

NCE N-Channel Super Trench Power MOSFET

Description

The NCEP40T11K 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.

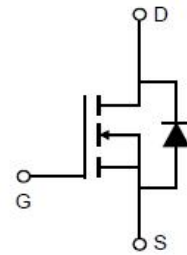
General Features

- $V_{DS} = 40V, I_D = 110A$
 $R_{DS(ON)} = 2.4m\Omega$ (typical) @ $V_{GS} = 10V$
 $R_{DS(ON)} = 3.3m\Omega$ (typical) @ $V_{GS} = 4.5V$
- 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

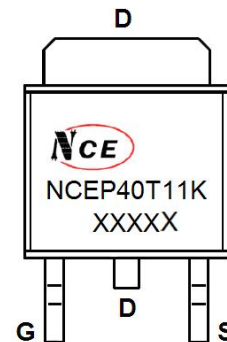
Application

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

100% UIS TESTED!
100% ΔV_{ds} TESTED!



Schematic Diagram



Marking and pin assignment



TO-252-2L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP40T11K	NCEP40T11K	TO-252-2L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	110	A
Drain Current-Continuous($T_c = 100^\circ C$)	$I_D(100^\circ C)$	85	A
Pulsed Drain Current	I_{DM}	440	A
Maximum Power Dissipation	P_D	150	W
Derating factor		1	W/ $^\circ C$
Single pulse avalanche energy ^(Note 1)	E_{AS}	500	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.0	$^{\circ}\text{C/W}$
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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	40		-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =40V,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	1.2	1.7	2.2	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =55A	-	2.4	3.5	mΩ
		V _{GS} =4.5V, I _D =55A	-	3.3	4.8	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V,I _D =55A	-	60	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =20V,V _{GS} =0V, F=1.0MHz	-	3510	-	PF
Output Capacitance	C _{oss}		-	1050	-	PF
Reverse Transfer Capacitance	C _{rss}		-	60	-	PF
Switching Characteristics (Note 2)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =20V,I _D =55A V _{GS} =10V,R _G =1.6Ω	-	10.5	-	nS
Turn-on Rise Time	t _r		-	4	-	nS
Turn-Off Delay Time	t _{d(off)}		-	35	-	nS
Turn-Off Fall Time	t _f		-	5	-	nS
Total Gate Charge	Q _g	V _{DS} =20V,I _D =55A, V _{GS} =10V	-	60	-	nC
Gate-Source Charge	Q _{gs}		-	9.9	-	nC
Gate-Drain Charge	Q _{gd}		-	9.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V,I _S =55A	-		1.2	V
Diode Forward Current	I _S		-	-	110	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = I _S	-		24	nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs	-		68	nC

Notes:

1. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=20V, V_G=10V, L=0.5\text{mH}, R_g=25\Omega$

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 heatsink, assuming a maximum junction temperature of $T_J(\text{MAX})=175^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

