

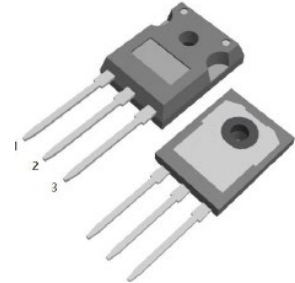
FEATURE

- ◆ Extremely low on-resistance $R_{DS(on)}$
- ◆ Excellent $Q_g \times R_{DS(on)}$ product(FOM)
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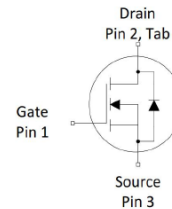
MOSFET

32A,650V,120mΩ N-CHANNEL MOSFET

Package
TO-247-3L



Schematic Diagram



Application

- ◆ PFC stages, hard switching PWM stages and resonant switching
- ◆ PWM stages for e.g. PC Silverbox, Adapter, LCD & PDP TV, Lighting, Server, Telecom and UPS

Parameter	Values	Unit
Bvdss	650	V
Id	32	A
Rdson(max)	120	mΩ
VGS(th) (typ)	4	V

Ordering Code	Marking	Package	Packaging
X120N65JEFHA3	X120N65JEFHA3	TO-247-3L	Tube

Absolute Maximum Ratings($T_c=25^\circ\text{C}$, unless otherwise noted)

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Drain-Source Voltage	V_{DS}	-	-	650	V	-
Gate-Source Voltage	V_{GS}	-20	-	20	V	-
Continuous Drain Current	I_D	-	-	32	A	$T_c=25^\circ\text{C}$ (Silicon limit)
		-	-	32		$T_c=25^\circ\text{C}$ (Package limit)
		-	-	20		$T_c=100^\circ\text{C}$ (Silicon limit)
		-	-	3		$T_a=25^\circ\text{C}$
Pulsed Drain Current(Note1)	I_{DM}	-	-	128	A	$T_c = 25^\circ\text{C}$, $t_p = 100\mu\text{s}$
Single Pulse Avalanche Energy	E_{AS}	-	-	456	mJ	$L=60\text{mH}$, $V_D=100\text{V}$, $T_c=25^\circ\text{C}$
Power Dissipation	P_D	-	-	281	W	$T_c=25^\circ\text{C}$
		-	-	2		$T_a=25^\circ\text{C}$
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55	-	150	$^\circ\text{C}$	-
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	T_L	-	-	260	$^\circ\text{C}$	-

Thermal Characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Thermal resistance , junction – case	R_{thJC}	-	0.34	0.45	°C/W	-
Thermal resistance ,junction - ambient	R_{thJA}	-	-	62		-

Electrical Characteristics ($T_j=25^{\circ}\text{C}$, unless otherwise noted)

Static characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Drain-Source Breakdown Voltage	BV_{DSS}	650	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Zero Gate Voltage Drain Current	I_{DSS}	-	1	10	μA	$V_{DS}=650V, V_{GS}=0V, T_j=25^{\circ}\text{C}$
		-	-	100		$V_{DS}=650V, V_{GS}=0V, T_j=150^{\circ}\text{C}$
Gate-Body Leakage Current	I_{GSS}	-	± 10	± 100	nA	$V_{GS}=20V, V_{DS}=0V$
Gate-Source Threshold Voltage	$V_{GS(th)}$	3.0	-	5.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Drain-Source On-State Resistance	$R_{DS(on)}$	-	101	120	m Ω	$V_{GS}=10V, I_D=15A$
Gate Resistance	R_g	-	10	-	Ω	$V_{GS}=0V, V_{DS}=0V, f=1\text{MHz}$
Forward Transconductance	g_{fs}	-	17	-	S	$V_{DS}=5V, I_D=15A$

