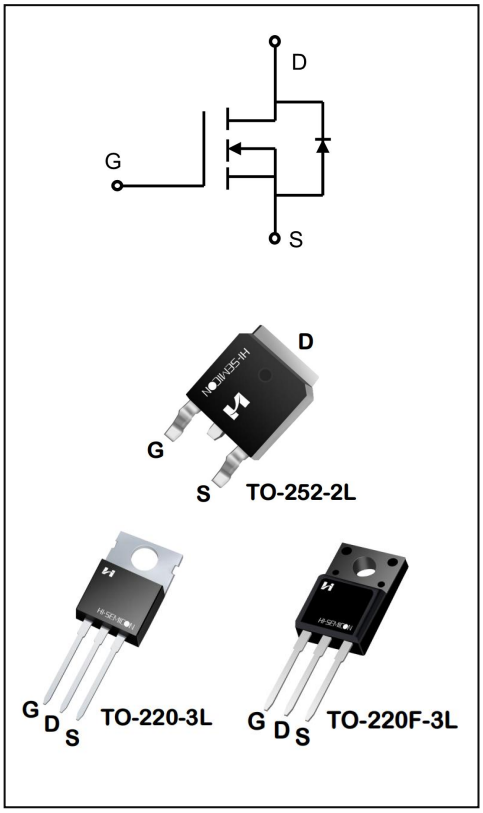
650V N-CHANNEL POWER MOSFET

GENERAL DESCRIPTION

The Power MOSFET is fabricated using advanced super junction technology. The resulting device has extremely low on resistance, making it especially suitable for applications which require superior power density and outstanding efficiency.



Features

- ◆V_{DS}=650V, I_D=8A
- ◆$R_{DS(ON)}$

  TYP:510mΩ@V_{GS}=10V , I_D=4A

Applications

- ◆Power faction correction (PFC)
- ◆Switched mode power supplies (SMPS)
- ◆Uninterruptible power supply (UPS)
- ◆LED lighting power

ORDERING INFORMATION

Part No.	Package	Marking	Material	Packing
SCF65R540T	TO-220F-3L	SCF65R540T	Pb free	Tube
SCP65R540T	TO-220-3L	SCP65R540T	Pb free	Tube
SCD65R540T	TO-252-2L	SCD65R540T	Pb free	Reel

ABSOLUTE MAXIMUM RATINGS (T_J=25°C unless otherwise noted)

Characteristics		Symbol	Ratings			Unit
			SCF65R540T	SCD65R540T	SCP65R540T	
Drain-Source Voltage		V_{DS}	650			V
Gate-Source Voltage		V_{GS}	±30			V
Drain Current	T_C = 25°C	I_D	8			A
	T_C = 100°C		5.6			
Drain Current Pulsed(Note 1)		I_{DM}	30			A
Power Dissipation(T_C=25°C)		P_D	35	48	85	W
-Derate above 25°C			0.28	0.38	1.2	W/°C
Single Pulsed Avalanche Energy (Note 2)		E_{AS}	89			mJ
Operation Junction Temperature Range		T_J	-55～+150			°C
Storage Temperature Range		T_{stg}	-55～+150			°C
Maximum lead temperature for soldering purposes,1/8" from case for 5 seconds		TL	300			°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	MAX			Unit
		SCF65R540T	SCD65R540T	SCP65R540T	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.57	2.6	2.1	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	62.0	65.0	°C/W

ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain -Source Breakdown Voltage	B_{VDSS}	V_{GS}=0V, I_D=250μA	650	--	--	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=650V, V_{GS}=0V	--	--	1	uA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=30V, V_{DS}=0V	--	--	100	nA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=-30V, V_{DS}=0V	--	--	-100	
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}= V_{DS}, I_D=250μA	2	3.1	4.0	V
Static Drain- Source On State Resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=4A	--	510	540	mΩ
Dynamic Characteristics						
Gate Rresistance	Rg	V_{GS}=0V; f=1.0MHZ	1	3.1	10	Ω
Input Capacitance	C_{iss}	V_{DS}=100V	--	479	--	pF
Output Capacitance	C_{oss}	V_{GS}=0V	--	20.6	--	
Reverse Transfer Capacitance	C_{rss}	f=1.0MHZ	--	2.5	--	

Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=325V; V_{GS}=10V R_G=25Ω; I_D=8A (Note 3.4)	--	11.5	--	ns
Turn-on Rise Time	t_r		--	32.6	--	
Turn-off Delay Time	$t_{d(off)}$		--	52.1	--	
Turn-off Fall Time	t_f		--	26.5	--	
Total Gate Charge	Q_g	V_{DS}=520V, I_D=8A V_{GS}=10V (Note 3.4)	--	18	--	nC
Gate-Source Charge	Q_{gs}		--	4.2	--	
Gate-Drain Charge	Q_{gd}		--	9.2	--	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	I_S	Integral Reverse P-N Junction Diode in the MOSFET	--	--	8	A
Pulsed Source Current	I_{SM}		--	--	32	
Diode Forward Voltage	V_{SD}	I_S=8A,V_{GS}=0V	--	0.9	1.4	V
Reverse Recovery Time	T_{rr}	I=8A,V_{GS}=0V, dIF/dt=100A/μS(Note 3)	--	411	--	ns
Reverse Recovery Charge	Q_{rr}		--	12	--	nC

NOTE:

1.Pluse width limited by maximum junction temperature

2.L=79mH, V_{DD}=100V, V_G=10V, R_G=25Ω, starting T_J=25°C

3.Pulse Test: Pulse width ≤300μs, Duty cycle≤2%

4.Essentially independent of operating temperature

Typical Performance Characteristics

Figure 1. On-Region Characteristics

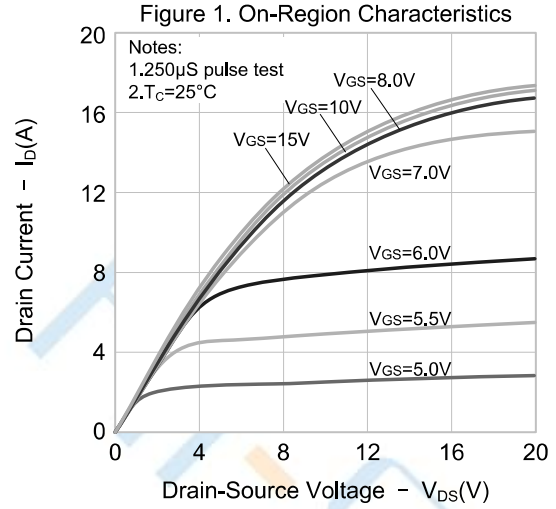


Figure 2. Transfer Characteristics

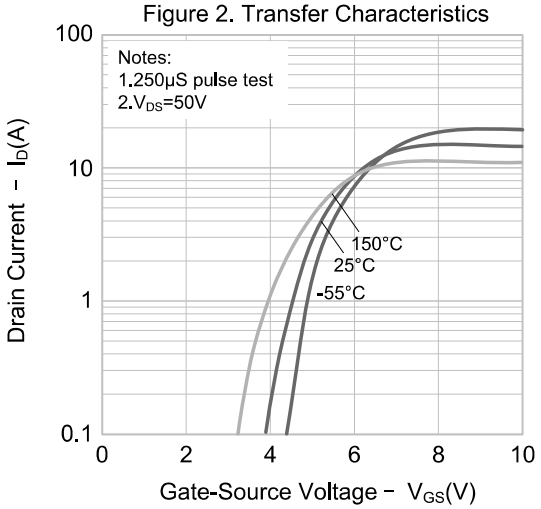


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

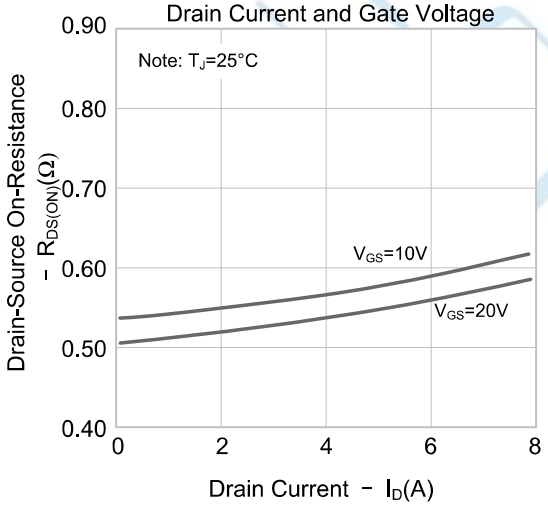


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

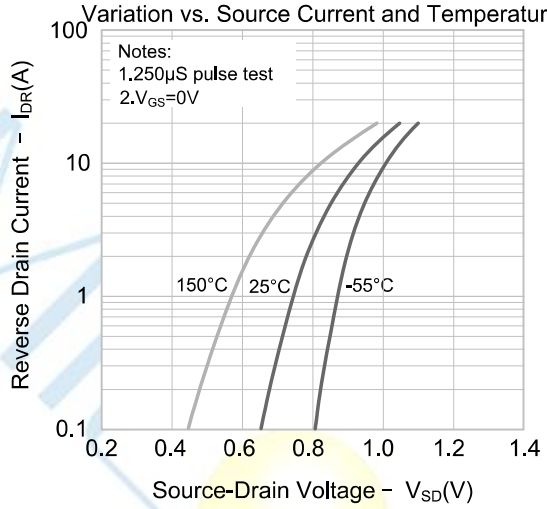


Figure 5. Capacitance Characteristics

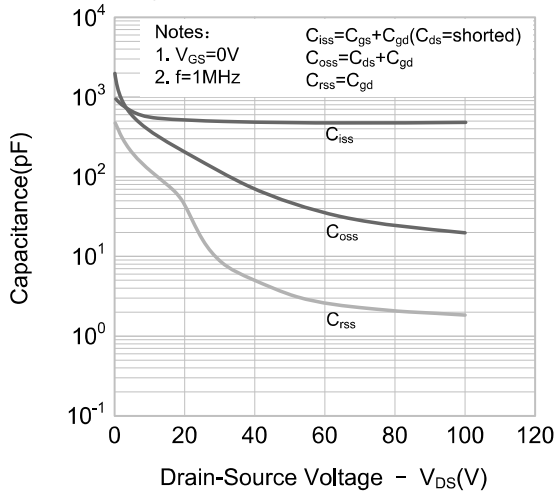
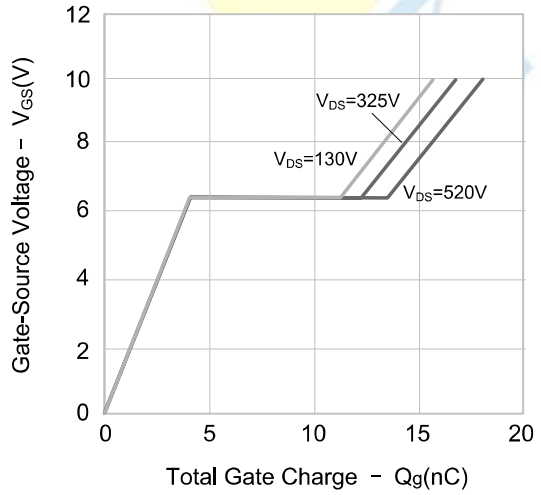


