

MOSFET

287A,40V,1.5mΩ N-CHANNEL MOSFET

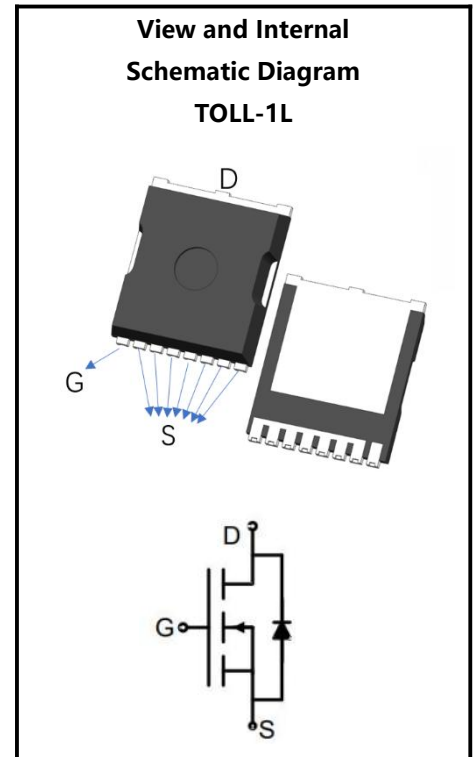
Features

- ◆ Extremely low on-resistance $R_{DS(on)}$
- ◆ Excellent $Q_g \times R_{DS(on)}$ product(FOM)
- ◆ Excellent Low Ciss
- ◆ High robustness and reliability
- ◆ Increases maximum current capability
- ◆ Low power loss, high power density
- ◆ Easy paralleling

Applications

- ◆ Synchronous Rectification for AC/DC Quick Charger
- ◆ Battery management
- ◆ UPS(Uninterruptible Power Supplies)

Parameter	Values	Unit
BV_{DSS}	40	V
I_D	287	A
$R_{DS(on)}$ (max)	1.5	mΩ
$V_{GS(th)}$ (Typ)	3.0	V



Ordering Code	Marking	Package	Packaging
X1P5N040GHT1	X1P5N040GHT1	TOLL-1L	Tape&Reel

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_{DSS}	-	-	40	V	-
Gate-Source Voltage	V_{GS}	-20	-	20	V	-
Continuous Drain Current(Note 1)	I_D	-	-	287	A	$T_C=25^\circ\text{C}$
		-	-	203		$T_C=100^\circ\text{C}$
Pulsed Drain Current(Note 2)	I_{DM}	-	-	1148	A	-
Single Pulse Avalanche Energy	E_{AS}	-	-	264	mJ	$L=0.5\text{mH}, V_D=32\text{V}, T_C=25^\circ\text{C}$
Power Dissipation	P_D	-	-	231	W	$T_C=25^\circ\text{C}$
		-	-	1.6		$T_a=25^\circ\text{C}$
Operating Junction and Storage Temperature Range	T_j, T_{STG}	-55	-	175	$^\circ\text{C}$	-

Thermal Characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Thermal resistance , Junction to Case	$R_{th(j-c)}$	-	0.5	0.65	$^\circ\text{C/W}$	-
Thermal resistance , Junction to Ambient	$R_{th(j-a)}$	-	-	93		-

**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}	40	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Zero Gate Voltage Drain Current	I_{DSS}	-	0.02	1	μA	$V_{DS}=40V, V_{GS}=0V, T_j=25^{\circ}\text{C}$
		-	-	100		$V_{DS}=40V, V_{GS}=0V, T_j=150^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}	-	± 10	± 100	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Gate-Source Threshold Voltage	$V_{GS(th)}$	2.0	-	4.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Drain-Source On-State Resistance	$R_{DS(on)}$	-	1.2	1.5	m Ω	$V_{GS}=10V, I_D=20A$
Gate resistance	R_G	-	4	-	Ω	$V_{DS}=0V, V_{GS}=0V, f=1.0\text{MHz}$
Forward Transconductance	g_{fs}	-	104	-	S	$V_{DS}=5V, I_D=20A$

