

NSH110N15D

N-Channel Enhanced Shielded Gate Trench Power MOSFET



VOLTAGE: 150 Volts

CURRENT: 82 Amperes

Package: TO-220C

Marking And Polarity

FEATURES

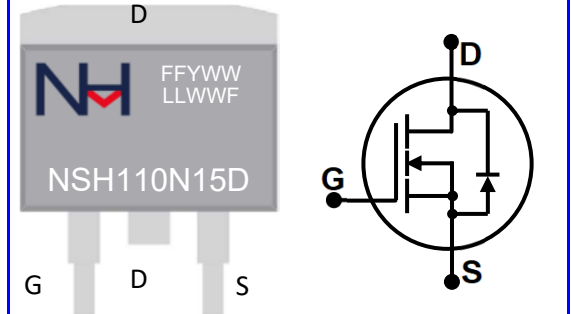
- Low $R_{DS(ON)}$ For High Efficiency
- Low Gate Charge For High Speed Swithing
- High EAS For High Reliability
- 100% UIS And RG Tested

TYPICAL APPLICATIONS

- DC/DC Converter And Synchronous Rectification
- High-Frequency Circuits And Battery Management System(BMS)
- The Motor Drives And Printed Circuit Board Control
- Automotive Electronics And UPS (Uninterruptible Power Supplies)
- Weight:App. 2.057 Grams (0.07255 Ounce)**

PRODUCT SUMMARY

VDS Min.@Tj	150	V
Id Min.@Ta	82	A
RDS(ON) Type@10V	11.00	mΩ



Remark:

- NH=Niuhan Trademark
- FF=Product Line Code,According To Actual Changes
YWW=Date Code,According To Actual Changes
LLWWF=Inernal Code,According To Actual Changes
- NSH110N15D=Model

Absolute Maximum Ratings (Ta=25°C Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Ratings	Unit
Drain-Source Voltage		V_{DS}	150	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current (Note 1)	Ta= 25 °C	I_D	82	A
	Ta= 100 °C		53	
Drain Current-Pulsed (Note 1)	Tj< 150 °C	I_{DM}	329	A
Maximum Power Dissipation Power	Ta= 25 °C	P_D	184	W
Dissipation Derating Factor Above 25°C	Ta= 100 °C		74	
Derating Factor		D_F	1.47	W/°C
Junction Temperature		T_J	-55 to 150	°C
Storage Temperature Range		T_{STD}	-55 to 150	°C
Avalanche Current,Single Pulse (Note 1)	L= 0.5 mH	I_{AS}	22	A
Single Pulse Avalanche Energy (Note 1) Test Circuit & Waveform See Fig.16	L= 0.5 mH IAS= 22.4 A,RG= 10 Ω Starting Tj=25 °C,VG = 10 V	E_{AS}	125	mJ

Thermal Characteristics (Ta=25°C Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Typ.	Unit
Thermal Resistance Junction To Ambient	Still Air Environment With Ta =25°C	$R_{\theta JA}$	60.0	°C/W
Thermal Resistance Junction-Case	Device Mounted On 1 in ² FR-4 Board With 2oz	$R_{\theta JC}$	0.68	

Notes: 1. Pulse Width Limited By Max. Junction Temperature. (See Fig. 13).



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Electrical Characteristics (Ta=25°C Unless Otherwise Specified)

