

NCE N-Channel Super Trench Power MOSFET

Description

The series of devices uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g . This device is ideal for high-frequency switching and synchronous rectification.

Application

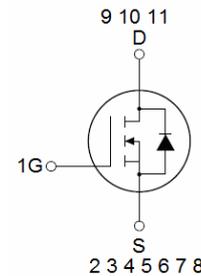
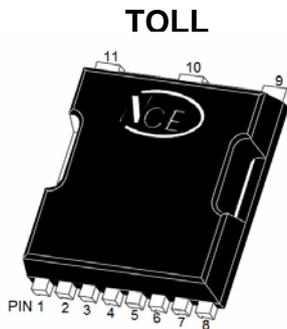
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS} = 150V, I_D = 170A$
 $R_{DS(ON)} = 5.0m\Omega$, typical @ $V_{GS} = 10V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating

100% UIS TESTED!

100% ΔV_{ds} TESTED!



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP15T14LL	NCEP15T14LL	TOLL	-	-	-

Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	150	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous ($T_C = 25^\circ C$)	$I_D (T_C = 25^\circ C)$	170	A
Drain Current-Continuous ($T_C = 100^\circ C$)	$I_D (T_C = 100^\circ C)$	120	A
Drain Current-Continuous ($T_A = 25^\circ C$)	$I_D (T_A = 25^\circ C)$	16	A
Pulsed Drain Current (Note 1)	I_{DM}	680	A
Maximum Power Dissipation ($T_C = 25^\circ C$)	$P_D (T_C = 25^\circ C)$	380	W
Maximum Power Dissipation ($T_A = 25^\circ C$)	$P_D (T_A = 25^\circ C)$	3.75	W
Derating factor		2.5	W/ $^\circ C$
Single pulse avalanche energy (Note 5)	E_{AS}	1300	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	0.4	$^\circ C/W$
Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	40	$^\circ C/W$

Electrical Characteristics (T_C=25°C unless otherwise noted)

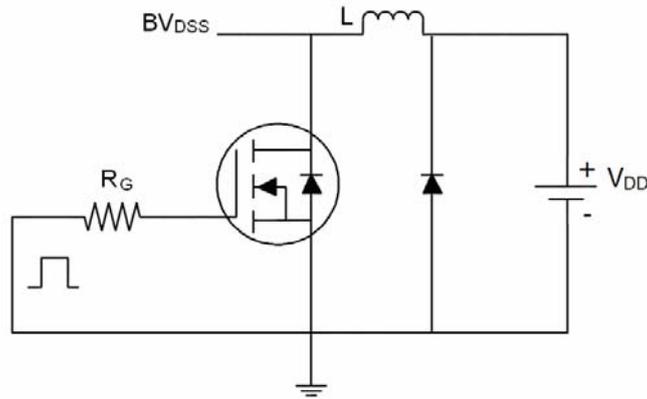
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	150		-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =150V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2.0	3.0	4.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =85A	-	5	5.8	mΩ
Gate resistance	R _G	F=1.0MHz	-	5.0	-	Ω
Forward Transconductance	g _{FS}	V _{DS} =10V, I _D =85A	70	-	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C _{iss}	V _{DS} =75V, V _{GS} =0V, F=1.0MHz	-	5500	7150	PF
Output Capacitance	C _{oss}		-	690	890	PF
Reverse Transfer Capacitance	C _{rss}		-	24	31	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =75V, I _D =85A V _{GS} =10V, R _G =4.7Ω	-	26	-	nS
Turn-on Rise Time	t _r		-	36	-	nS
Turn-Off Delay Time	t _{d(off)}		-	47	-	nS
Turn-Off Fall Time	t _f		-	15	-	nS
Total Gate Charge	Q _g	V _{DS} =75V, I _D =85A, V _{GS} =10V	-	80	104	nC
Gate-Source Charge	Q _{gs}		-	32	41	nC
Gate-Drain Charge	Q _{gd}		-	22	28	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _F =85	-		1.2	V
Diode Forward Current (Note 2)	I _S		-	-	170	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = I _S	-	146		nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs (Note 3)	-	485		nC

Notes:

