

N-Channel Enhancement Mode Power MOSFET

Description

SMIRF7N65 is an N-channel enhancement mode power MOS field effect transistor. The improved planar stripe cell and the improved guard ring terminal have been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

These devices are widely used in AC-DC power suppliers, DCDC converters and H-bridge PWM motor drivers.

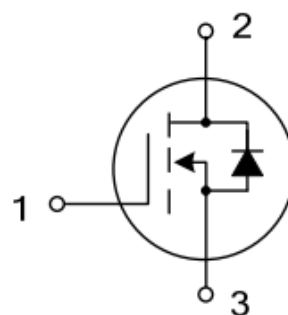
General Features

- 7A, 650V, $R_{DS(on)}$ (typ.) = 1.1ohm@VGS=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

I_D	7A
V_{DSS}	650V
$R_{dson (max)}$	1.3Ω(V _{GS} =10V, I _D =3.5A)
Q_g	28nC



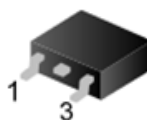
1.Gate 2.Drain 3.Source



TO-220



TO-220F



TO-252

Order Information

Order Information	Marking ID	Package	Packing Type Supplied As
SMIRF7N65T9RL	IRF7N65	TO252-2L	2500 Units on Reel
SMIRF7N65T2TL	IRF7N65	TO220F-3L	1000 units on Box, 5000 units on Carton
SMIRF7N65T1TL	IRF7N65	TO220-3L	1000 units on Box, 5000 units on Carton

Absolute Maximum Ratings Ta=25 °C 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}	28	A
Total Dissipation (Ta=25℃)	TO252	P _D	145	W
	TO220		145	
	TO220F		45	
Junction Temperature		T _J	150	℃
Storage Temperature		T _{STG}	-65 to 150	℃
Single Pulse Avalanche Energy		E _{AS}	230	mJ
ESD HBM(Human Body Mode)			≥2000	V
ESD MM(Machine Mode)			≥200	V

Electrical Characteristics Ta = 25°C

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	3.0	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			1.4	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		1.1	1.3	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°C

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

Note1: Ensure that the channel temperature does not exceed 150°C

Note2: V_{DD}=50V, T_{ch}=25 °C(initial), I_{AS}=7A, R_g=25Ω

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

Dynamic Characteristics Ta = 25 °C

PARAMETER	Symbol	Test Condition	MIN	TYP	MAX	UNIT
Input Capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, f=1.0MHZ		955		pF
output Capacitance	C _{oss}			135		pF
Reverse Transfer Capacitance	C _{rss}			16		pF
Gate Resistance	R _g	V _{DS} =0V, V _{GS} =0V, f=1.0MHZ		1.8		Ω

Switching Characteristics Ta=25 °C

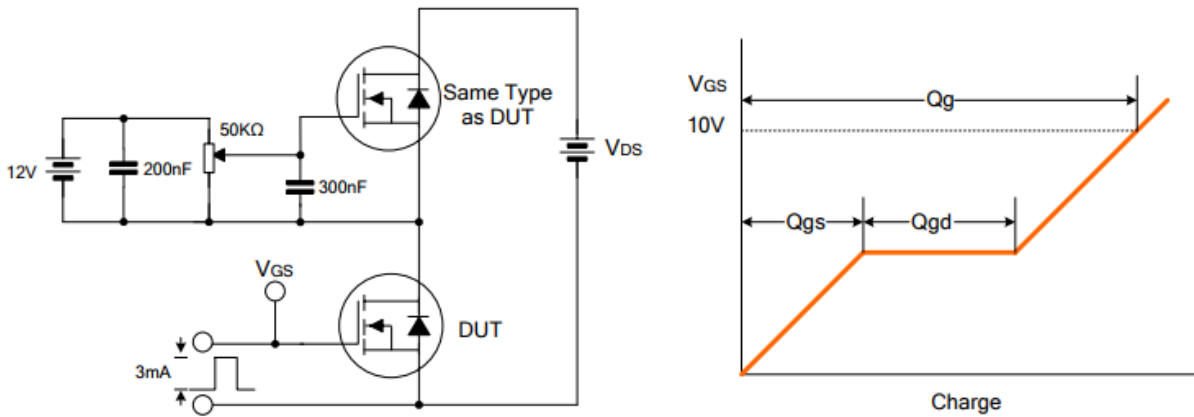
PARAMETER	Symbol	Test Condition	MIN	TYP	MAX	UNIT
Turn-On Delay Time	T _{d(on)}	V _{DS} =325V, I _D =7A, V _{GS} =10V, R _G =25Ω		30		nS
Turn-On Rise Time	T _r			80		nS
Turn-Off Delay Time	T _{d(off)}			90		nS
Turn-Off Rise Time	T _f			60		nS
Total Gate Charge	Q _g	V _{DS} =520V, I _D =7A, V _{GS} =10V		28		nC
Gate-Source Charge	Q _{gs}			7		nC
Gate-Drain Charge	Q _{gd}			12		nC

