

30V(D-S) N-Channel Enhancement Mode Power MOS FET

General Features

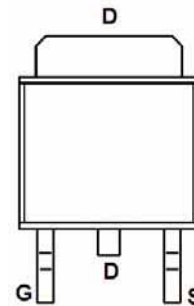
- $V_{DS}=30V, I_D=30A$
 $R_{DS(ON)} < 14m\Omega @ V_{GS}=10V$
 $R_{DS(ON)} < 25m\Omega @ V_{GS}=4.5V$
- High density cell design for ultra low Rdson
- Fully characterized Avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- Special process technology for high ESD capability



Lead Free

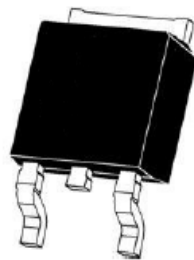
Application

- Power switching application
- Hard Switched and High Frequency Circuits
- Uninterruptible Power Supply

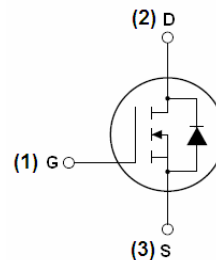


Marking and pin Assignment

PIN Configuration



TO-252-2L top view



Schematic diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
MSN0330D	MSN0330D	TO-252-2L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	30	A
Drain Current-Continuous($T_C=100^{\circ}C$)	$I_D (100^{\circ}C)$	21	A
Pulsed Drain Current	I_{DM}	80	A
Maximum Power Dissipation	P_D	40	W
Derating factor		0.27	W/ $^{\circ}C$
Single pulse avalanche energy ^(Note 5)	E_{AS}	72	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)	$R_{\theta JC}$	3.8	°C/W
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Electrical Characteristics ($T_c=25^{\circ}\text{C}$ unless otherwise noted)

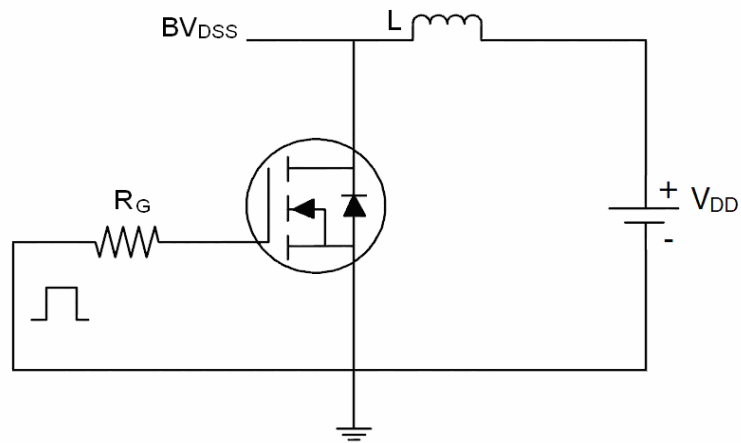
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	30	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =30V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1.0	1.5	2.2	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =20A	-	10	14	mΩ
		V _{GS} =4.5V, I _D =15A	-	13	25	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =20A	26	-	-	S
Dynamic Characteristics ^(Note4)						
Input Capacitance	C _{ISS}	V _{DS} =15V, V _{GS} =0V, F=1.0MHz	-	938	-	PF
Output Capacitance	C _{OSS}		-	142	-	PF
Reverse Transfer Capacitance	C _{RSS}		-	99	-	PF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =15V, R _L =0.75Ω V _{GS} =10V, R _G =3Ω	-	5	-	nS
Turn-on Rise Time	t _r		-	12	-	nS
Turn-Off Delay Time	t _{d(off)}		-	19	-	nS
Turn-Off Fall Time	t _f		-	6	-	nS
Total Gate Charge	Q _g	V _{DS} =15V, I _D =20A, V _{GS} =10V	-	17.5		nC
Gate-Source Charge	Q _{gs}		-	3		nC
Gate-Drain Charge	Q _{gd}		-	4.1		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		-	-	30	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =20A di/dt = 100A/μs ^(Note3)	-	19	-	nS
Reverse Recovery Charge	Q _{rr}		-	10	-	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

