N-Channel Enhancement Mode Power MOSFET

Description

The GC20N65MA uses advanced super junction technology and design to provide excellent Ros(on), low gate charge and operation. This device is suitable for industry's AC-DC SMPS requirement for PFC, AC/DC power conversion, and industrial power application.

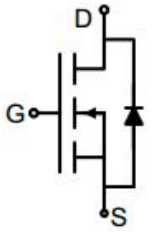
AEC-Q101 Qualified

General Features

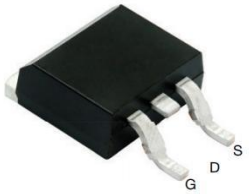
- V_{DS} 650V
- I_D (at V_{GS} = 10V) 20A
- $R_{DS(ON)}$ (at V_{GS} = 10V) < 180mΩ
- 100% Avalanche Tested
- RoHS Compliant

Application

- Power switch
- DC/DC converters



Schematic diagram



TO-263

Ordering Information

Device	Package	Marking	Packaging
GC20N65MA	TO-263	GC20N65	800pcs/Tube

Absolute Maximum Ratings T_C = 25ºC, unless otherwise noted

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	650	V
Continuous Drain Current	T_C = 25ºC	I_D	20	A
	T_C = 100ºC		13	
Pulsed Drain Current (note1)		I_{DM}	60	A
Gate-Source Voltage		V_{GS}	±30	V
Power Dissipation		P_D	151	W
Single pulse avalanche energy （note2）		E_{AS}	245	mJ
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 To 150	ºC

Thermal Resistance

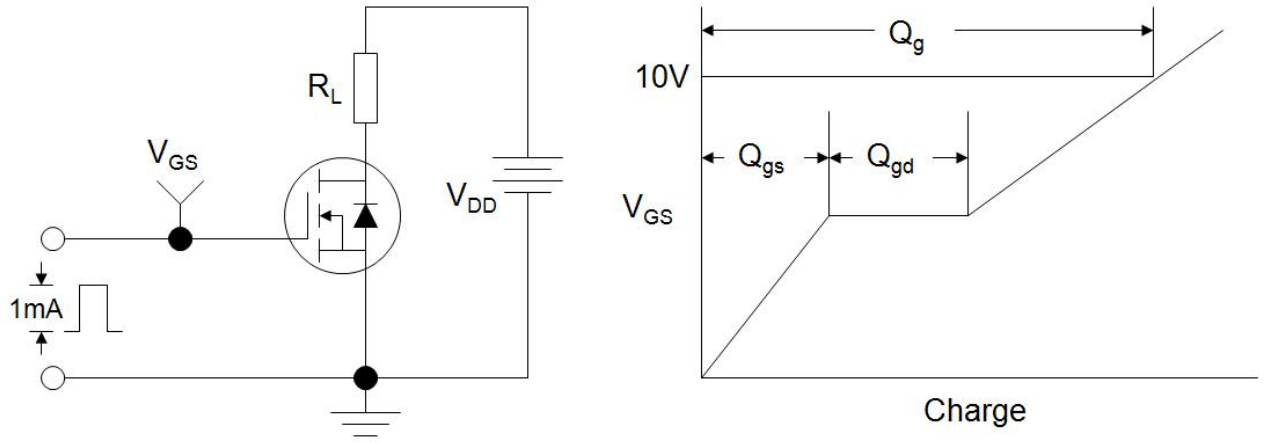
Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Ambient	R_{thJA}	60	ºC/W
Maximum Junction-to-Case	R_{thJC}	0.83	ºC/W

