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

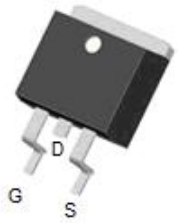
- V_{DS} =200V,I_D =125A
  $R_{DS(ON)}$=7.7mΩ , typical (TO-220)@ V_{GS}=10V
  $R_{DS(ON)}$=7.5mΩ , typical (TO-263)@ V_{GS}=10V
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating

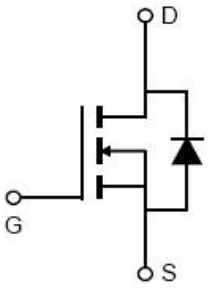
100% UIS TESTED!

100% ΔVds TESTED!

TO-220

TO-263





Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP090N20	NCEP090N20	TO-220-3L	-	-	-
NCEP090N20D	NCEP090N20D	TO-263-2L	-	-	-

Absolute Maximum Ratings (T_C=25℃unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	200	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	125	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	88	A
Pulsed Drain Current	I_{DM}	500	A
Maximum Power Dissipation	P_D	340	W
Derating factor		2.27	W/℃
Single pulse avalanche energy (Note 1)	E_{AS}	1692	mJ
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 175	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case	$R_{\theta JC}$	0.44	℃/W

Electrical Characteristics (T_C=25℃unless otherwise noted)

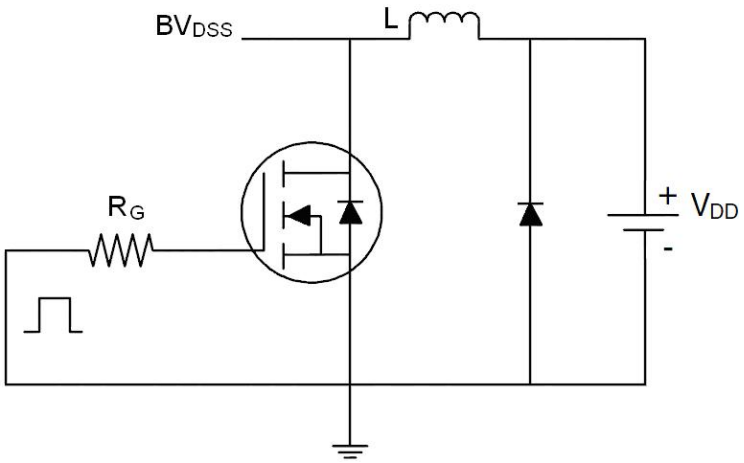
Parameter	Symbol	Condition		Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA		200	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=200V,V_{GS}=0V		-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V		-	-	±100	nA
On Characteristics							
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	-	7.7	9.0	mΩ
			TO-263	-	7.5	9.0	
Forward Transconductance	g_{FS}	V_{DS}=10V,I_D=20A		70	-	-	S
Dynamic Characteristics							
Input Capacitance	C_{lss}	V_{DS}=100V,V_{GS}=0V, F=1.0MHz		-	6000	-	PF
Output Capacitance	C_{oss}			-	535	-	PF
Reverse Transfer Capacitance	C_{rss}			-	17.5	-	PF
Switching Characteristics (Note 2)							
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=100V,I_D=20A V_{GS}=10V,R_G=4.7Ω		-	54	-	nS
Turn-on Rise Time	t_r			-	38	-	nS
Turn-Off Delay Time	$t_{d(off)}$			-	65	-	nS
Turn-Off Fall Time	t_f			-	15	-	nS
Total Gate Charge	Q_g	V_{DS}=100V,I_D=20A, V_{GS}=10V		-	95		nC
Gate-Source Charge	Q_{gs}			-	30.5		nC
Gate-Drain Charge	Q_{gd}			-	24.5		nC
Drain-Source Diode Characteristics							
Diode Forward Voltage	V_{SD}	V_{GS}=0V,I_S=20A		-		1.2	V
Diode Forward Current	I_S			-	-	125	A
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F = 50A di/dt = 100A/μs		-	98		nS
Reverse Recovery Charge	Qrr			-	260		nC

