

NCE N-Channel Super Trench II Power MOSFET

Description

The series of devices uses **Super Trench II** 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

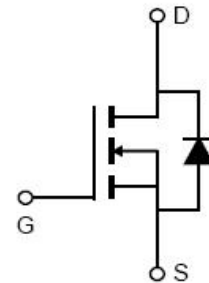
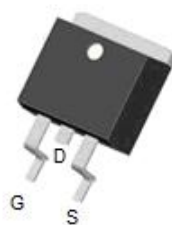
- $V_{DS} = 60V, I_D = 190A$
 $R_{DS(on)} = 2.25m\Omega$, typical @ $V_{GS} = 10V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating

100% UIS TESTED!
100% ΔV_{ds} TESTED!

TO-220



TO-263



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP025N60	NCEP025N60	TO-220-3L	-	-	-
NCEP025N60D	NCEP025N60D	TO-263-2L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	190	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D(100^\circ C)$	142	A
Pulsed Drain Current	I_{DM}	760	A
Maximum Power Dissipation	P_D	220	W
Derating factor		1.47	W/ $^\circ C$
Single pulse avalanche energy ^(Note 1)	E_{AS}	672	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.68	$^{\circ}\text{C/W}$
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Electrical Characteristics ($T_c=25^{\circ}\text{C}$ unless otherwise noted)

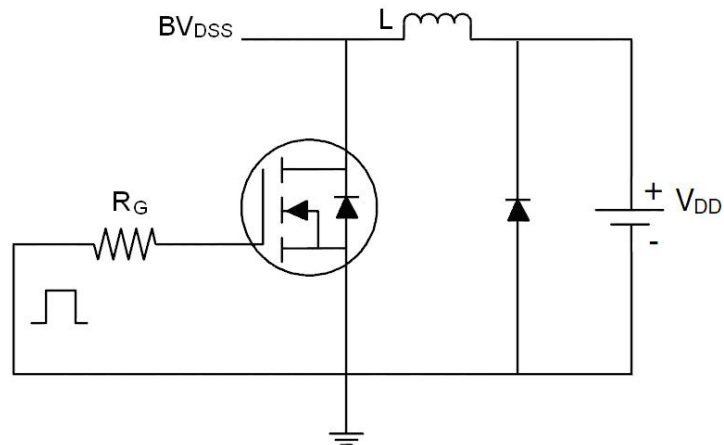
Parameter	Symbol	Condition	Min	Typ	Max	Unit	
Off Characteristics							
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	60		-	V	
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V, V _{GS} =0V	-	-	1	μA	
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA	
On Characteristics							
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 =20A	TO-220	-	2.25	2.65	mΩ
			TO-263	-	2.25	2.65	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =20A	45	-	-	S	
Dynamic Characteristics							
Input Capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V, F=1.0MHz	-	5190	-	PF	
Output Capacitance	C _{oss}		-	900	-	PF	
Reverse Transfer Capacitance	C _{rss}		-	61.5	-	PF	
Switching Characteristics (Note 2)							
Turn-on Delay Time	t _{d(on)}	V _{DD} =30V, I _D =20A V _{GS} =10V, R _G =4.7Ω	-	16	-	nS	
Turn-on Rise Time	t _r		-	9	-	nS	
Turn-Off Delay Time	t _{d(off)}		-	58	-	nS	
Turn-Off Fall Time	t _f		-	12	-	nS	
Total Gate Charge	Q _g	V _{DS} =30V, I _D =20A, V _{GS} =10V	-	78		nC	
Gate-Source Charge	Q _{gs}		-	20		nC	
Gate-Drain Charge	Q _{gd}		-	16.5		nC	
Drain-Source Diode Characteristics							
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =20A	-		1.2	V	
Diode Forward Current	I _S		-	-	190	A	
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = I _S di/dt = 100A/μs	-	56		nS	
Reverse Recovery Charge	Q _{rr}		-	80		nC	

Notes:

