

NCE P-Channel Enhancement Mode Power MOSFET

Description

The NCE40P40L uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is well suited for high current load applications.

General Features

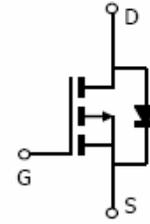
- $V_{DS} = -40V, I_D = -40A$
 $R_{DS(ON)} < 14m\Omega @ V_{GS} = -10V$
 $R_{DS(ON)} < 24m\Omega @ V_{GS} = -4.5V$
- High density cell design for ultra low $R_{ds(on)}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation

Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

100% UIS TESTED!

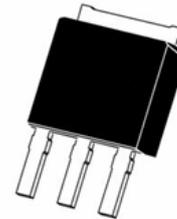
100% ΔV_{ds} TESTED!



Schematic diagram



Marking and pin assignment



TO-251S top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE40P40L	NCE40P40L	TO-251S	-	-	-

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	-40	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D(100^\circ C)$	-28	A
Pulsed Drain Current	I_{DM}	-120	A
Maximum Power Dissipation	P_D	80	W
Derating factor		0.53	W/ $^\circ C$
Single pulse avalanche energy ^(Note 5)	E_{AS}	544	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)	$R_{\theta JC}$	1.88	$^{\circ}\text{C}/\text{W}$
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Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

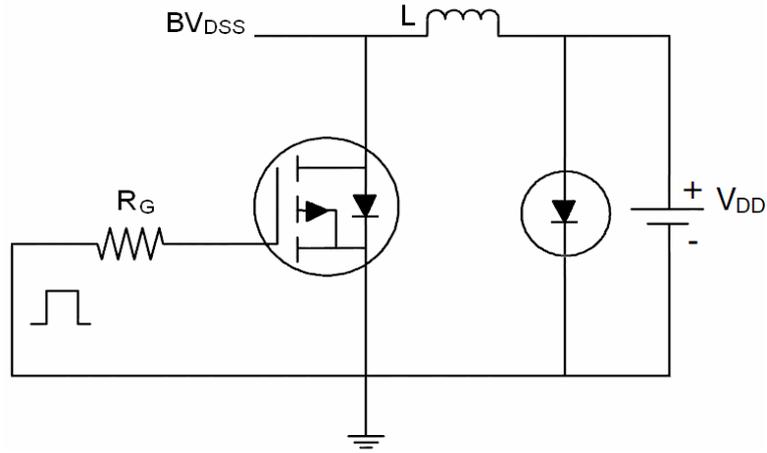
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-40V, V_{GS}=0V$	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.5	-1.9	-3.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-12A$	-	12	14	m Ω
		$V_{GS}=-4.5V, I_D=-12A$	-	18.5	24	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_D=-12A$	-	34	-	S
Dynamic Characteristics ^(Note 4)						
Input Capacitance	C_{iss}	$V_{DS}=-20V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	2960	-	PF
Output Capacitance	C_{oss}		-	370	-	PF
Reverse Transfer Capacitance	C_{rss}		-	310	-	PF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-20V, I_D=-20A$ $V_{GS}=-10V, R_G=3\Omega$	-	10	-	nS
Turn-on Rise Time	t_r		-	18	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	38	-	nS
Turn-Off Fall Time	t_f		-	24	-	nS
Total Gate Charge	Q_g	$V_{DS}=-20, I_D=-12A,$ $V_{GS}=-10V$	-	42.2	72	nC
Gate-Source Charge	Q_{gs}		-	6.9		nC
Gate-Drain Charge	Q_{gd}		-	9.7		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ^(Note 3)	V_{SD}	$V_{GS}=0V, I_S=-20A$	-		-1.2	V
Diode Forward Current ^(Note 2)	I_S		-	-	-40	A
Reverse Recovery Time	t_{rr}	$T_J = 25^{\circ}\text{C}, I_F = -20A$ $di/dt = -100A/\mu s$ ^(Note 3)	-	40		nS
Reverse Recovery Charge	Q_{rr}		-	42		nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