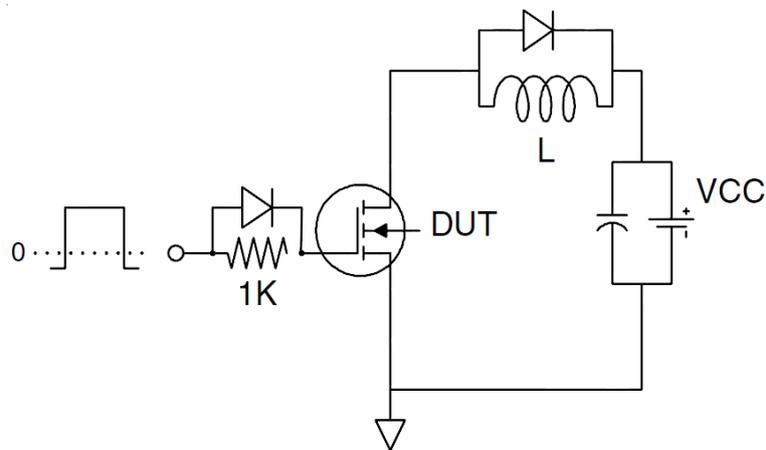
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. The value of R_{θJA} is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with T_A =25° C. The value in any given application depends on the user's specific board design, and the maximum temperature of 175° C may be used if the PCB allows it.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition : T_J=25°C, V_{DD}=50V, V_G=10V, L=0.5mH, R_G=25Ω

Test Circuit

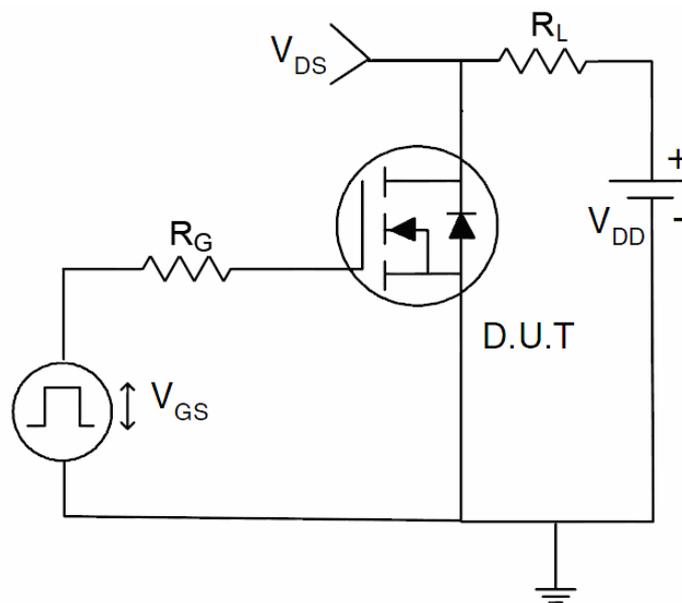
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

