

NCE N-Channel Super Trench Power MOSFET

Description

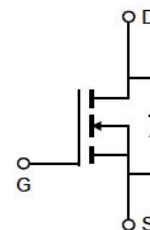
The NCEP60T20D uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g . This device is ideal for high-frequency switching and synchronous rectification.

General Features

- $V_{DS} = 60V, I_D = 200A$
 $R_{DS(ON)} = 1.8m\Omega$ (typical) @ $V_{GS} = 10V$
- Excellent gate charge x $R_{DS(on)}$ product
- 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



Schematic diagram



TO-263T-2L top view

100% UIS TESTED!

100% ΔV_{ds} TESTED!

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCEP60T20D	NCEP60T20D	TO-263-2L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous (Silicon Limited)	I_D	200	A
Drain Current-Continuous ($T_c = 100^\circ\text{C}$)	$I_D (100^\circ\text{C})$	150	A
Pulsed Drain Current	I_{DM}	800	A
Maximum Power Dissipation	P_D	255	W
Derating factor		1.7	W/ $^\circ\text{C}$
Single pulse avalanche energy ^(Note 1)	E_{AS}	2000	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.59	$^\circ\text{C/W}$
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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	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	2.2	3.0	4.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =100A	-	1.8	2.2	mΩ
Forward Transconductance	g _{FS}	V _{DS} =10V, I _D =100A	-	60	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V, F=1.0MHz	-	9200	-	PF
Output Capacitance	C _{oss}		-	1900	-	PF
Reverse Transfer Capacitance	C _{rss}		-	61	-	PF
Switching Characteristics (Note 2)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =30V, I _D =100A V _{GS} =10V, R _G =4.7Ω	-	23	-	nS
Turn-on Rise Time	t _r		-	19	-	nS
Turn-Off Delay Time	t _{d(off)}		-	58	-	nS
Turn-Off Fall Time	t _f		-	14	-	nS
Total Gate Charge	Q _g	V _{DS} =30V, I _D =100A, V _{GS} =10V	-	130		nC
Gate-Source Charge	Q _{gs}		-	40.6		nC
Gate-Drain Charge	Q _{gd}		-	23.9		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =200A	-		1.2	V
Diode Forward Current	I _S		-	-	120	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = I _S	-	67		nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs	-	112		nC

Notes:

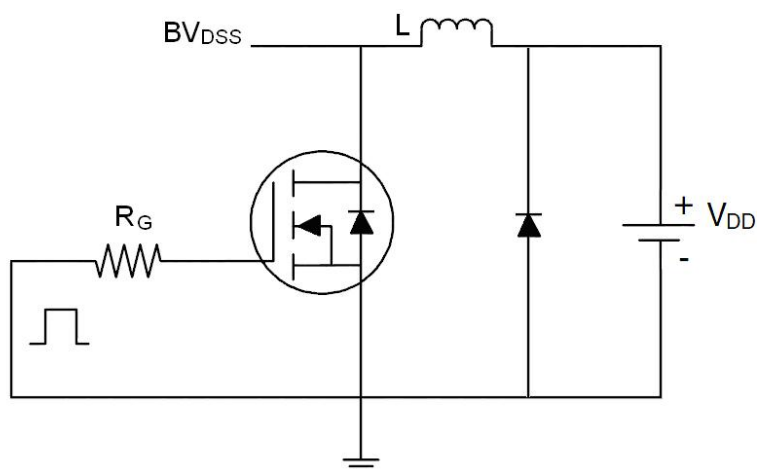
1.EAS condition : T_j=25°C, V_{DD}=30V, V_G=10V, L=0.5mH, R_g=25Ω

2.Guaranteed by design, not subject to production

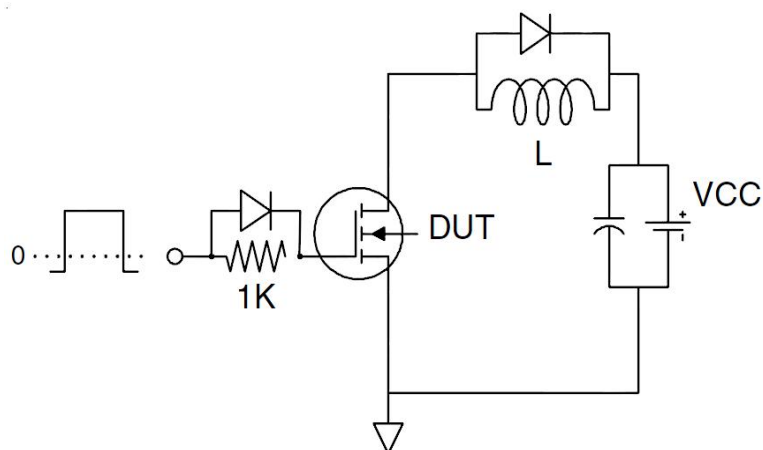
3.These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsin k, assuming a maximum junction temperature of T_J(MAX)=175° C. The SOA curve provides a single pulse rating.

