N-Channel Super Junction Power MOSFET

Description

IRF600R65C is power MOSFET using advanced super junction technology that can realize very low on-resistance and gate charge. It will provide much high efficiency by using optimized charge coupling technology. These user friendly devices give an advantage of low EMI to designers as well as low switching loss.

I_D	7A
V_{DSS}	650V
$R_{dson(max)}$	0.6Ω(V_{GS}=10V, I_D=3.5A)
Q_g	25nC

General Features

● 7A,650V,$R_{DS(on)(max)}$= 0.6ohm@V_{GS}=10V
● Low Gate charge
● Low Crss
● Fast Switching
● Improved dv/dt Capability

Application

● Power switching application
● Hard switched and high frequency circuits
● Uninterruptible power supply
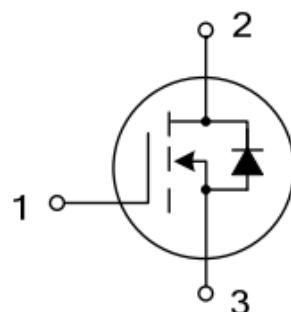
1.Gate 2.Drain 3.Source

TO-220   TO-220F
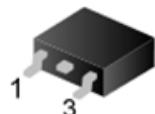
TO-252

Order Information

Order Information	Marking ID	Package	Packing Type Supplied As
SM600R65CT9RL	600R65C	TO252-2L	3000 Units on Reel
SM600R65CT2TL	600R65C	TO220F-3L	1000 units on Box、5000 units on Carton
SM600R65CT1TL	600R65C	TO220-3L	1000 units on Box、5000 units on Carton

Absolute Maximum Ratings Ta=25 ºC unless otherwise noted

Parameter		Symbol	Value	Unit
Drain-source Voltage		V_{DS}	650	V
Gate-source Voltage		V_{GS}	±30	V
Continuous Drain Current(Ta=25℃)		I_D	7	A
Drain Current-Pulsed		I_{DM}	21	A
Total Dissipation (Ta=25℃)	TO252	P_D	52	W
	TO220		63	
	TO220F		28	
Junction Temperature		T_J	150	ºC
Storage Temperature		T_{STG}	-65 to 150	ºC
Single Pulse Avalanche Energy		E_{AS}	165	mJ
ESD HBM(Human Body Mode)			≥2000	V
ESD MM(Machine Mode)			≥200	V

Electrical Characteristics Ta = 25ºC

PARAMETER	Symbol	Test Condition	MIN	Typ	MAX	UNIT
Drain-source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=250µA	650			V
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS}=V_{DS} ,I_D=250µA	2.0		4.0	V
Drain-source Leakage Current	I_{DSS}	V_{DS}=650V,V_{GS}=0V			1	uA
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS}=0V，I_S=7A			1.3	V
Gate-body Leakage Current (V_{DS} = 0)	I_{GSS}	V_{GS}=±30V			±100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	V_{GS}=10V,I_D=3.5A			0.6	Ω

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant in temperature etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings

Thermal Characteristics Ta=25℃

PARAMETER		Symbol	TYP	MAX	UNIT
Maximum Junction-to-case	TO252	R_{QJC}		2.5	ºC/W
	TO220F,TO220			3.1	ºC/W
Maximum Junction-to-Ambient	TO252	R_{QJA}		63	ºC/W
	TO220F,TO220			80	ºC/W

Note1: Ensure that the channel temperature does not exceed 150ºC

Note2: V_{DD}=50V,Tch=25 ºC(initial),I_{AS}=7A，Rg=25Ω

Note3: This transistor is sensitive to electrostatic and should be handled with care

Dynamic Characteristics Ta = 25 ºC

PARAMETER	Symbol	Test Condition	MIN	TYP	MAX	UNIT
Input Capacitance	C_{iss}			380		pF
output Capacitance	C_{oss}	V_{DS}=25V,V_{GS}=0V, f=1.0MHZ		110		pF
Reverse Transfer Capacitance	C_{rss}			7		pF