Dynamic characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Input Capacitance	C_{iss}	-	7074	-	pF	$V_{DS}=20V, V_{GS}=0V, f=1.0\text{MHz}$
Output Capacitance	C_{oss}	-	4889	-		
Reverse Transfer Capacitance	C_{rss}	-	551	-		
Turn-On Delay Time	$t_{d(on)}$	-	0.6	-	ns	$V_{GS}=10V, V_{DD}=20V,$ $R_{G_ext}=2.2\Omega, I_D=13.3A$
Turn-On Rise Time	t_r	-	32	-		
Turn-Off Delay Time	$t_{d(off)}$	-	62	-		
Turn-Off Fall Time	t_f	-	9	-		

Gate charge characteristics

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Total Gate Charge	Q_g	-	97	-	nC	$V_{DS}=20V, I_D=65A, V_{GS}=10V$
Gate-Source Charge	Q_{gs}	-	37	-	nC	
Gate-Drain Charge	Q_{gd}	-	17	-	nC	

Body Diode Characteristic

Parameter	Symbol	Values			Unit	Note/Test Conditions
		Min	Typ	Max		
Continuous Diode Forward Current	I_S	-	-	287	A	-
Pulsed Diode Forward Current	I_{SM}	-	-	1148	A	-
Diode Forward Voltage	V_{SD}	-	0.8	1.2	V	$I_S=20A, V_{GS}=0V$
Reverse Recovery Time	t_{rr}	-	106	-	ns	$V_{DS}=35V, V_{GS}=0V, I_S=1A$ $di/dt=100A/\mu s$
Reverse Recovery Charge	Q_{rr}	-	302	-	nC	

Notes

1. Computed continuous current assumes the condition of T_{j_Max} while the actual continuous current depends on the thermal & electro-mechanical application board design.
2. This single-pulse measurement was taken under $T_{j_Max} = 150^{\circ}\text{C}$.