Specifications T_J = 25ºC, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Value**			**Unit**
			Min.	**Typ.**	**Max.**	
Static Parameters						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	650	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} =650 V, V_{GS} = 0V	--	--	1	μA
Gate-Source Leakage	I_{GSS}	V_{GS} = ±30V	--	--	±100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	3.0	4.0	5.0	V
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS} = 10V, I_D = 10A	--	148	180	mΩ
Forward Transconductance	g_{FS}	V_{GS} = 5V, I_D = 10A	--	17	--	S
Dynamic Parameters						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = 400V, f = 1.0MHz	--	1680	--	pF
Output Capacitance	C_{oss}		--	38	--	
Reverse Transfer Capacitance	C_{rss}		--	0.6	--	
Total Gate Charge	Q_g	V_{DD} = 400V, I_D = 10A, V_{GS} = 10V	--	28	--	nC
Gate-Source Charge	Q_{gs}		--	11	--	
Gate-Drain Charge	Q_{gd}		--	7	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 400V, I_D = 10A, R_G = 4Ω	--	9	--	ns
Turn-on Rise Time	t_r		--	5	--	
Turn-off Delay Time	$t_{d(off)}$		--	47	--	
Turn-off Fall Time	t_f		--	3.5	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	T_C = 25ºC	--	--	20	A
Body Diode Voltage	V_{SD}	T_J = 25ºC, I_{SD} = 10A, V_{GS} = 0V	--	--	1.2	V
Reverse Recovery Charge	Qrr	I_F = 10A, V_{GS} = 0V di/dt=100A/us	--	1.1	--	μC
Reverse Recovery Time	Trr		--	123	--	ns

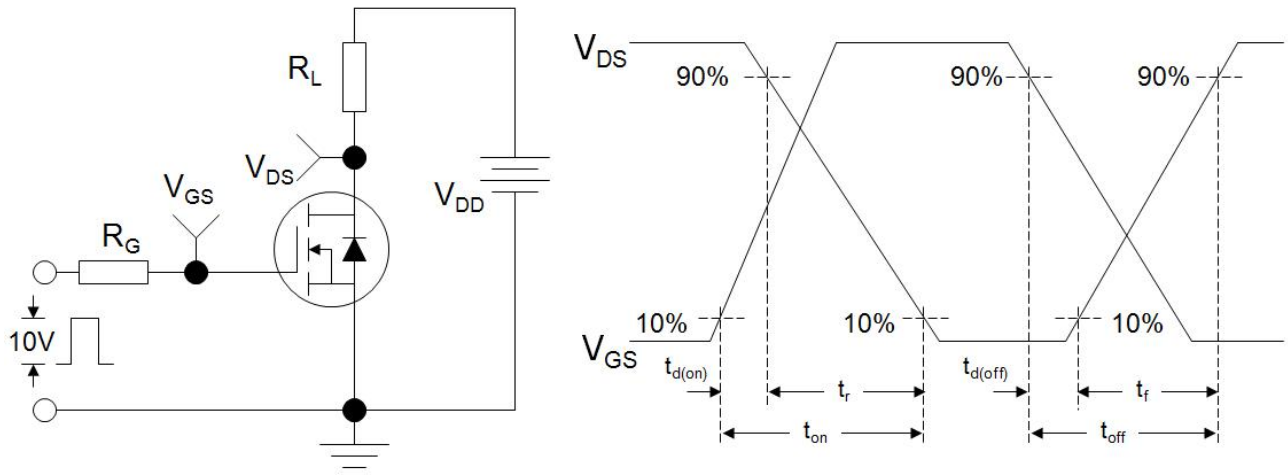
Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. EAS condition : Tj=25℃ ,VDD=50V,VGS=10V,L=10mH,Rg=25Ω
   The table shows the minimum avalanche energy, which is 673mJ when the device is tested until failure
3. Identical low side and high side switch with identical R_G