Drain-Source Diode Maximum Ratings and Characteristics Ta=25 °C

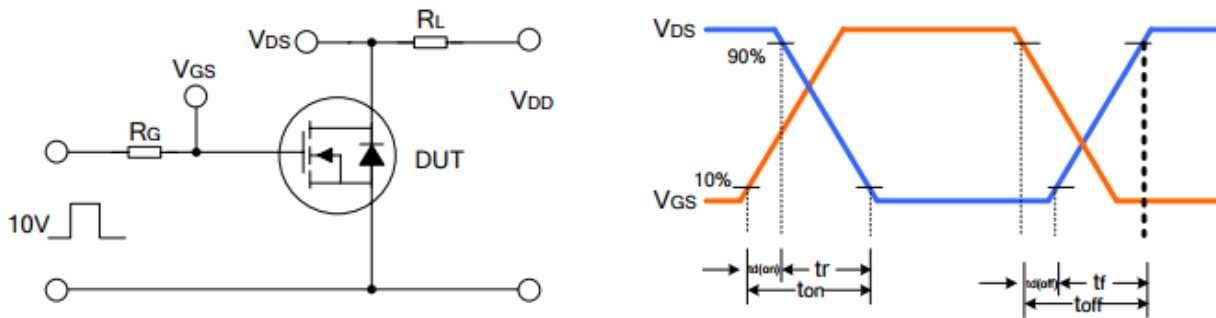
PARAMETER	Symbol	Test Condition	MIN	TYP	MAX	UNIT
Max. Diode Forward Current	I _s	Integral Reverse P-N Junction Diode in the MOSFET			7	A
Pulsed Source Current	I _{sm}				28	
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _s =7A		0.92	1.5	V
Reverse Recovery Time	T _{rr}	V _{GS} =0V, I _s =7A, dI _F /dt=100A/μs		400		nS
Reverse Recovery Charge	Q _{rr}			3.3		μC

Test Circuit

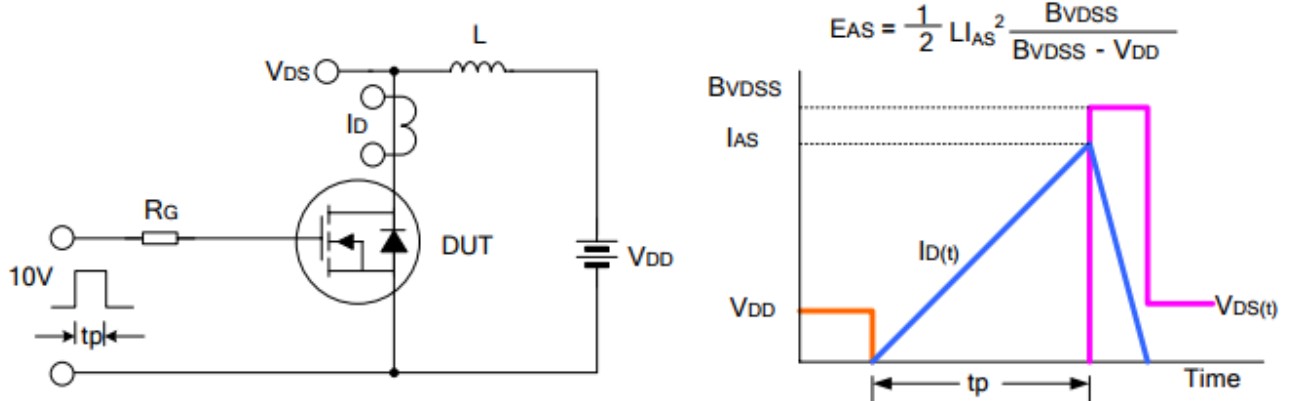
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveform



Typical Characteristics Curve

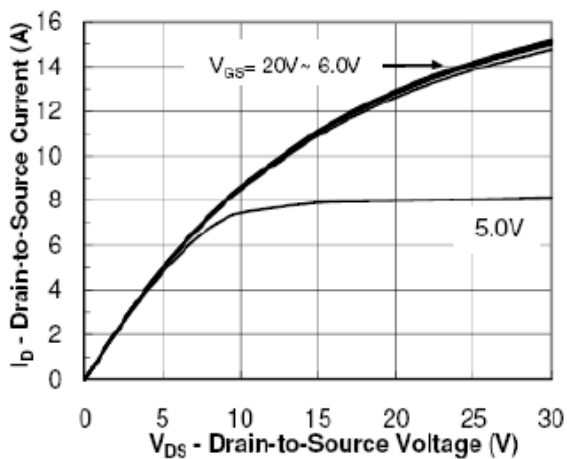


Figure 1: Output Characteristics

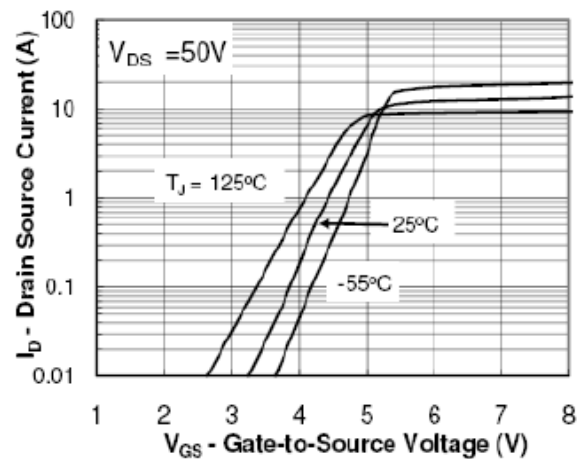


Figure 2: Transfer Characteristics

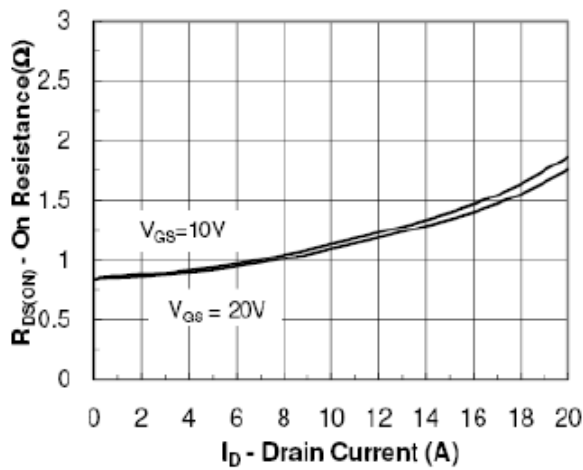


Figure 3: On Resistance Vs Drain Current