RATING AND CHARACTERISTIC CURVES



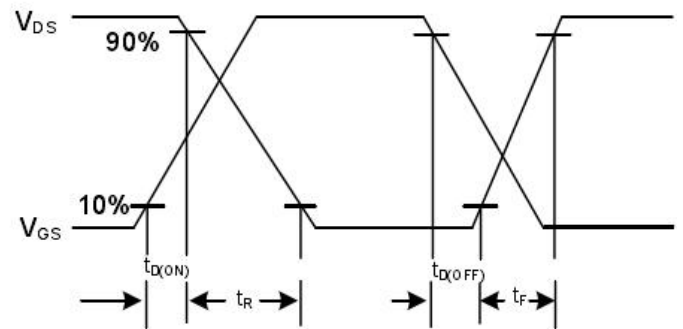
Peak Diode Recovery dv/dt Test Circuit



Peak Diode Recovery dv/dt Waveforms



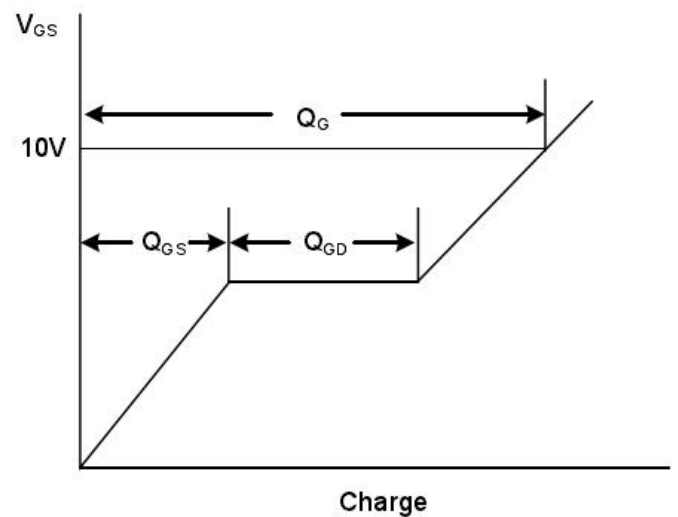
Switching Test Circuit



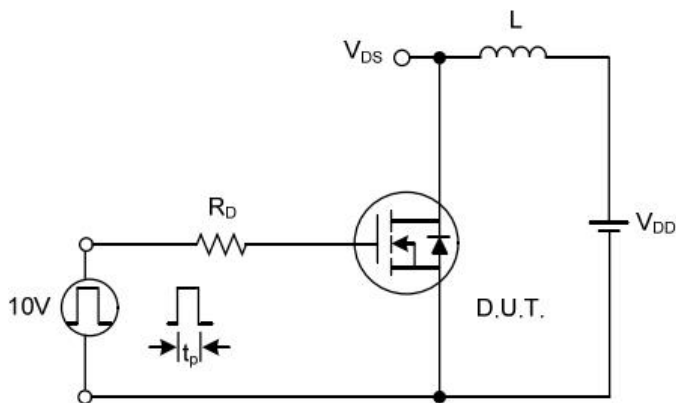
Switching Waveforms



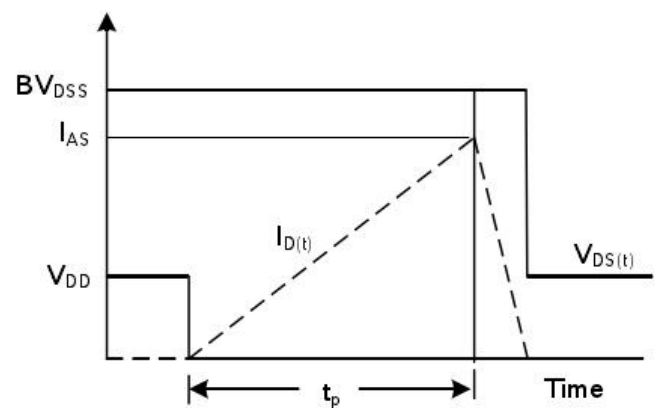
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