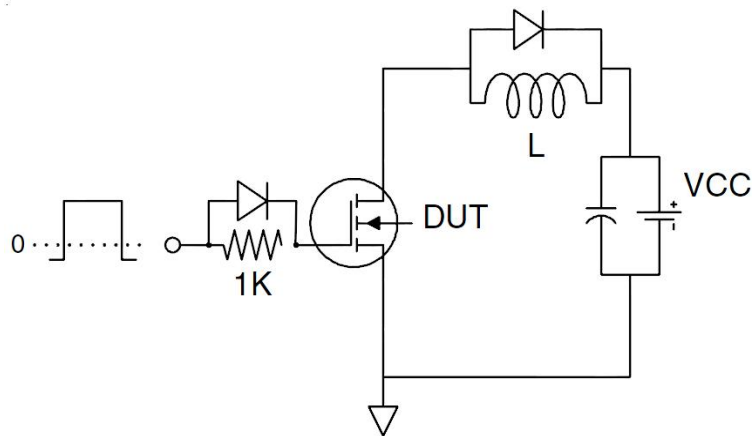
1. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=30V, V_G=10V, L=0.5\text{mH}, R_g=25\Omega$
2. Guaranteed by design, not subject to production.
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heat sink, assuming a maximum junction temperature of $T_J(\text{MAX})=175^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

Test Circuit

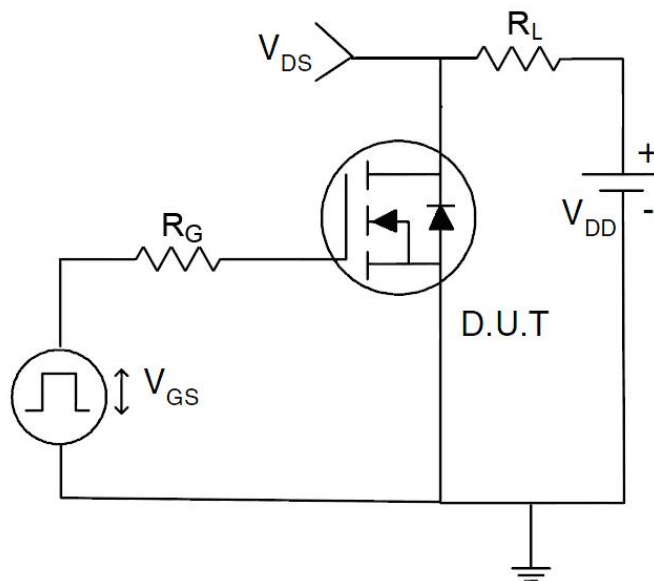
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