Switching Characteristics Ta=25 ºC

PARAMETER	Symbol	Test Condition	MIN	TYP	MAX	UNIT
Turn-On Delay Time	$T_{d(on)}$	V_{DS}=400V,I_D=7A, V_{GS}=10V ,R_G=20Ω		13		nS
Turn-On Rise Time	T_r			10		nS
Turn-Off Delay Time	$T_{d(off)}$			85		nS
Turn-Off Rise Time	T_f			14		nS
Total Gate Charge	Q_g	V_{DS}=480V，I_D=7A, V_{GS}=10V		25		nC
Gate-Source Charge	Q_{gs}			2		nC
Gate-Drain Charge	Q_{gd}			2.7		nC

Drain-Source Diode Maximum Ratings and Characteristics Ta=25 ºC

| PARAMETER	Symbol	Test Condition	MIN	TYP	MAX	UNIT
Max. Diode Forward Current	I_s	Integral Reverse P-N Junction Diode in the MOSFET			7	A
Pulsed Source Current	I_{sm}				21	
Diode Forward Voltage	V_{SD}	V_{GS}=0V,I_s=7A		0	1.3	V
Reverse Recovery Time	T_{rr}	V_{GS}=0V,I_s=7A, dIF/dt=100A/μs		190		nS
Reverse Recovery Charge	Q_{rr}			2.3		μC

Test Circuit

Gate Charge Test Circuit & Waveform
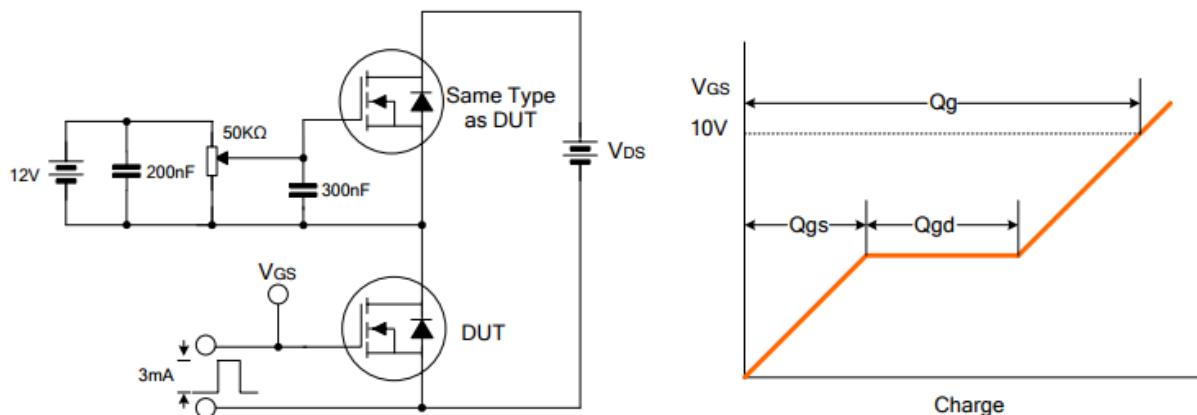
Resistive Switching Test Circuit & Waveform
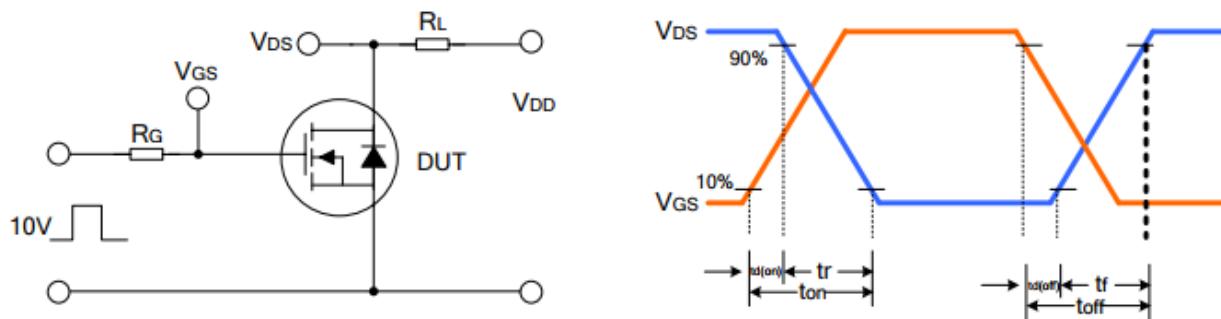
Unclamped Inductive Switching Test Circuit & Waveform