Test Circuit

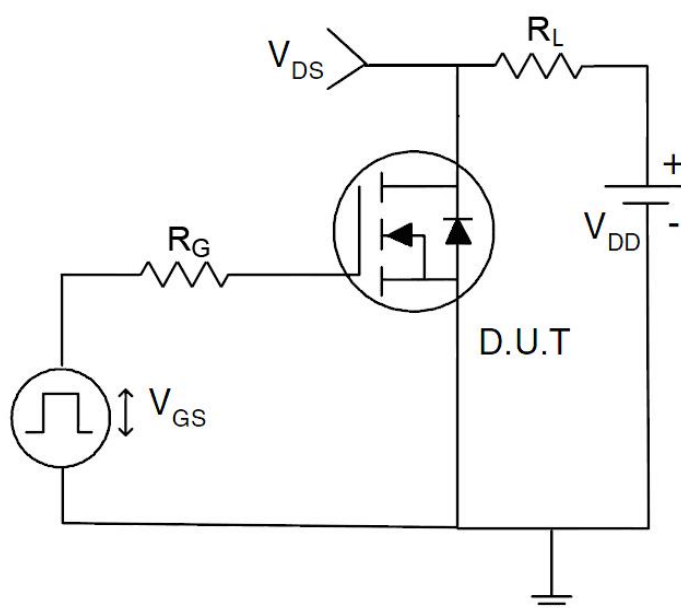
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