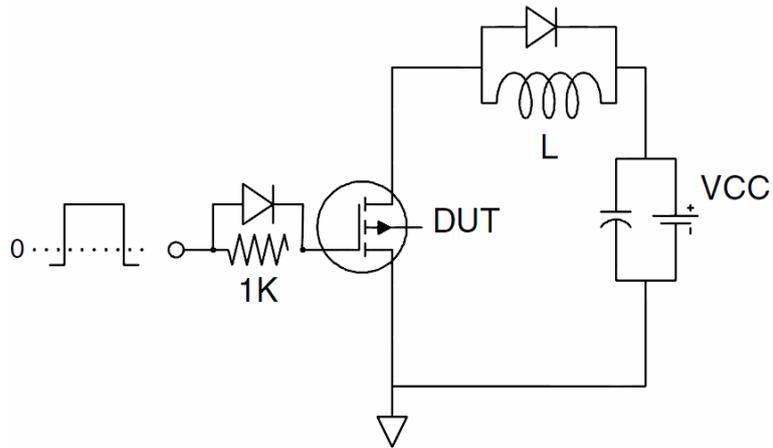
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. E_{AS} condition: $T_J=25^{\circ}\text{C}, V_{DD}=-20V, V_G=-10V, L=1\text{mH}, R_G=25\Omega, I_{AS}=33A$