$$EAS = \frac{1}{2} LI_{AS}^2 \frac{B_{VDSS}}{B_{VDSS} - V_{DD}}$$

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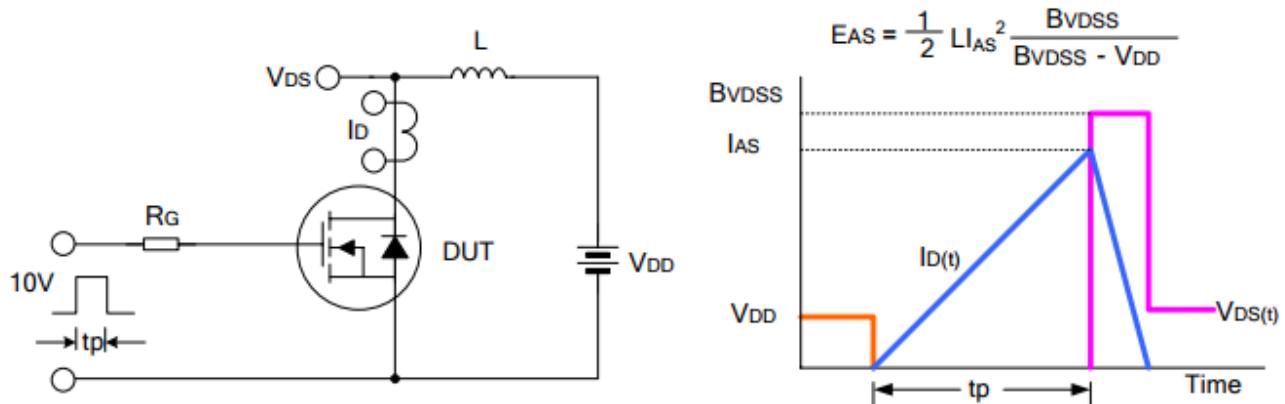
## Typical Characteristics Curve
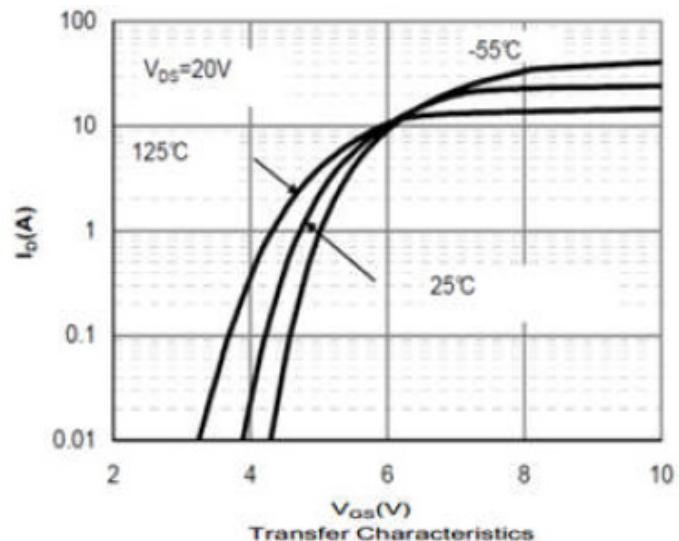