Dynamic characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Input Capacitance	C_{iss}	-	2620	-	pF	$V_{DS}=400V, V_{GS}=0V, f=1.0\text{MHz}$
Output Capacitance	C_{oss}	-	65	-		
Reverse Transfer Capacitance	C_{rss}	-	7	-		
Turn-On Delay Time	$t_{d(on)}$	-	44	-	ns	$V_{DD}=325V, I_D=15A, V_{GS}=10V, R_G=2.5\Omega$
Turn-On Rise Time	t_r	-	63	-		
Turn-Off Delay Time	$t_{d(off)}$	-	91	-		
Turn-Off Fall Time	t_f	-	30	-		

Gate charge characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Total Gate Charge	Q_g	-	68	-	nC	$V_{DS}=325V, I_D=15A, V_{GS}=10V$
Gate-Source Charge	Q_{gs}	-	25	-		
Gate-Drain Charge	Q_{gd}	-	31	-		

Reverse diode

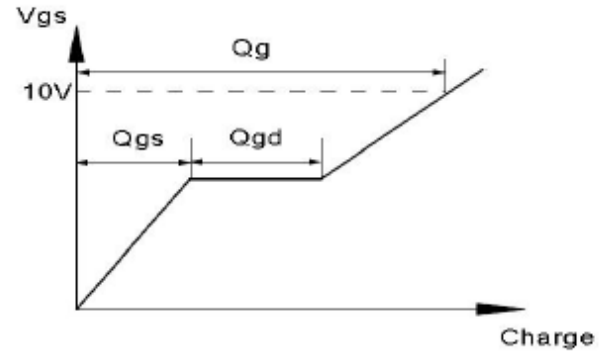
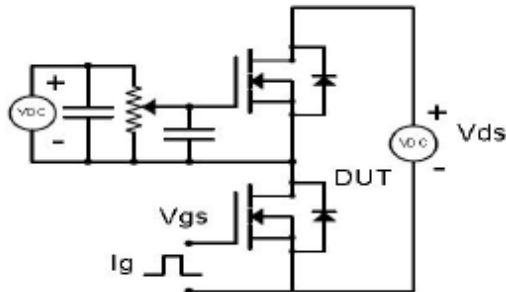
Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Continuous Diode Forward Current	I_S	-	-	32	A	-
Pulsed Diode Forward Current	I_{SM}	-	-	128	A	-
Diode Forward Voltage	V_{SD}	-	0.87	1.5	V	$I_S=20A, V_{GS}=0V$
Reverse Recovery Time	t_{rr}	-	151	-	ns	$V_R=400V, I_F=15A$
Reverse Recovery Charge	Q_{rr}	-	920	-	nC	$di/dt=100A/\mu s, (Note2)$

Notes

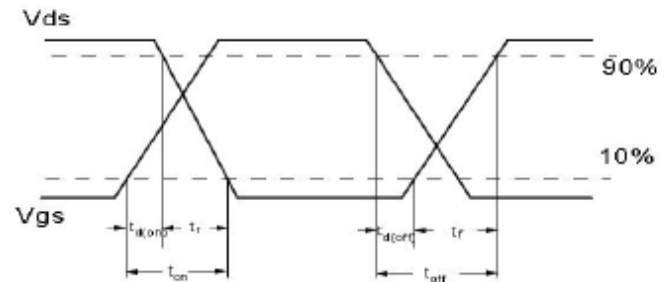
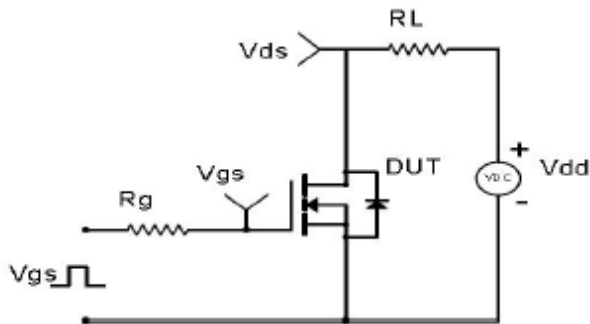
1. Repetitive Rating:pulse width limited by maximum junction temperature.
2. Pulse width $\leq 300\mu s$,duty cycle $\leq 2\%$.