Typical Electrical and Thermal Characteristics

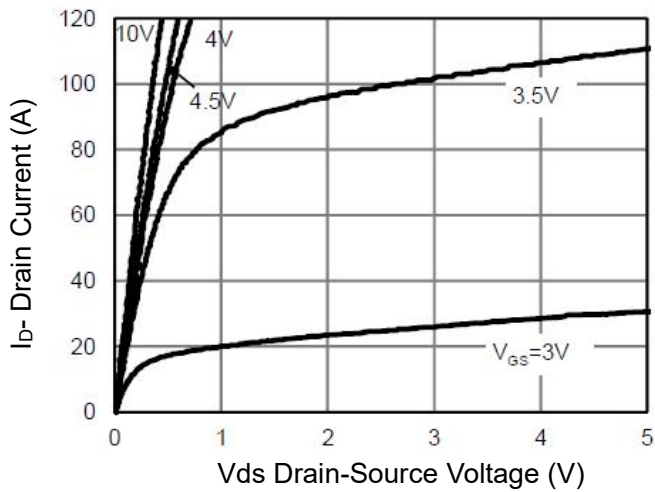


Figure 1 Output Characteristics

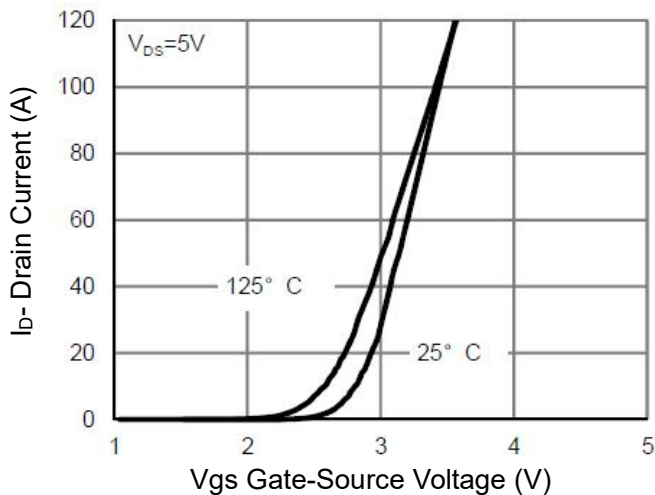


Figure 2 Transfer Characteristics

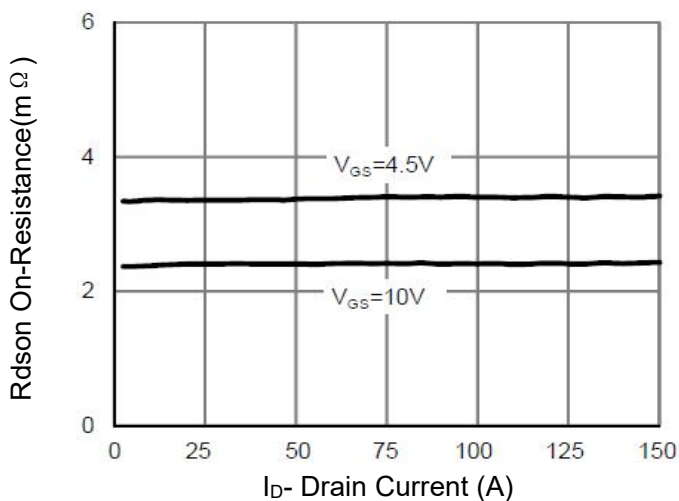