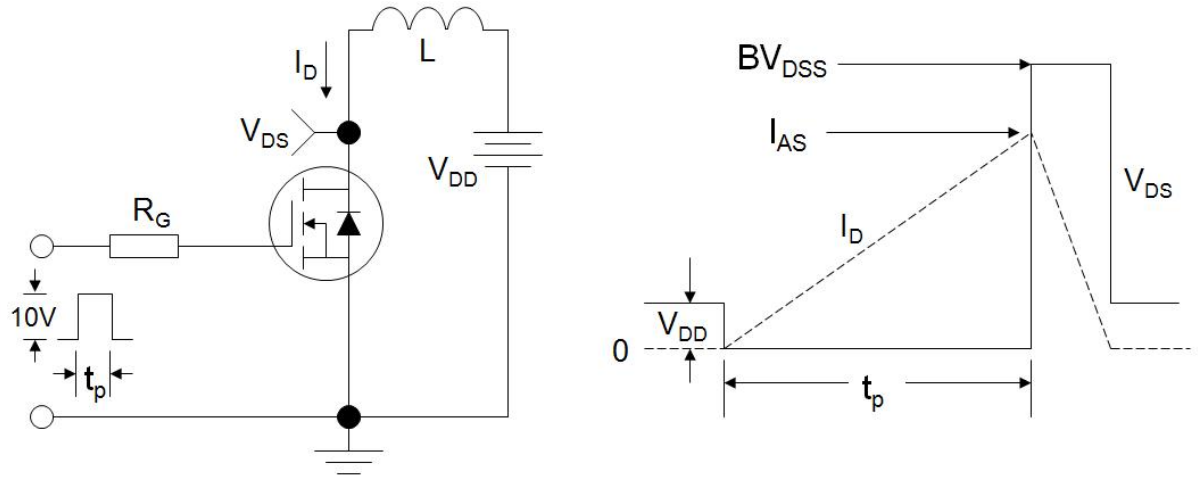
Gate Charge Test Circuit



Switch Time Test Circuit



EAS Test Circuit



Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 1. Output Characteristics

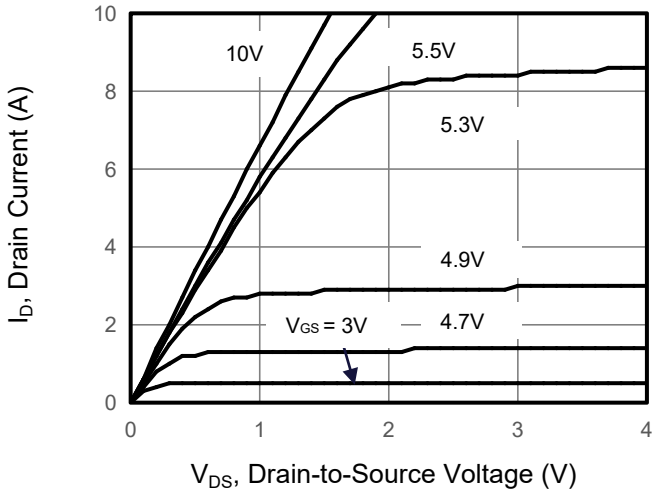


Figure 2. Transfer Characteristics