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Static off Characteristics						
Drain-Source Breakdown Voltage	VGS=0V,ID=250uA	BV_{DSS}	150	--	--	V
Bvdss Temperature Coefficient	ID=250uA,Reference25℃	$\Delta BV_{DSS}/\Delta T_J$	--	0.172	--	V/℃
Drain-Source Leakage Current	VDS= 150 V,VGS=0V	I_{DSS}	--	--	1	uA
Gate-Body Leakage Current	VGS= ±20 V,VDS=0V	I_{GSS}	--	--	±100	nA
Forward Transconductance	ID= 20 A,VDS= 5 V	g_{fs}	--	45	--	S
Static on Characteristics						
Gate Threshold Voltage	VGS= VDS ID=250uA	$V_{GS(TH)}$	2.0	3.0	4.0	V
Drain-Source On Resistance	ID= 20 A,VGS= 10 V	$R_{DS(ON)}$	--	11.00	13.00	mΩ
	ID= 20 A,VGS= 4.5 V		--	12.65	17.42	
Dynamic Characteristics						
Gate Resistance	VGS=0V,VDS=0V, Freq.=1MHz	R_g	--	4.50	--	Ω
Input Capacitance	VDS= 50 V	C_{iss}	--	1850.0	--	pF
Output Capacitance	VGS= 0 V	C_{oss}	--	240.0	--	pF
Reverse Transfer Capacitance	F= 1 MHz	C_{rss}	--	6.0	--	pF
Switching Paramters (Test Circuit & Waveform See Fig.14)						
Turn-On Delay Time	VDS= 75 V	$t_{d(on)}$	--	10.0	--	ns
Turn-On Rise Time	VGS= 10 V	t_r	--	5.0	--	ns
Turn-Off Delay Time	RG= 10 Ω	$t_{d(off)}$	--	19.0	--	ns
Turn-Off Rise Time		t_f	--	7.0	--	ns
Gate Charge Paramters (Test Circuit & Waveform See Fig.15)						
Total Gate Charge	VDS= 75 V	Q_g	--	25.0	--	nC
Gate-Source Charge	VGS= 10 V	Q_{gs}	--	11.0	--	nC
Gate-Drain Charge	ID= 20 A	Q_{gd}	--	4.0	--	nC
Drain-Source Diode Characteristics And Maximum Ratings (Test Circuit & Waveform See Fig.17)						
Max. Diode Forward Cuurent		I_S	--	--	82	A
Max. Pulsed Forward Cuurent		I_{SM}	--	--	288	A
Diode Forward Voltage	ID= 20 A,VGS=0V	V_{SD}	--	0.90	1.26	V
Reverse Recovery Time	ID= 20 A,di/dt= 100 A/us	t_{rr}	--	75.0	--	ns
Reverse Recovery Charge	VGS= 10 V,VDS= 75 V	Q_{rr}	--	130.0	--	nC

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Typical Characteristics Curves

