

## DESCRIPTION

The MXD20N45 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a wide variety of applications.

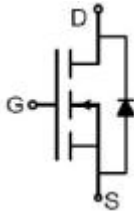
## GENERAL FEATURES

- $V_{DS}=20V$ ,  $I_D=85A$   
 $R_{DS(ON)}(Typ.)=6m\Omega$  @  $V_{GS}=2.5V$   
 $R_{DS(ON)}(Typ.)=3.9m\Omega$  @  $V_{GS}=4.5V$
- High Power and current handling capability
- Lead free product is acquired
- Surface Mount Package

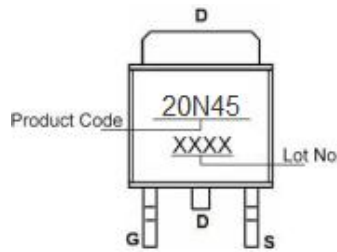
## APPLICATION

- Battery Protection
- Load switch
- Power management

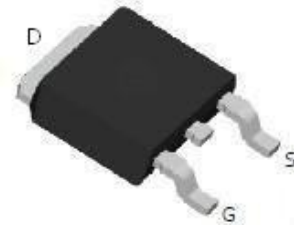
## PINOUT



Schematic diagram



Marking and Pin Assignment



TO-252 top view

## ORDERING INFORMATION

Device	Storage Temperature	Package	Devices Per Reel
MXD20N45	-55°C to 175°C	TO-252	2500

## KEY PERFORMANCE PARAMETERS ( $T_A=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage ( $V_{GS}=0V$ )	$V_{DS}$	20	V
Gate-Source Voltage ( $V_{DS}=0V$ )	$V_{GS}$	$\pm 12$	V
Drain Current-Continuous ( $T_C=25^\circ C$ ) <sup>(Note1)</sup>	$I_D$	85	A
Drain Current-Continuous ( $T_C=100^\circ C$ )	$I_D$	59	A
Drain Current-Continuous@Current-Pulsed <sup>(Note2)</sup>	$I_{DM(pluse)}$	340	A
Maximum Power Dissipation ( $T_C=25^\circ C$ )	$P_D$	87	W
Maximum Power Dissipation ( $T_C=100^\circ C$ )	$P_D$	43	W
Single Pulse Avalanche Energy <sup>(Note3)</sup>	$E_{AS}$	340	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 175	$^\circ C$

## THERMAL CHARACTERISTIC

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2.2	$^\circ C/W$

Notes 1.The maximum current rating is package limited.

Notes 2.Repetitive Rating: Pulse width limited by maximum junction temperature

Notes 3. $E_{AS}$  condition:  $T_J=25^\circ C, V_{DD}=30V, V_G=4.5V, R_G=25\Omega$ ,



**ELECTRICAL CHARACTERISTICS** ( $T_A=25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
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**On/Off Characteristics**

Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	20	25	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=20V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 12V, V_{DS}=0V$	-	-	$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.5	0.7	1.1	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=2.5V, I_D=15A$	-	6	9	m $\Omega$
		$V_{GS}=4.5V, I_D=20A, T_J=125^\circ\text{C}$	-	5.4	8	m $\Omega$
		$V_{GS}=4.5V, I_D=20A, T_J=25^\circ\text{C}$	-	3.9	5.5	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=15A$	-	40	-	S

**Dynamic Characteristics**

Input Capacitance	$C_{iss}$	$V_{DS}=15V, V_{GS}=0V, F=1.0\text{MHz}$	-	2800	-	pF
Output Capacitance	$C_{oss}$		-	353	-	pF
Reverse Transfer Capacitance	$C_{rss}$		-	265	-	pF
Gate resistance	$R_g$	$V_{DS}=0V, V_{GS}=0V, F=1.0\text{MHz}$	-	1.1	-	$\Omega$
Total Gate Charge	$Q_g$	$V_{DS}=10V, I_D=12A, V_{GS}=4.5V$	-	32	-	nC
Gate-Source Charge	$Q_{gs}$		-	3	-	nC
Gate-Drain Charge	$Q_{gd}$		-	11	-	nC