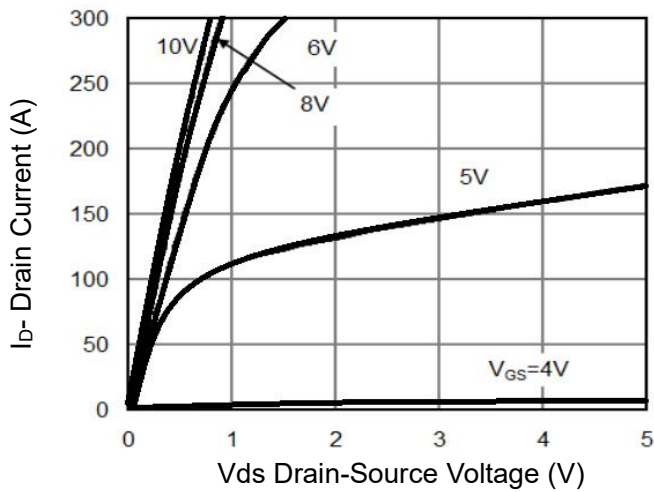


Figure 1 Output Characteristics

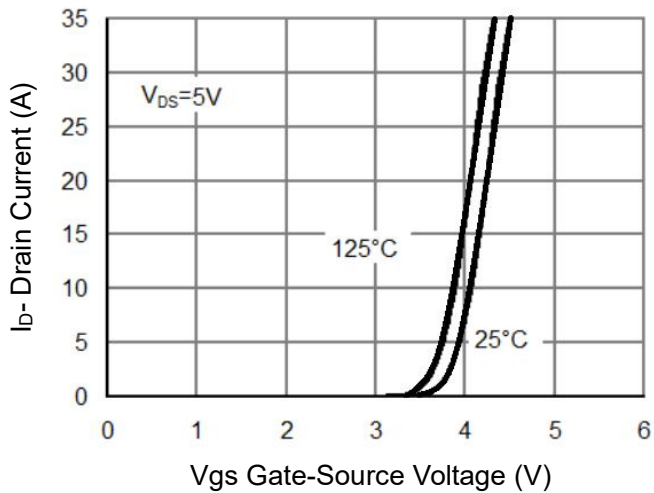


Figure 2 Transfer Characteristics

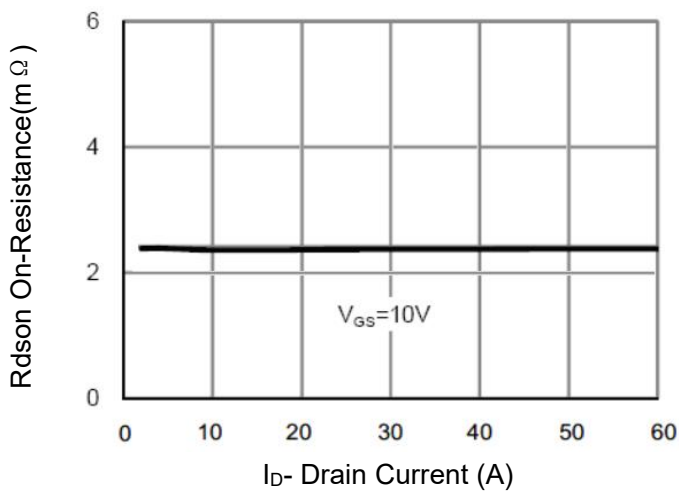


Figure 3 Rdson- Drain Current

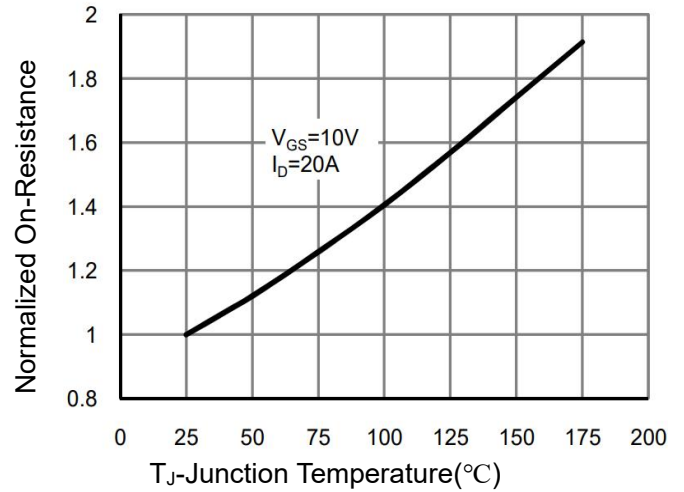


Figure 4 Rdson-Junction Temperature

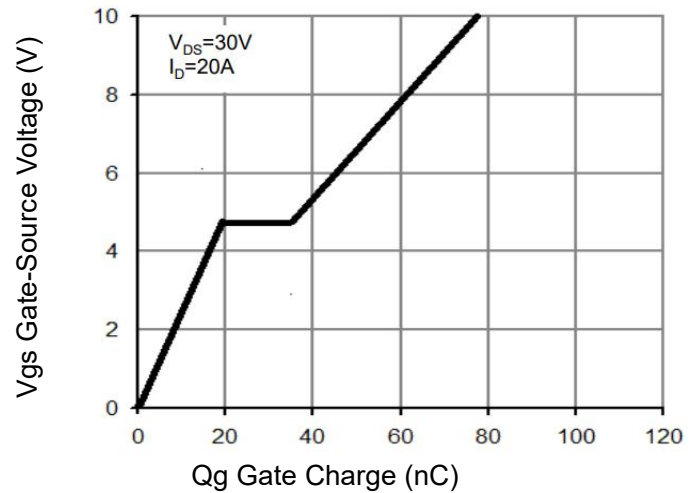