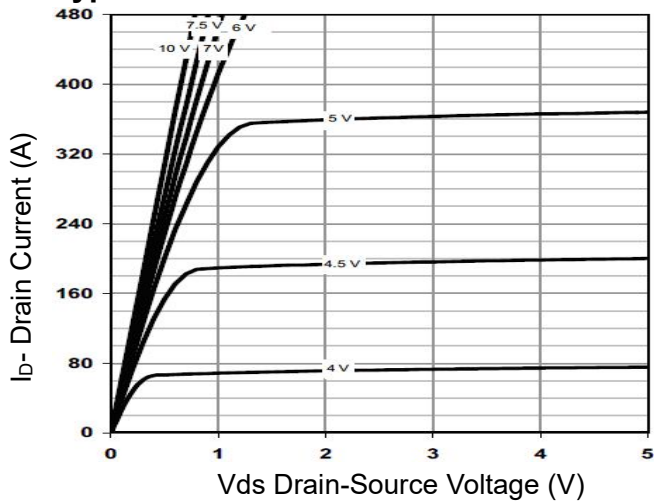


Figure 1 Output Characteristics

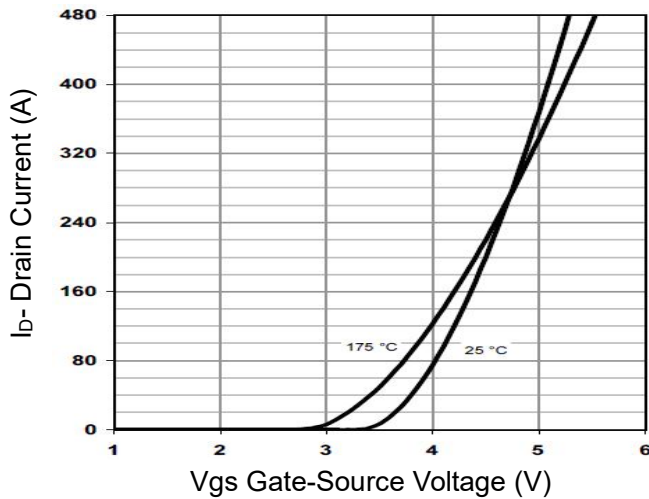


Figure 2 Transfer Characteristics

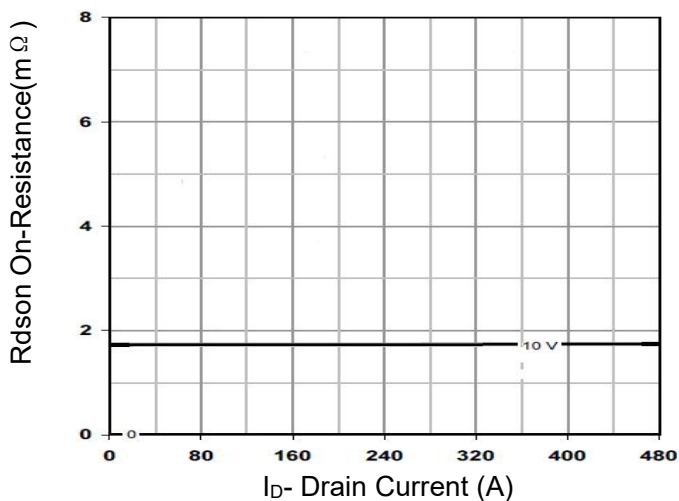


Figure 3 Rdson- Drain Current

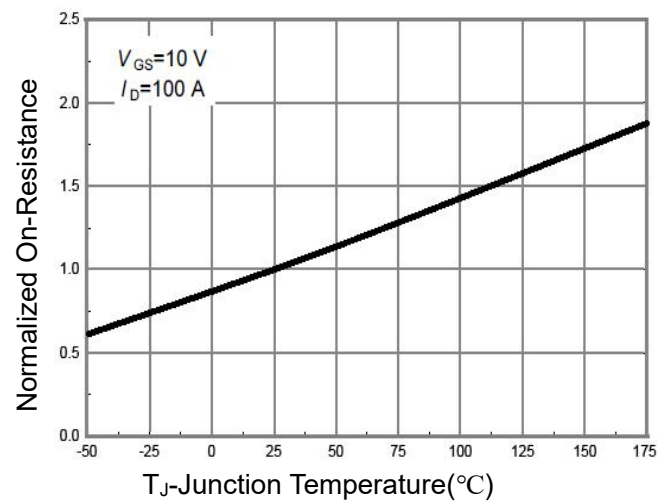


Figure 4 Rdson-Junction Temperature

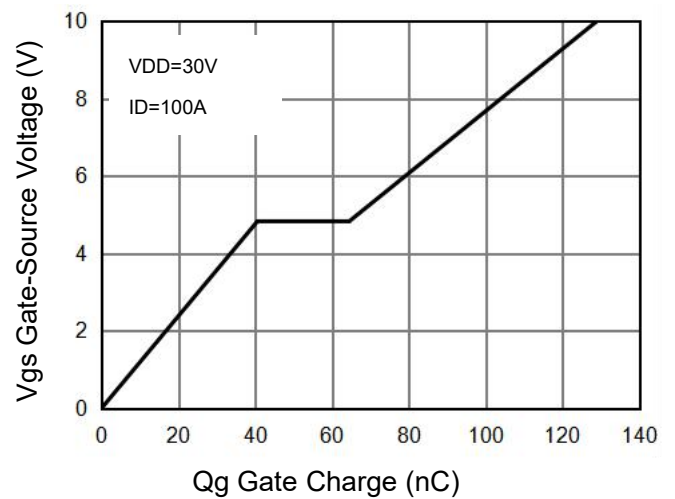


