P-Channel Enhancement Mode Power MOSFET

Description

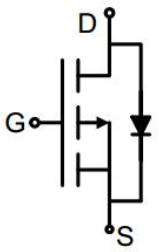
The G040P04M uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge. It can be used in a wide variety of applications.

General Features

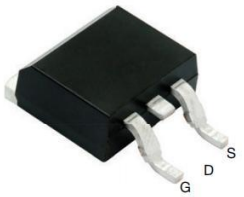
- V_{DS} -40V
- I_D (at V_{GS} = -10V) -180A
- $R_{DS(ON)}$ (at V_{GS} = -10V) < 3.5mΩ
- $R_{DS(ON)}$ (at V_{GS} = -4.5V) < 4.5mΩ
- 100% Avalanche Tested
- RoHS Compliant

Application

- Power switch
- DC/DC converters



Schematic diagram



TO-263

Ordering Information

Device	Package	Marking	Packaging
G040P04M	TO-263	G040P04	800pcs/Reel

Absolute Maximum Ratings T_C = 25ºC, unless otherwise noted

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	-40	V
Continuous Drain Current	T_C = 25ºC	I_D	-180	A
	T_C = 100ºC		-114	
Pulsed Drain Current (note1)		I_{DM}	-720	A
Gate-Source Voltage		V_{GS}	±20	V
Power Dissipation		P_D	178	W
Single pulse avalanche energy (note2)		E_{AS}	625	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}	50	ºC/W
Thermal Resistance, Junction-to-Case	R_{thJC}	0.7	ºC/W

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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	-40	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = -40V, V_{GS} = 0V	--	--	-1	μA
Gate-Source Leakage	I_{GSS}	V_{GS} = ±20V	--	--	±100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = -250μA	-1.0	-1.6	-2.5	V
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS} = -10V, I_D = -15A	--	2.9	3.5	mΩ
		V_{GS} = -4.5V, I_D = -15A	--	3.7	4.5	
Forward Transconductance	g_{FS}	V_{DS} = -5V, I_D = -15A	--	44	--	S
Dynamic Parameters						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = -20V, f = 1.0MHz	--	13500	--	pF
Output Capacitance	C_{oss}		--	1900	--	
Reverse Transfer Capacitance	C_{rss}		--	1400	--	
Total Gate Charge	Q_g	V_{DD} = -20V, I_D = -15A, V_{GS} = -10V	--	270	--	nC
Gate-Source Charge	Q_{gs}		--	40	--	
Gate-Drain Charge	Q_{gd}		--	48	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = -20V, I_D = -15A, R_G = 1.6Ω	--	44	--	ns
Turn-on Rise Time	t_r		--	49	--	
Turn-off Delay Time	$t_{d(off)}$		--	138	--	
Turn-off Fall Time	t_f		--	44	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	T_C = 25ºC	--	--	-180	A
Body Diode Voltage	V_{SD}	T_J = 25ºC, I_{SD} = -15A, V_{GS} = 0V	--	--	-1.2	V
Reverse Recovery Charge	Q_{rr}	I_F = -15A, V_{GS} = 0V di/dt=-100A/us	--	198	--	nC
Reverse Recovery Time	T_{rr}		--	77	--	ns

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. EAS condition : Tj=25℃ ,VDD=-40V,VGS=-10V,L=0.5mH,Rg=25Ω
   The table shows the minimum avalanche energy, which is 1722mJ when the device is tested until failure
3. Identical low side and high side switch with identical R_G

