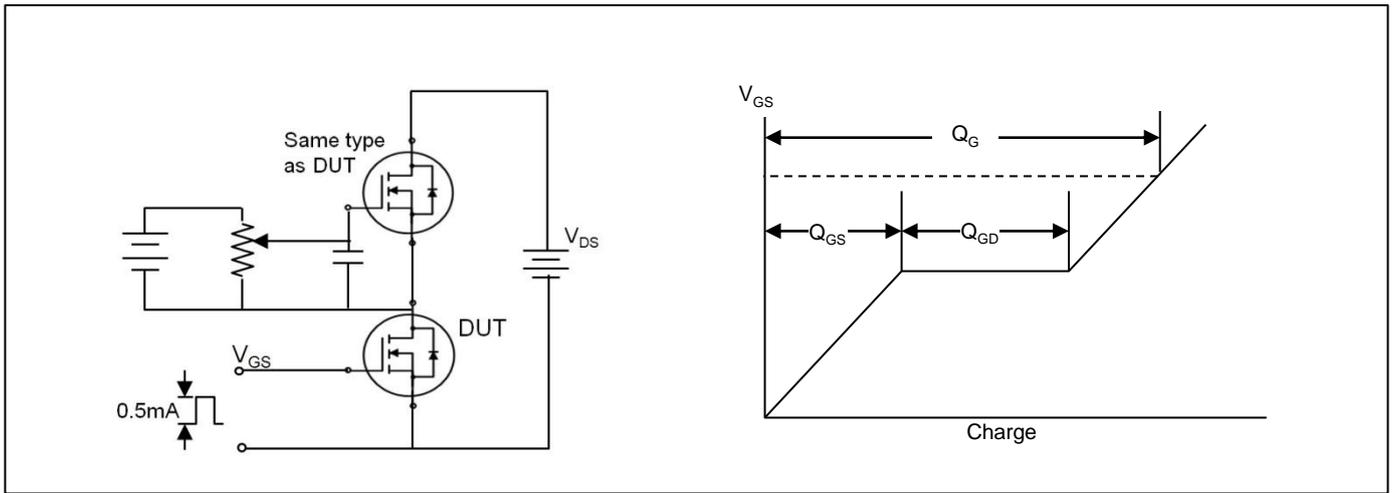


Fig 12. Gate charge test circuit & waveform

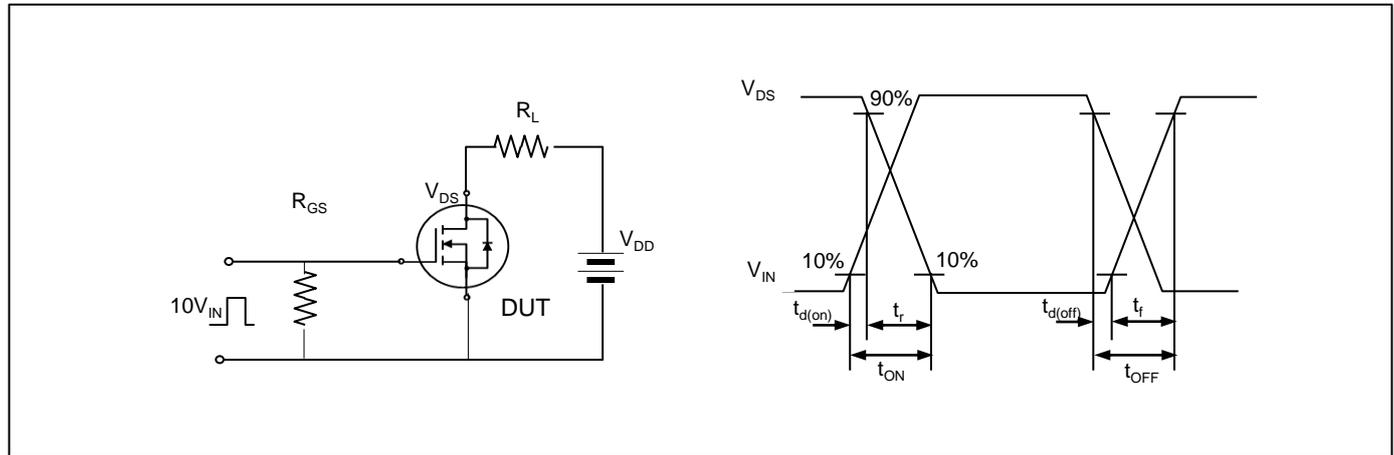


Fig 13. Switching time test circuit & waveform