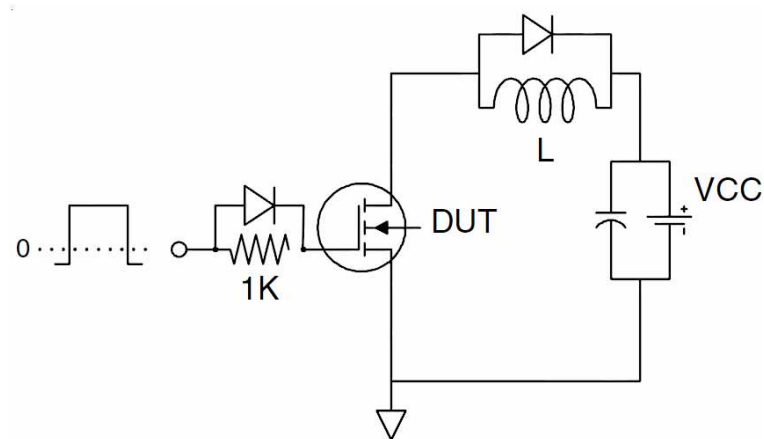
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition: $T_J=25^{\circ}\text{C}, V_{DD}=30V, V_G=10V, L=0.5mH, R_G=25\Omega$

Test circuit

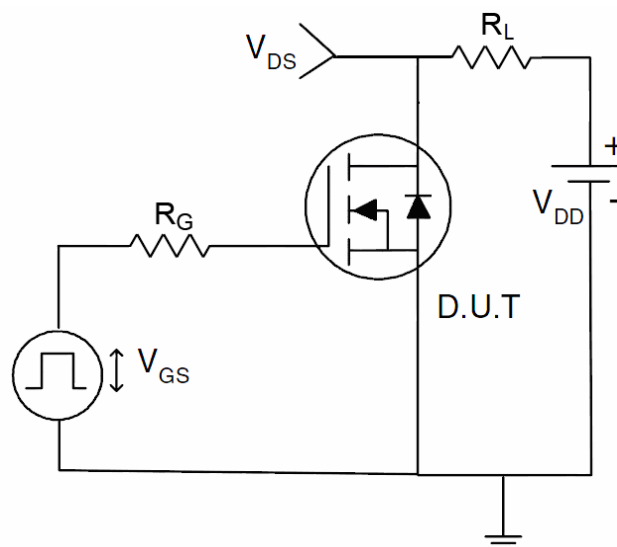
1) E_{AS} test Circuits



2) Gate charge test Circuit:



3) Switch Time Test Circuit:



Typical Electrical and Thermal Characteristics (Curves)