Figure 3 Rdson- Drain Current

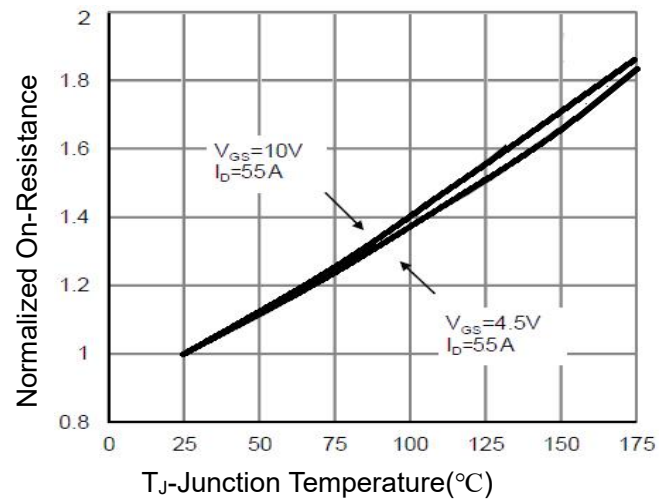


Figure 4 Rdson-Junction Temperature

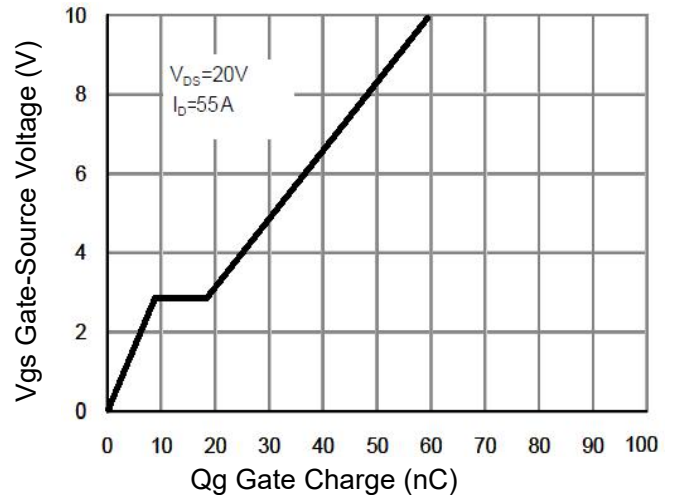


Figure 5 Gate Charge

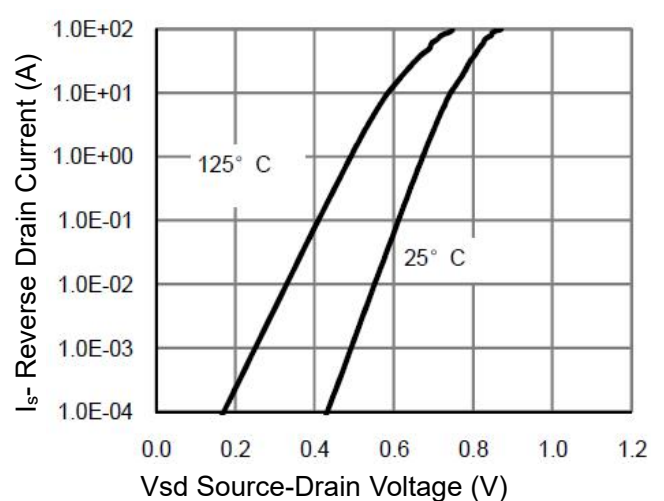


Figure 6 Source- Drain Diode Forward