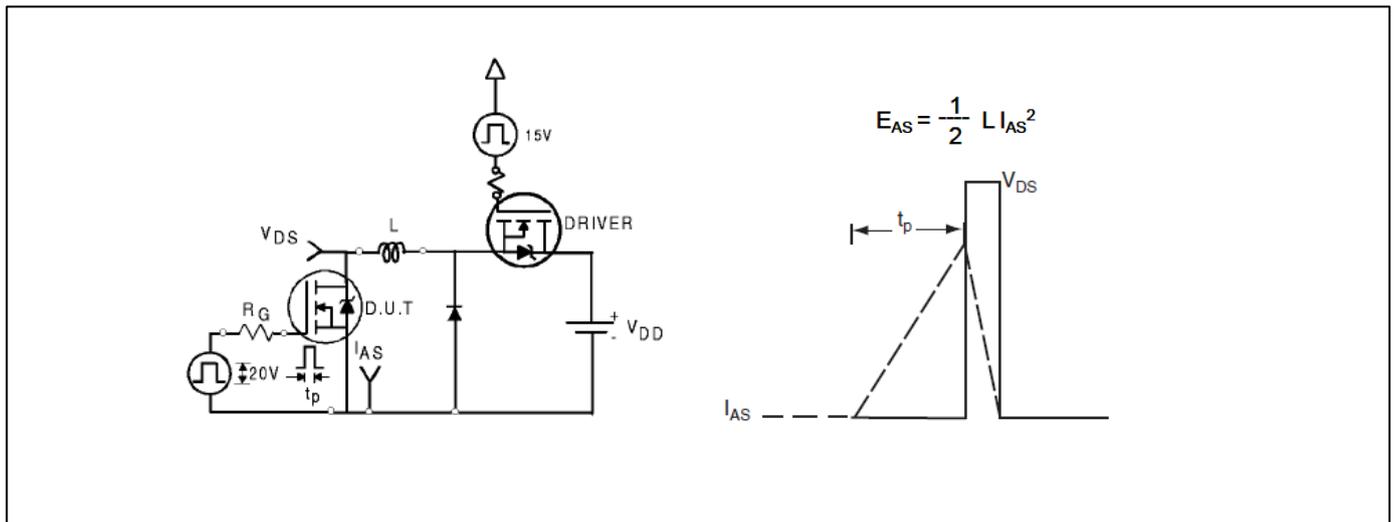


Fig 14. Unclamped Inductive switching test circuit & waveform

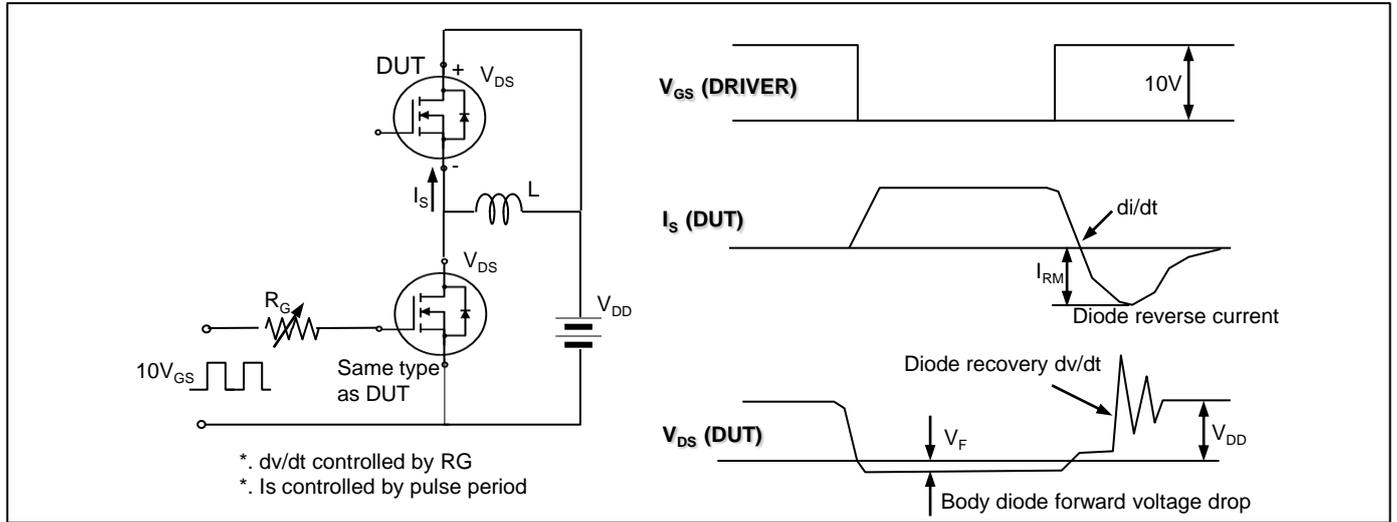
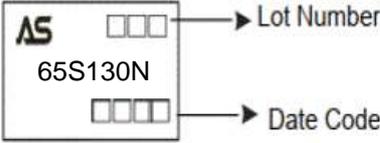