RATING AND CHARACTERISTIC CURVES

Figure.1 Output Characteristics

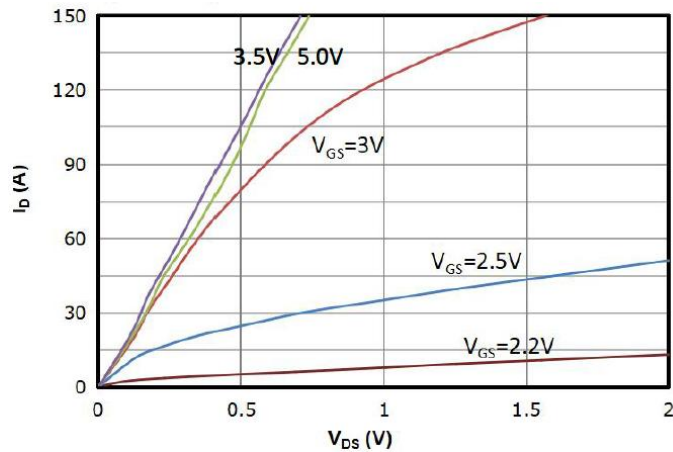


Figure.2 Transfer Characteristics

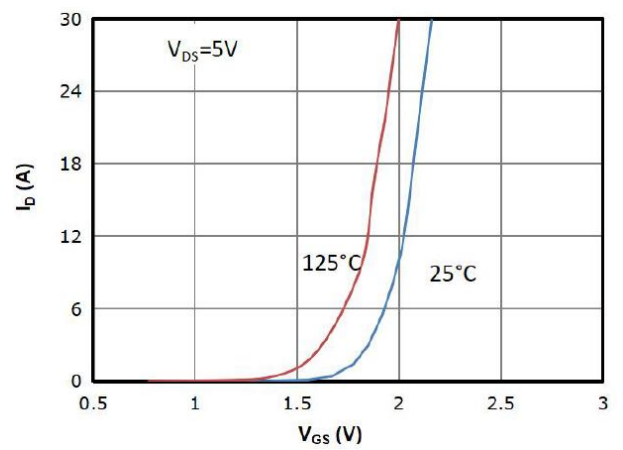
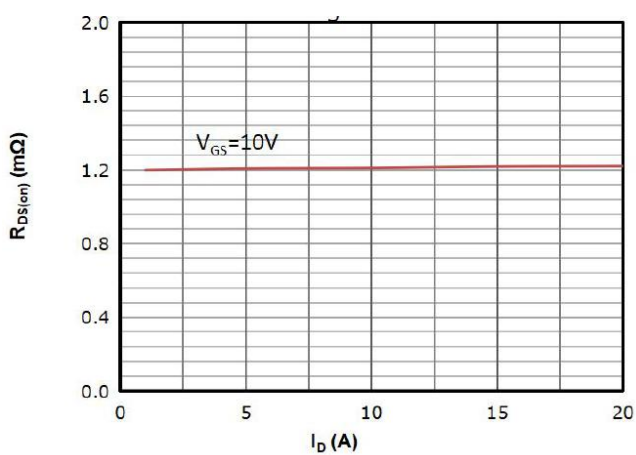
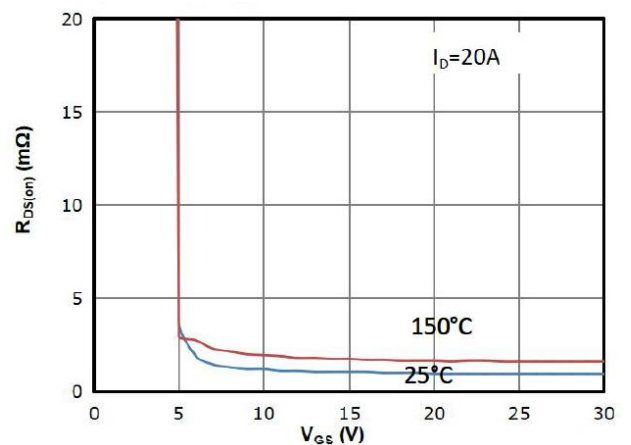