Figure 5 Gate Charge

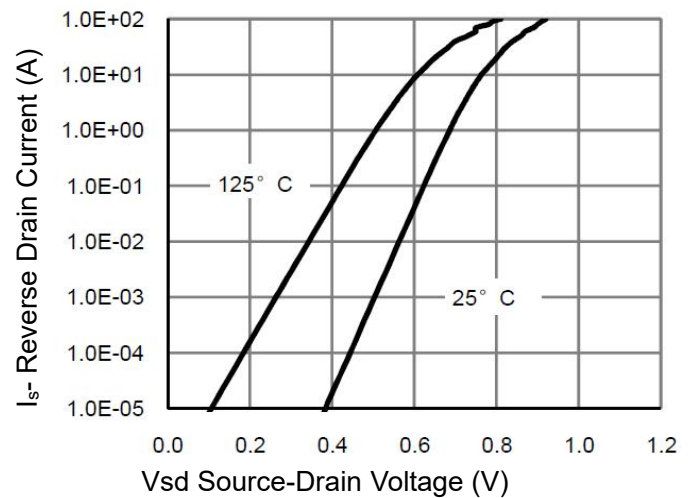


Figure 6 Source- Drain Diode Forward

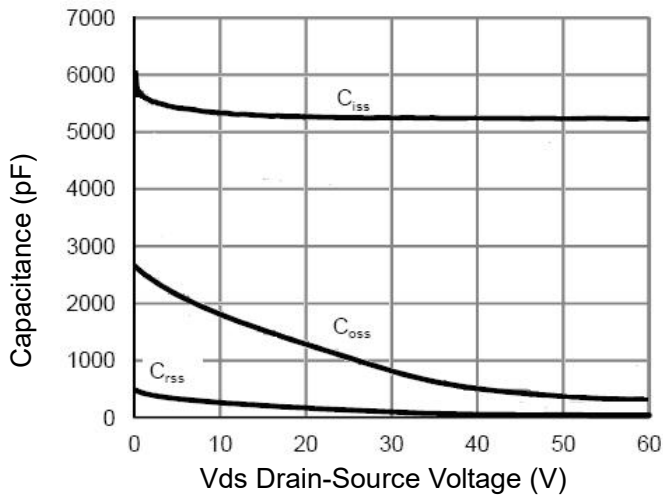


Figure 7 Capacitance vs Vds

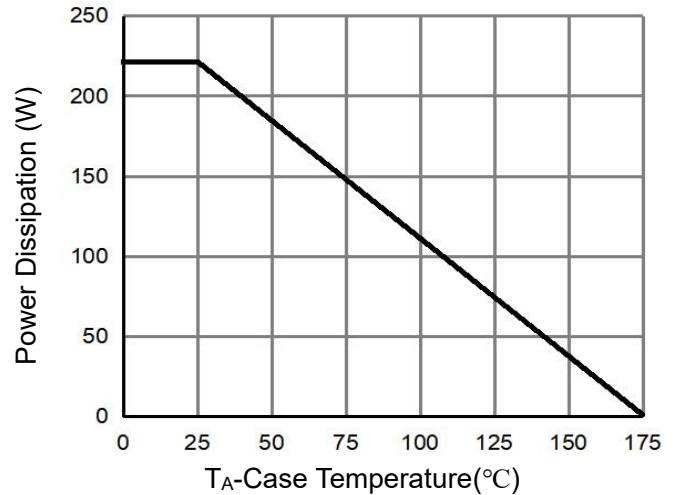


Figure 9 Power De-rating

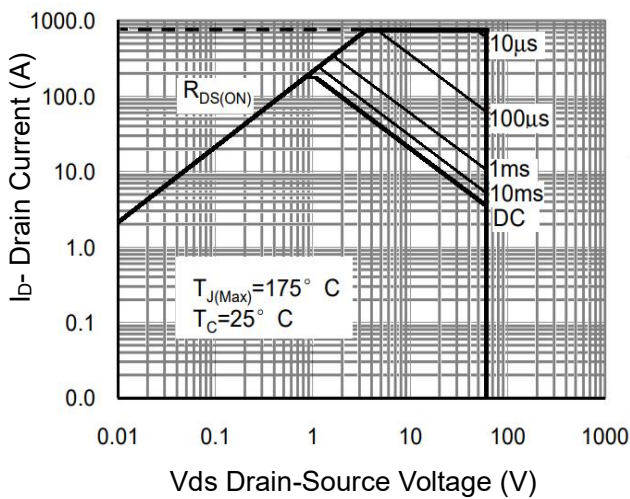


Figure 8 Safe Operation Area (Note3)