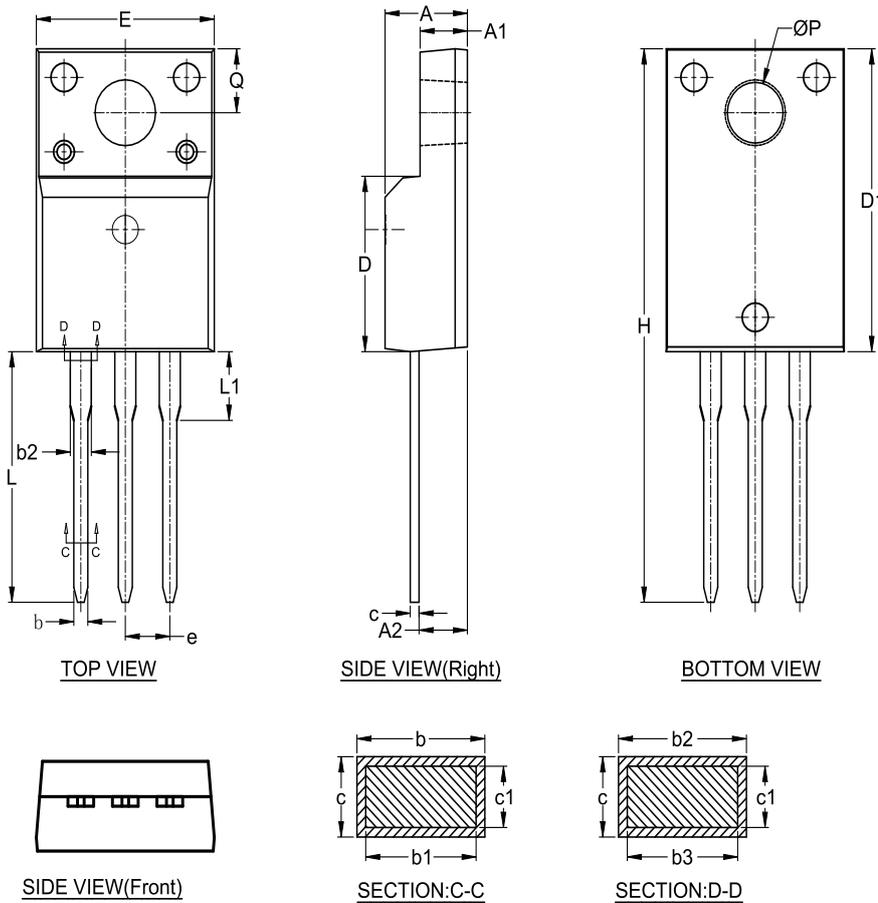
Fig 15. Peak diode recovery  $dv/dt$  test circuit & waveform

## Ordering and Marking Information

Ordering Device No.	Marking	Package	Packing	Quantity
ASDM65S130NF-T	65S130N	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 ASDsemi logo 'AS' in the top left. To its right are four small squares representing the Lot Number. Below the logo is the part number '65S130N'. Below the part number are four more small squares representing the Date Code. Arrows point from the text 'Lot Number' and 'Date Code' to their respective square groups.</p>

# TO-220F



DIM SYMBOL	MIN.	NOM.	MAX.
A	4.600	4.700	4.800
A1	2.600	2.700	2.800
A2	2.660	2.760	2.860
b	0.740	0.840	0.940
b1	0.700	0.800	0.900
b2	1.140	1.240	1.340
b3	1.100	1.200	1.300
c	0.440	0.540	0.640
c1	0.400	0.500	0.600
D	9.090	9.190	9.290
D1	15.770	15.870	15.970
E	10.060	10.160	10.260
e	2.540 BSC.		
H	28.800	29.000	29.200
L	12.930	13.130	13.330
L1	3.400	3.600	3.800
ØP	3.080	3.180	3.280
Q	3.150	3.350	3.550



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