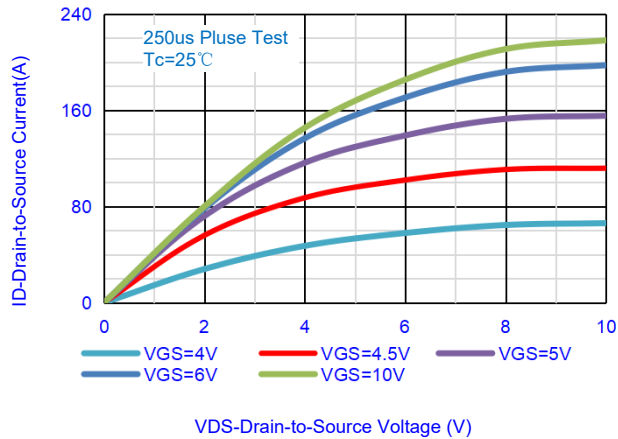


Fig.1-Output Characteristics

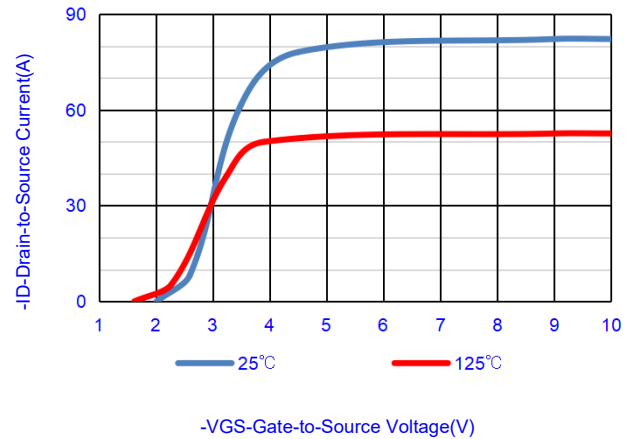


Fig.2- Transfer Characteristics

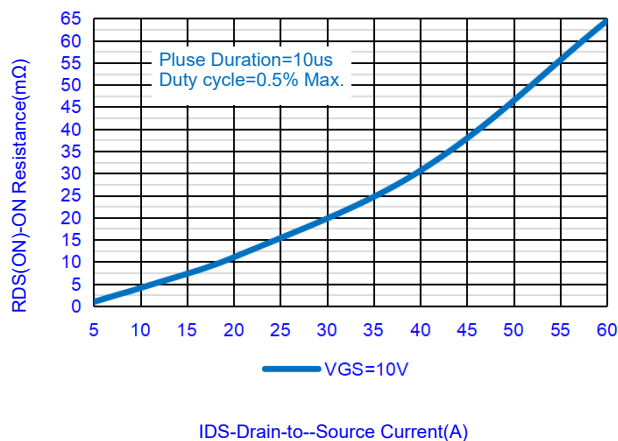


Fig.3- On Resistance vs. Drain Current

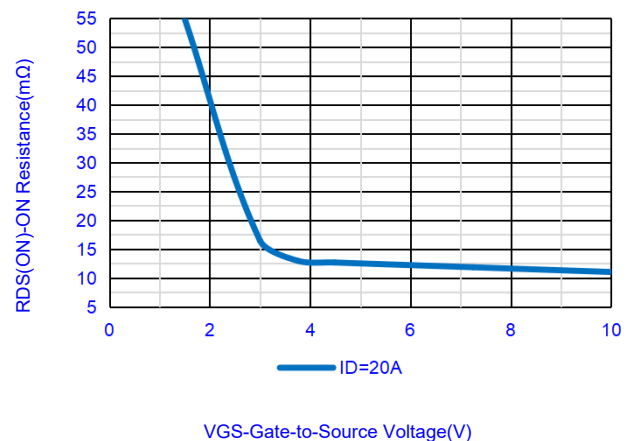


Fig.4- On Resistance vs. Gate Source Voltage

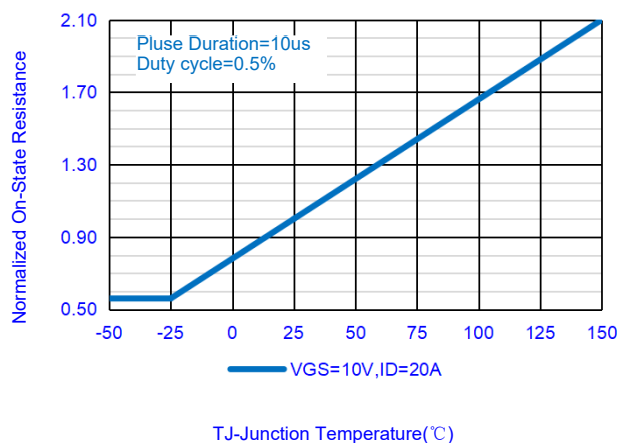


Fig.5- On Resistance vs. Junction Temperature

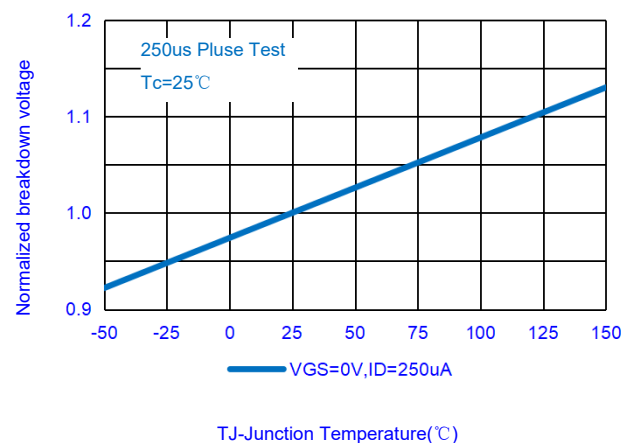


Fig.6- Breakdown Voltage vs. Junction Temperature

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Typical Characteristics Curves