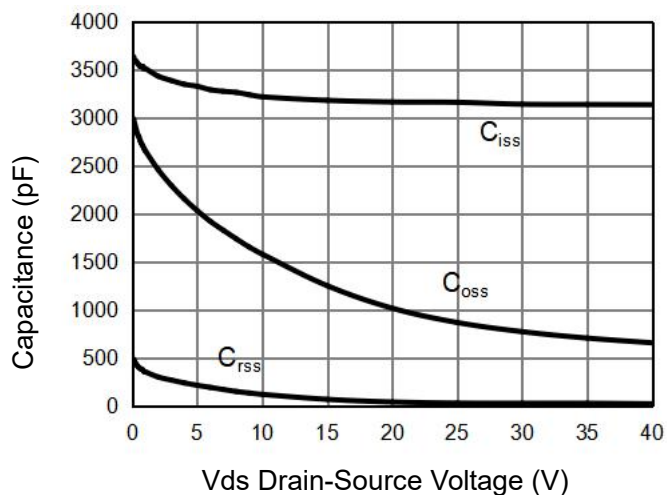


Figure 7 Capacitance vs Vds

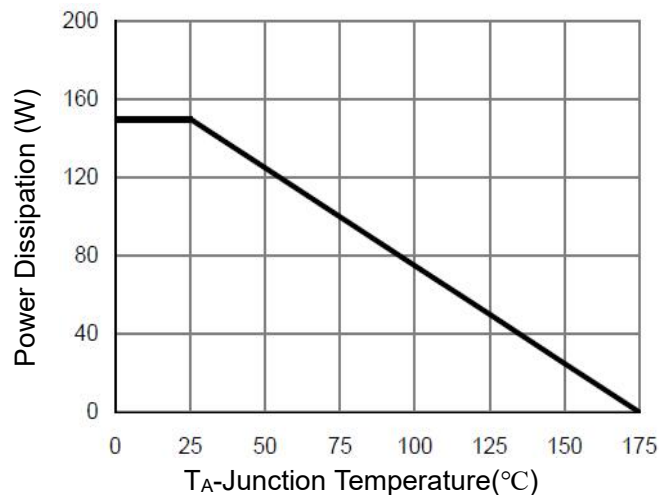


Figure 9 Power De-rating

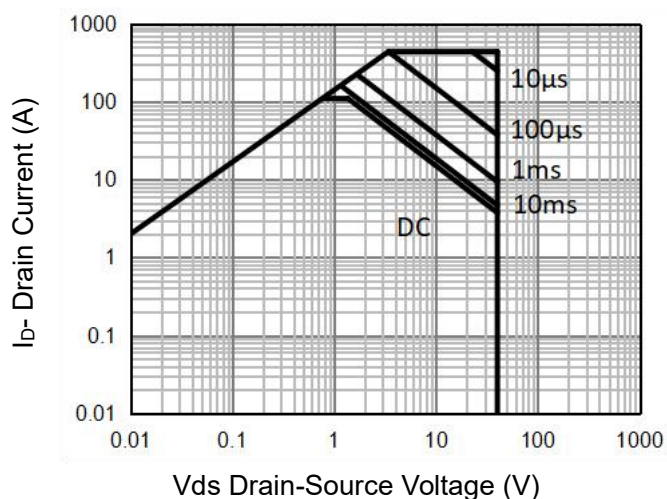


Figure 8 Safe Operation Area (Note 3)