Figure 5 Gate Charge

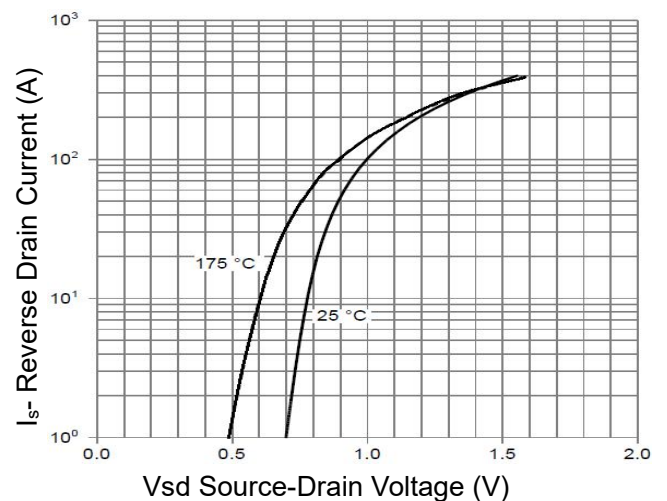


Figure 6 Source- Drain Diode Forward

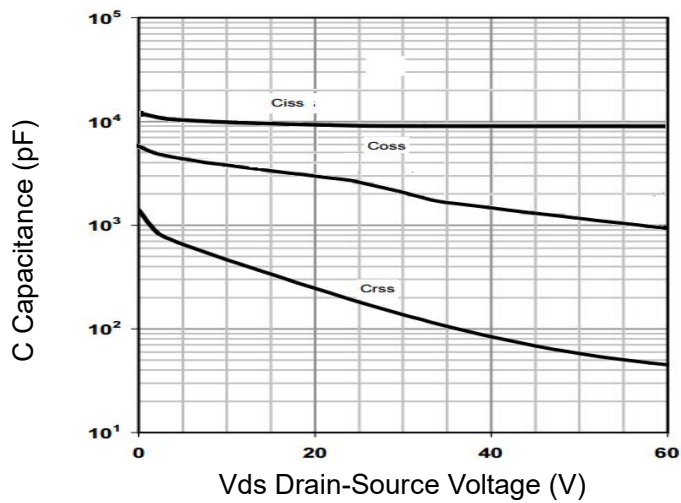


Figure 7 Capacitance vs V_{ds}

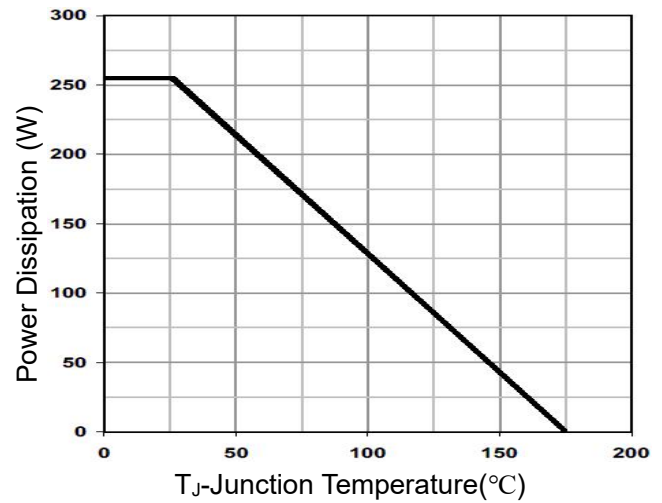


Figure 9 Power De-rating

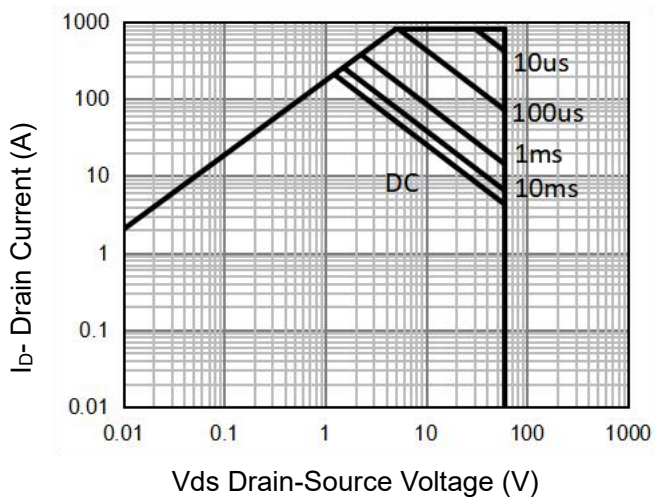


Figure 8 Safe Operation Area (Note3)