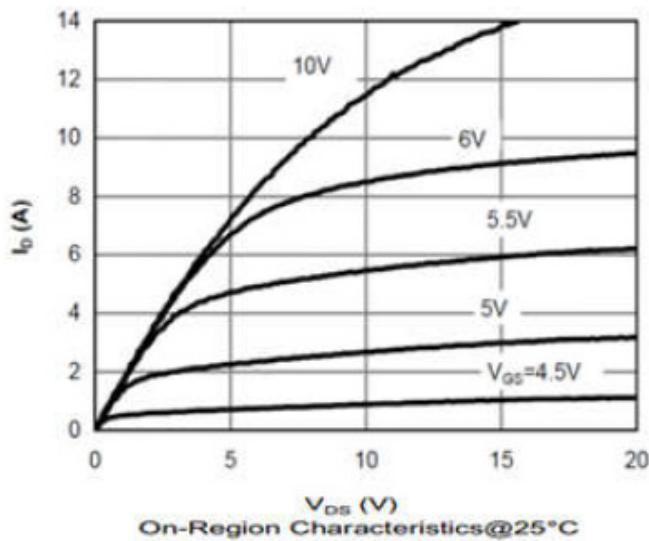
Figure 1: Output Characteristics
Figure 2: Transfer Characteristics
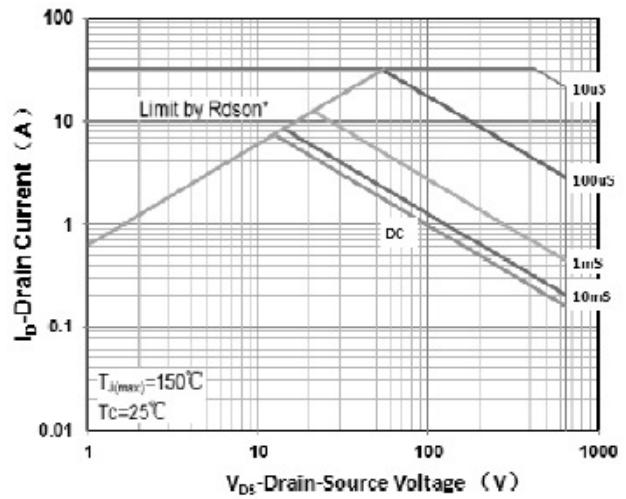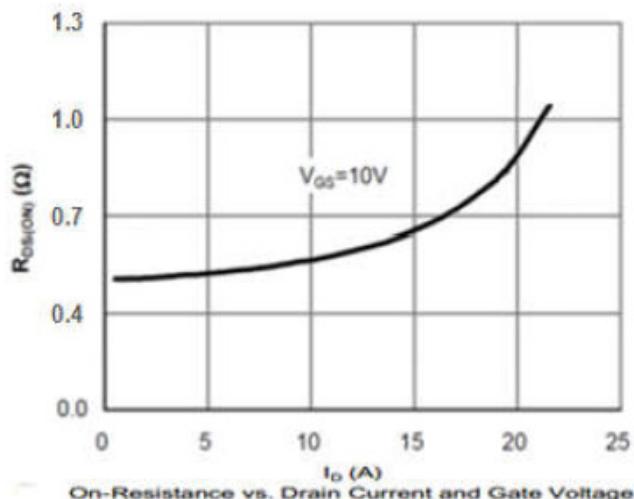
Figure 3: On Resistance Vs Drain Current