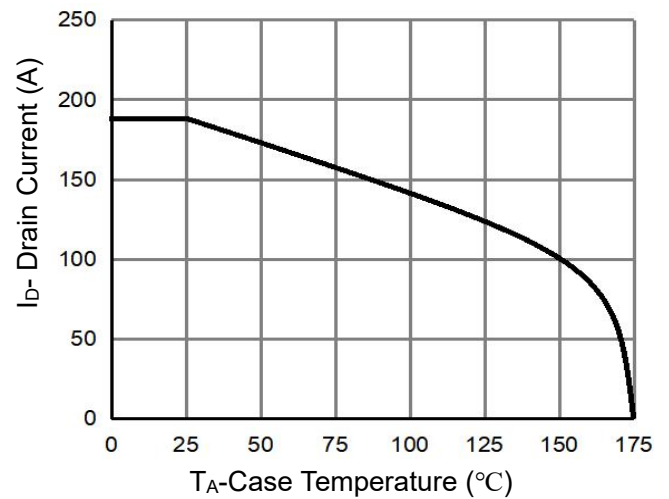


Figure 10 Current De-rating

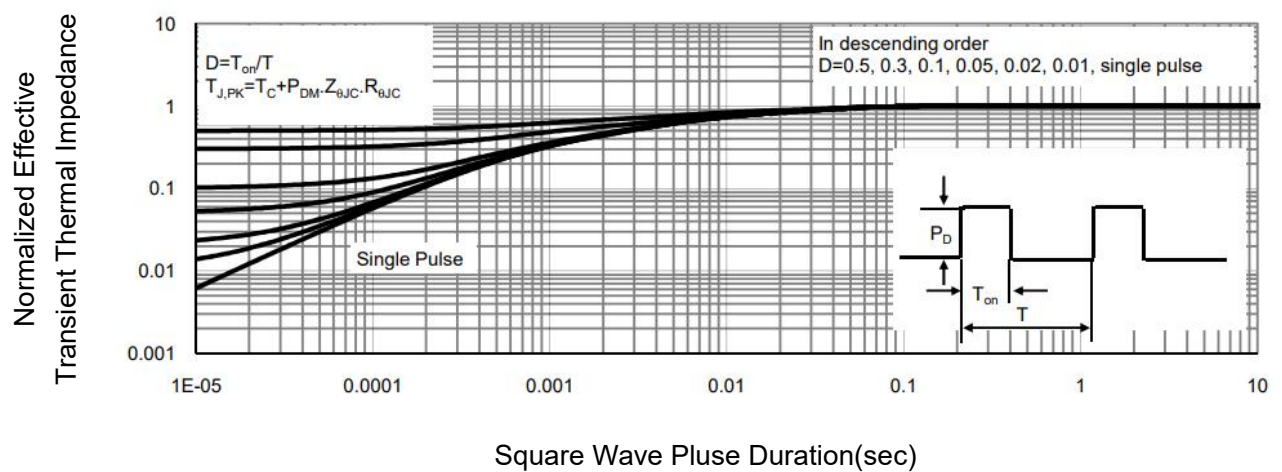
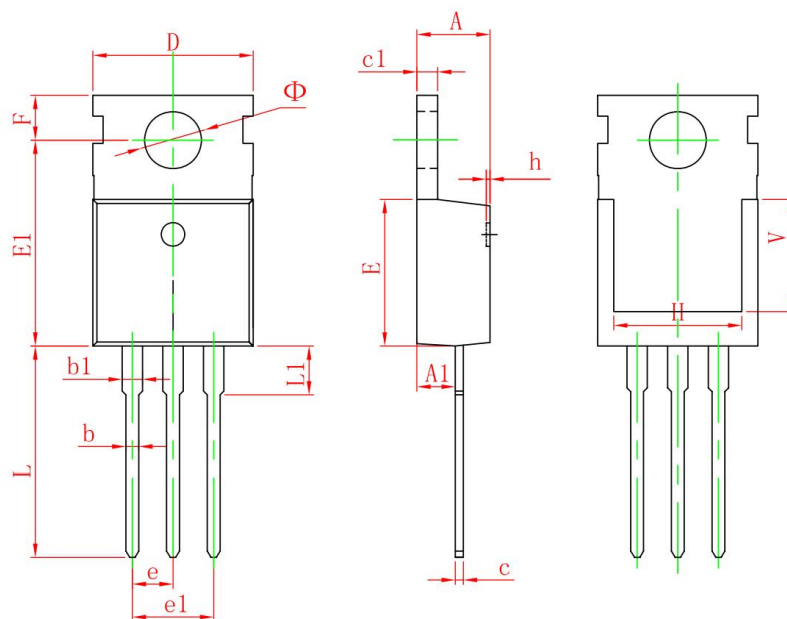