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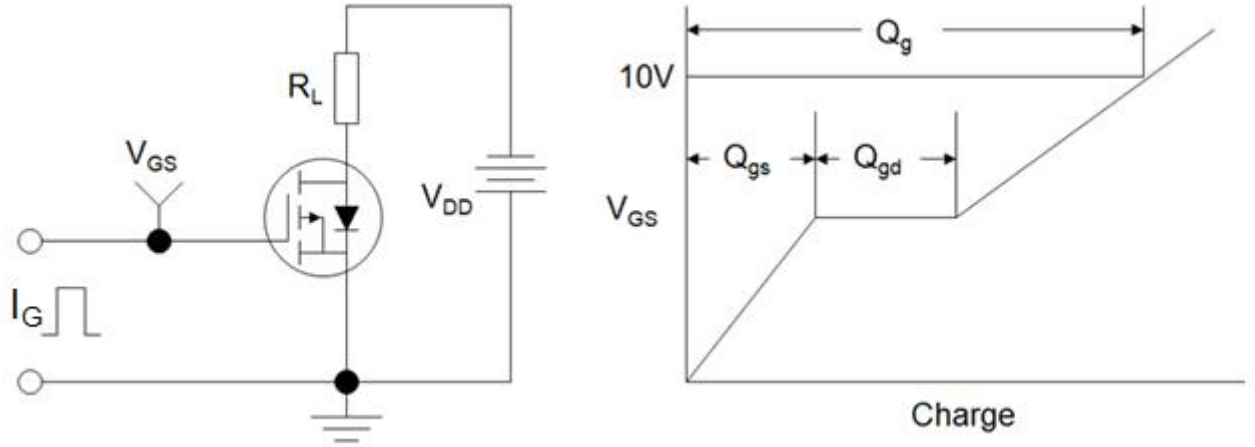
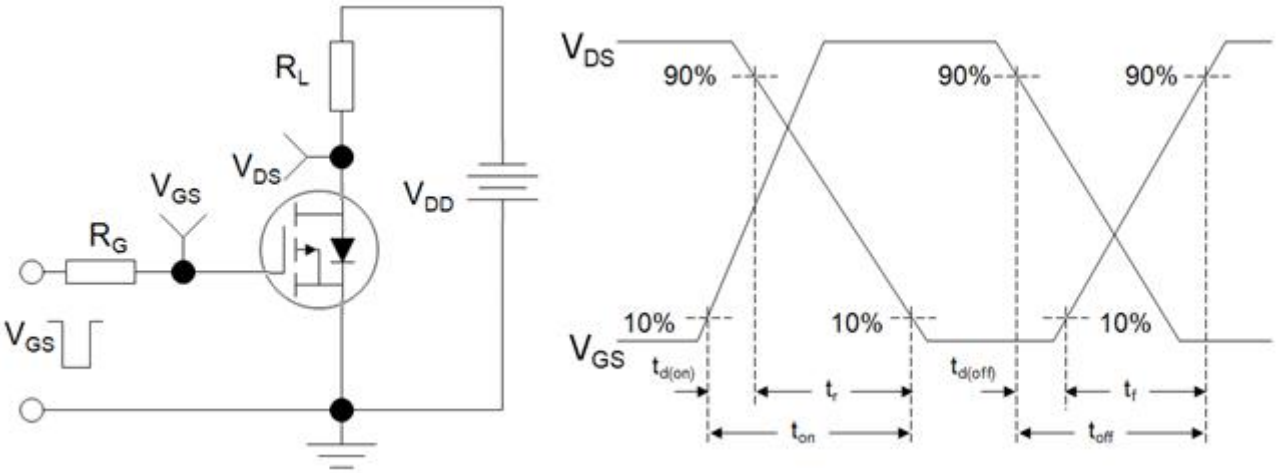
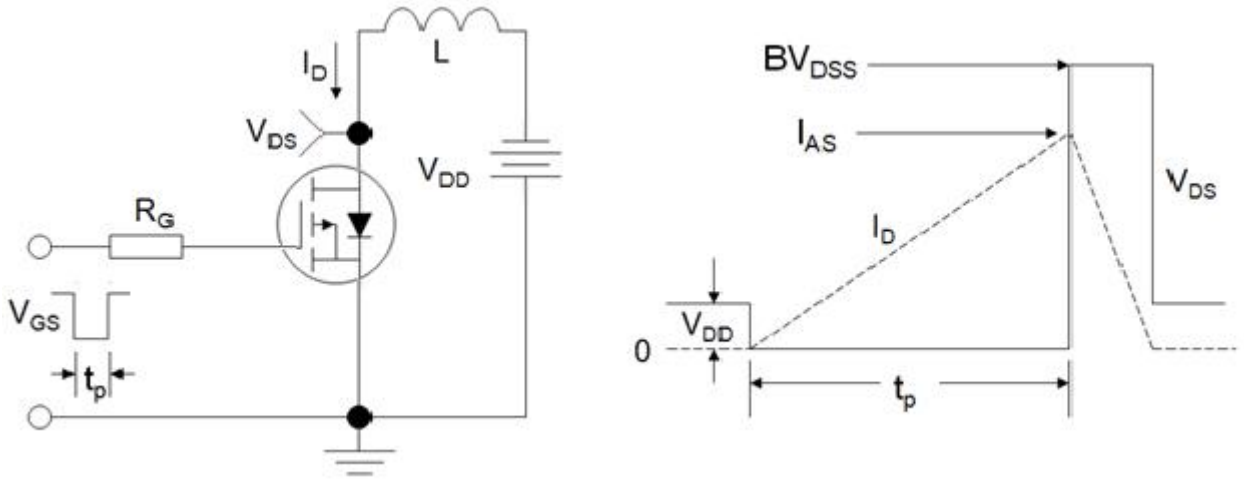
Gate Charge Test Circuit