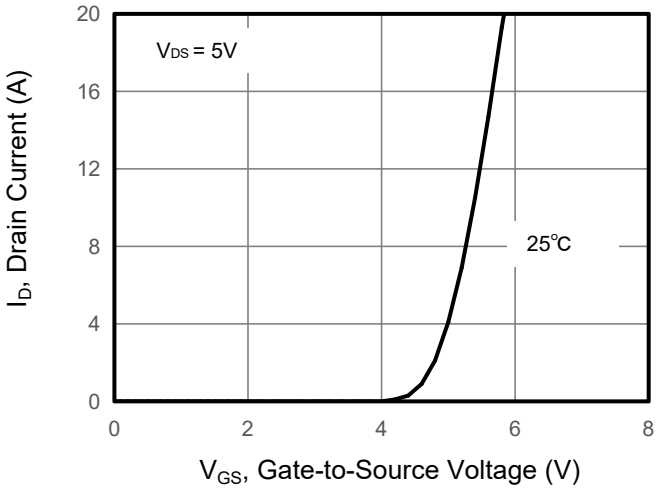


Figure 3. Drain Source On Resistance

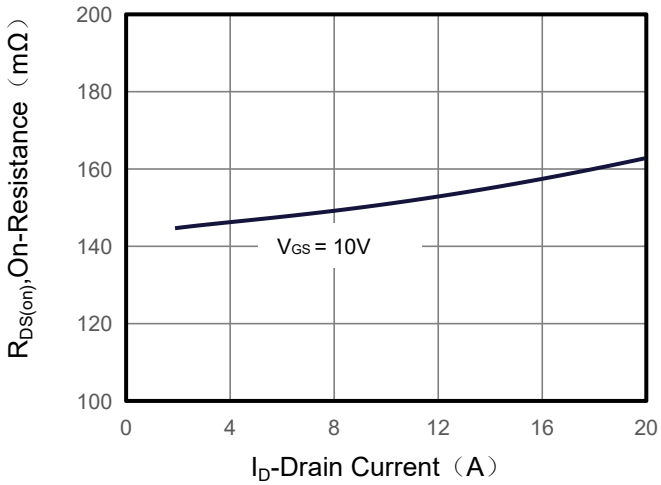


Figure 4. Gate Charge

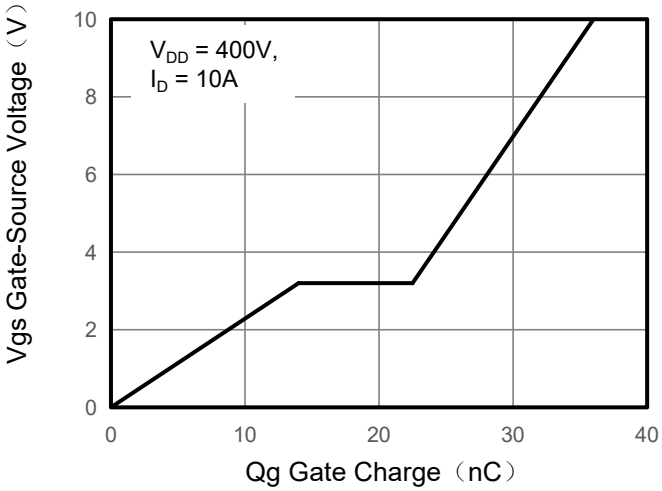


Figure 5. Capacitance

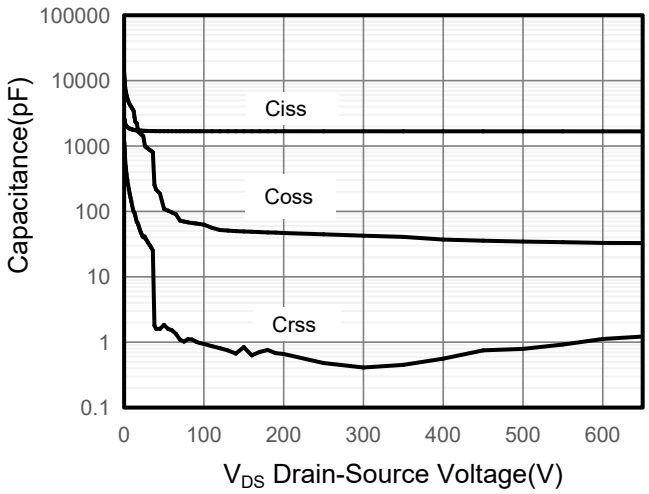
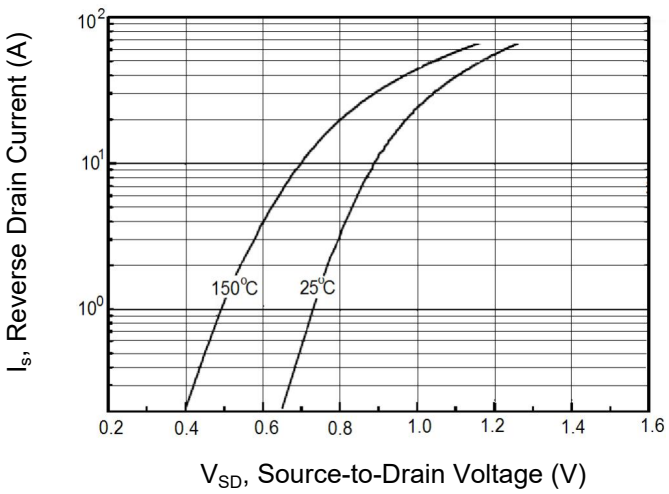