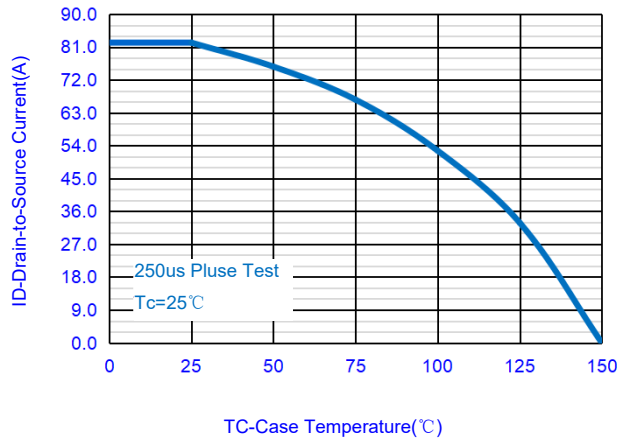


Fig.7-Maximum Continuous Drain Current vs. Case Temperature

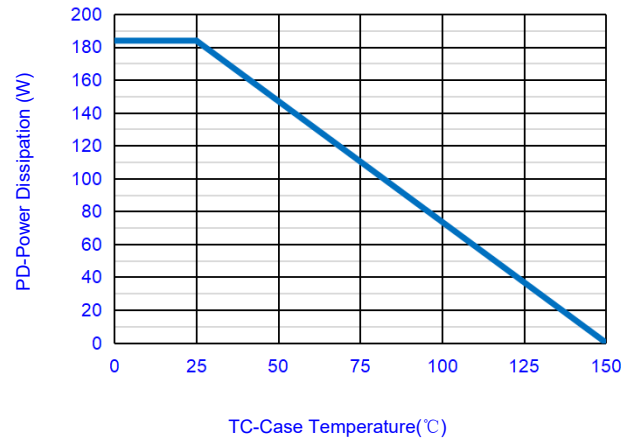


Fig.8-Maximum Power Dissipation vs. Case Temperature

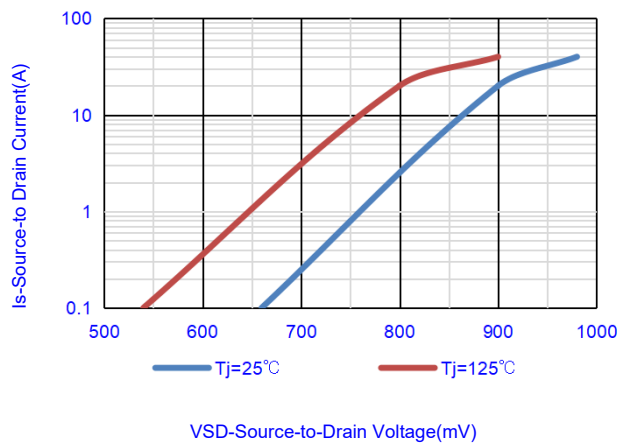


Fig.9- Source-Drain Diode Forward Voltage

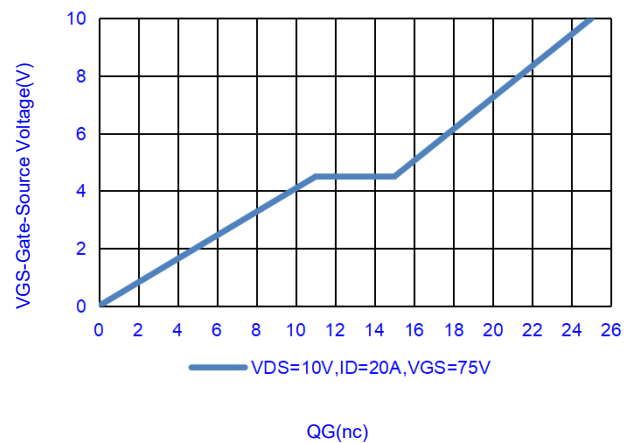


Fig.10-Gate Charge Waveform

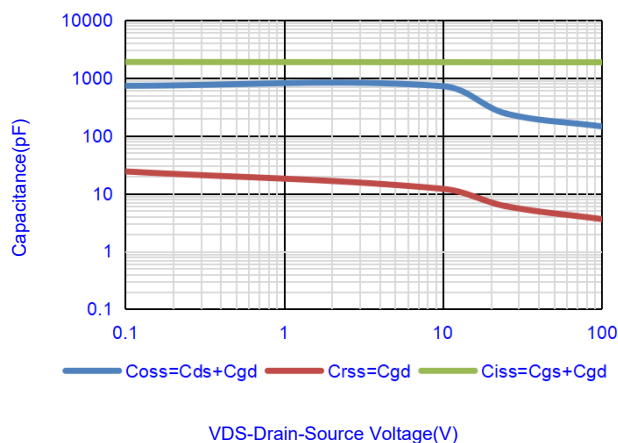


Fig.11- Gate-Source Voltage-VGS(V)