Notes:

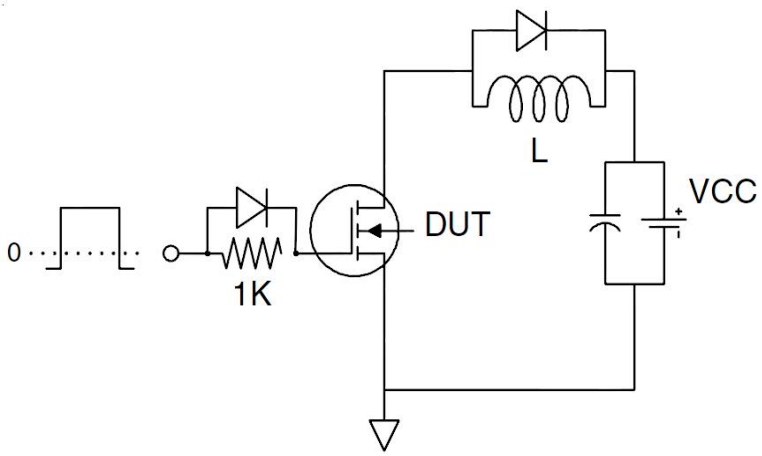
1. EAS condition : Tj=25℃,V_{DD}=50V,V_G=10V,L=0.5mH,Rg=25Ω
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heat sink, assuming a maximum junction temperature of TJ(MAX)=175° C. The SOA curve provides a single pulse rating.

Test Circuit

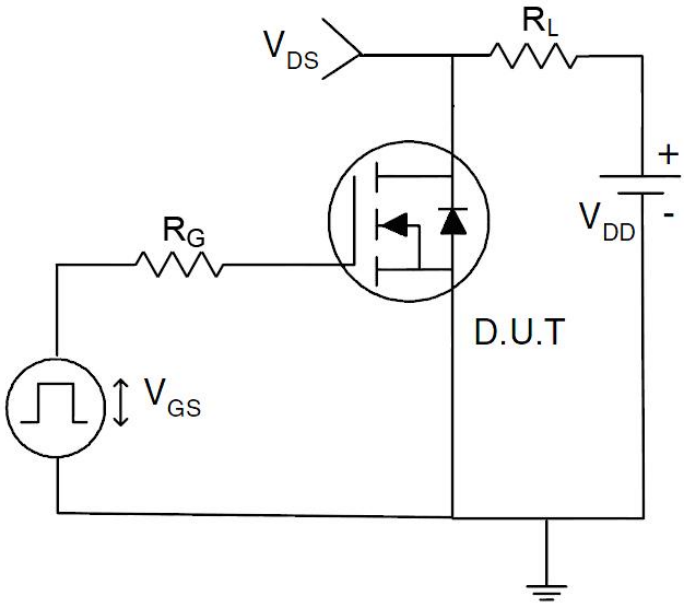
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