Figure 4: Safe

Operating Area
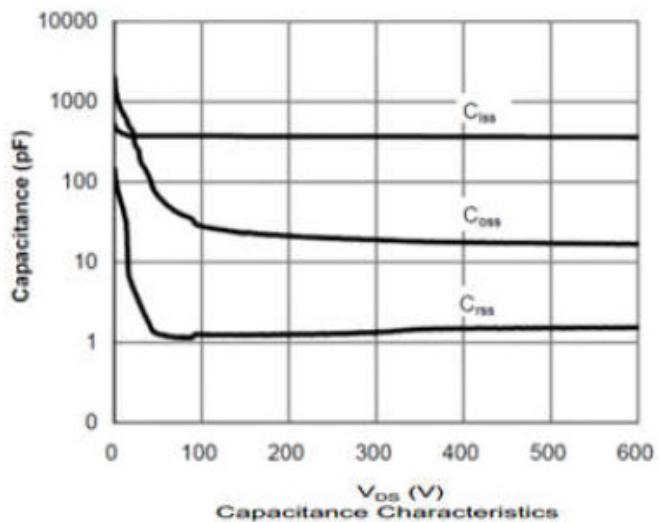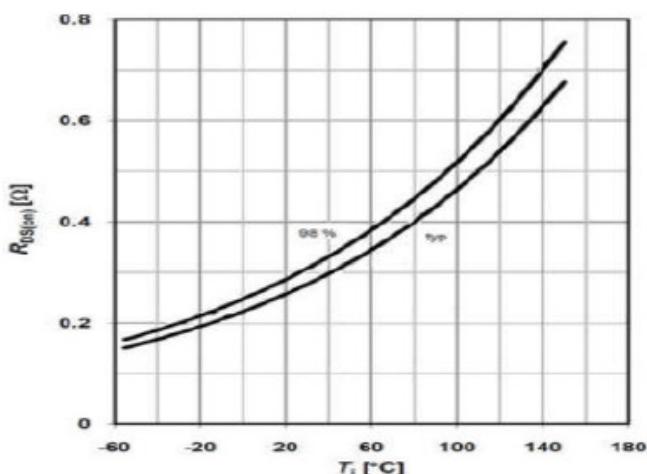
Figure5: On Resistance Vs Junction Temperature

Characteristics


Figure6: Capacitance

Typical   Characteristics Curve
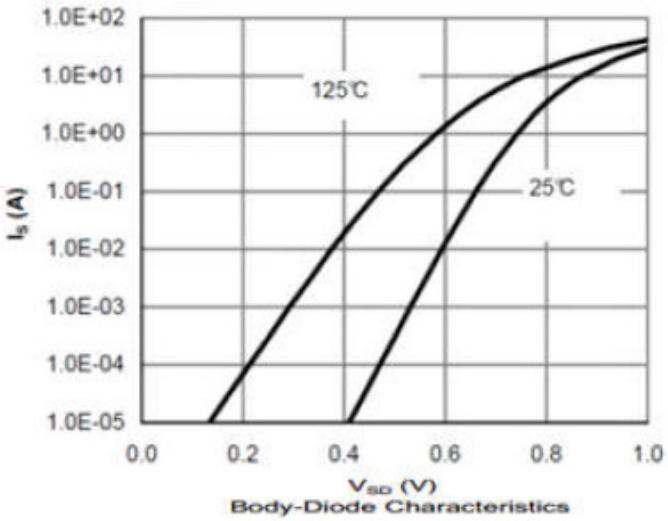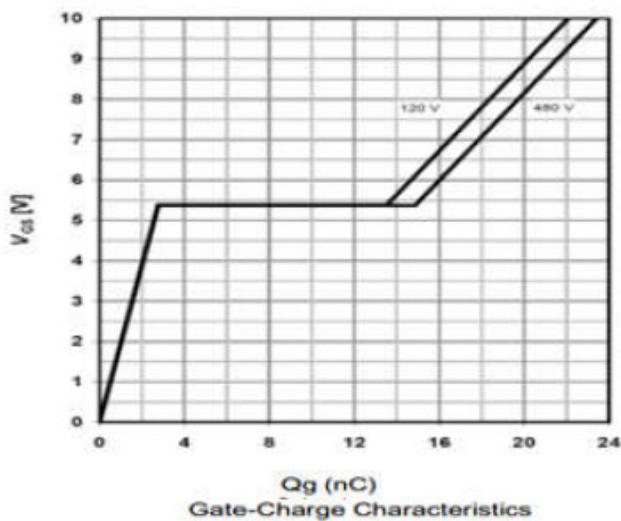
Figure7: Gate Charge Waveform