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics

Figure 7. Breakdown Voltage Variation vs. Temperature

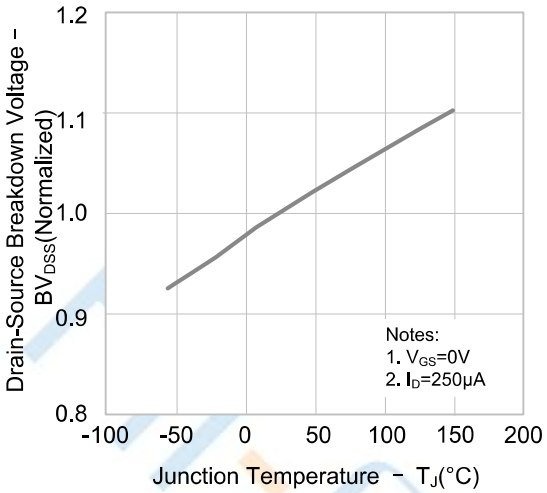


Figure 8. On-resistance Variation vs. Temperature

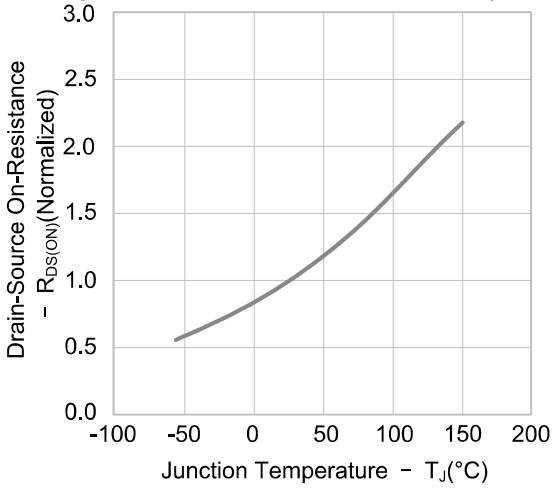
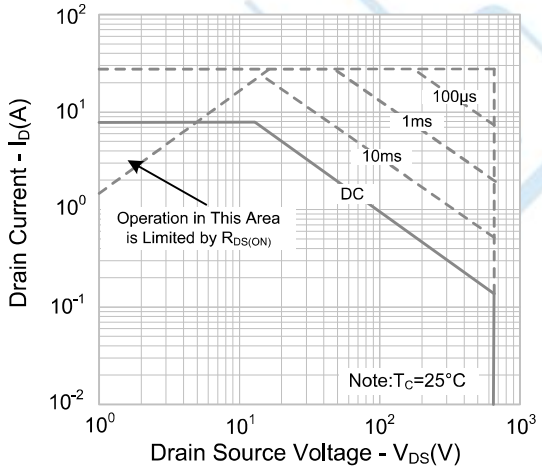
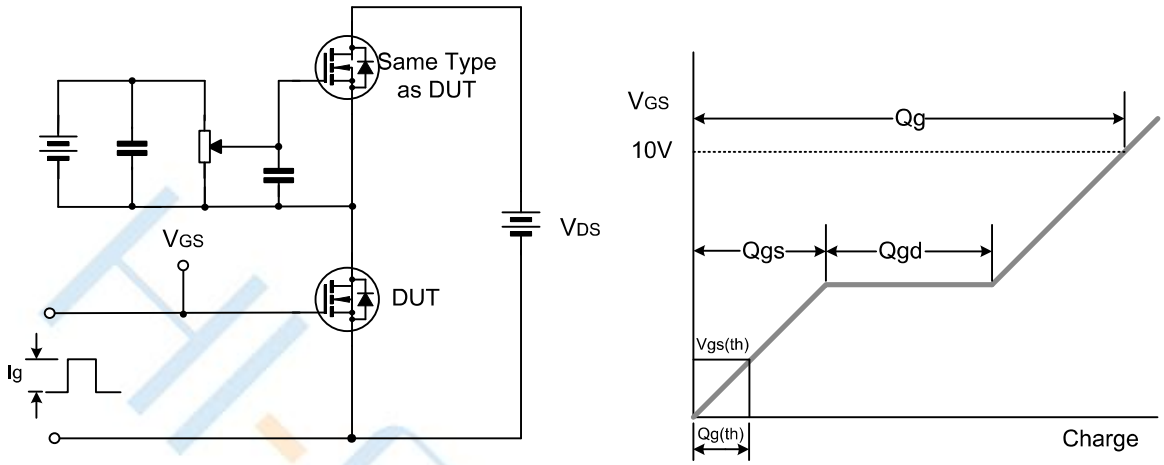