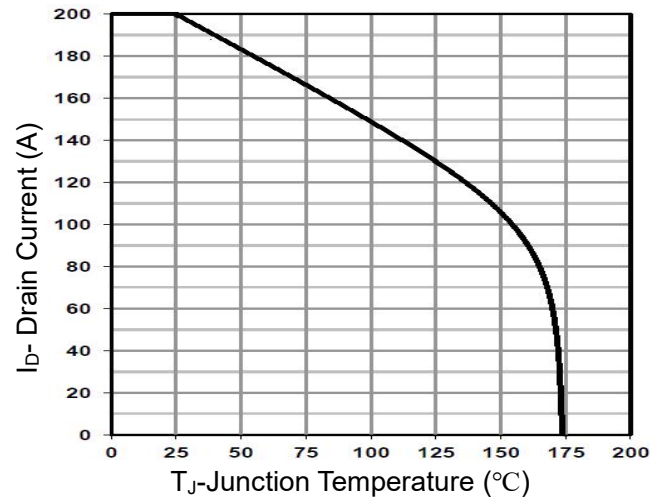


Figure 10 Current De-rating

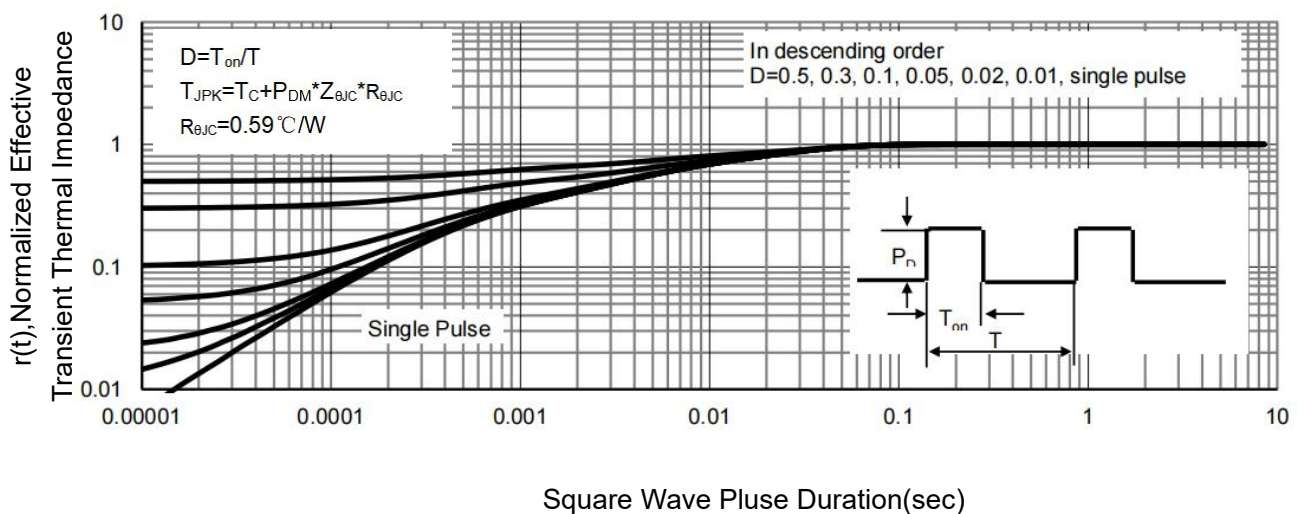
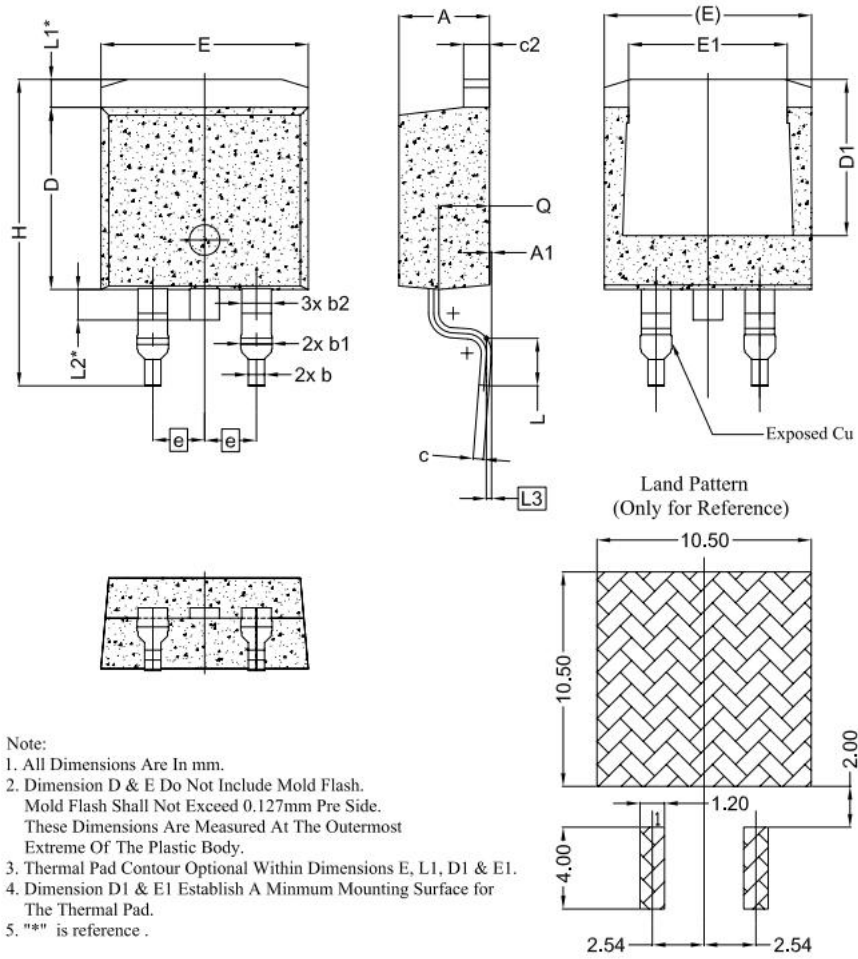