Figure 6. Source-Drain Diode Forward



Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 7. Drain-Source On-Resistance

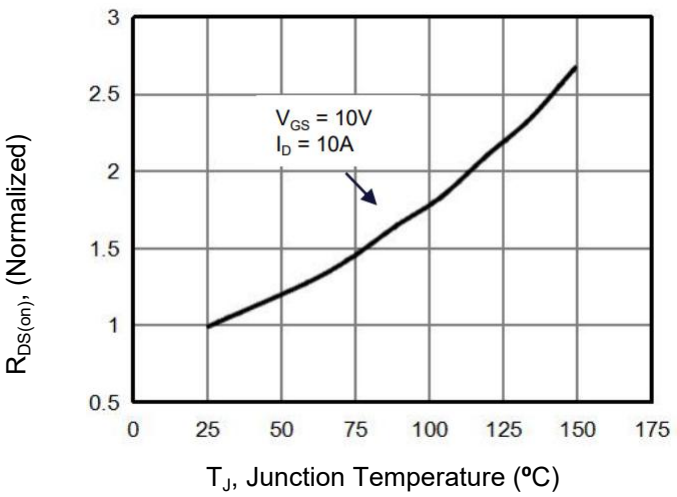


Figure 8. Safe Operation Area

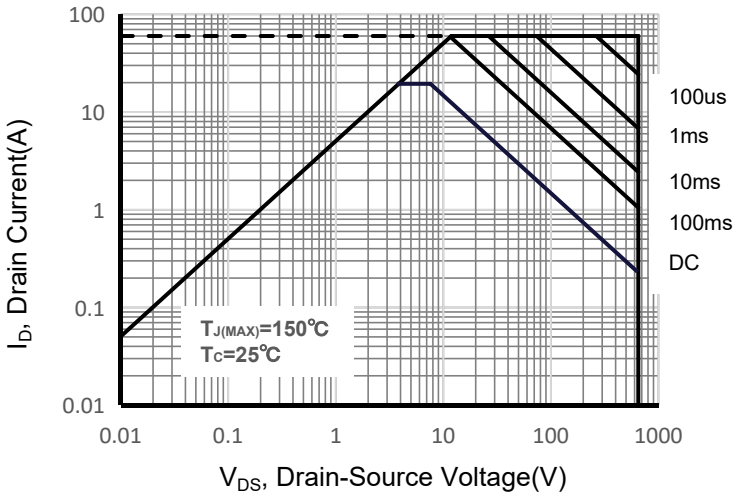


Figure 9. Maximum Continuous Drain Current vs Case Temperature

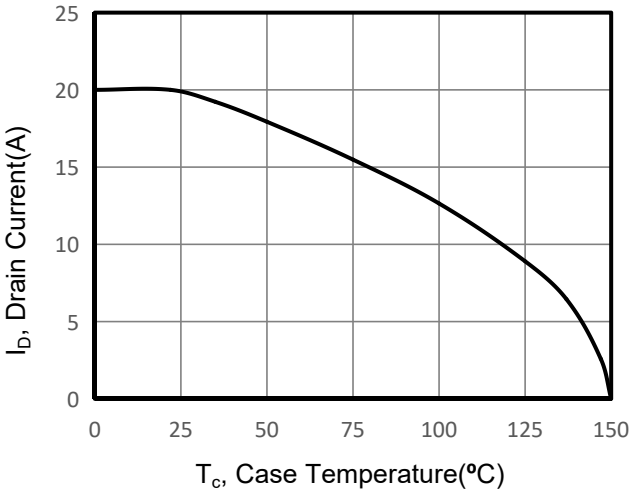