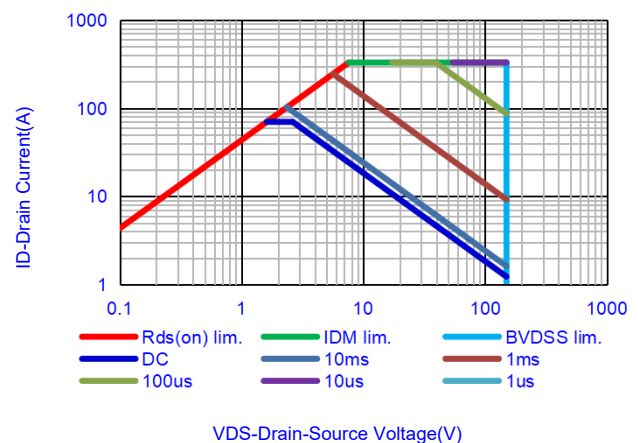


Fig.12-Maximum Safe Operating Area(SOA)

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Typical Characteristics Curves

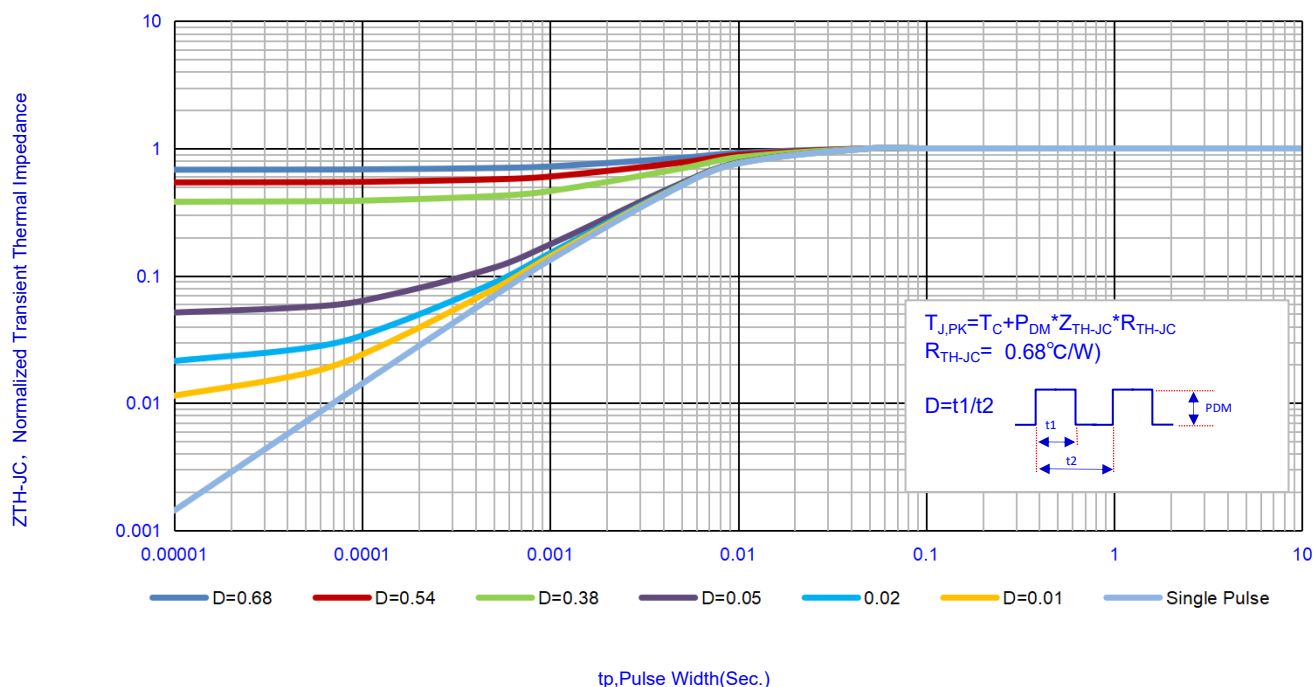


Fig.13- Normalized Maximum Transient Thermal Impedance vs.Pulse Width