Figure8: Source-Drain Diode
Forward Voltage
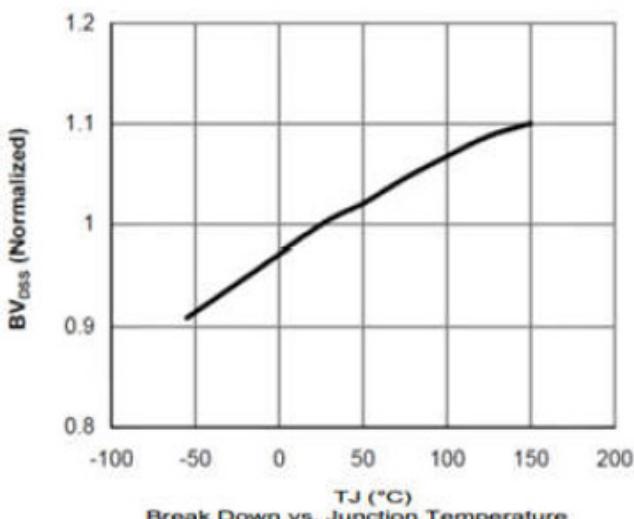

Figure9:   Breakdown Voltage Vs Junction Temperature

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Outline Information (TO252-2L)
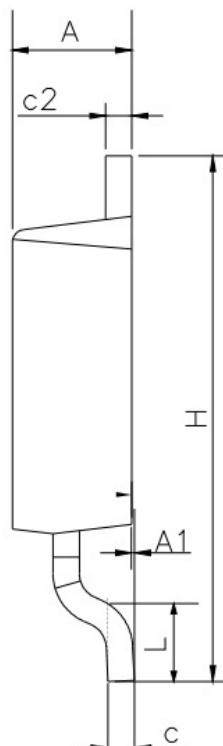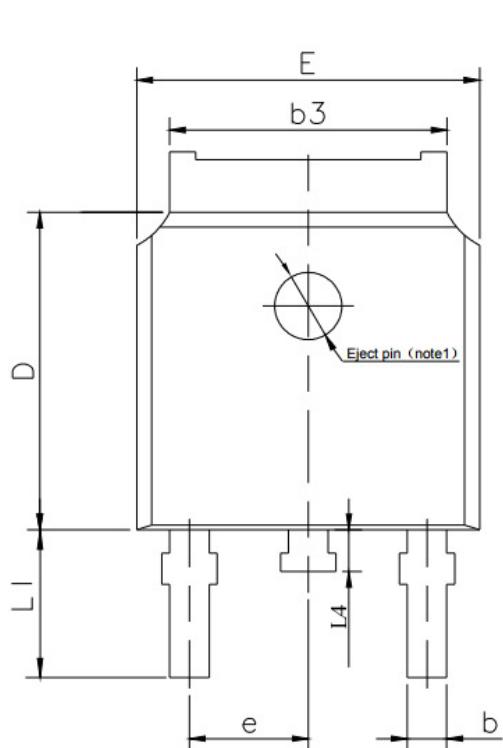
SYMBOL	MIN	NOM	MAX
A	2.10	2.30	2.50
A1	0	----	0.127
b	0.66	0.76	0.89
b3	5.10	5.33	5.46
c	0.45	----	0.65
c2	0.45	----	0.65
D	5.80	6.10	6.40
E	6.30	6.60	6.90
e		2.30TYP	
H	9.60	10.10	10.60
L	1.40	1.50	1.70
L1		2.90REF	
L4	0.60	0.80	1.00