Switch Time Test Circuit



EAS Test Circuit



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Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 1. Output Characteristics

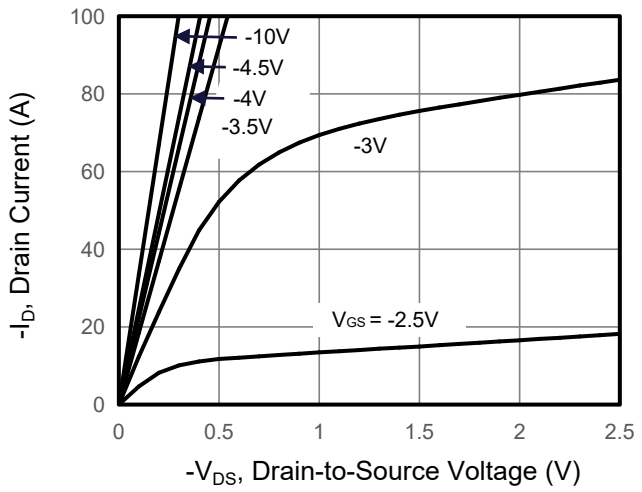

Figure 2. Transfer Characteristics

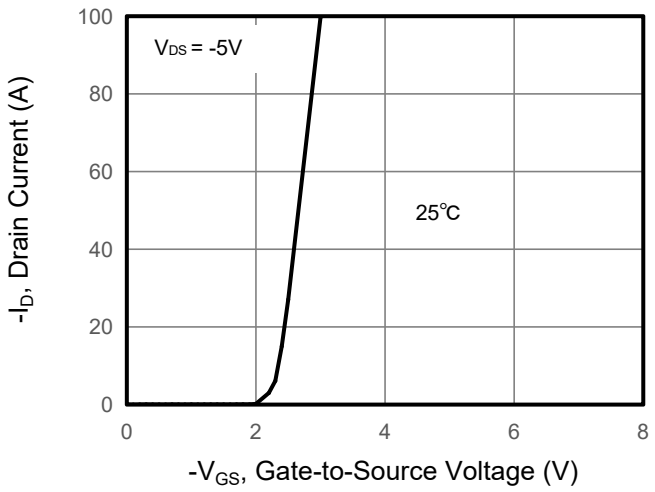

Figure 3.Drain Source On Resistance