Test Circuit & Waveform

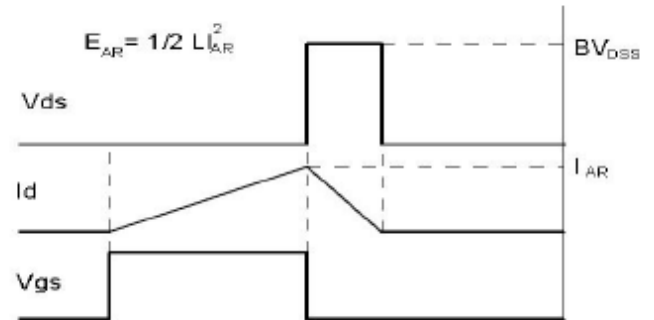
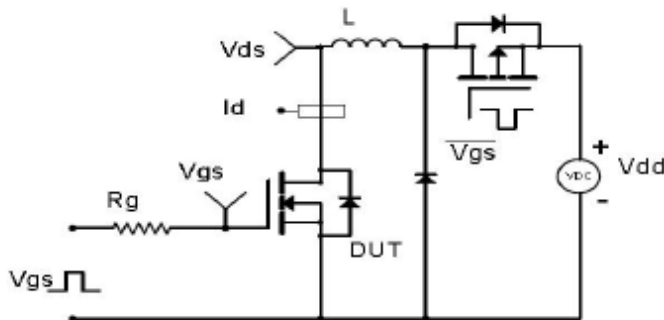
Gate Charge Test Circuit & Waveform



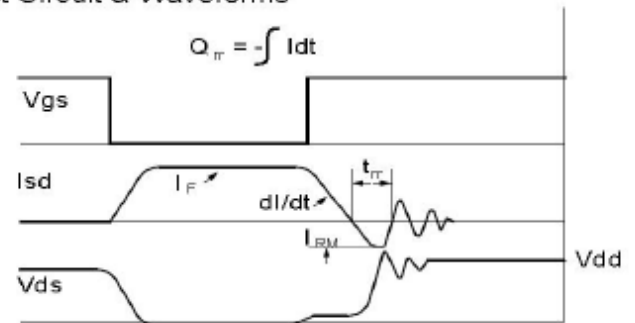
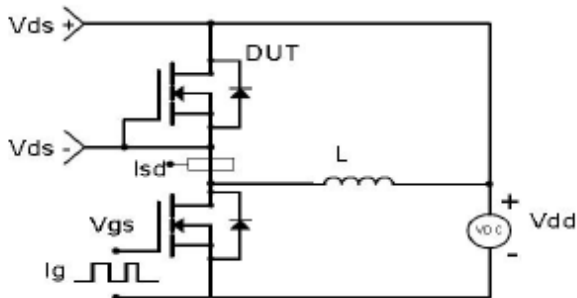
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