Test Circuit

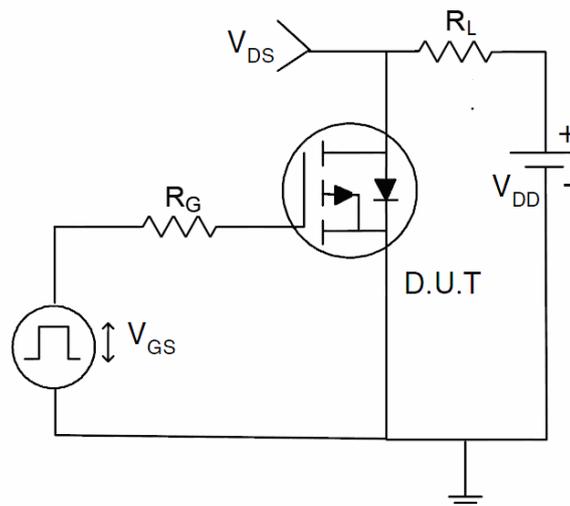
1) E_{AS} Test Circuit



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

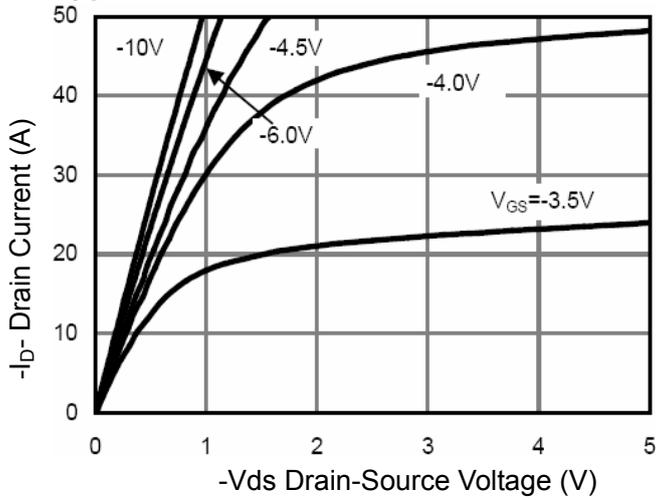


Figure 1 Output Characteristics

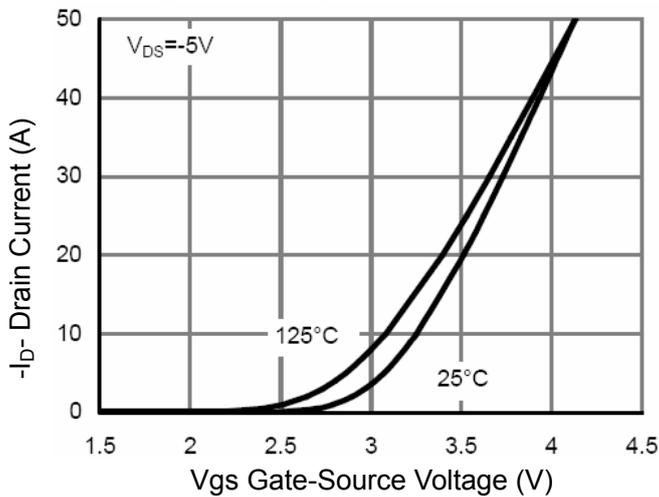


Figure 2 Transfer Characteristics

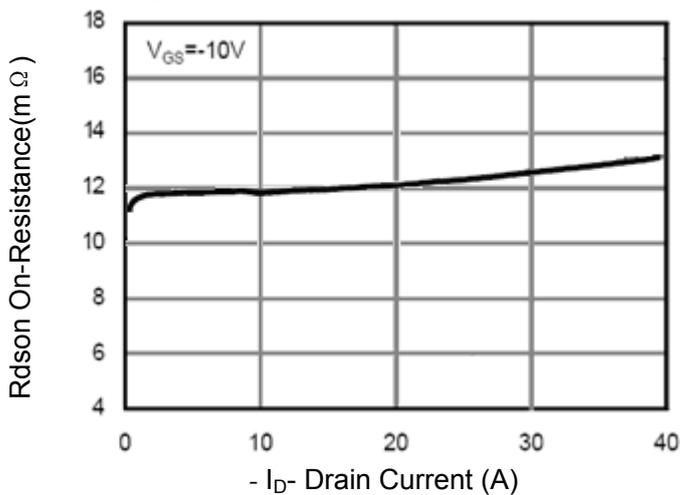