**Switching Characteristics**

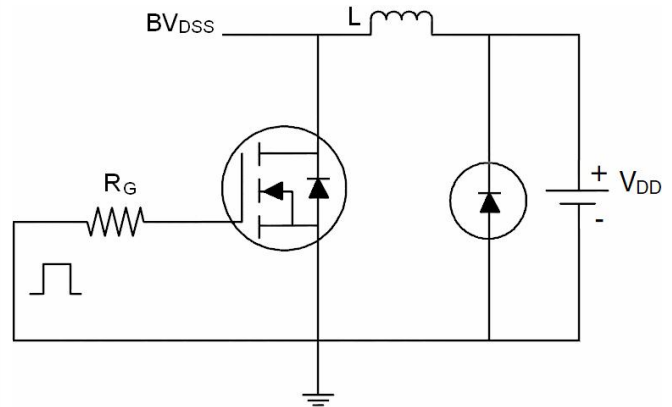
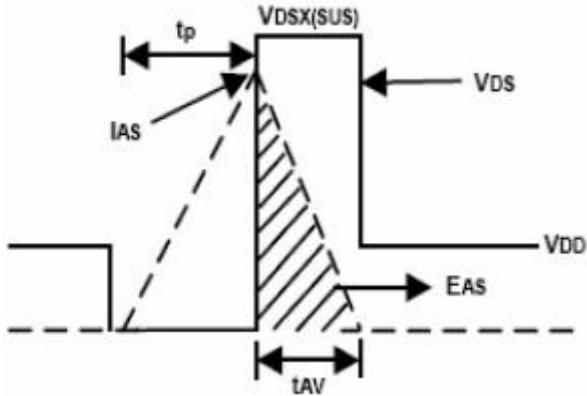
Turn-on Delay Time	$t_{d(on)}$	$V_{DS}=15V, R_L=0.75\Omega, V_{GS}=4.5V, R_{GEN}=3\Omega$	-	17	-	nS
Turn-on Rise Time	$t_r$		-	49	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	74	-	nS
Turn-Off Fall Time	$t_f$		-	26	-	nS

**Source-Drain Diode Characteristics**

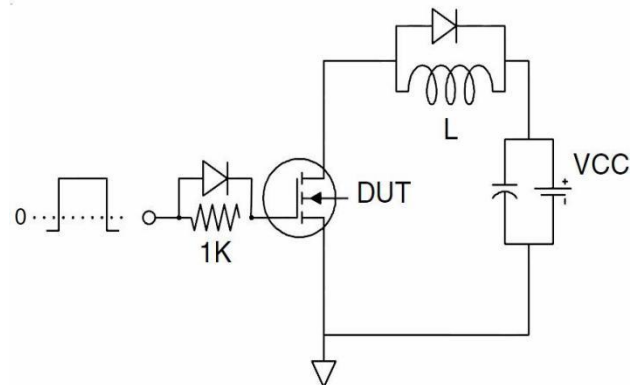
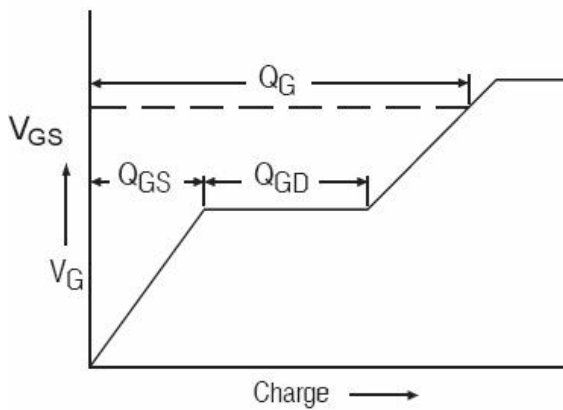
Source-Drain Current(Body Diode)	$I_{SD}$		-	-	85	A
Forward On Voltage	$V_{SD}$	$V_{GS}=0V, I_{SD}=20A$	-	-	1.2	V
Reverse Recovery Time	$t_{rr}$	$I_F=20A, di/dt=100A/\mu s$	-	23	-	nS
Reverse Recovery Charge	$Q_{rr}$		-	10	-	nC