RATING AND CHARACTERISTIC CURVES

Figure.1 Typical Output Characteristics

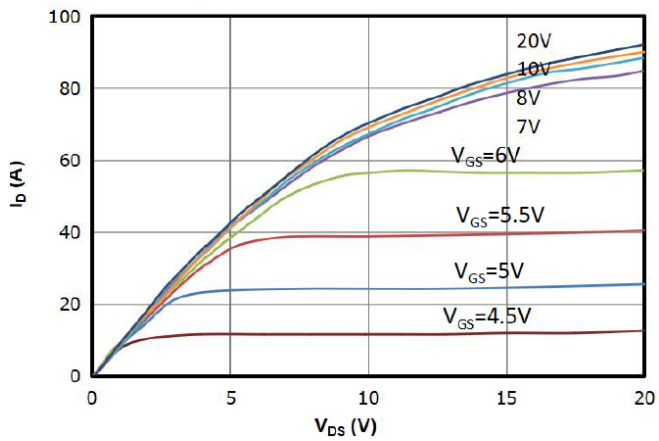


Figure.2 Transfer Characteristics

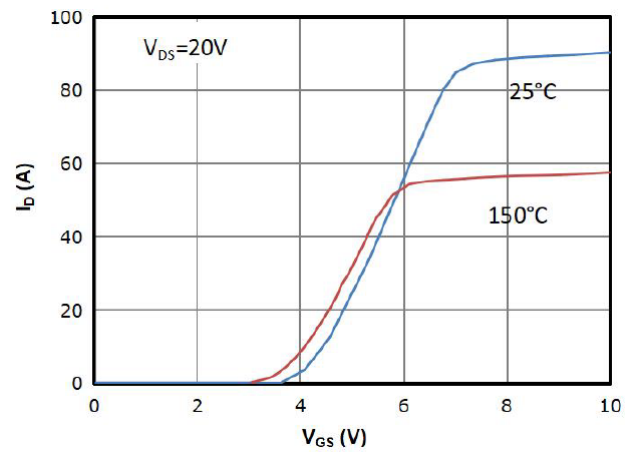


Figure.3 R_{DS(on)} vs Drain Current and Gate Voltage

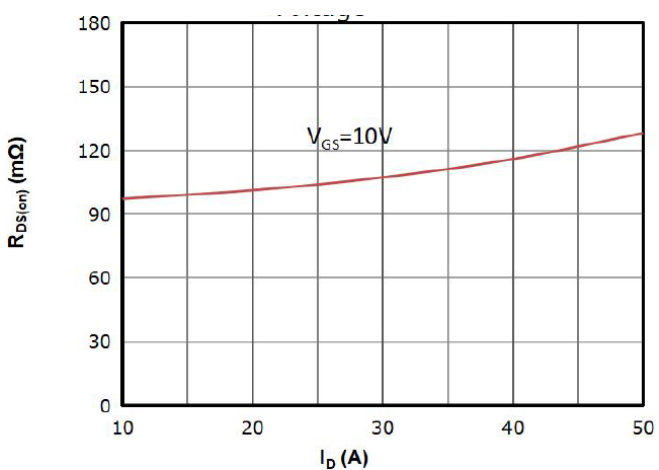


Figure.4 R_{DS(on)} vs Gate Voltage

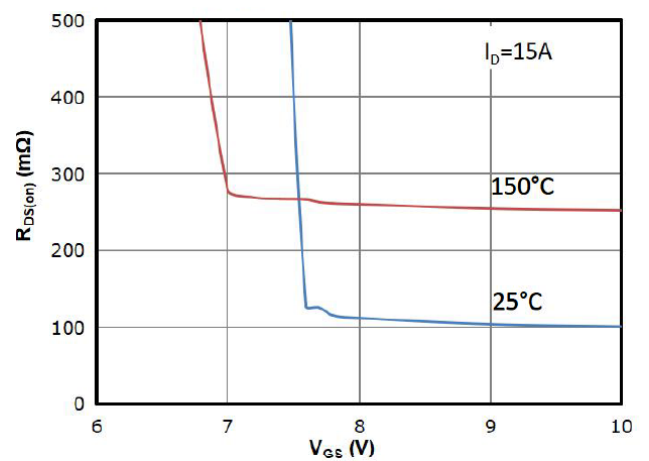