Test Circuit & Waveform

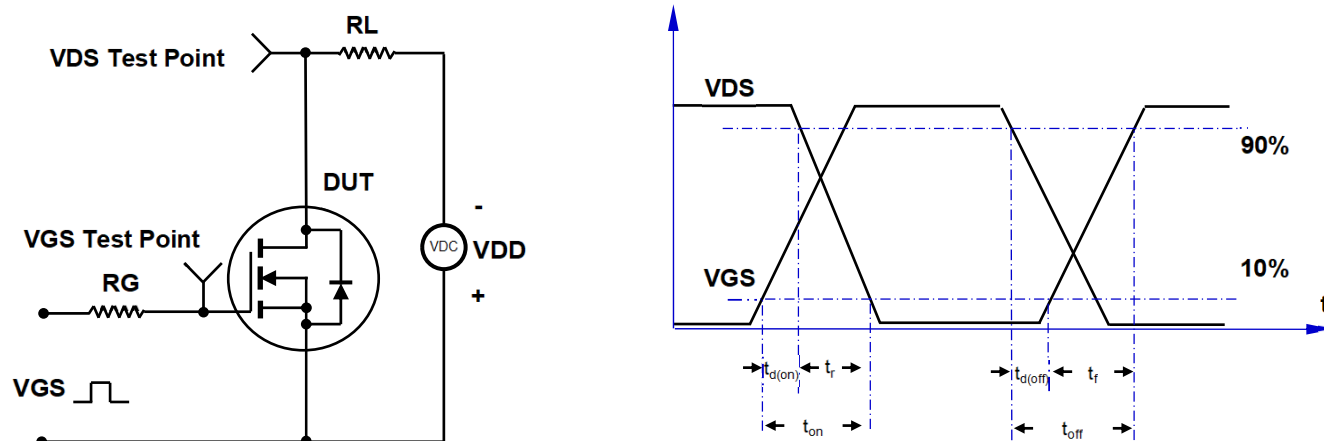


Fig.14- Resistive Switching Test Circuit & Waveform

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Test Circuit & Waveform

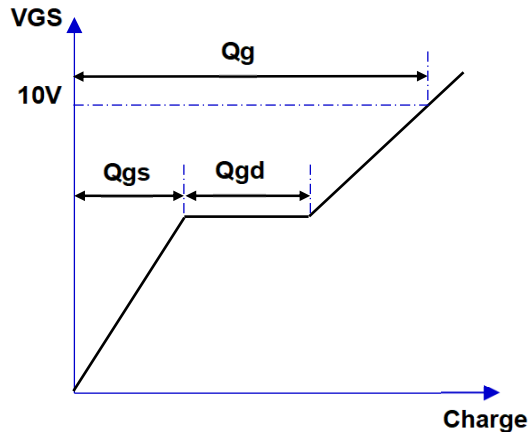
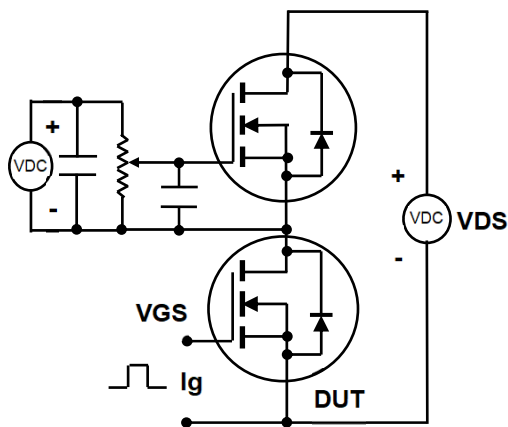