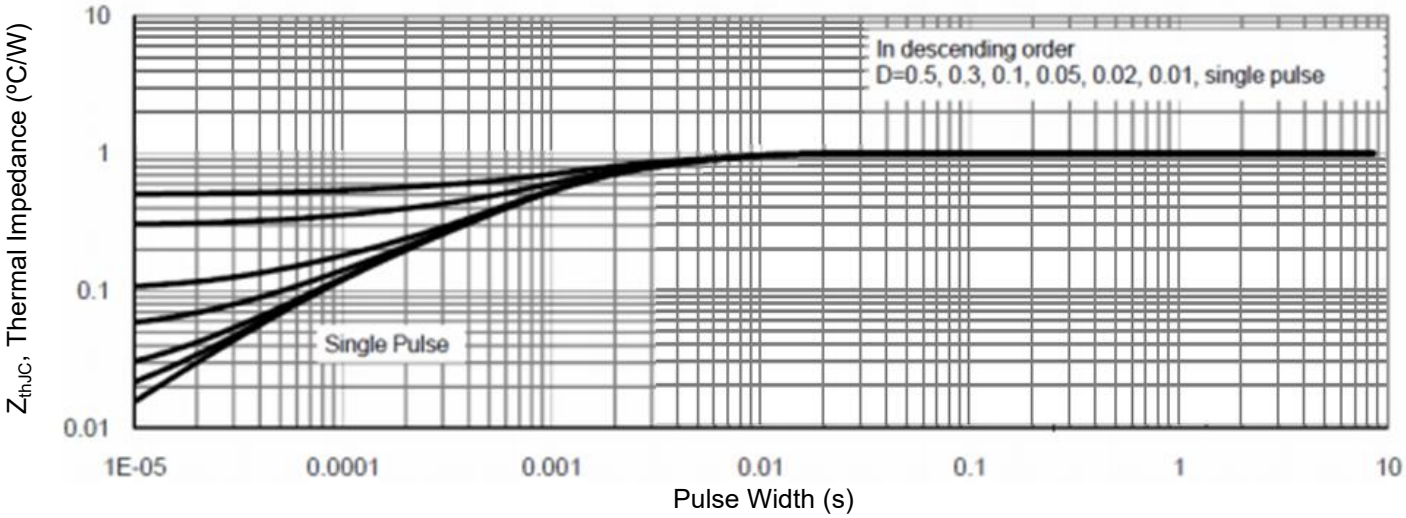
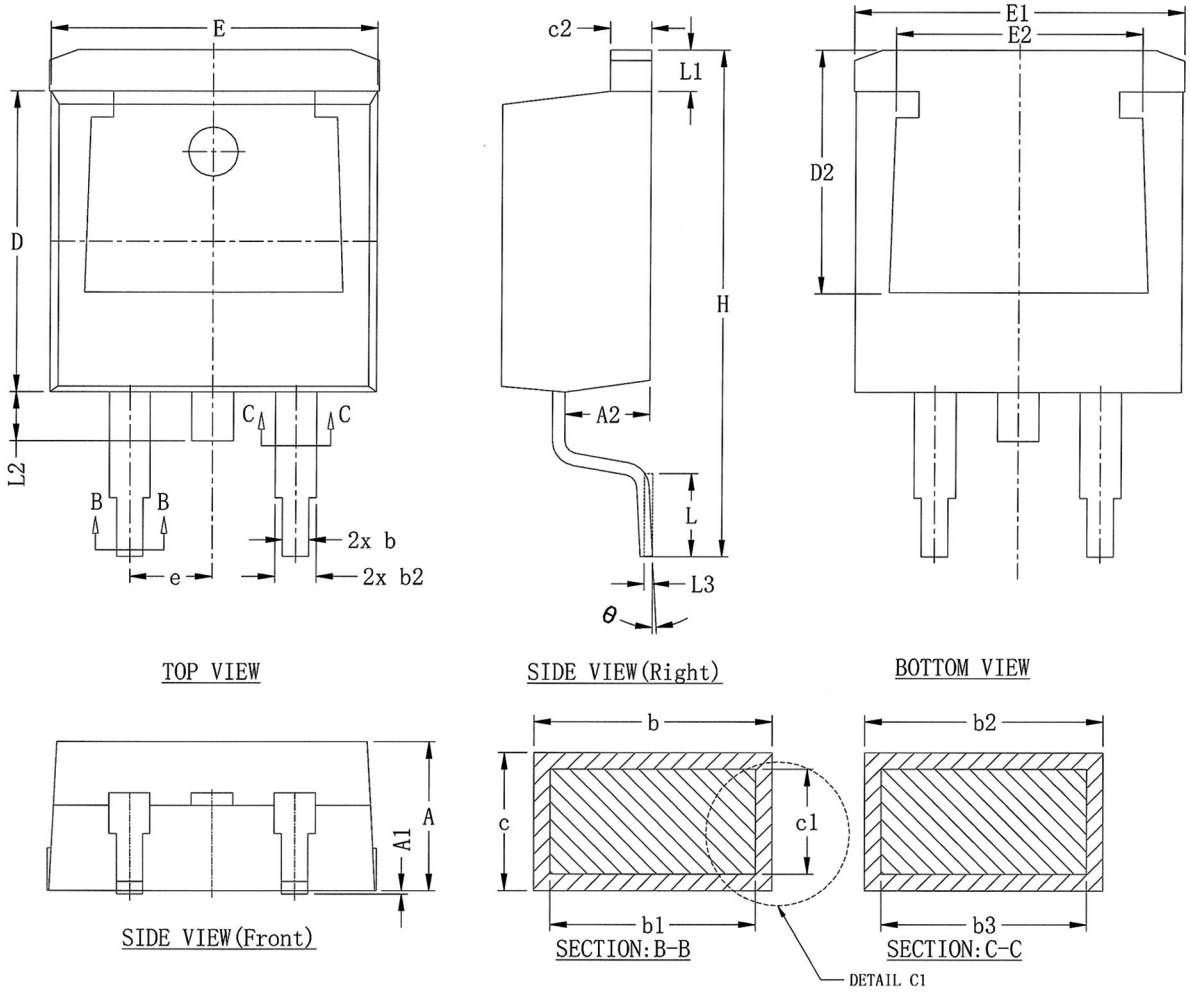


Figure 10. Normalized Maximum Transient Thermal Impedance



TO-263 Package information



DIM / SYMBOL	MIN.	NOM.	MAX.	DIM / SYMBOL	MIN.	NOM.	MAX.
A	4.450	4.550	4.650	D2	7.215	7.415	7.615
A1	0.000	———	0.150	E	9.900	10.000	10.100
A2	2.500	2.600	2.700	E1	9.900	10.100	10.300
b	0.753	0.853	0.953	E2	7.341	7.541	7.741
b1	0.713	0.813	0.913	e	2.540 BSC.		
b2	1.210	1.310	1.410	H	15.300	15.500	15.700
b3	1.170	1.270	1.370	L	2.340	2.540	2.740
c	0.330	0.421	0.521	L1	1.066	1.266	1.466
c1	0.281	0.381	0.481	L2	1.400	1.500	1.600
c2	1.210	1.310	1.410	L3	0.254 BSC.		
D	9.100	9.200	9.300	θ	0°	---	5°