Figure.5 $R_{DS(on)}$ vs Temperature

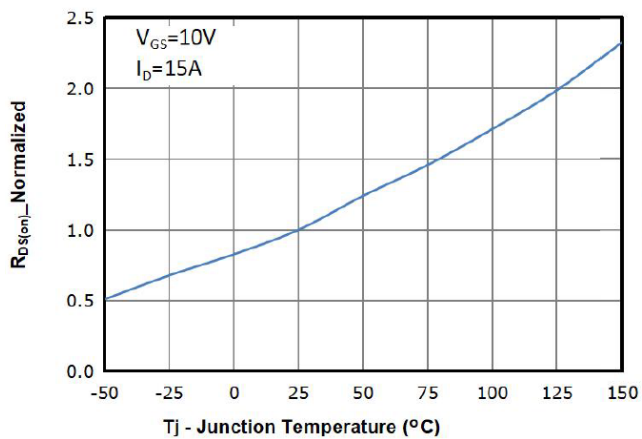


Figure.6 $V_{GS(th)}$ vs Temperature

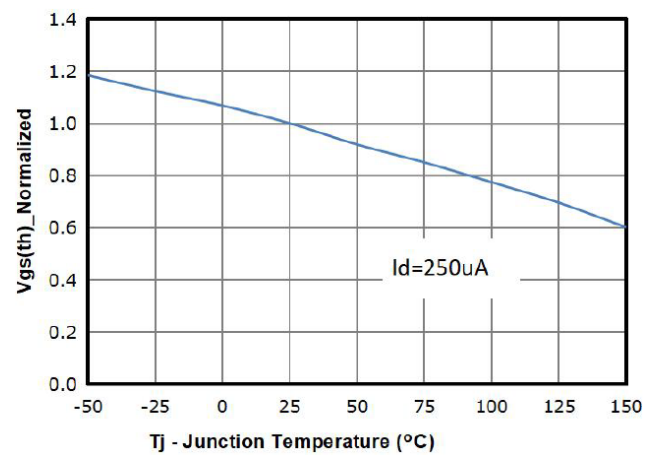


Figure.7 BV_{DSS} vs Temperature

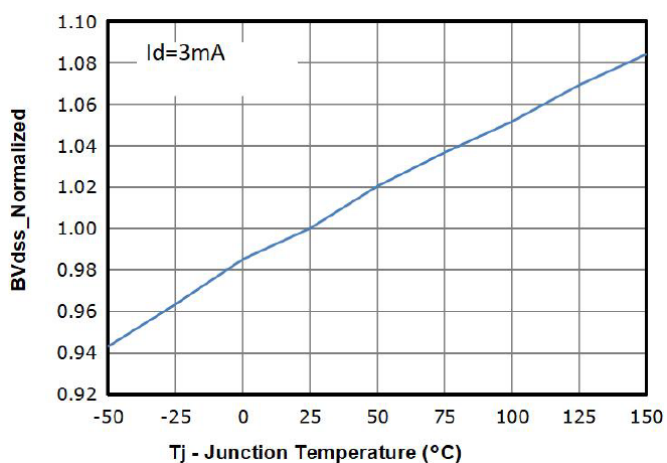


Figure.8 Capacitance Characteristics

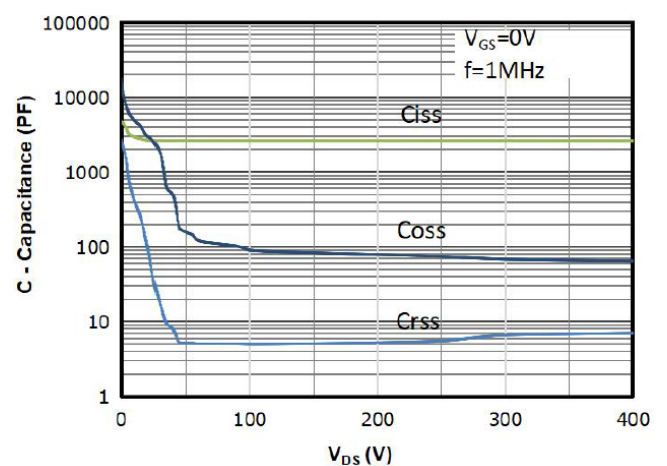


Figure.9 Gate Charge characteristics