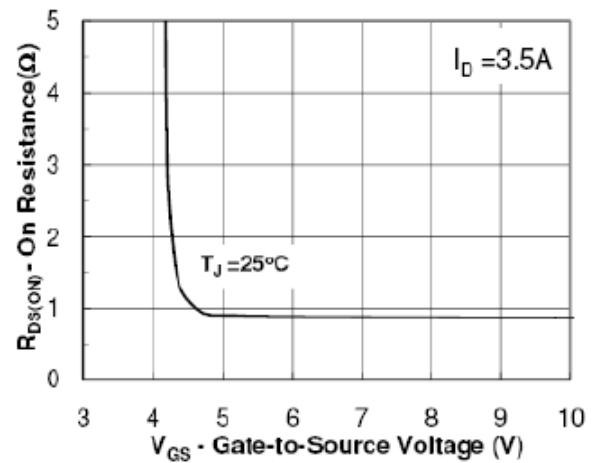


Figure 4: On Resistance Vs Gate Source

Voltage

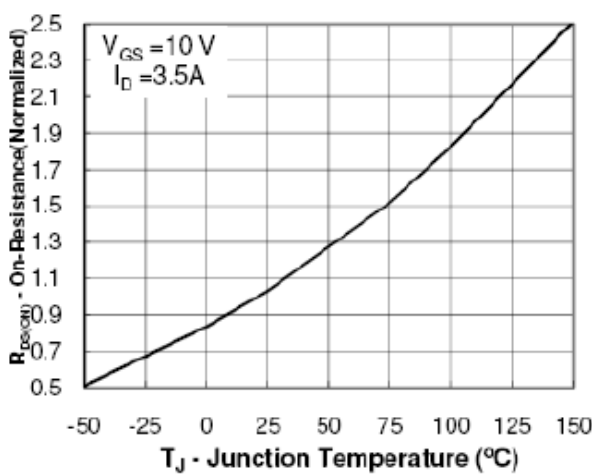


Figure5: On Resistance Vs Junction Temperature Characteristics

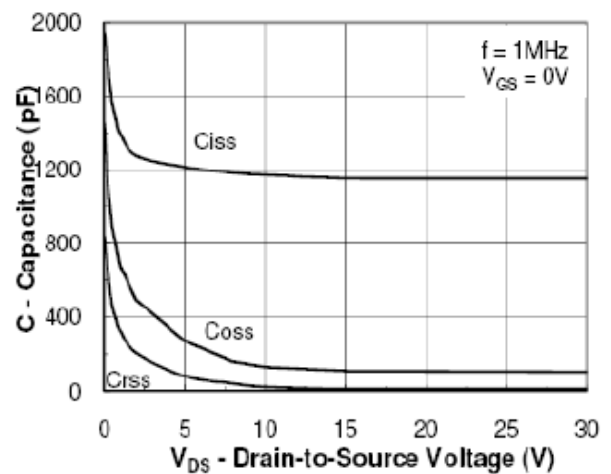


Figure6: Capacitance