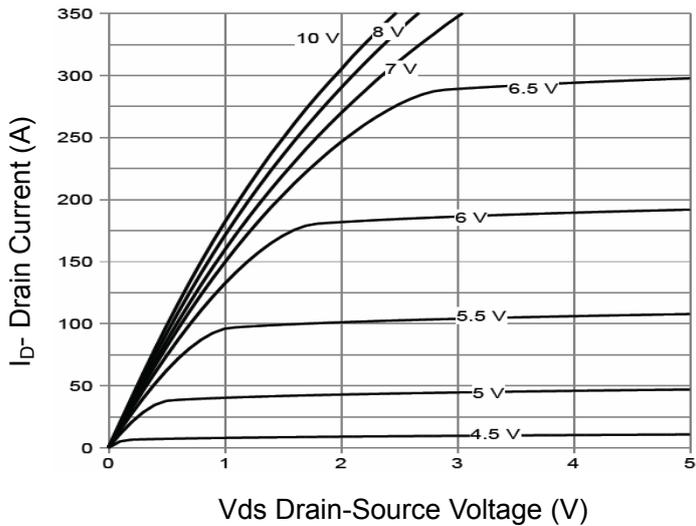


Figure 1 Output Characteristics

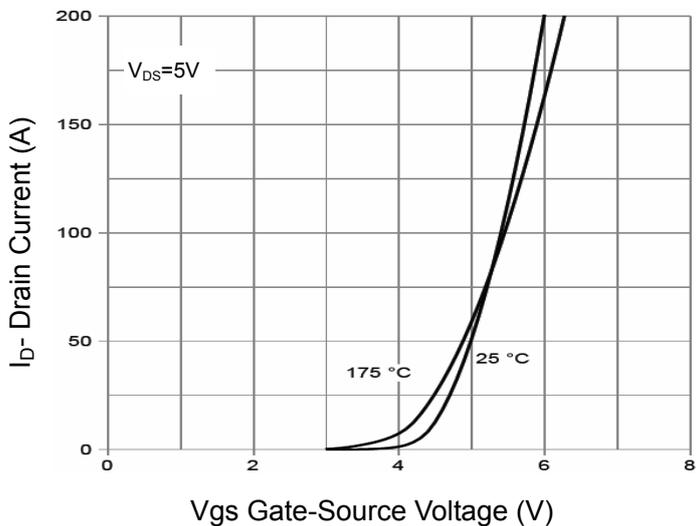


Figure 2 Transfer Characteristics

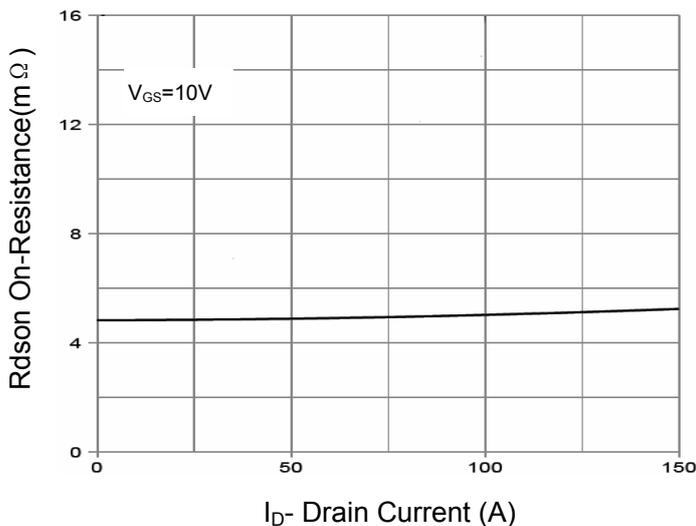


Figure 3 $R_{DS(on)}$ - Drain Current