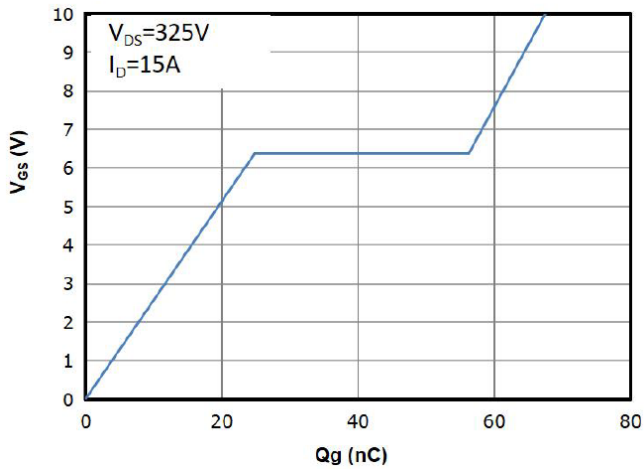


Figure.10 Body-Diode Forward Characteristics

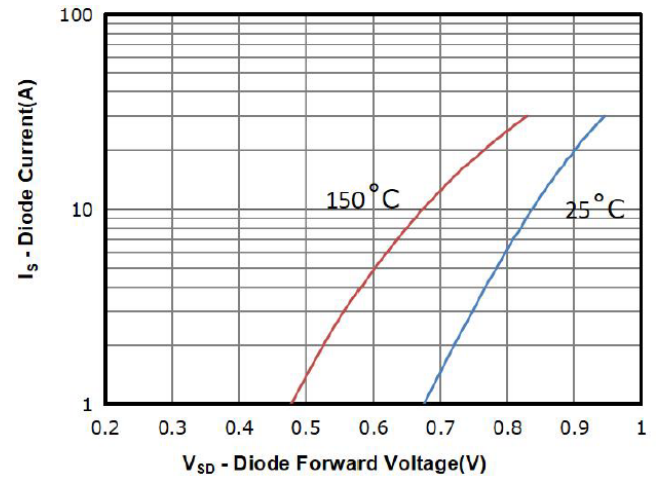


Figure.11 Power Dissipation

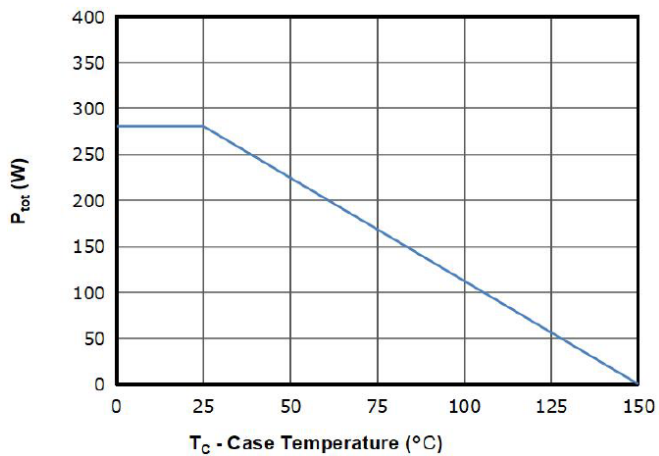


Figure.12 Drain Current Derating

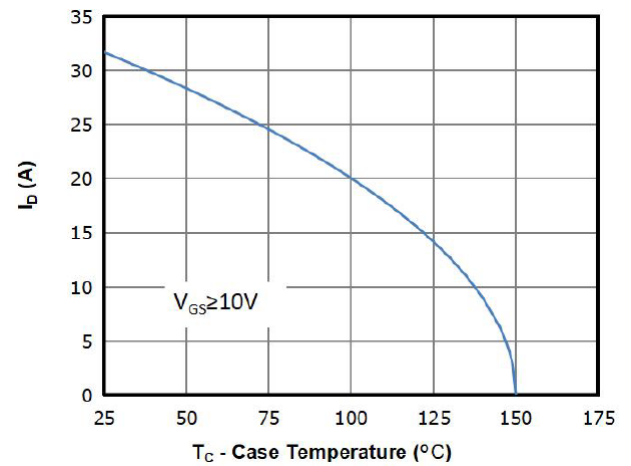


Figure.13 Safe Operating Area

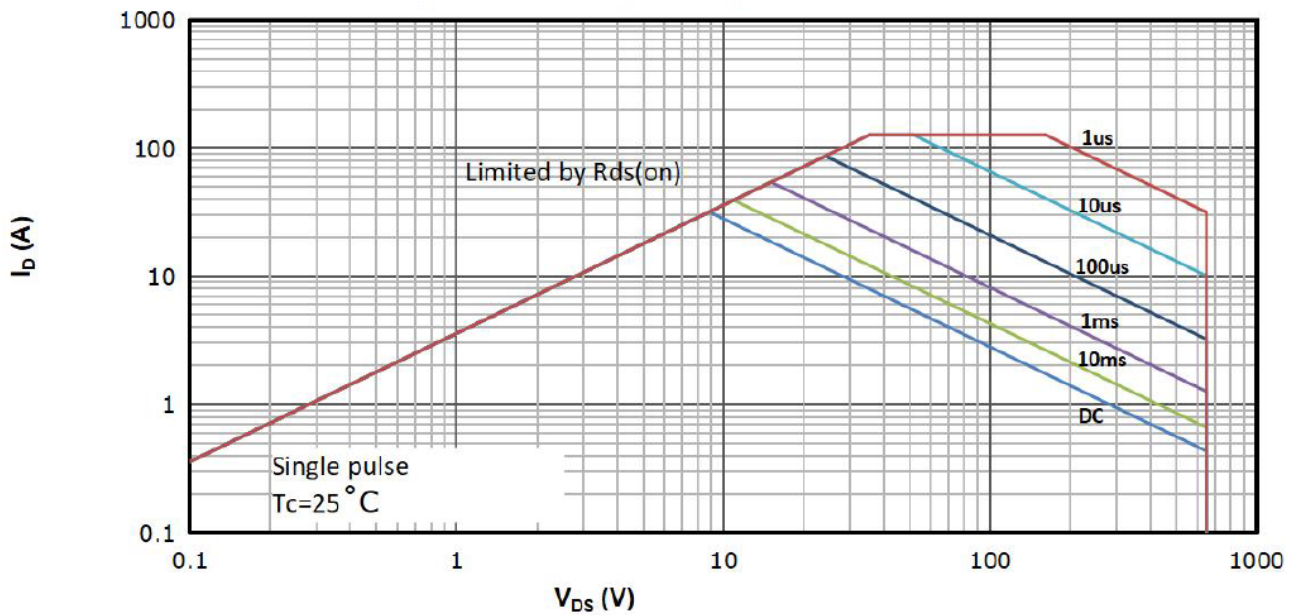
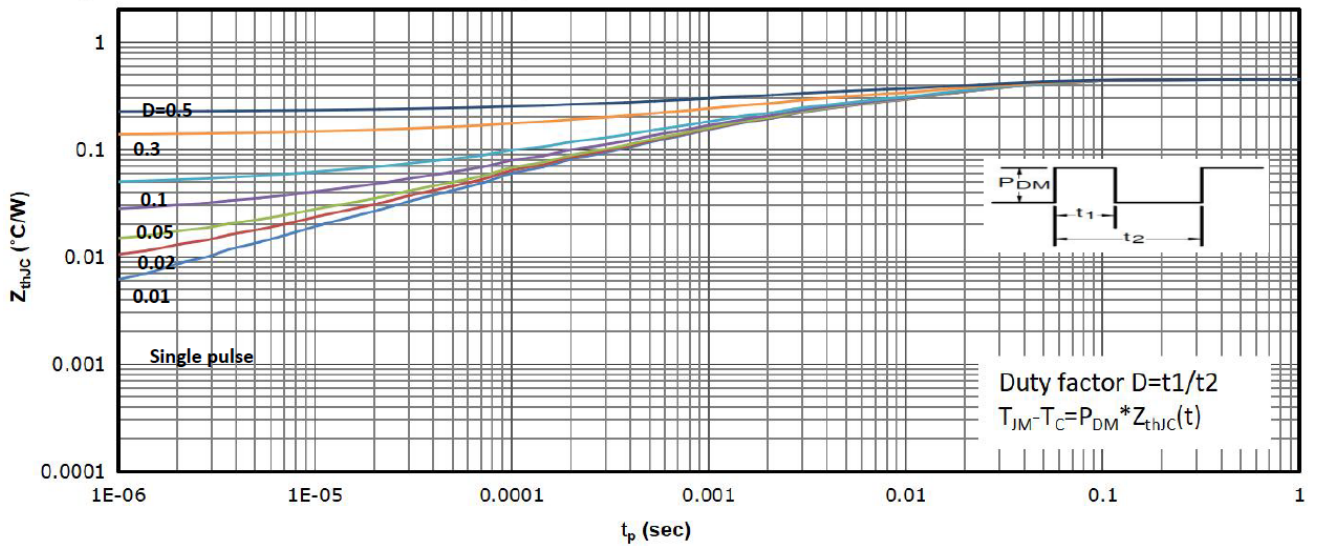