Typical Characteristics Curve

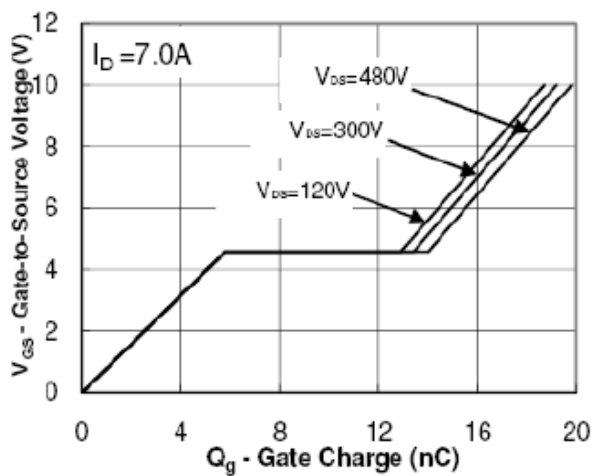


Figure7: Gate Charge Waveform
Forward Voltage

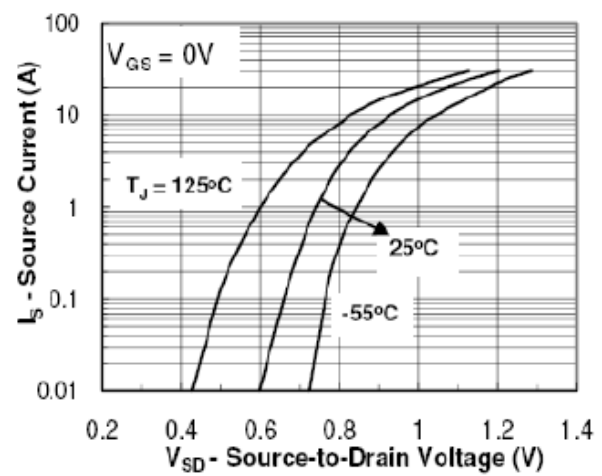


Figure8: Source-Drain Diode

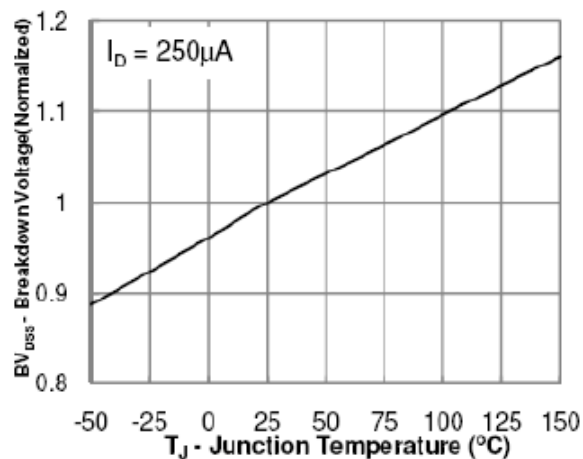
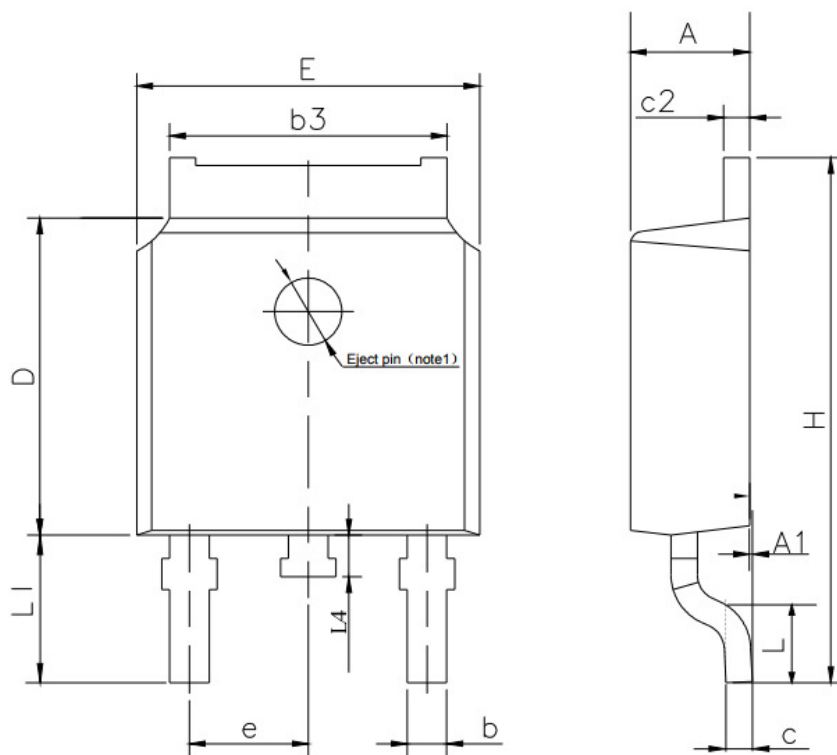