Fig.15- Gate Charge Test Circuit & Waveform

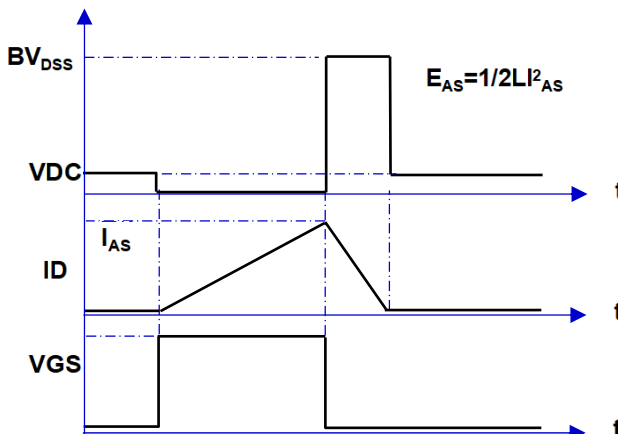
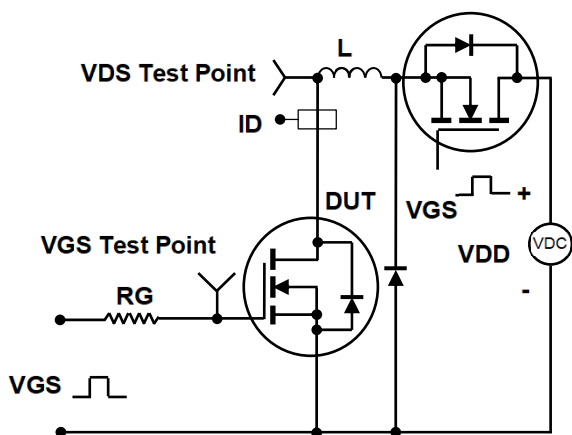


Fig.16- EAS Test Circuit & Waveform

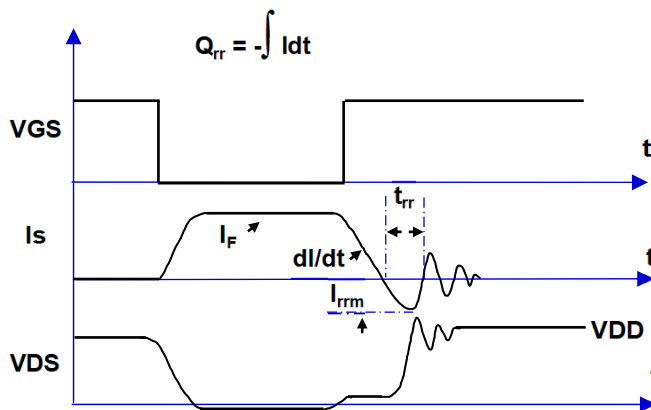
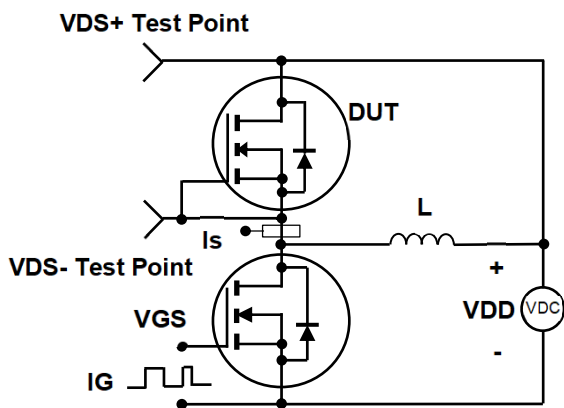


Fig.17- Diode Recovery Test Circuit & Waveform

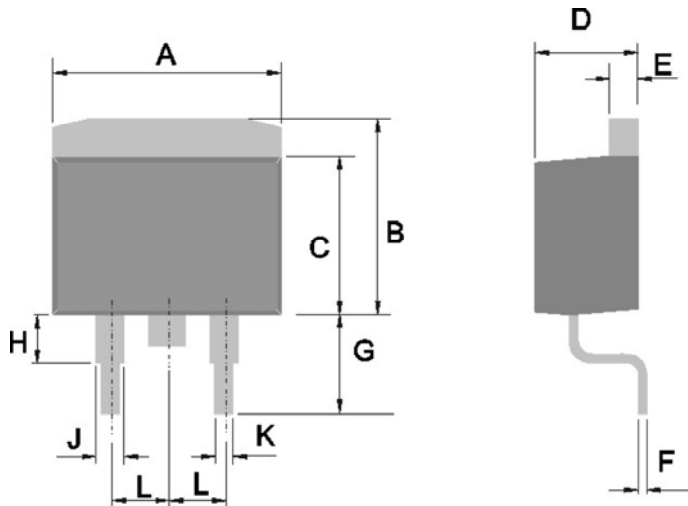
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OUTLINE DRAWINGS