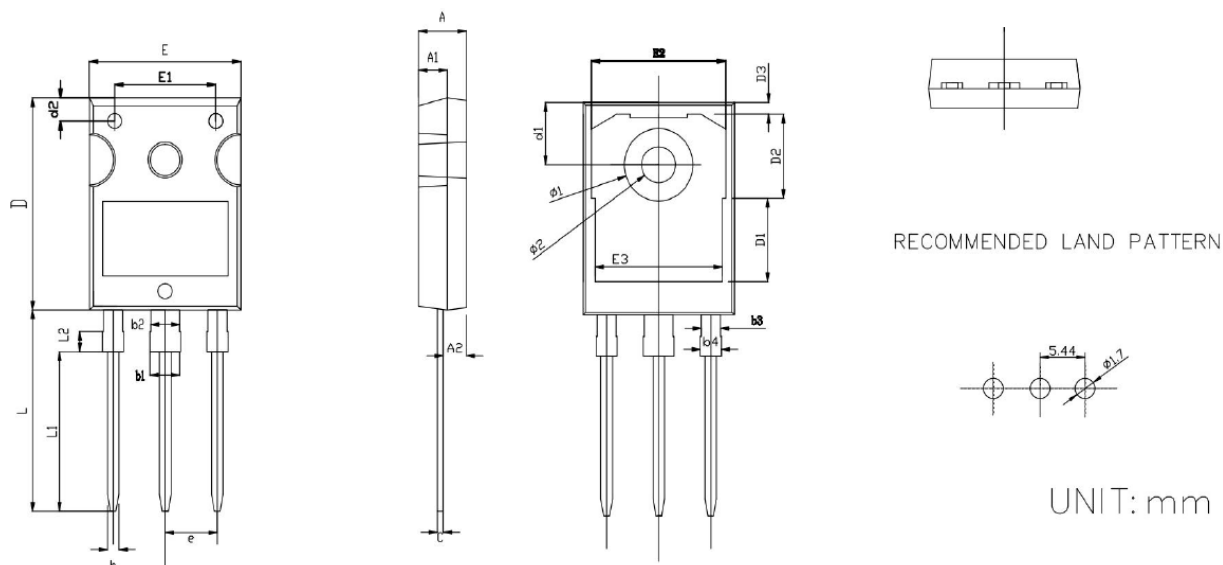


Figure.14 Max .Transient Thermal Impedance



Package Outline: TO-247-3L



SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.20	0.189	0.205
A1	2.80	3.20	0.110	0.126
A2	2.26	2.56	0.089	0.101
b	1.10	1.30	0.043	0.051
b1	2.90	3.20	0.114	0.126
b2	2.90	3.10	0.114	0.122
b3	1.90	2.10	0.075	0.083
b4	2.00	2.20	0.079	0.087
c	0.50	0.70	0.020	0.028
D	20.80	21.20	0.819	0.835
D1	8.23		0.324	
D2	8.32		0.328	
D3	1.17		0.046	
d1	6.00	6.30	0.236	0.248
d2	2.20	2.40	0.087	0.094
E	15.60	16.00	0.614	0.630
E1	10.50		0.413	
E2	14.02		0.552	
E3	13.50		0.531	
e	5.34	5.54	0.210	0.218
L	19.72	20.12	0.776	0.792
L1	15.79		0.622	
L2	1.98		0.078	
φ1	7.10	7.30	0.280	0.287
φ2	3.50	3.70	0.138	0.146