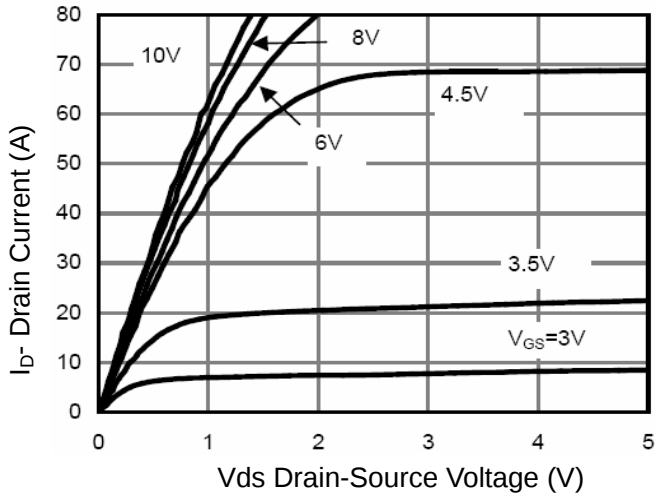


Figure 1 Output Characteristics

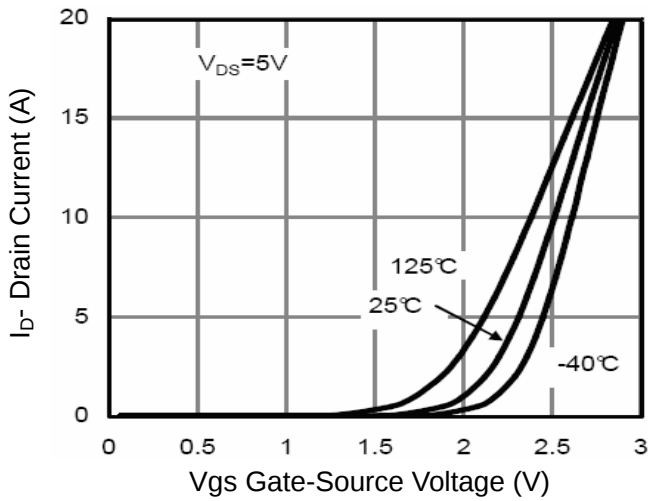


Figure 2 Transfer Characteristics

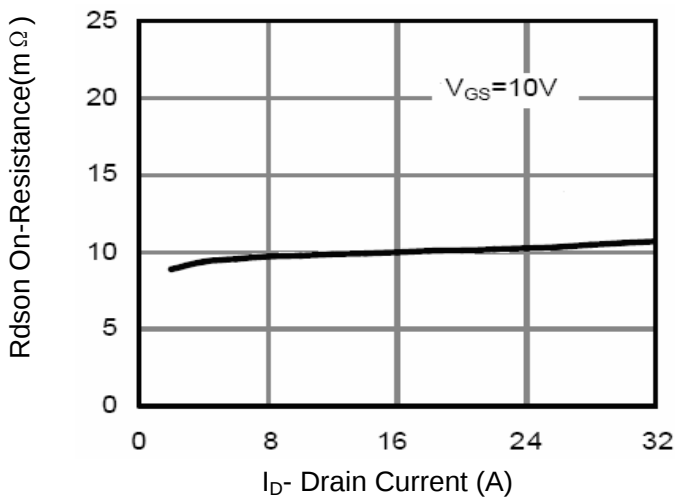


Figure 3 Rdson- Drain Current

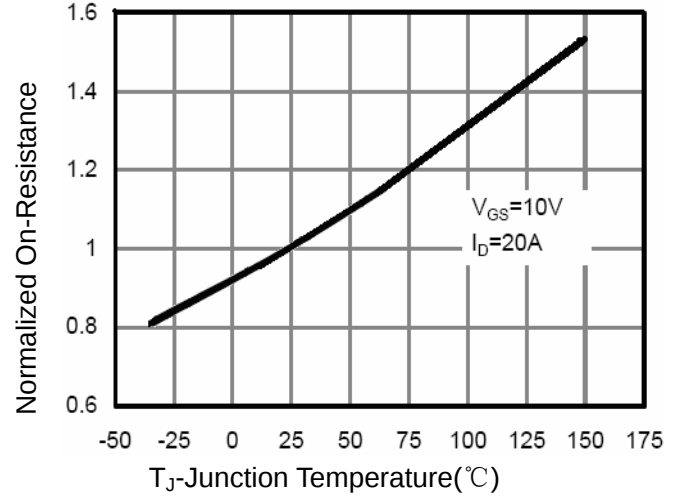