**TEST CIRCUIT**

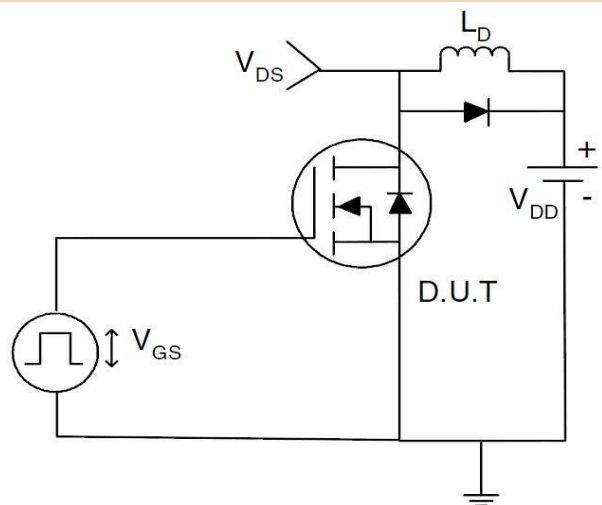
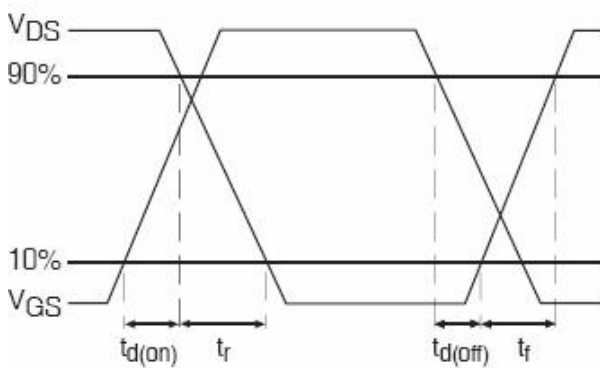
**1) EAS Test Circuits**