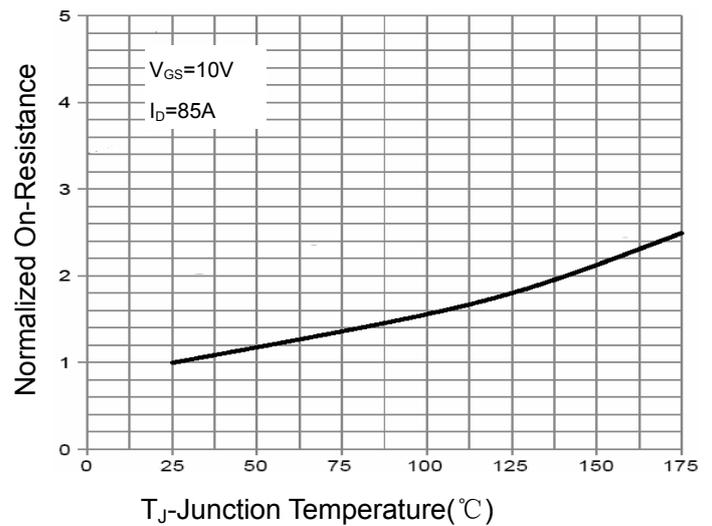


Figure 4 $R_{DS(on)}$ -Junction Temperature

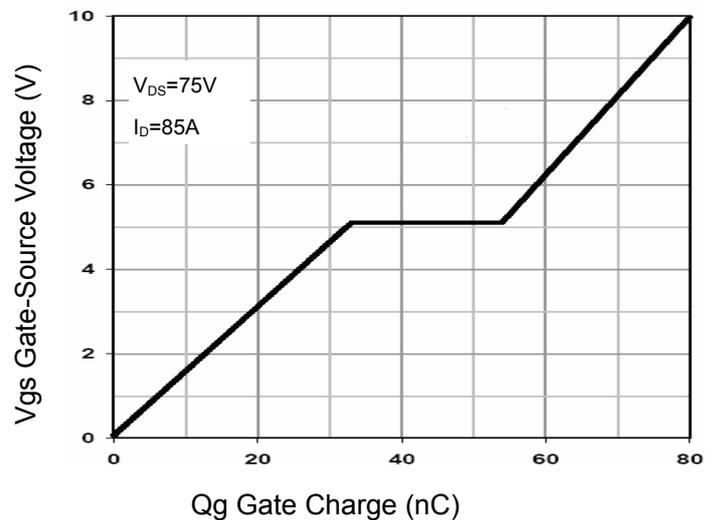


Figure 5 Gate Charge

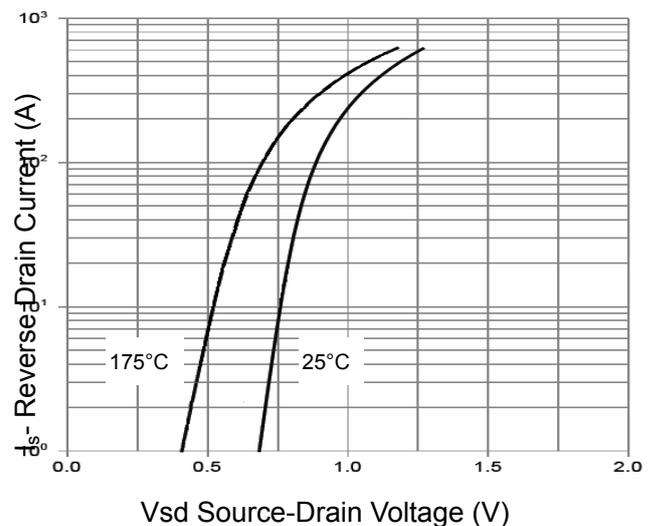
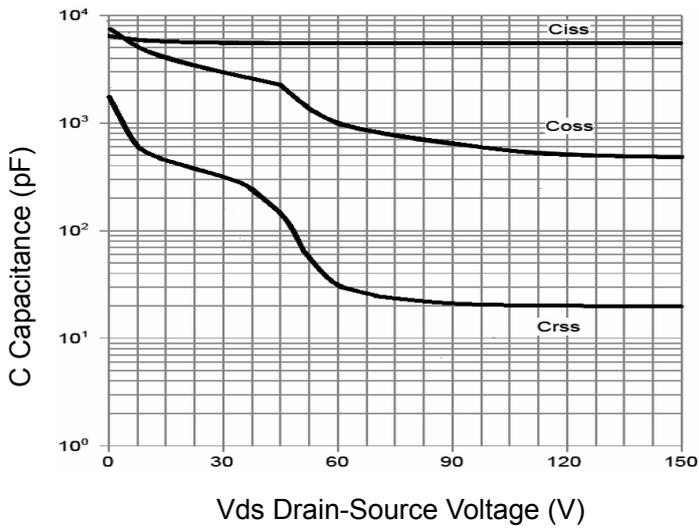
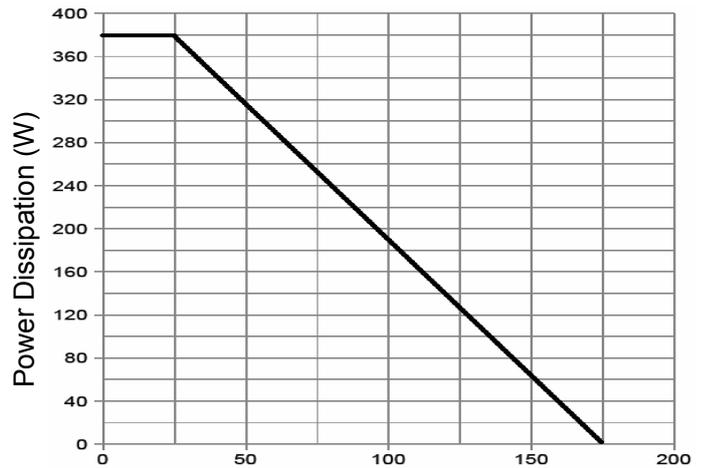