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Outline Information (TO220F-3L)
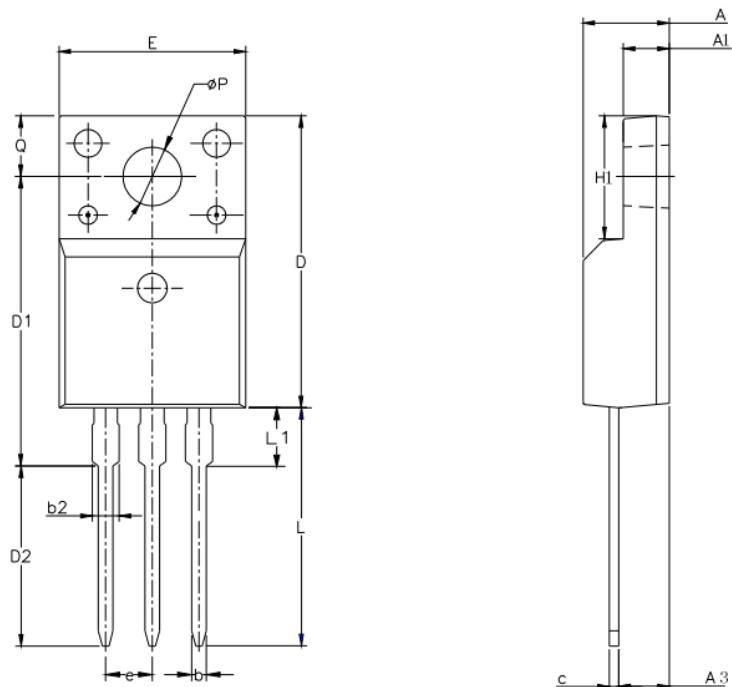
SYMBOL	MIN	NOM	MAX
A	4.42	4.70	5.02
A1	2.30	2.54	2.80
A3	2.50	2.76	3.10
b	0.70	0.80	0.90
b2	—	—	1.47
c	0.35	0.50	0.65
D	15.25	15.87	16.25
D1	15.30	15.75	16.30
D2	9.30	9.80	10.30
E	9.73	10.16	10.36
e	2.54BCS		
H1	6.40	6.68	7.00
L	12.48	12.98	13.48
L1	/	/	3.50
ØP	3.00	3.18	3.40
Q	3.05	3.30	3.55

Outline Information (TO220-3L)
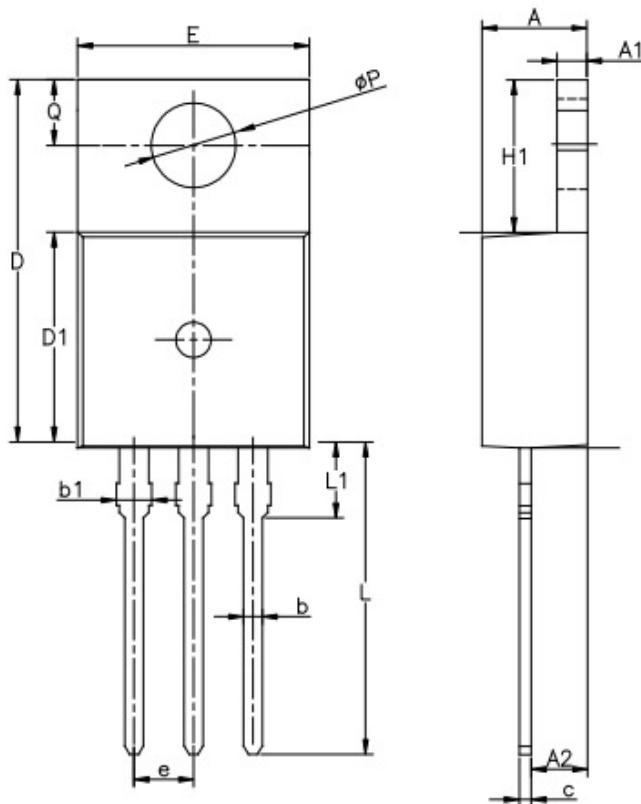
SYMBOL	MIN	NOM	MAX
A	4.30	4.50	4.70
A1	1.00	1.30	1.50
A2	1.80	2.40	2.80
b	0.60	0.80	1.00
b1	1.00	—	1.60
c	0.30	—	0.70
D	15.10	15.70	16.10
D1	8.10	9.20	10.00
E	9.60	9.90	10.40
e	2.54BSC		
H1	6.10	6.50	7.00
L	12.60	13.08	13.60
L1	—	—	3.95
ØP	3.40	3.70	3.90
Q	2.60	—	3.20

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