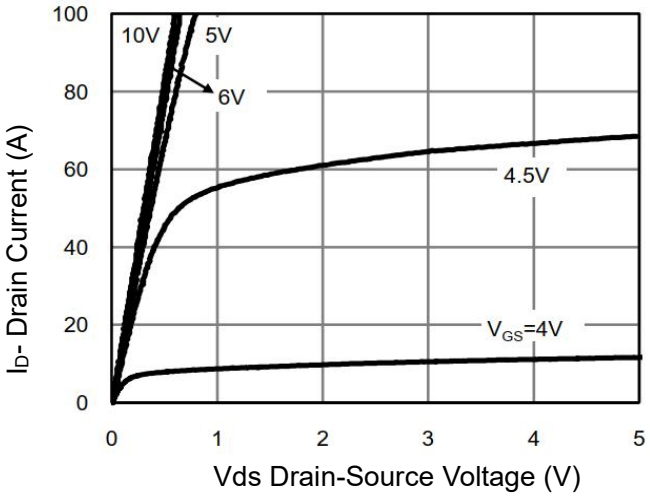


Figure 1 Output Characteristics

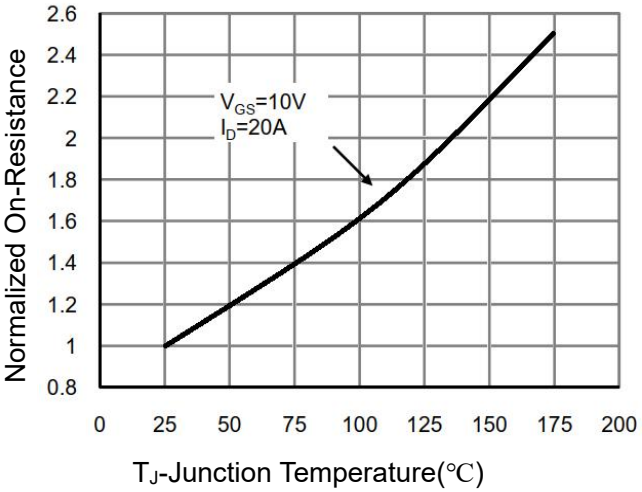


Figure 4 Rdson-JunctionTemperature

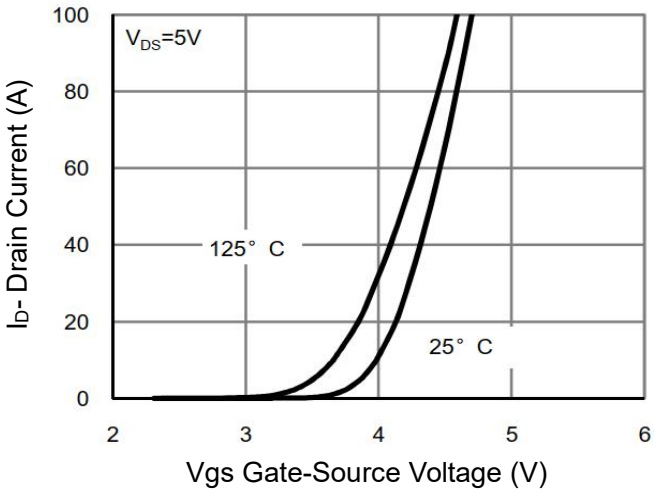


Figure 2 Transfer Characteristics

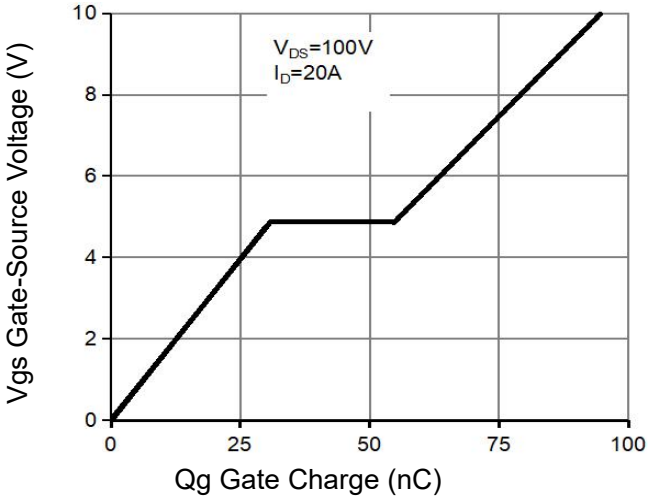


Figure 5 Gate Charge

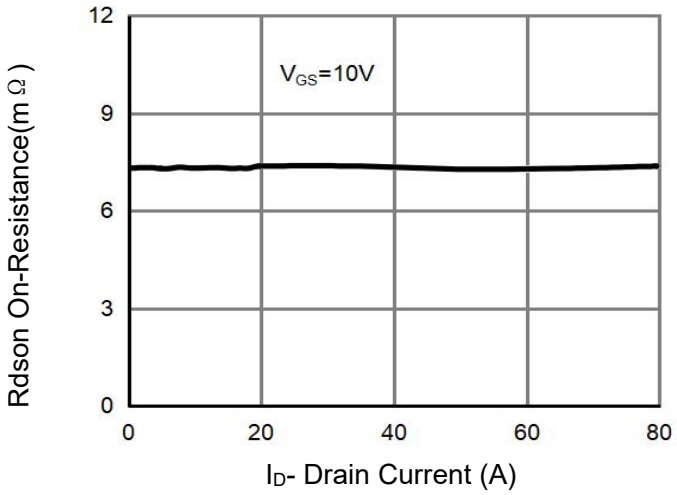