Figure 3 Rdson- Drain Current

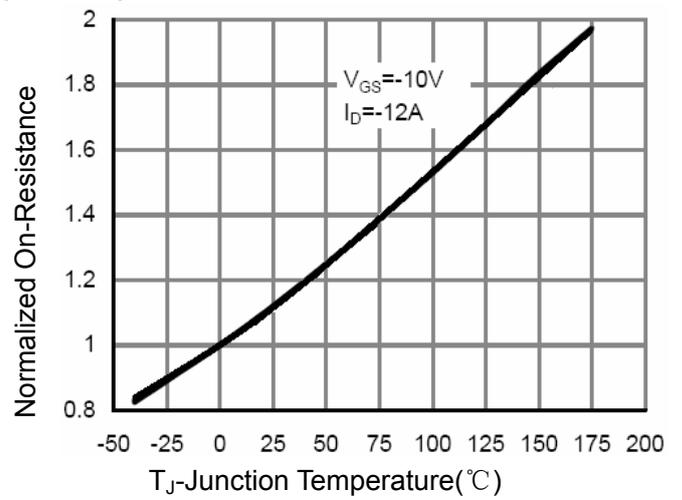


Figure 4 Rdson-Junction Temperature

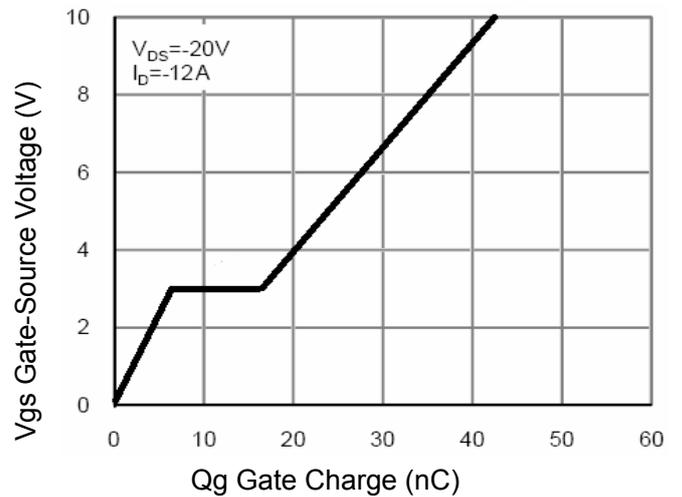


Figure 5 Gate Charge

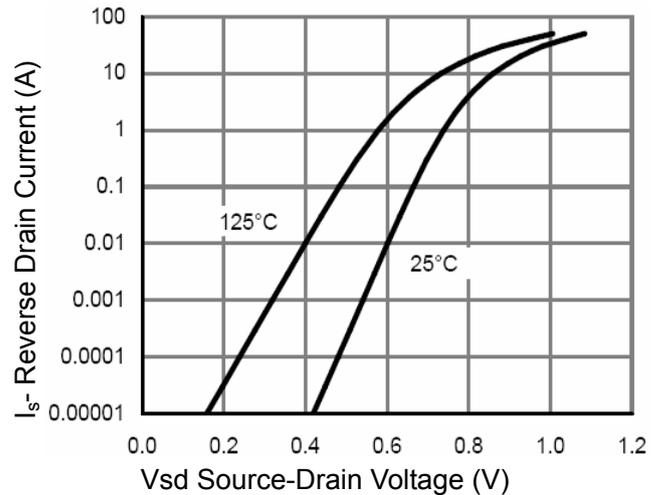


Figure 6 Source- Drain Diode Forward

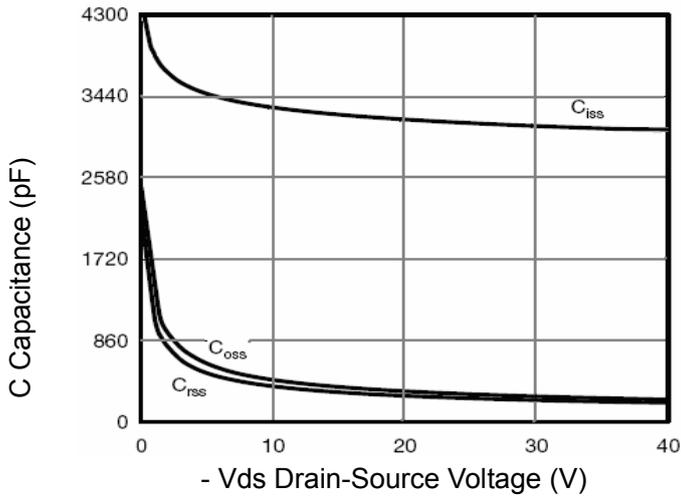


Figure 7 Capacitance vs Vds