Figure 11 Normalized Maximum Transient Thermal Impedance

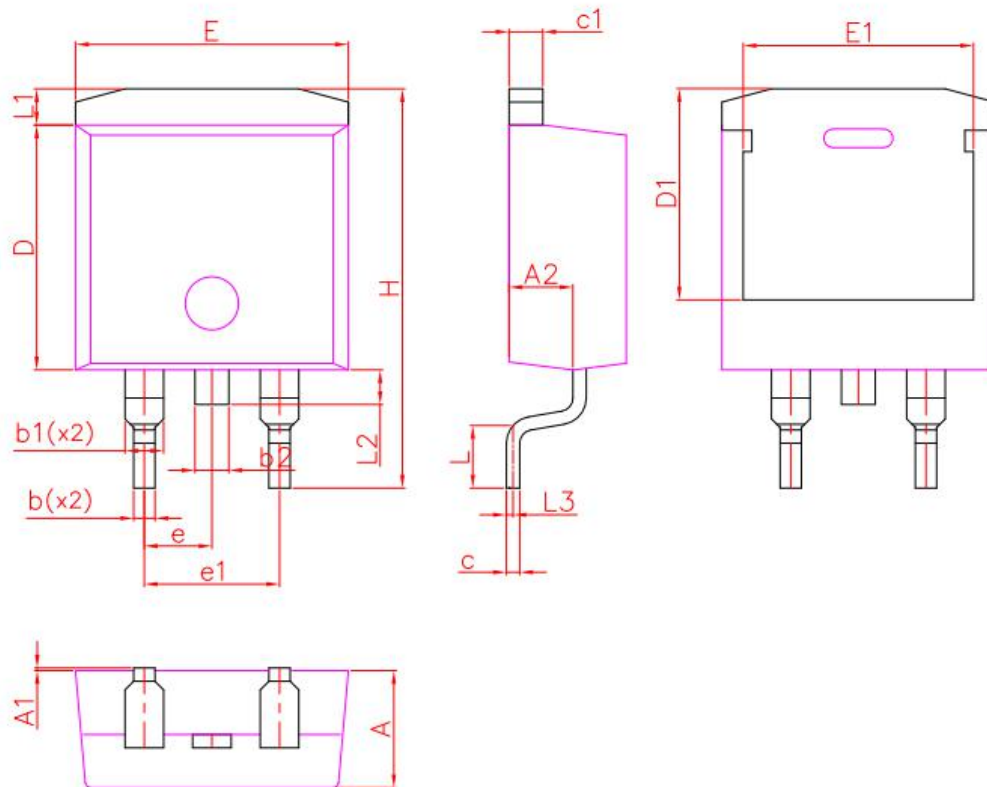
TO-263-2L(G) Package Information



- Note:
1. All Dimensions Are In mm.
 2. Dimension D & E Do Not Include Mold Flash.
Mold Flash Shall Not Exceed 0.127mm Per 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

TO-263-2L(E) Package Information



T0263			
DIM.	MIN.	NOM.	MAX.
A	4.20	4.40	4.60
A1	0.00	0.10	0.25
A2	2.20	2.40	2.60
b	0.70	0.80	0.90
b1	1.20	1.45	1.75
b2	1.17	1.27	1.37
c	0.40	0.50	0.60
c1	1.15	1.27	1.40
D	9.10	9.20	9.30
D1	7.63	7.93	8.23
E	10.05	10.25	10.45
E1	8.35	8.65	8.95
e	2.54BSC		
e1	5.08BSC		
H	14.61	15.00	15.88
L	1.78	2.35	2.79
L1	1.36REF		
L2	1.3REF		
L3	0.25REF		
All dimensions in millimeters			

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