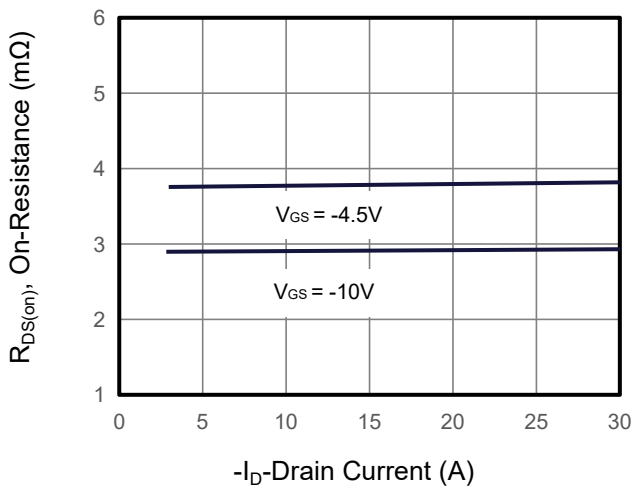

Figure 4. Gate Charge

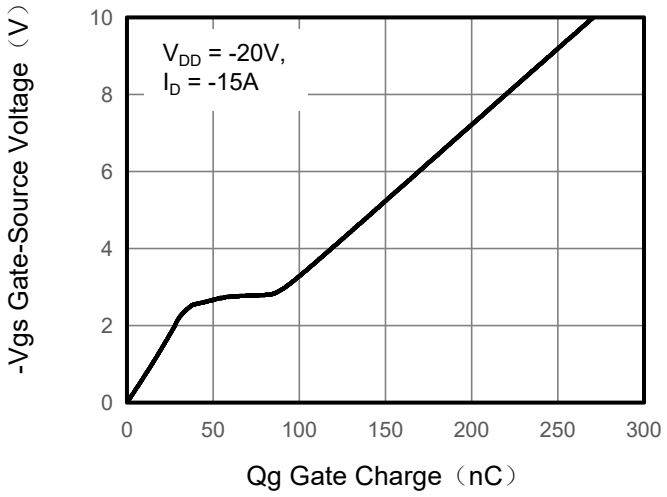

Figure 5. Capacitance

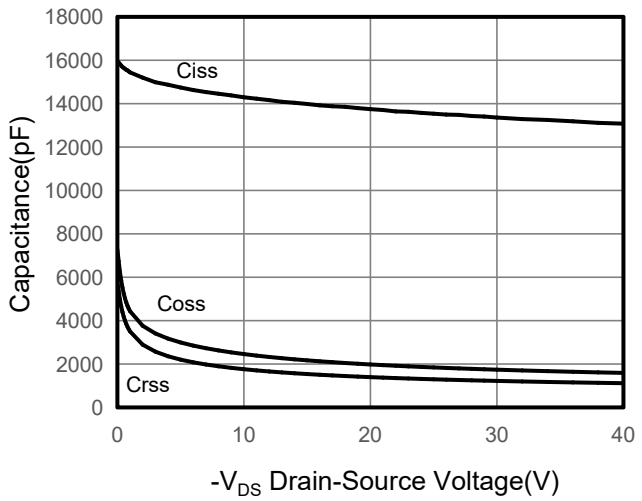

Figure 6. Source-Drain Diode Forward

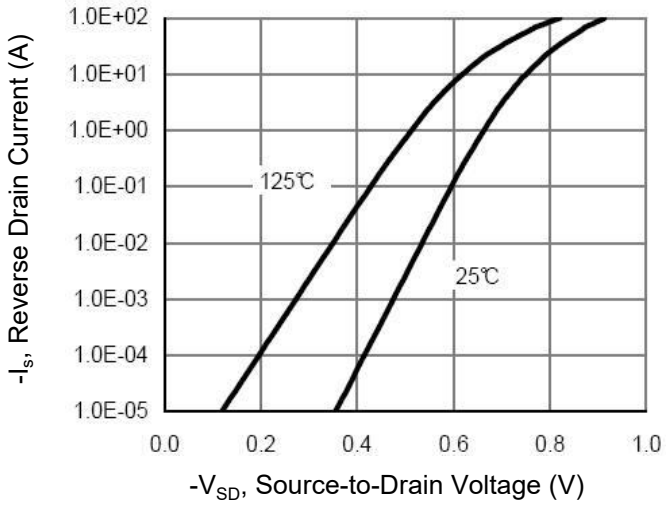

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Figure 7. Drain-Source On-Resistance