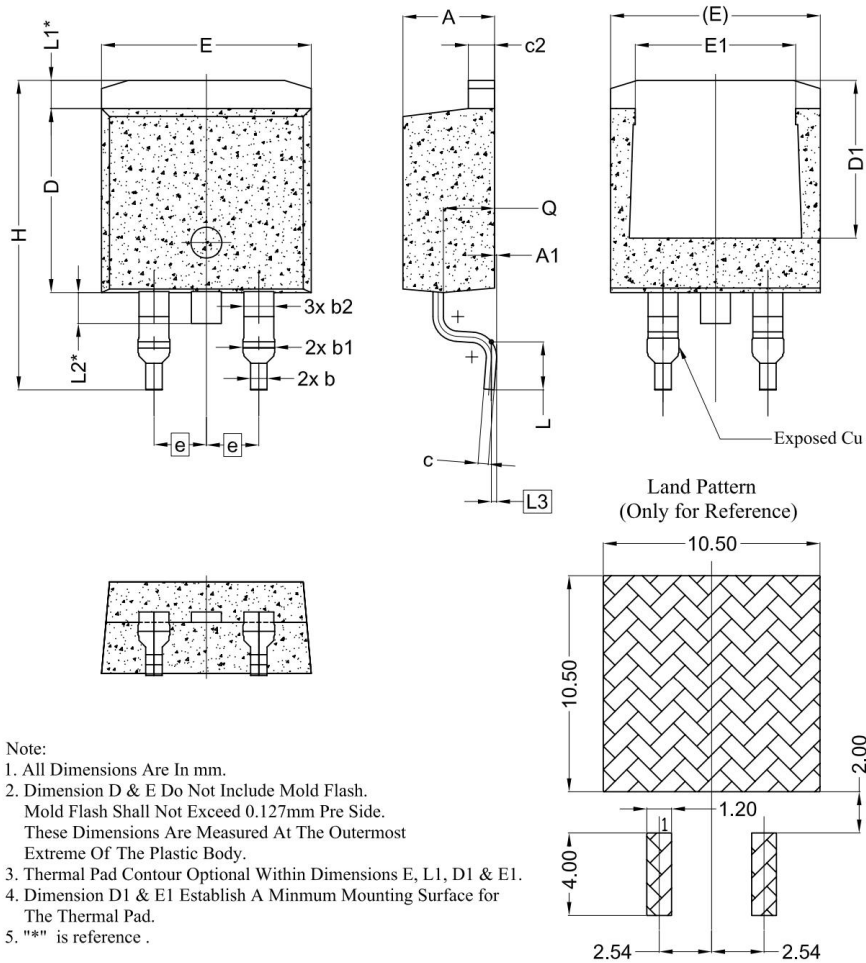
Figure 11 Normalized Maximum Transient Thermal Impedance

TO-220-3L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.950	9.750	0.352	0.384
E1	12.650	13.050	0.498	0.514
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	6.900 REF.		0.276 REF.	
Φ	3.400	3.800	0.134	0.150

TO-263-2L Package Information



Note:

1. All Dimensions Are In mm.
2. Dimension D & E Do Not Include Mold Flash.
Mold Flash Shall Not Exceed 0.127mm Pre Side.
These Dimensions Are Measured At The Outermost Extreme Of The Plastic Body.
3. Thermal Pad Contour Optional Within Dimensions E, L1, D1 & E1.
4. Dimension D1 & E1 Establish A Minmum Mounting Surface for The Thermal Pad.
5. "*" is reference .

SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	4.24	4.44	4.64
A1	0.00	0.10	0.25
b	0.70	0.80	0.90
b1	1.20	1.55	1.75
b2	1.20	1.45	1.70
c	0.40	0.50	0.60
c2	1.15	1.27	1.40
D	8.82	8.92	9.02
D1	6.86	7.65	—
E	9.96	10.16	10.36
E1	6.89	7.77	7.89
e	2.54 BSC		
H	14.61	15.00	15.88
L	1.78	2.32	2.79
L1	1.36 REF.		
L2	1.50 REF.		
L3	0.25 BSC		
Q	2.30	2.48	2.70

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