Figure.3 R_{DS(on)} vs Drain Current and Gate Voltage

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


Figure.5 Rds(on) vs Temperature

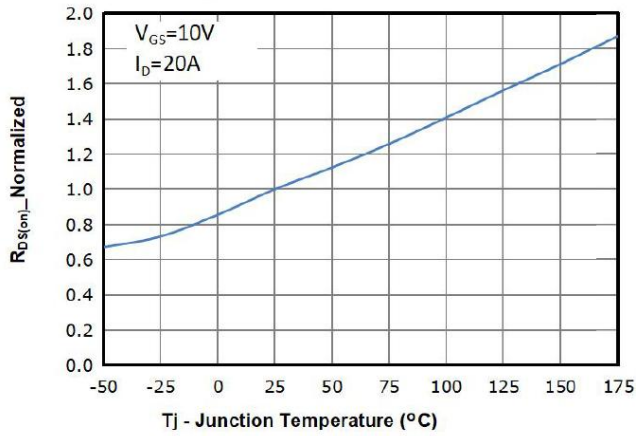


Figure.6 Vgs(th) vs Temperature

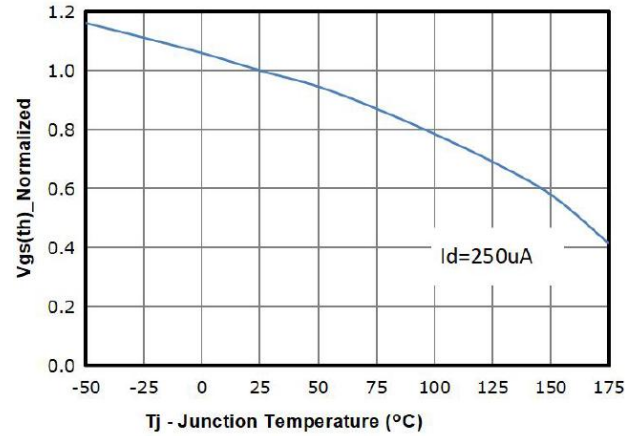


Figure.7 BVdss vs Temperature

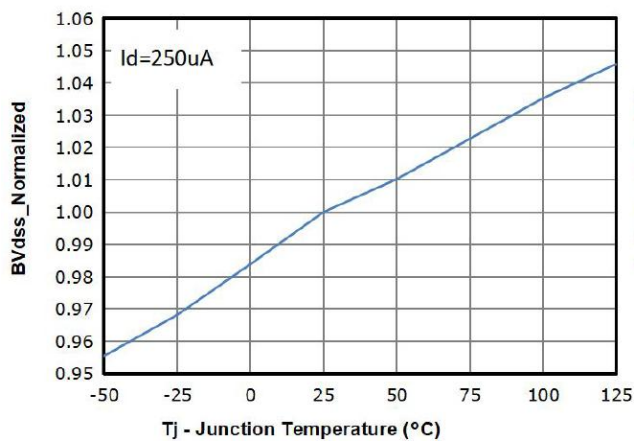
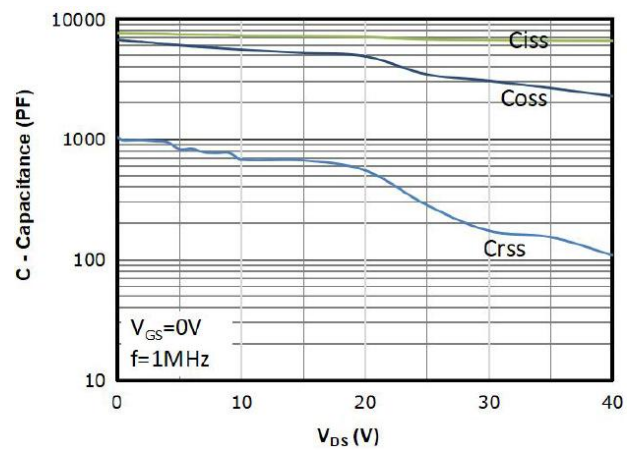