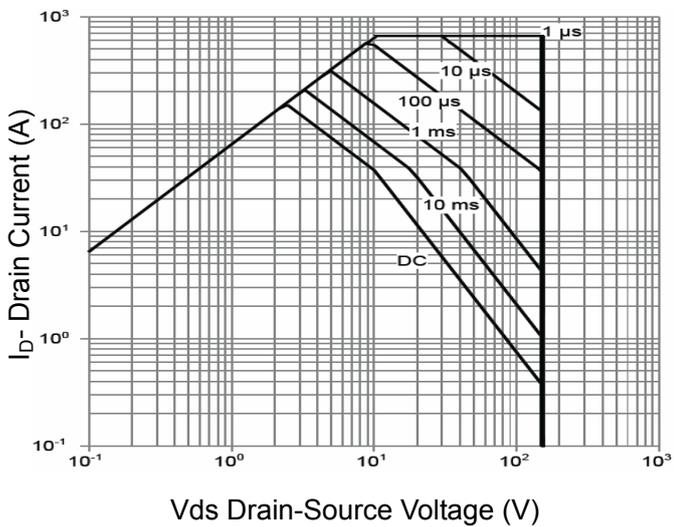
Figure 6 Source- Drain Diode Forward



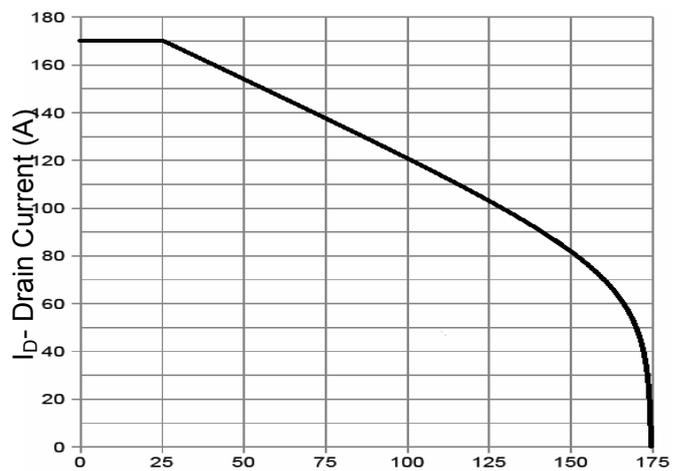
Vds Drain-Source Voltage (V)
Figure 7 Capacitance vs Vds



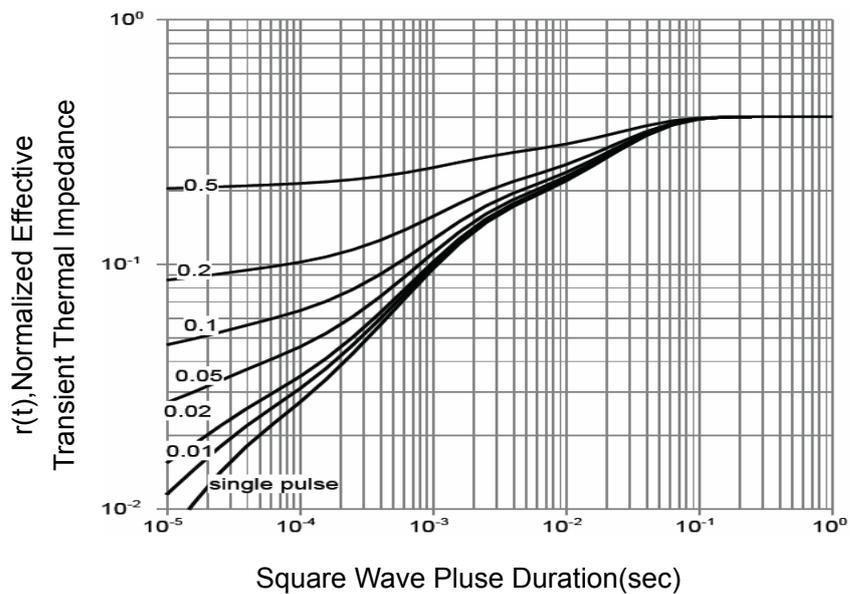
T_J-Junction Temperature(°C)
Figure 9 Power De-rating