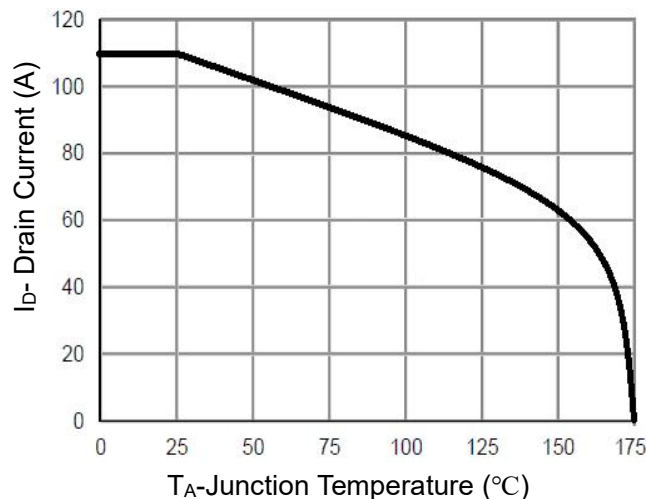


Figure 10 Current De-rating

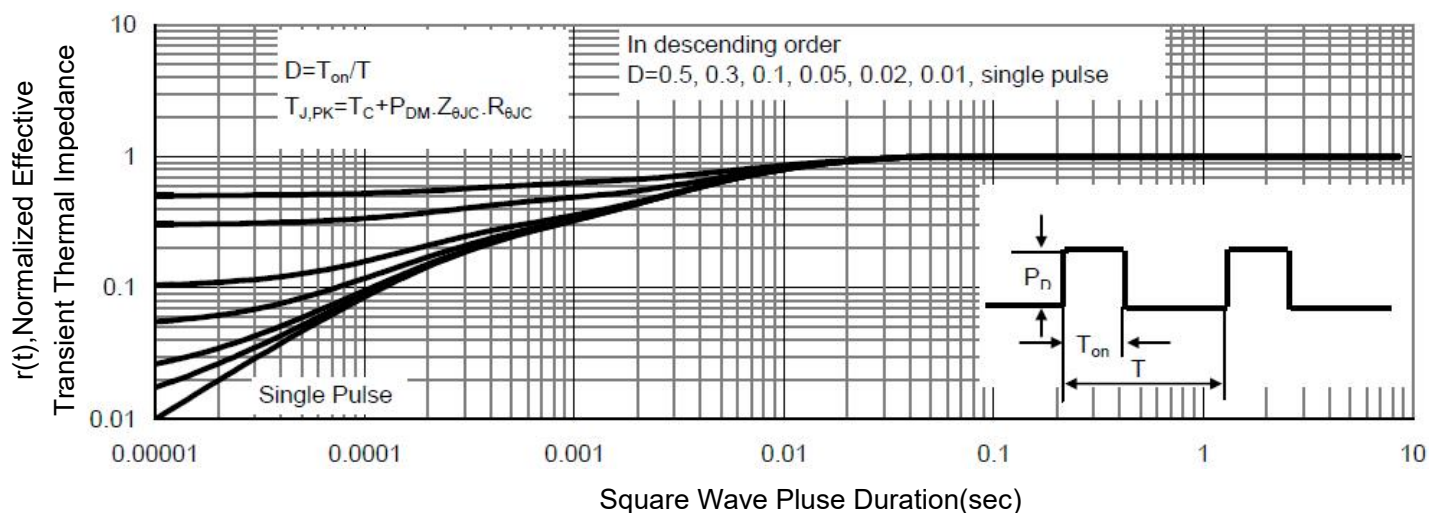
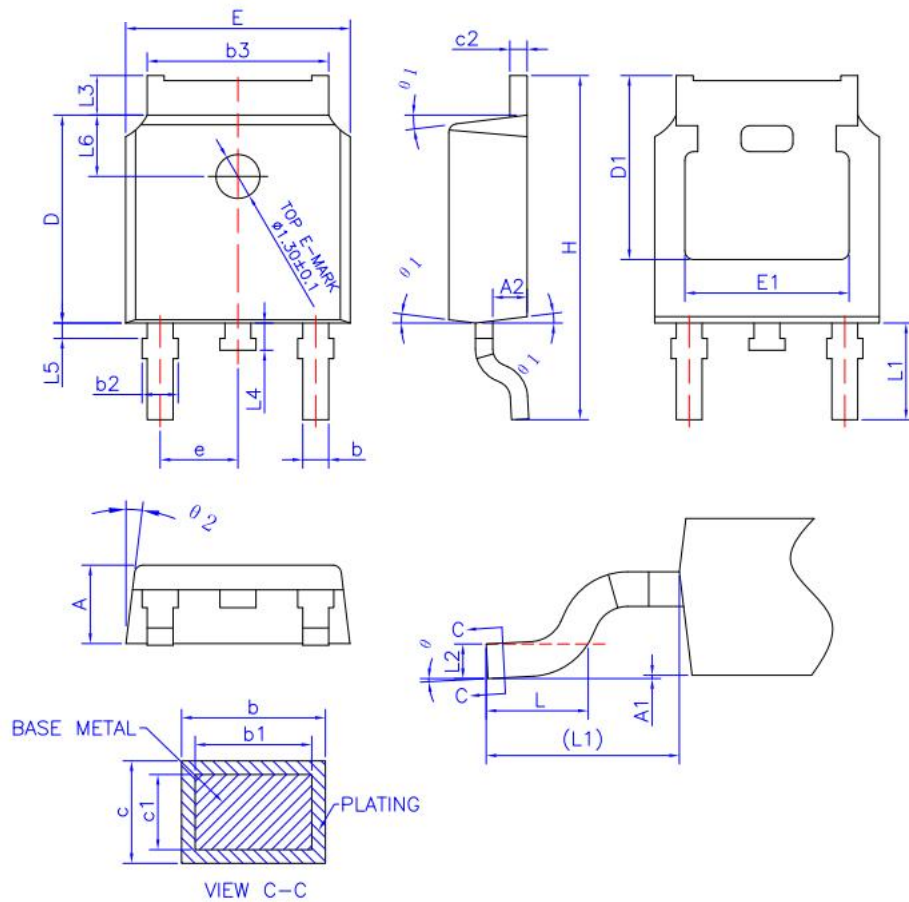