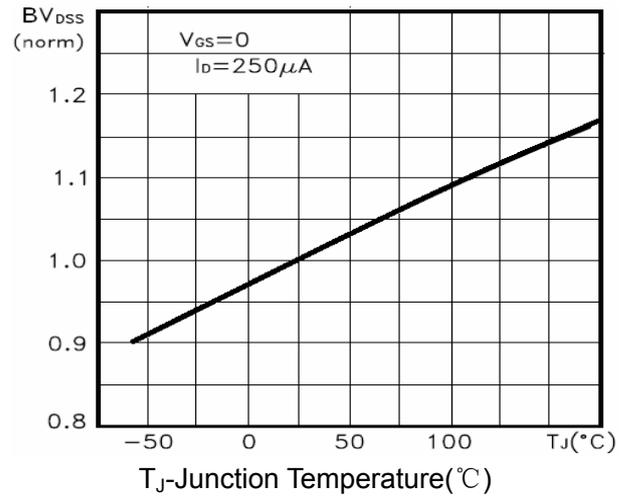


Figure 9 BV_{DSS} vs Junction Temperature

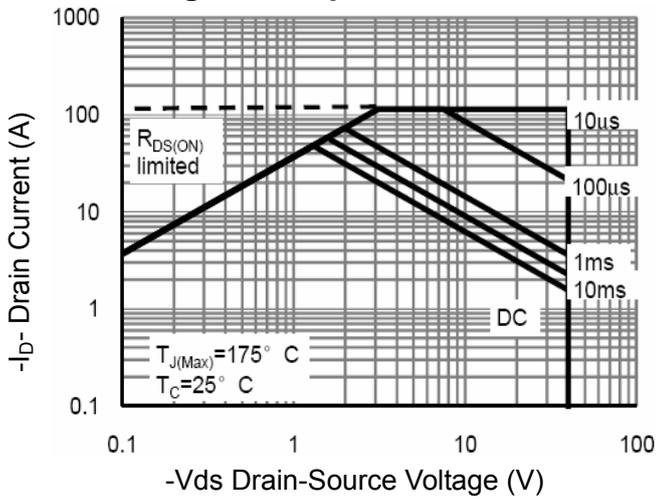


Figure 8 Safe Operation Area

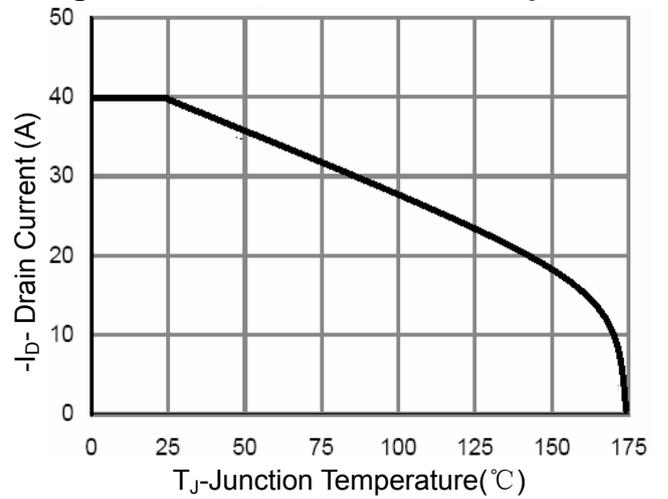


Figure 10 ID Current Derating vs Junction Temperature

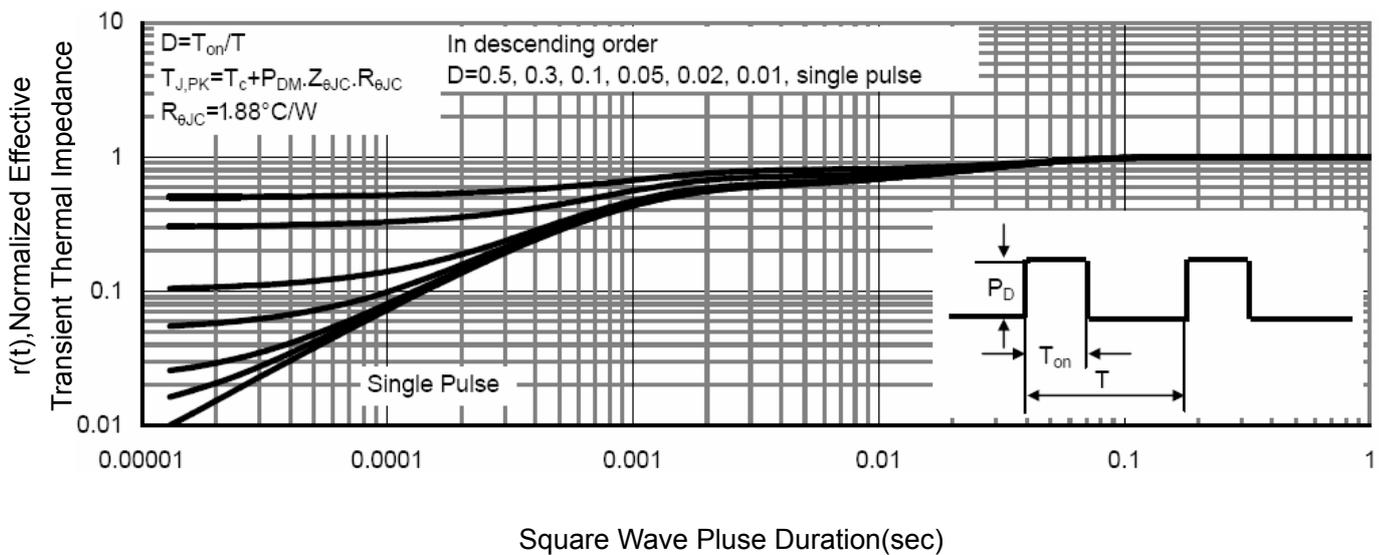
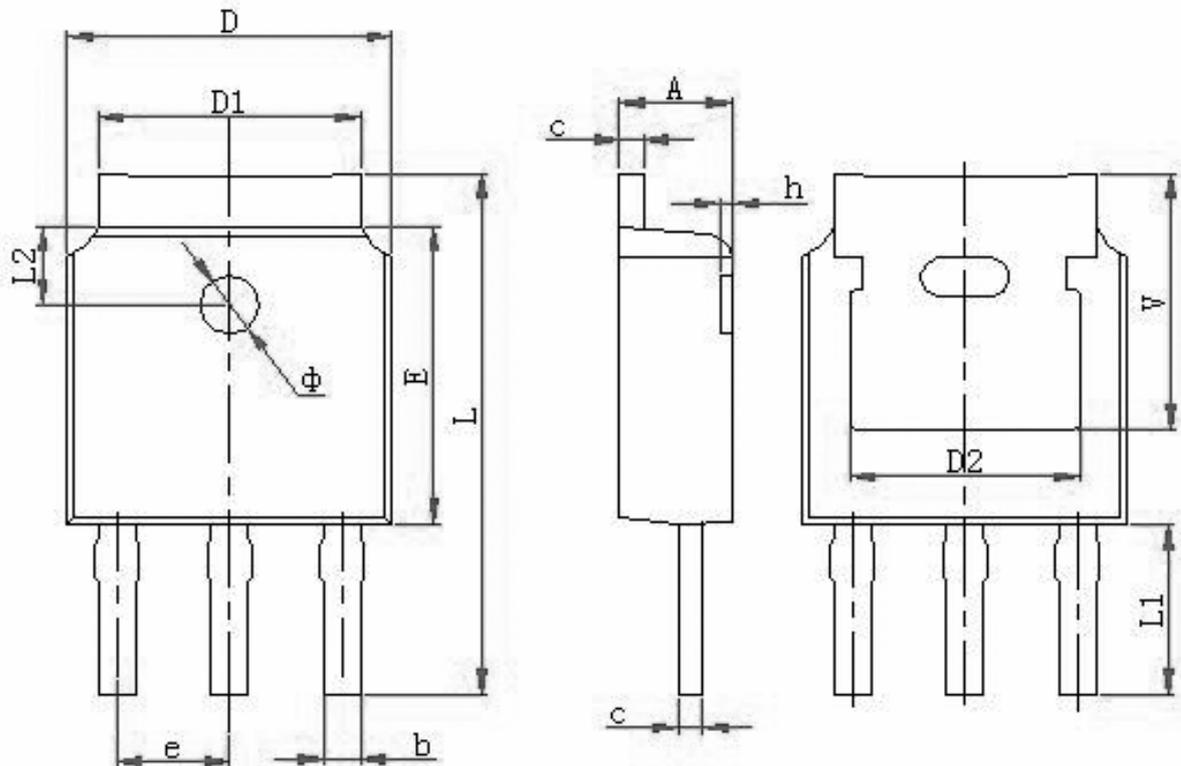


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-251S Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	10.400	11.000	0.409	0.433
L1	3.300	3.700	0.130	0.146
L2	1.600 REF.		0.063 REF.	
Φ	1.100	1.300	0.043	0.051
h	0.000	0.300	0.000	0.012
V	5.350 REF.		0.211 REF.	

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