Figure.8 Capacitance Characteristics





Xfabsemi

X1P5N040GHT1

Figure.9 Gate Charge Characteristics

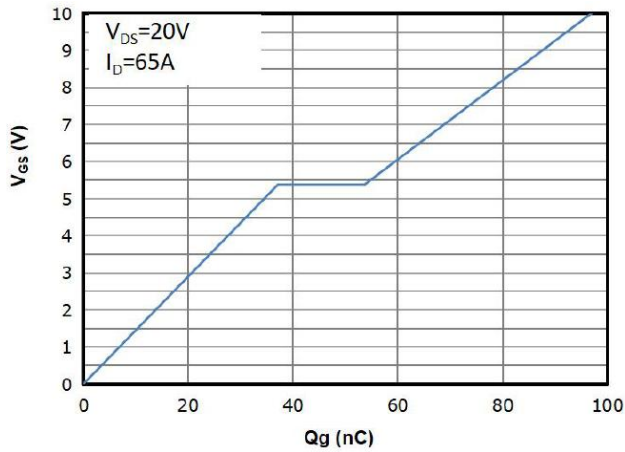


Figure.10 Body-diode Forward Characteristics

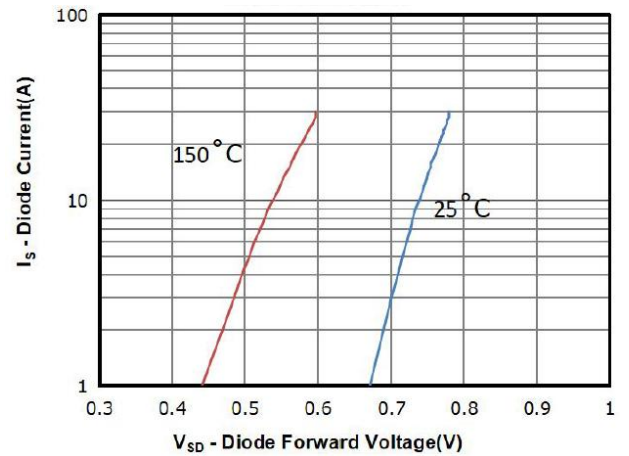


Figure.11 Power Dissipation

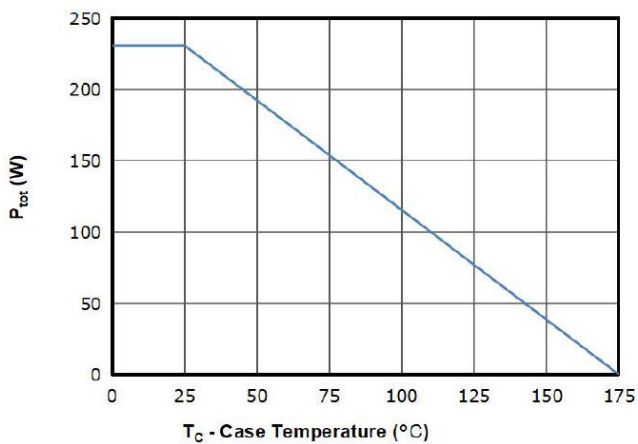


Figure.12 Drain Current Derating

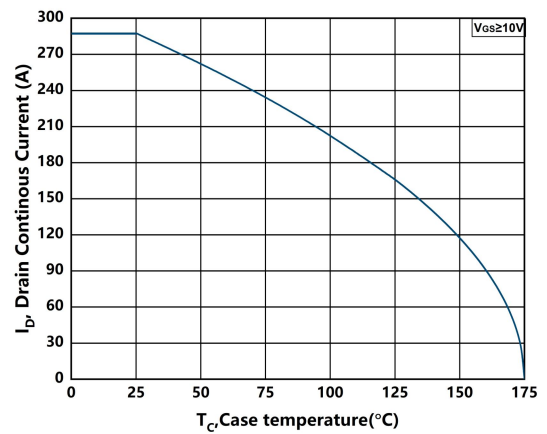