Figure 3 Rdson- Drain Current

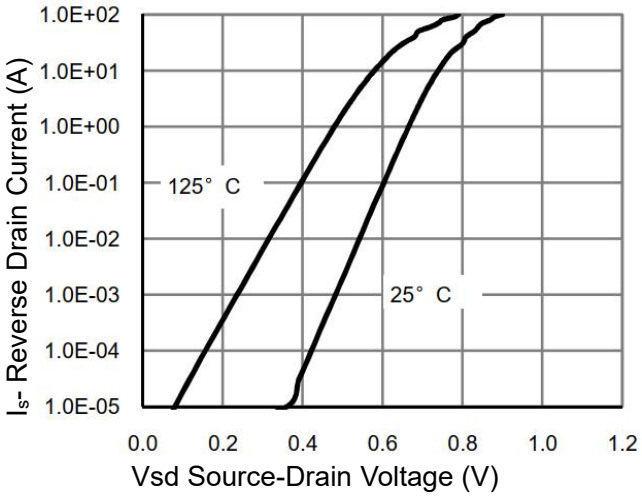


Figure 6 Source- Drain Diode Forward

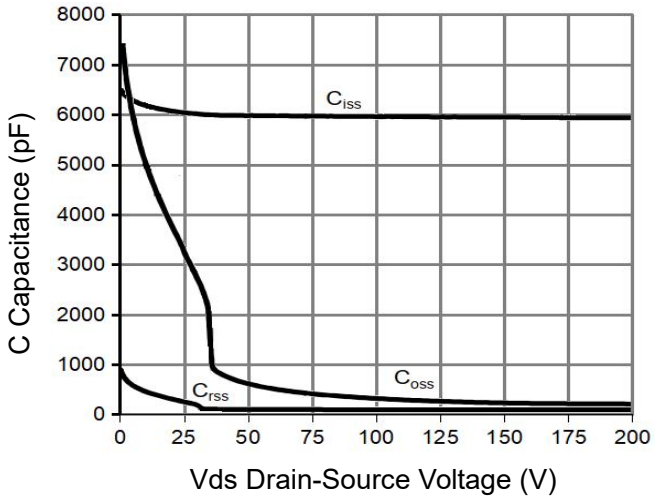


Figure 7 Capacitance vs Vds

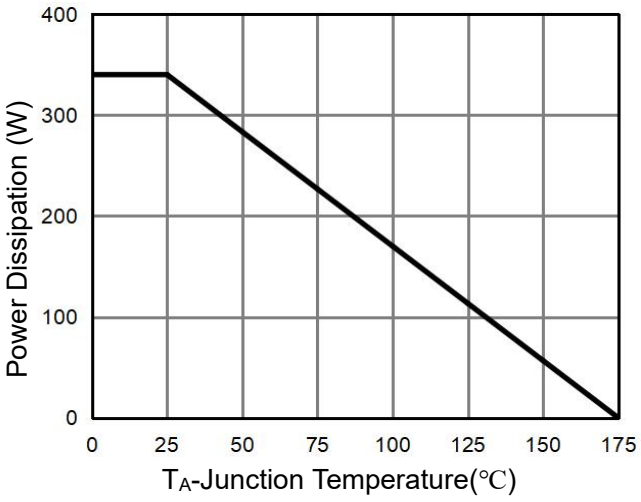


Figure 9 Power De-rating

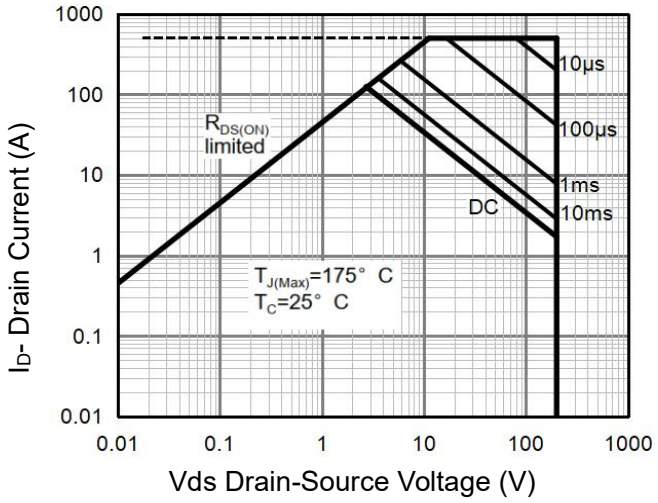


Figure 8 Safe Operation Area (Note3)