**2) Gate Charge Test Circuit**

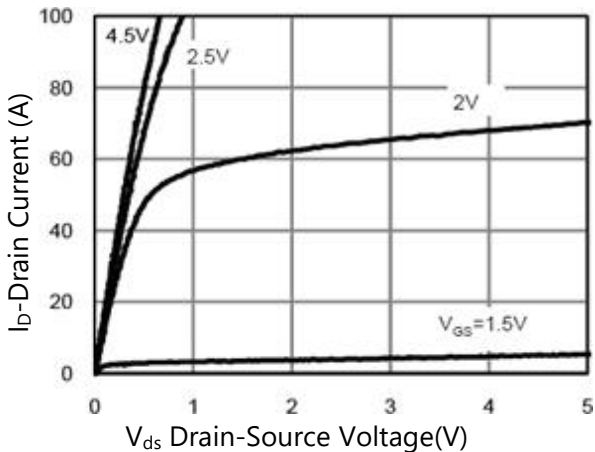


**3) Switch Time Test Circuit**

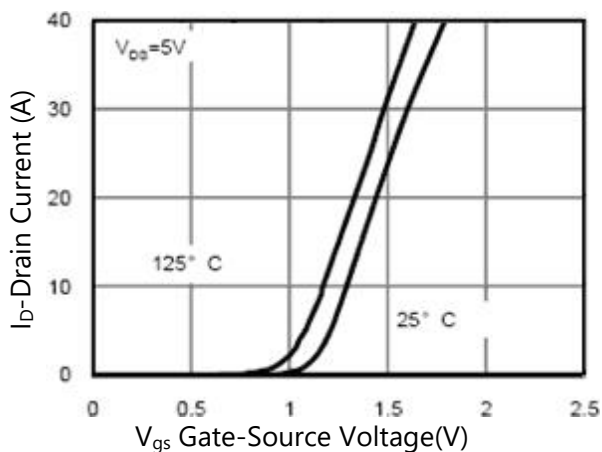


**TYPICAL PERFORMANCE CHARACTERISTICS**

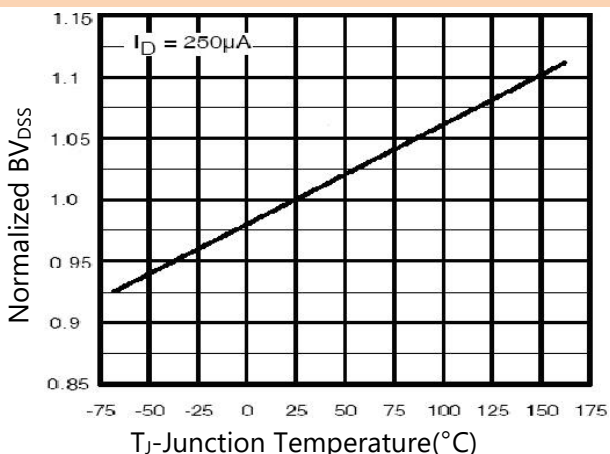
**Figure1. Output Characteristics**



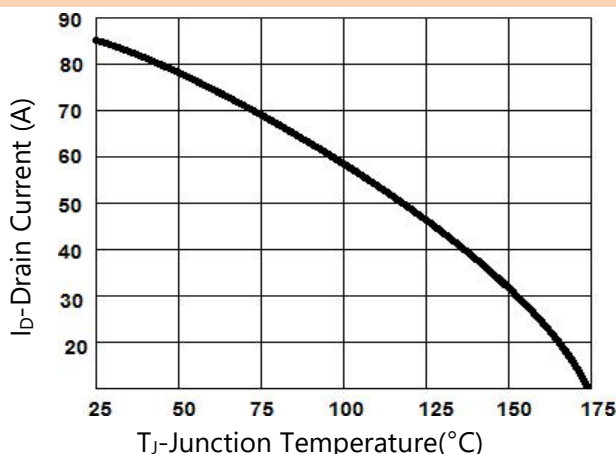
**Figure2. Transfer Characteristics**



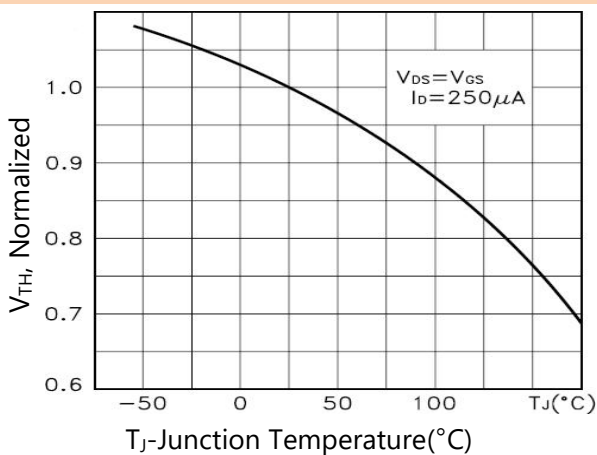
**Figure3.  $BV_{DSS}$  vs Junction Temperature**