Figure.13 Safe Operating Area

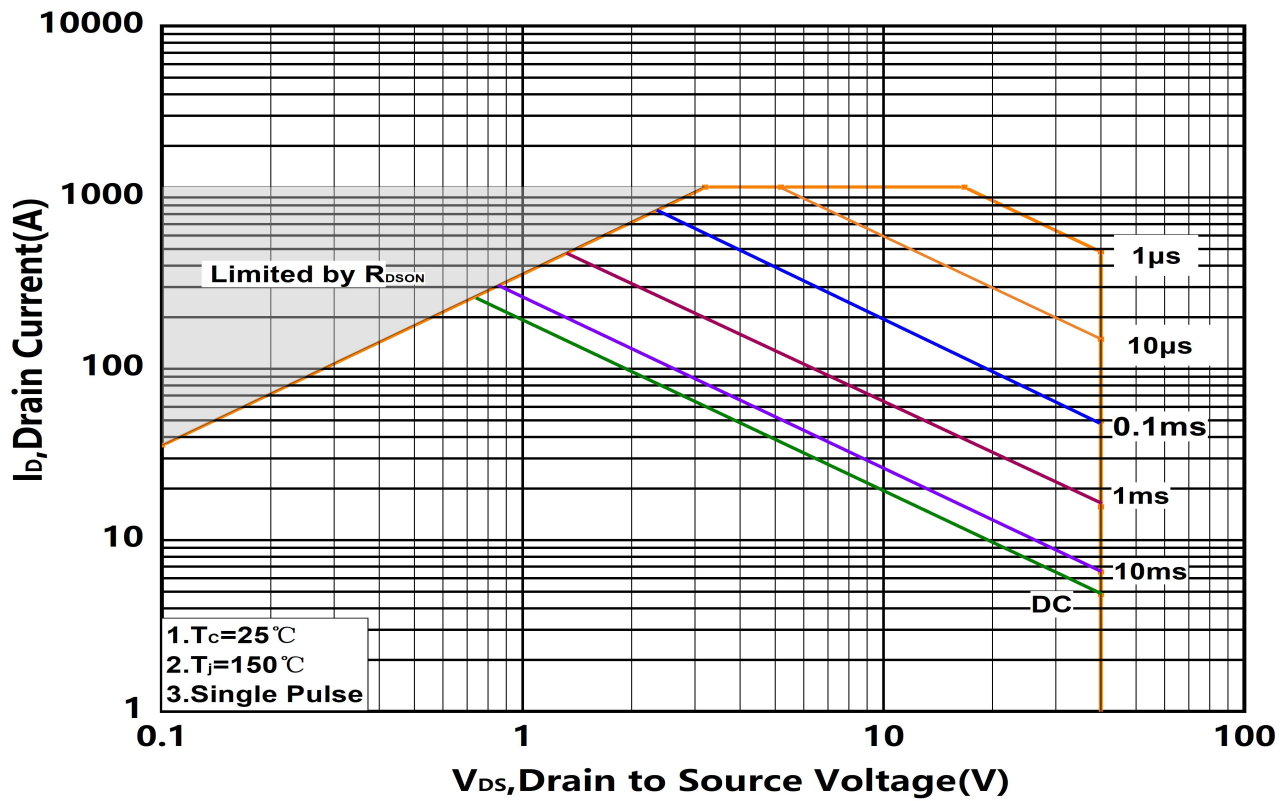
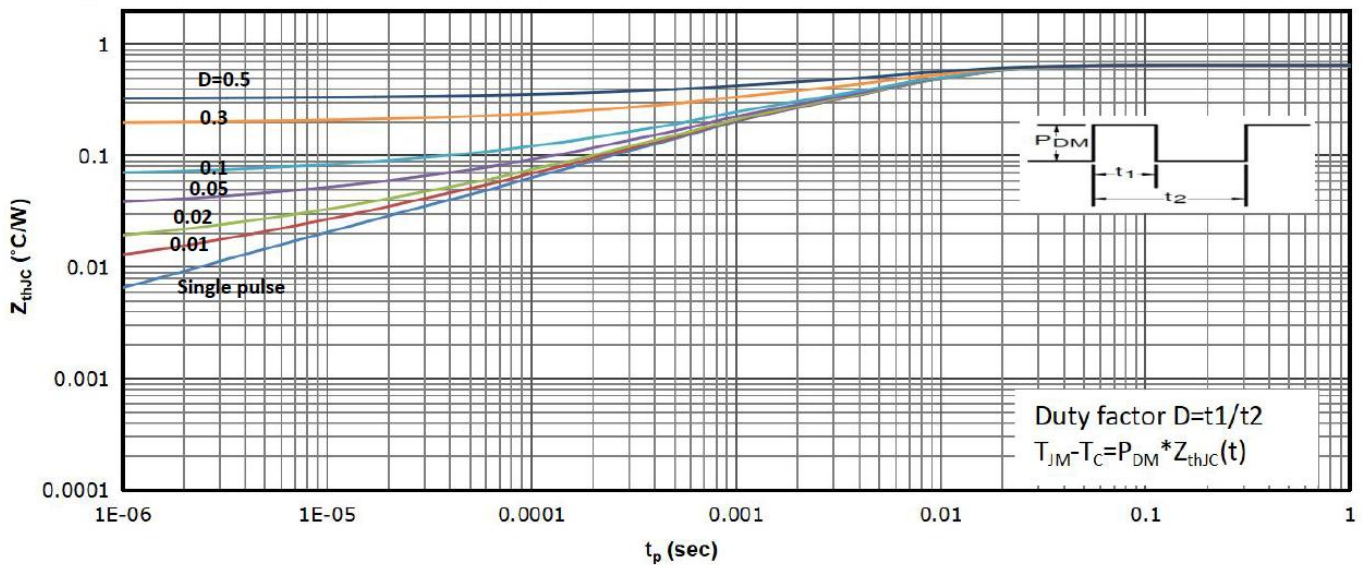
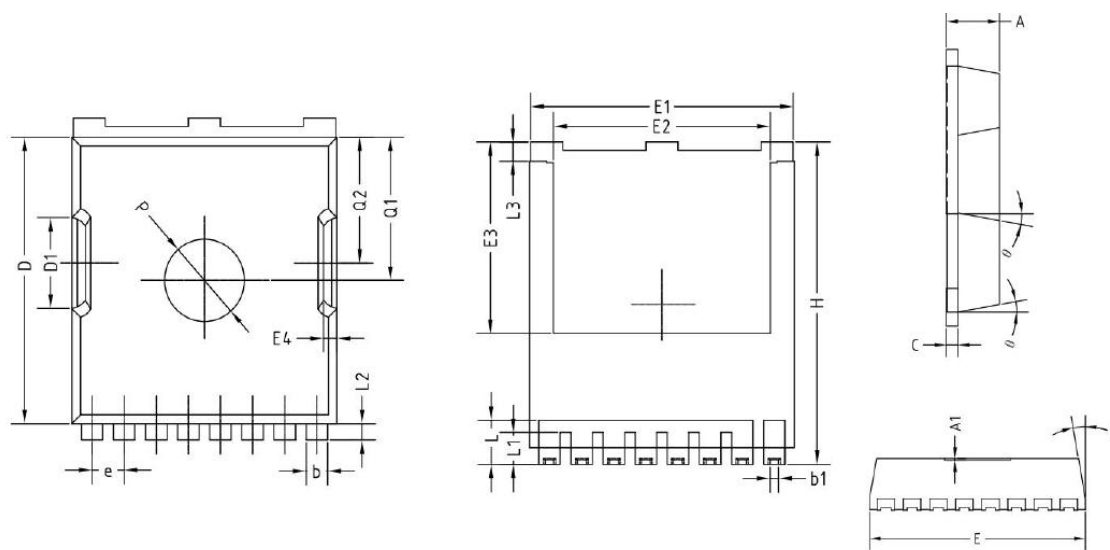


Figure.14 Max transient Thermal Impedance



Package Outline: TOLL-1L



SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.20	2.40	0.087	0.094
A1	0.05	0.20	0.002	0.008
b	0.65	0.85	0.026	0.033
b1	0.30	0.50	0.012	0.020
C	0.35	0.65	0.014	0.026
D	10.35	10.70	0.407	0.421
D1	3.15	3.45	0.124	0.136
E	9.80	10.00	0.386	0.394
E1	9.65	9.95	0.380	0.392
E2	7.90	8.30	0.311	0.327
E3	6.80	7.20	0.268	0.283
E4	0.30	0.75	0.012	0.030
e	1.15	1.25	0.045	0.049
L	1.35	1.85	0.053	0.073
L1	0.95	1.35	0.037	0.053
L2	0.40	0.80	0.016	0.031
L3	0.60	0.85	0.024	0.033
θ	7°	12°	7°	12°
P	2.90	3.10	0.114	0.122
Q	4.50	4.70	0.177	0.185
Q1	5.10	5.30	0.201	0.209
H	11.55	11.95	0.455	0.470