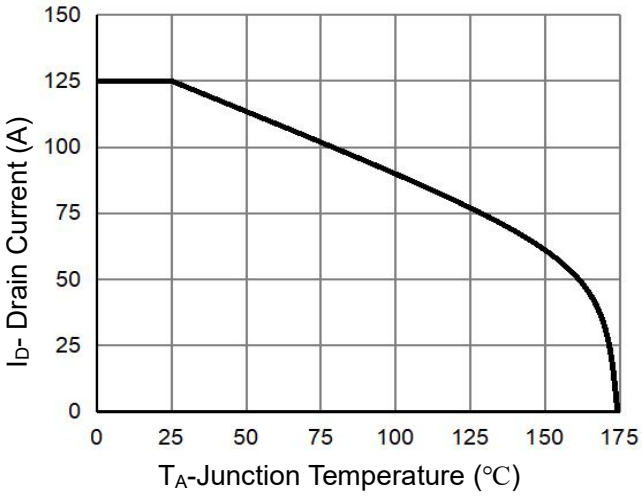


Figure 10 Current De-ratin

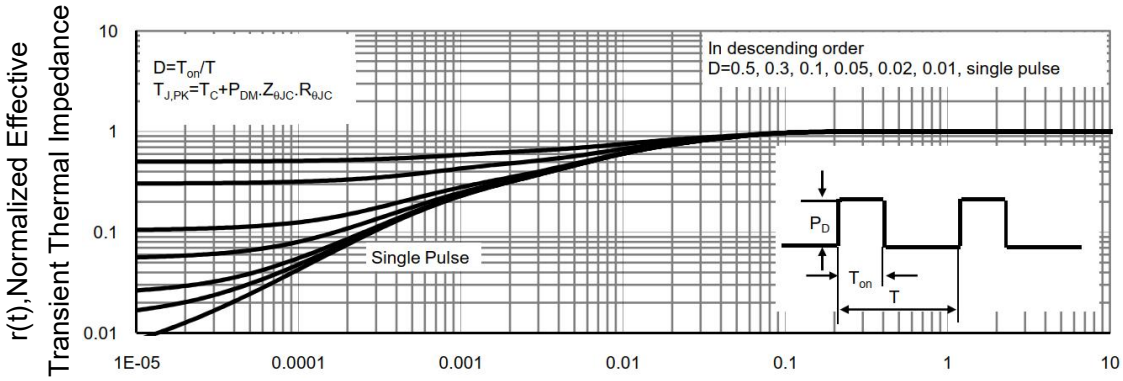
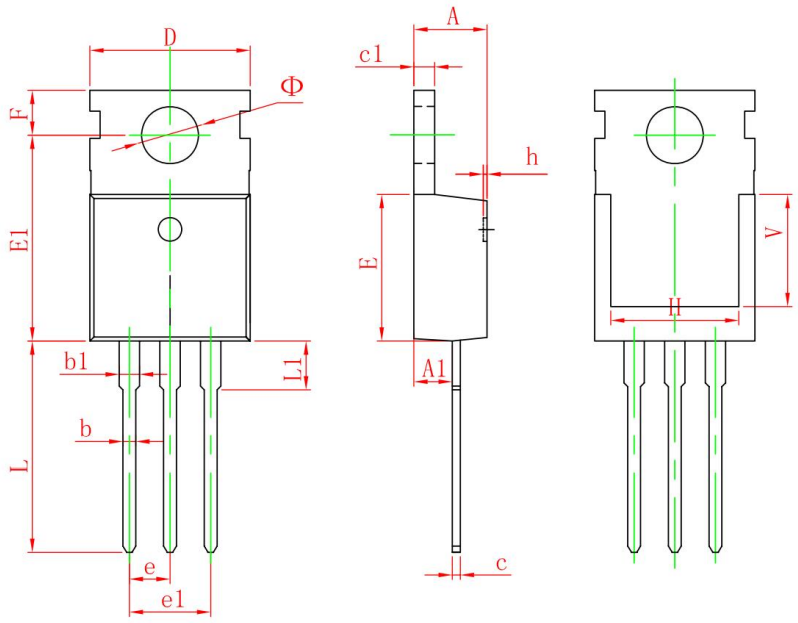


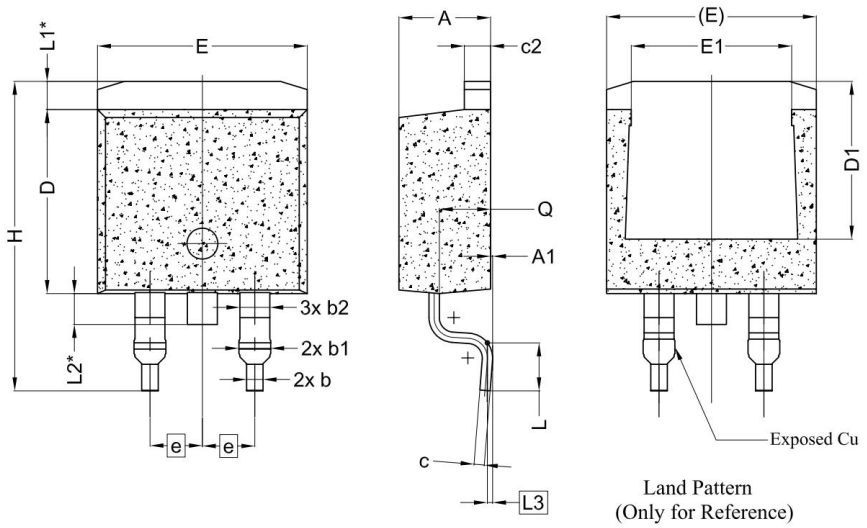
Figure 11 Normalized Maximum Transient Thermal Impedance

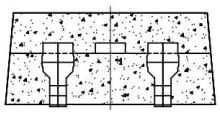
TO-220-3L Package Information



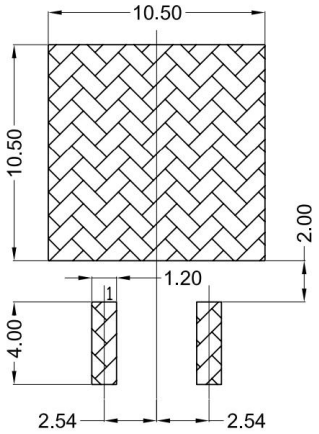
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.950	9.750	0.352	0.384
E1	12.650	13.050	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





Land Pattern
(Only for Reference)



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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