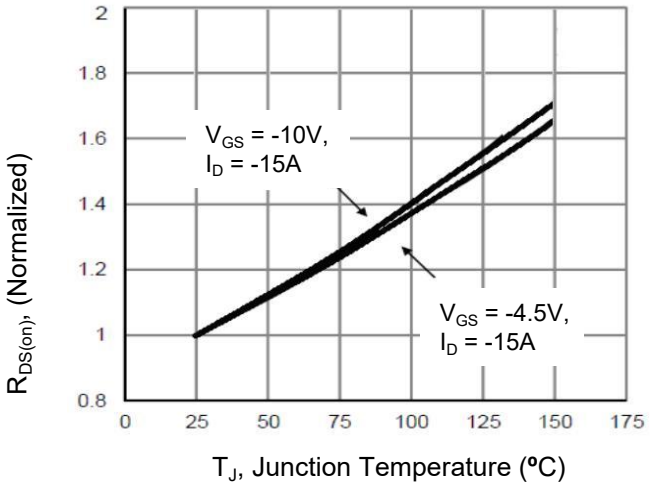


Figure 8. Safe Operation Area

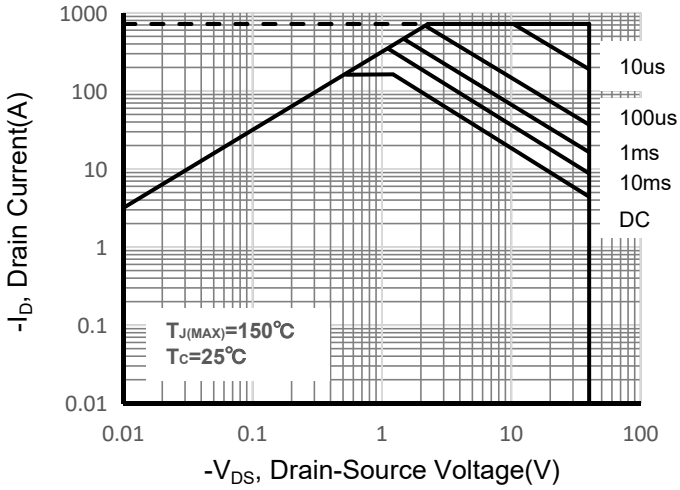


Figure 9. Maximum Continuous Drain Current vs Case Temperature

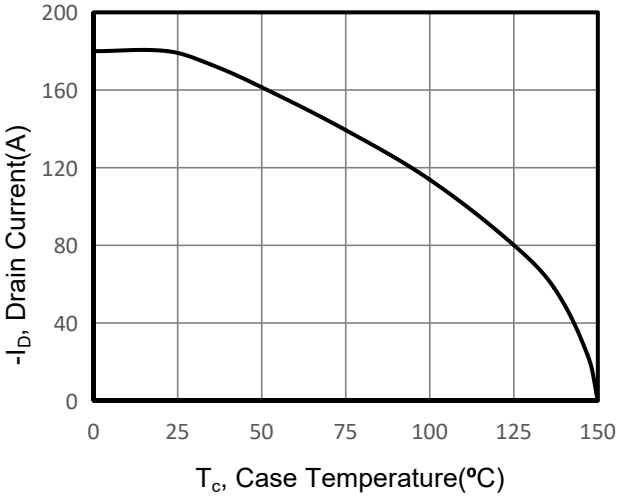
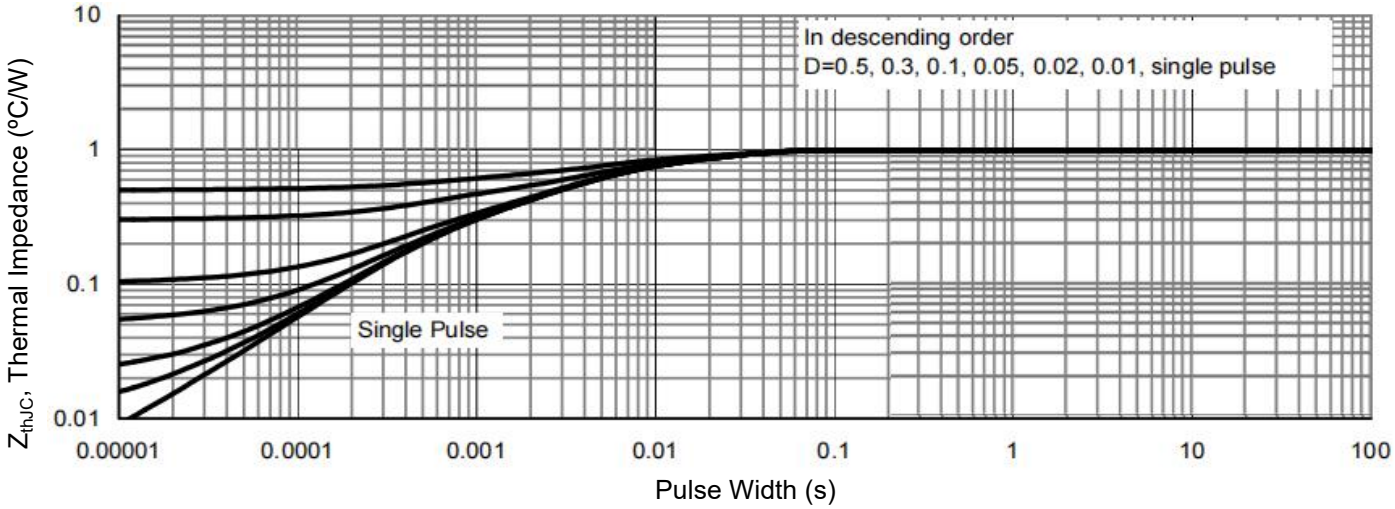