Figure9: Breakdown Voltage Vs Junction Temperature

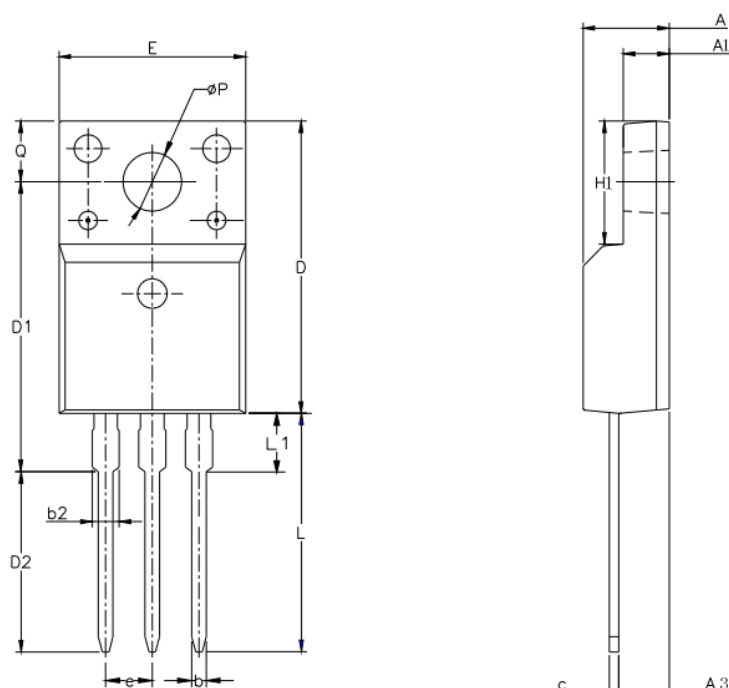
Note: The above characteristics curves are presented for reference only and not guaranteed by production test unless otherwise noted

Outline Information (TO252-2L)



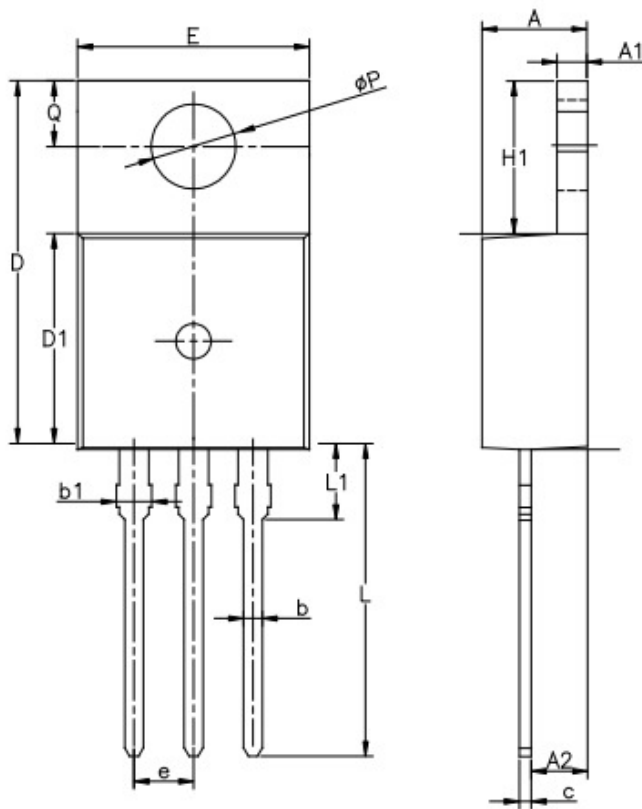
SYMBOL	MIN	NOM	MAX
A	2.10	2.30	2.50
A1	0	---	0.127
b	0.66	0.76	0.89
b3	5.10	5.33	5.46
c	0.45	---	0.65
c2	0.45	---	0.65
D	5.80	6.10	6.40
E	6.30	6.60	6.90
e	2.30TYP		
H	9.60	10.10	10.60
L	1.40	1.50	1.70
L1	2.90REF		
L4	0.60	0.80	1.00

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
ϕP	3.40	3.70	3.90
Q	2.60	—	3.20