Figure 4 Rdson-Junction Temperature

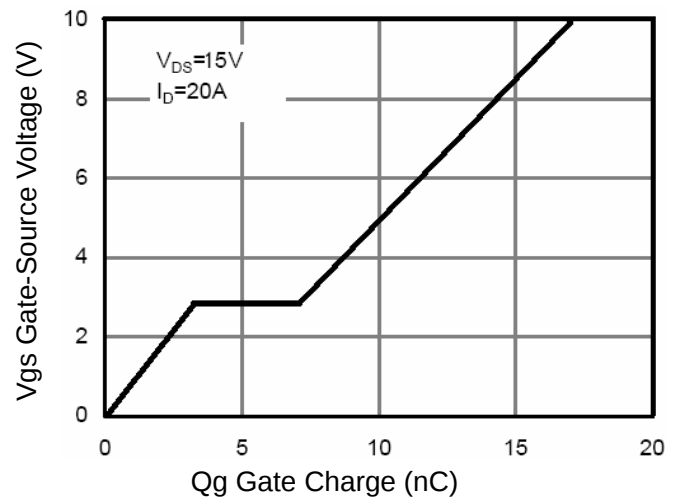


Figure 5 Gate Charge

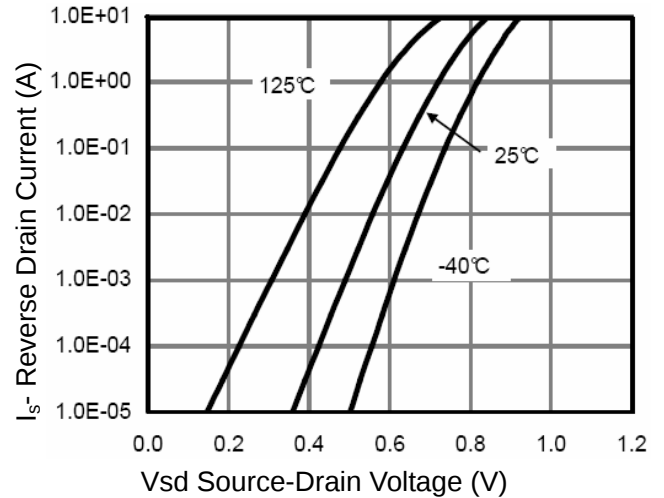


Figure 6 Source- Drain Diode Forward

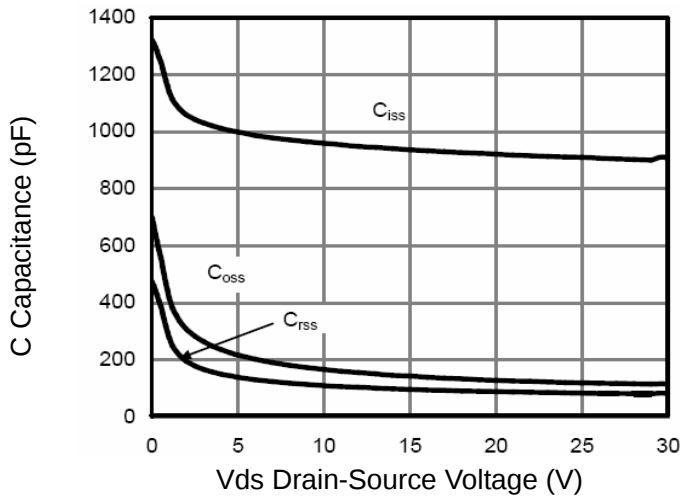


Figure 7 Capacitance vs Vds