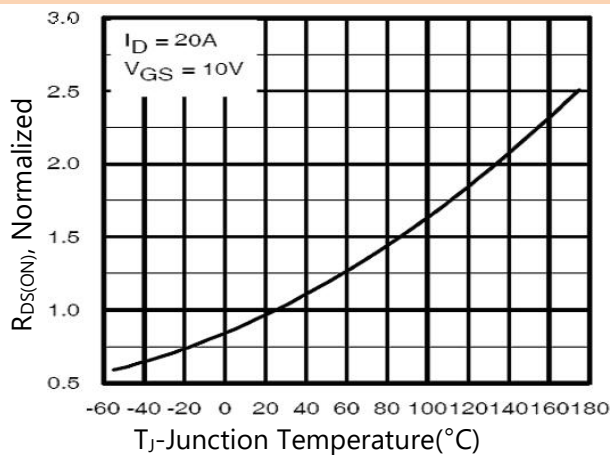
**Figure4. Drain Current**



**Figure5.  $V_{GS(th)}$  vs Junction Temperature**

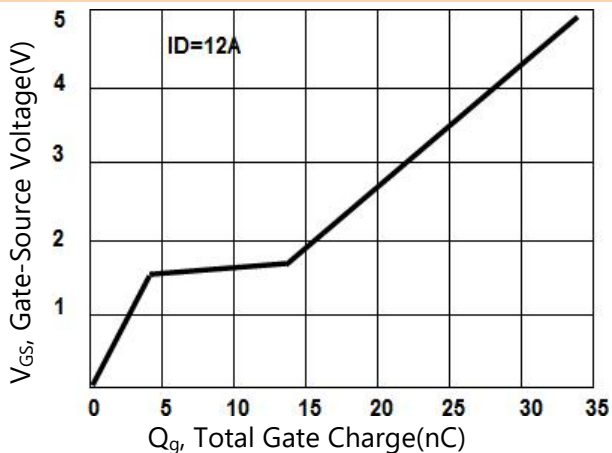


**Figure6.  $R_{DS(ON)}$  vs Junction Temperature**

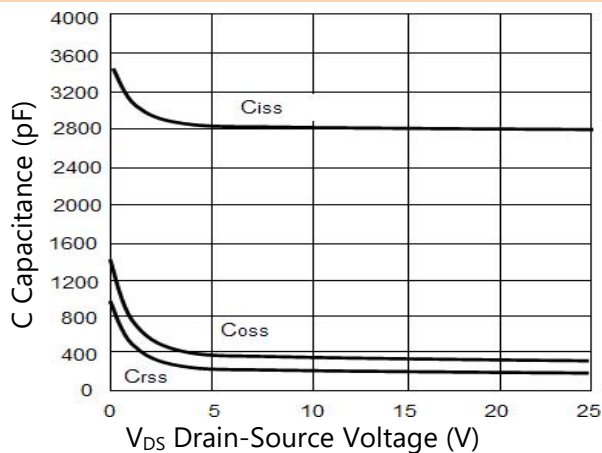


**TYPICAL PERFORMANCE CHARACTERISTICS**

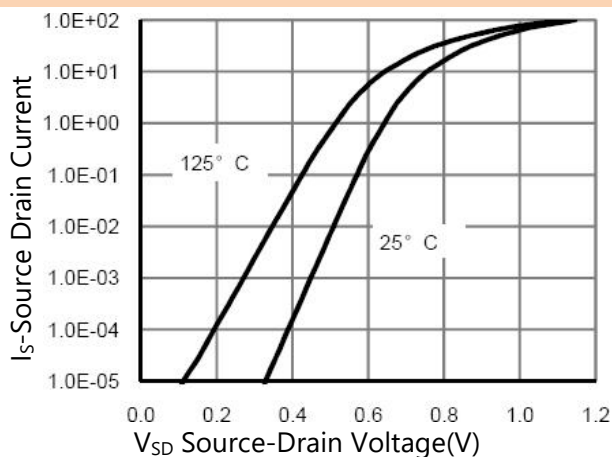
**Figure7. Gate Charge Waveforms**



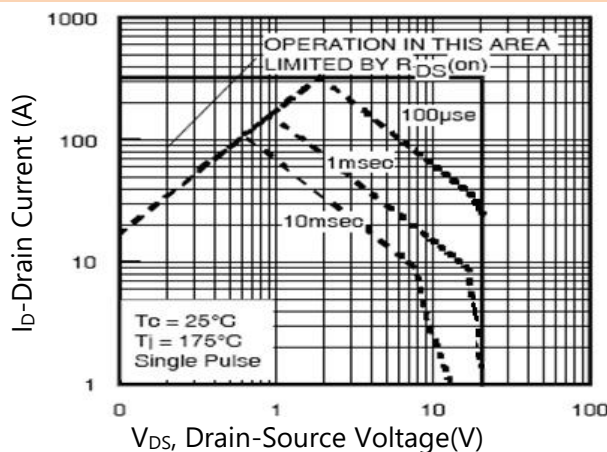
**Figure8. Capacitance**



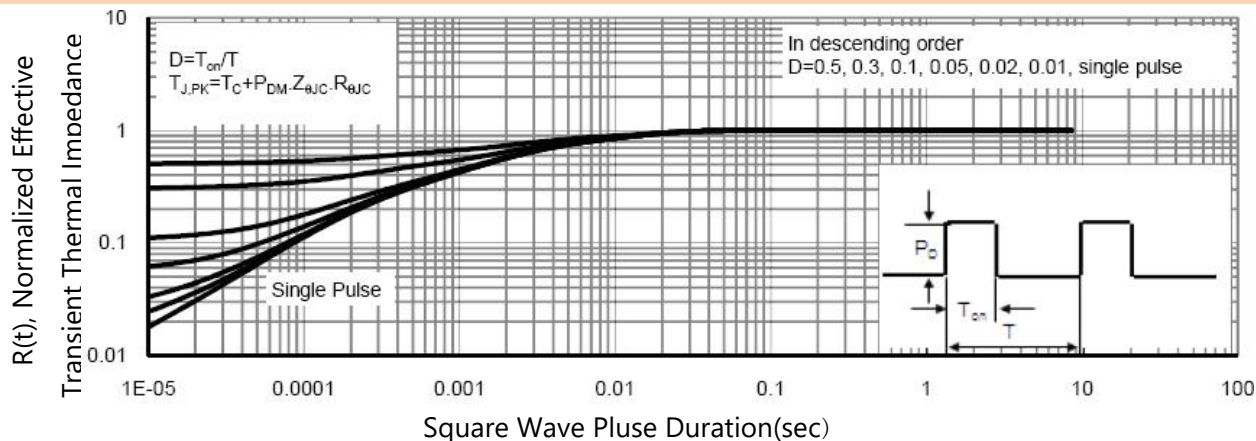
**Figure9. Body Diode Forward**



**Figure10. Maximum Safe Operating Area**

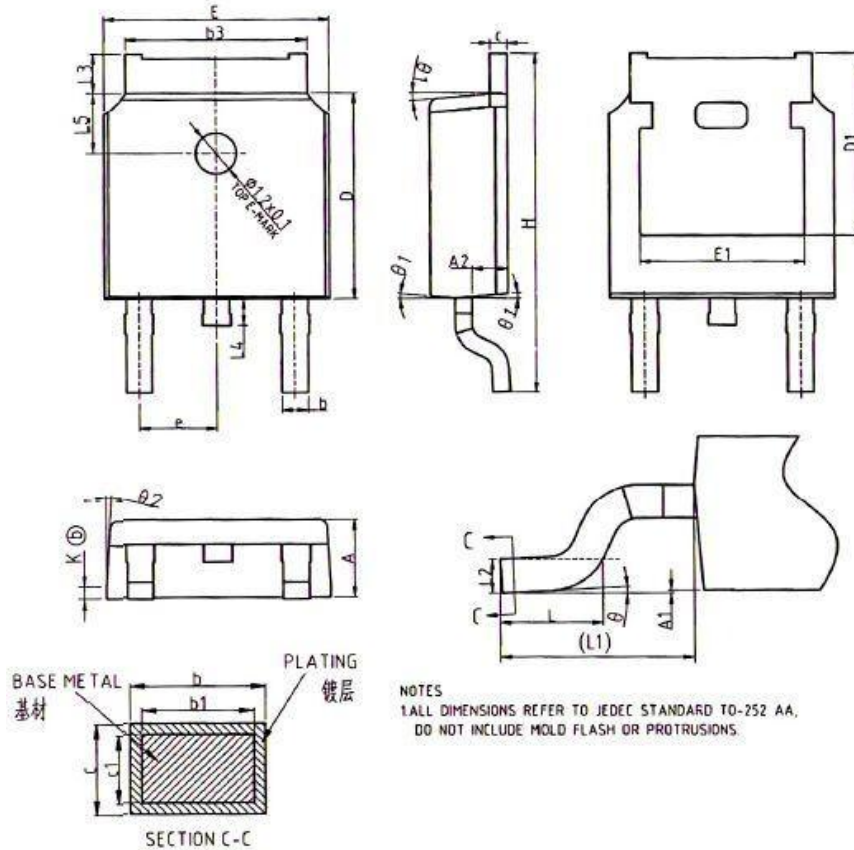


**Figure11. Normalized Maximum Transient Thermal Impedance**



PACKAGE INFORMATION

TO-252



SYMBOL	COMMON DIMENSIONS IN MILLIMETERS			SYMBOL	COMMON DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX		MIN	NOM	MAX
A	2.20	2.30	2.38	H	9.90	10.10	10.30
A1	0.00	-	0.10	L	1.40	1.50	1.70
A2	0.97	1.07	1.17	L1	2.90REF		
b	0.72	0.78	0.85	L2	0.51BSC		
b1	0.71	0.76	0.81	L3	0.90	-	1.25
b3	5.23	5.33	5.46	L4	0.60	0.80	1.00
c	0.47	0.53	0.58	L5	1.70	1.80	1.90
c1	0.46	0.51	0.56	θ	0°	-	8°
D	6.00	6.10	6.20	θ1	5°	7°	9°
D1	5.30REF			θ2	5°	7°	9°
E	6.50	6.60	6.70	K	0.40REF		
E1	4.70	4.83	4.92				
e	2.286BSC						