Figure 10. Normalized Maximum Transient Thermal Impedance



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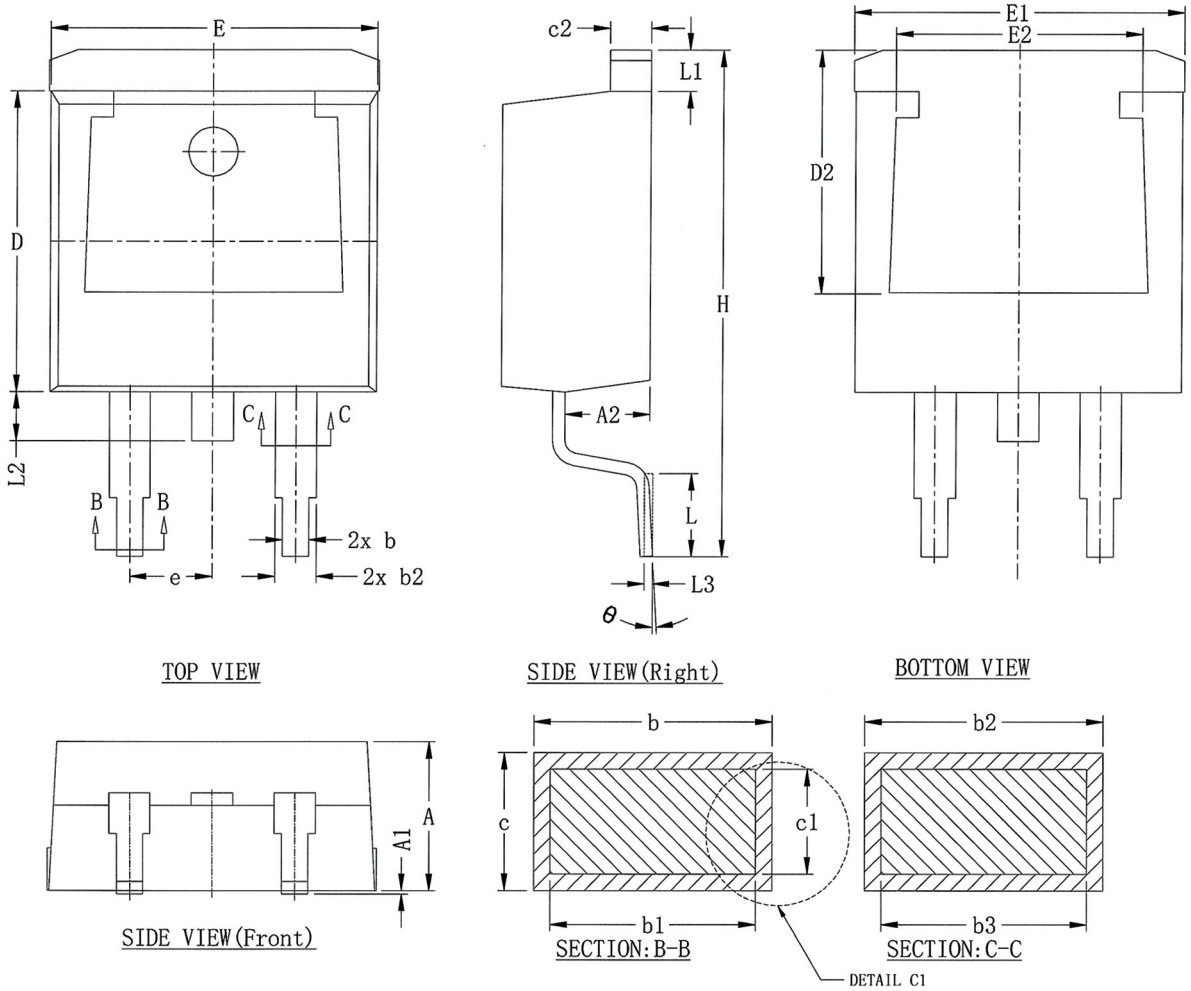
TO-263 Package Information



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°

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