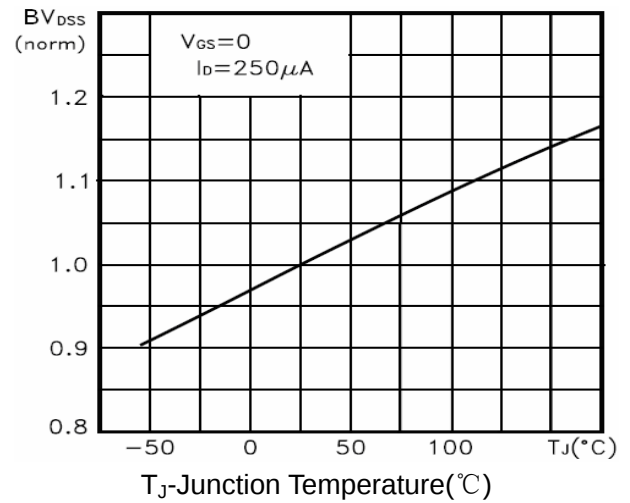


Figure 9 BV_{DSS} vs Junction Temperature

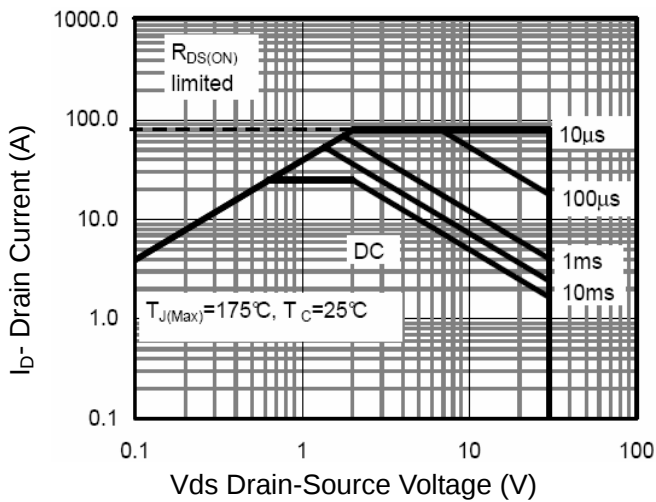


Figure 8 Safe Operation Area

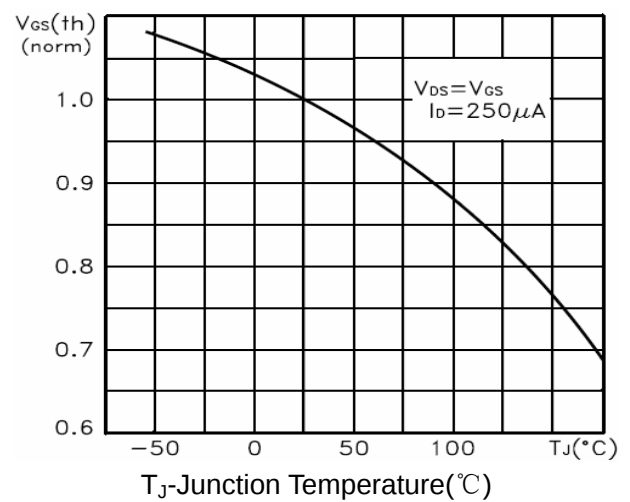


Figure 10 $V_{GS(th)}$ vs Junction Temperature

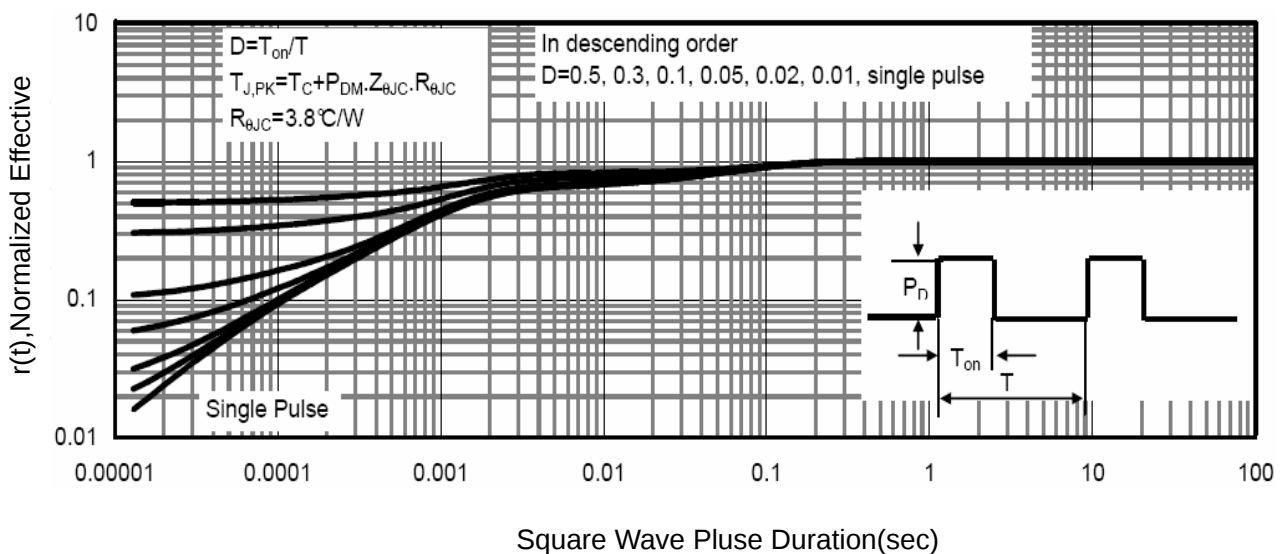