TO-220C

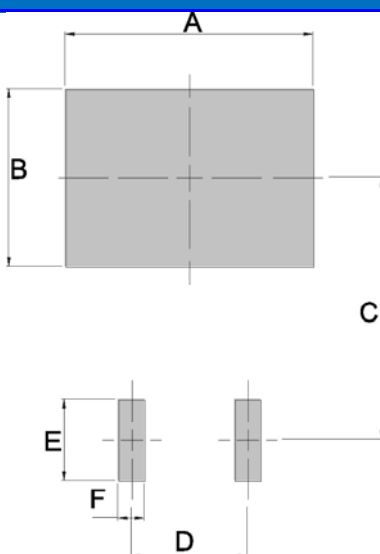


OUTLINE DIMENSIONS

Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	9.50	-	10.50	0.374	-	0.413
B	10.00	-	11.00	0.394	-	0.433
C	8.50	-	9.50	0.335	-	0.374
D	4.00	-	5.00	0.157	-	0.197
E	1.00	-	1.60	0.039	-	0.063
F	0.20	-	0.60	0.008	-	0.024
G	4.45	-	5.25	0.175	-	0.207
H	1.25	-	1.85	0.049	-	0.073
J	1.00	-	1.60	0.039	-	0.063
K	0.60	-	1.00	0.024	-	0.039
L	2.25	-	2.75	0.089	-	0.108

OUTLINE DRAWINGS

TO-220C



OUTLINE DIMENSIONS

Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	10.86	-	-	0.24	-
B	-	7.86	-	-	0.298	-
C	-	11.64	-	-	0.261	-
D	-	5.08	-	-	0.091	-
E	-	3.62	-	-	0.109	-
F	-	1.14	-	-	0.056	-

PACKING INFORMATION

Package Code	Package Method	Inner Box Size L×W×H(mm)	Quantity (Pcs/Inner Box)	Outer Carton Size L×W×H(mm)	Quantity (Pcs/Carton)
TO-220C	T/R	355×340×40	800	370×360×420	8000

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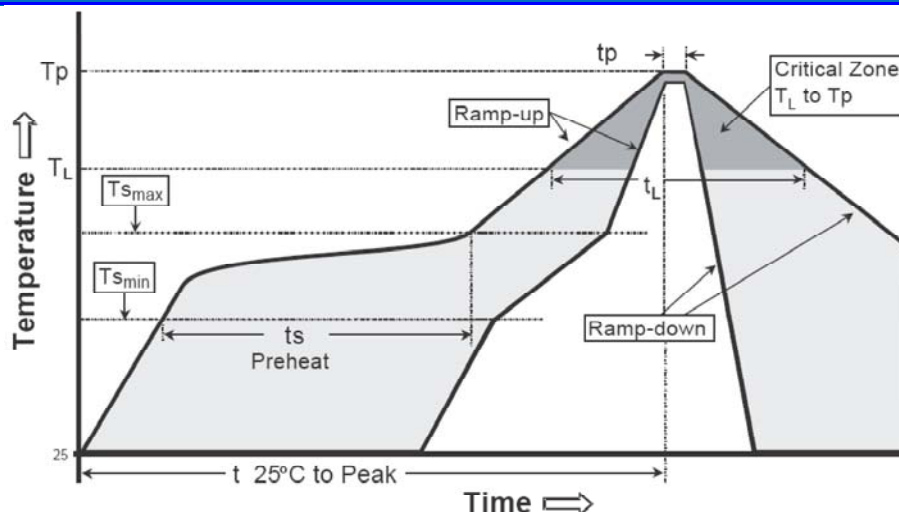
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Recommended wave soldering condition

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

Recommended temperature profile for IR reflow



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat -Temperature Min(TS min) -Temperature Max(TS max) -Time(ts min to ts max)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: -Temperature (TL) - Time (tL)	183°C 60-150 seconds	217°C 60-150 seconds
Peak Temperature(TP)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.



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