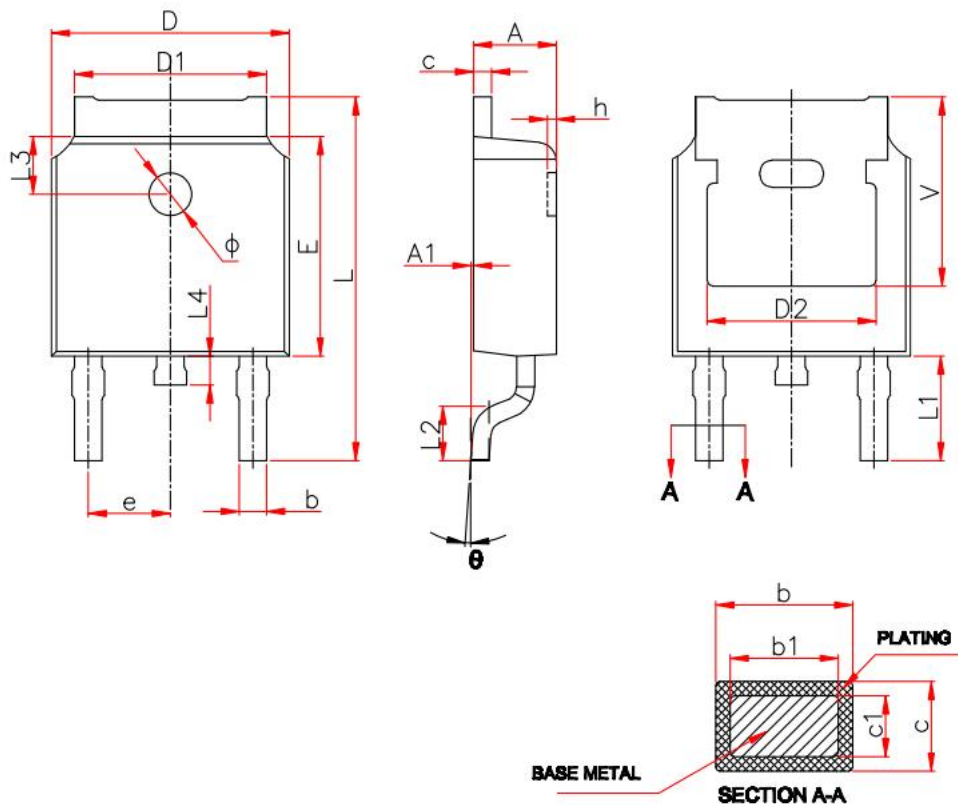
Figure 11 Normalized Maximum Transient Thermal Impedance

TO-252-2L(P) Package Information



SYMBOL	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0	---	0.10
A2	0.90	1.01	1.10
b	0.72	---	0.85
b1	0.71	0.76	0.81
b2	0.72	---	0.90
b3	5.13	5.33	5.46
c	0.47	---	0.60
c1	0.46	0.51	0.56
c2	0.47	---	0.60
D	6.00	6.10	6.20
D1	5.25	---	---
E	6.50	6.60	6.70
E1	4.70	---	---
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90 REF		
L2	0.508 BSC		
L3	0.90	---	1.25
L4	0.60	0.80	1.00
L5	0.15	---	0.75
L6	1.80 REF		
θ	0°	---	8°
θ1	5°	7°	9°
θ2	5°	7°	9°

TO-252-2L(E) Package Information



Symbol	Millimeters	
	Min.	Max.
A	2.20	2.40
A1	0.00	0.13
b	0.66	0.86
b1	0.73	0.79
c	0.46	0.58
c1	0.50	0.52
D	6.50	6.70
D1	5.10	5.46
D2	4.83 REF.	
E	6.00	6.20
e	2.19	2.39
L	9.80	10.40
L1	2.90 REF.	
L2	1.40	1.70
L3	1.60 REF.	
L4	0.60	1.00
Φ	1.10	1.30
θ	0°	8°

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