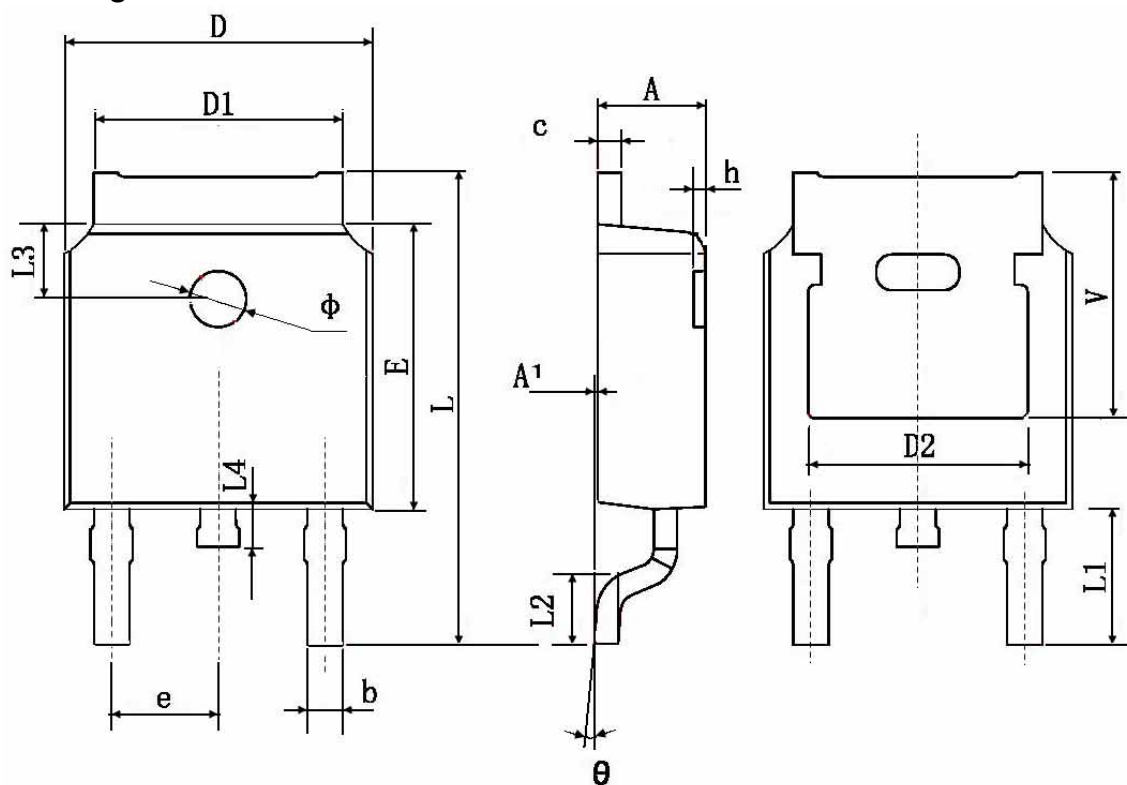


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-252 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
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 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	