Vds Drain-Source Voltage (V)
Figure 8 Safe Operation Area

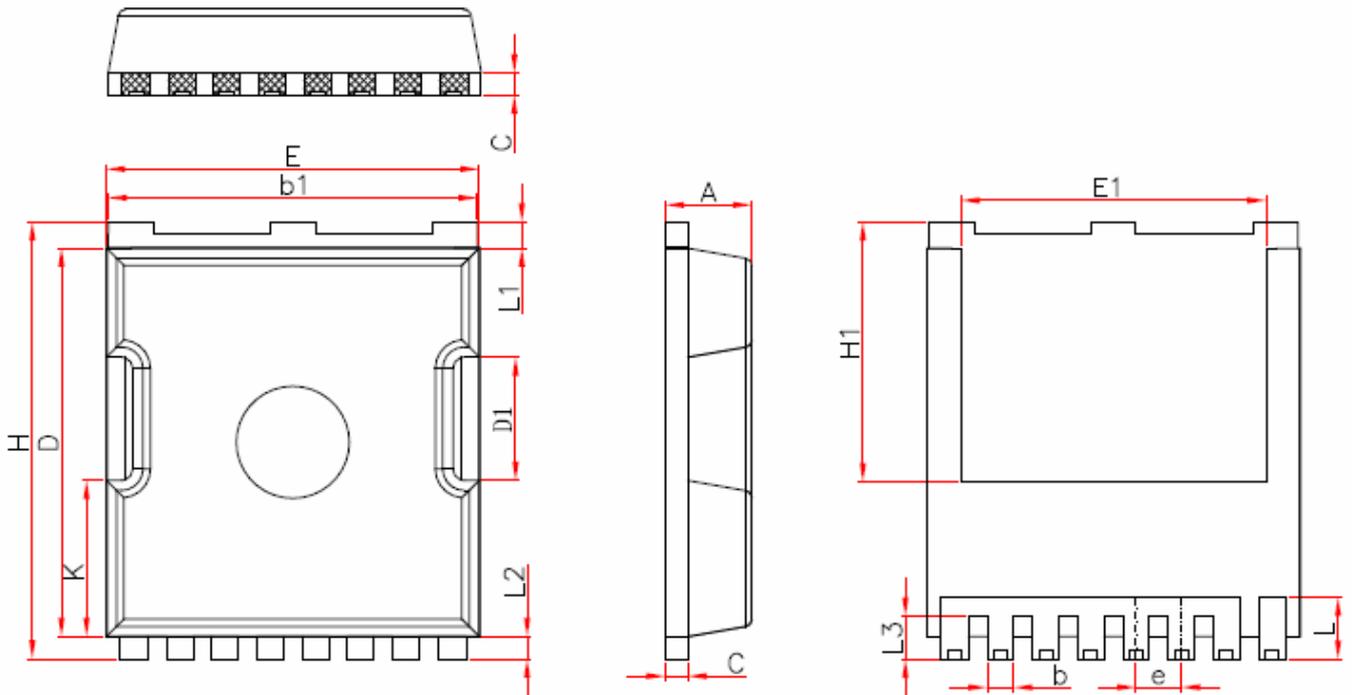


T_J-Junction Temperature(°C)
Figure 10 Current De-rating



Square Wave Pulse Duration(sec)
Figure 11 Normalized Maximum Transient Thermal Impedance

TOLL Package Information



Symbol	Millimeters		
	Min.	Nom.	Max.
A	2.20	2.30	2.40
b	0.65	0.75	0.85
b1	9.70	9.80	9.90
C	0.50	0.60	0.70
D	10.30	10.40	10.50
D1	3.15	3.3	3.45
E	9.70	9.90	10.10
E1	8.00	8.10	8.20
e	1.10	1.20	1.30
H	11.6	11.7	11.8
H1	6.85	6.95	7.05
K	4.08	4.18	4.28
L	1.60	1.65	2.10
L1	0.60	0.70	0.80
L2	0.50	0.60	0.70
L3	1.05	1.20	1.30

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