Figure 9-1. Max. Safe Operating Area

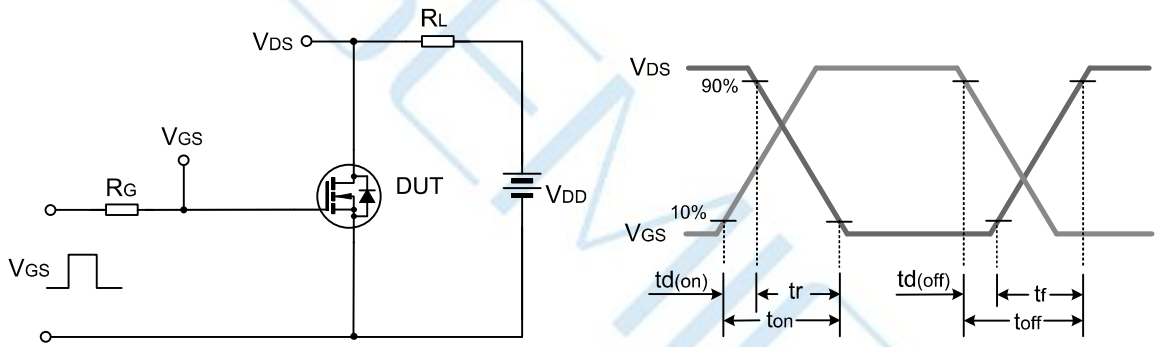


Test Circuit

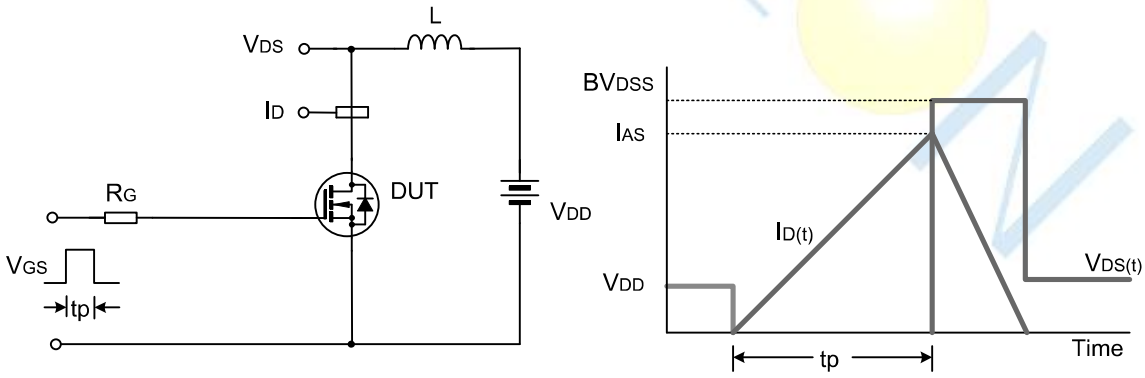
Gate Charge Test Circuit & Waveform



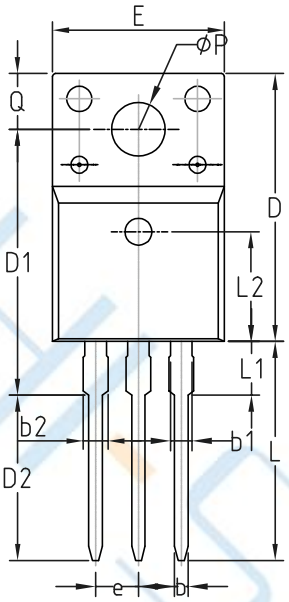
Resistive Switching Test Circuit & Waveform

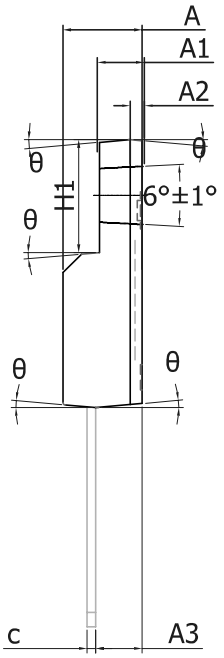


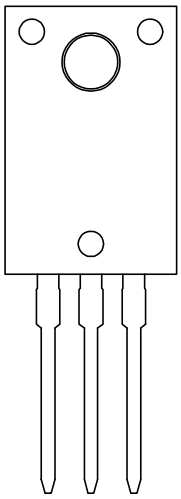
Unclamped Inductive Switching Test Circuit & Waveform

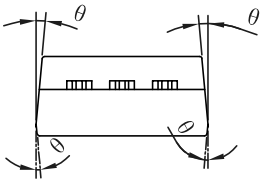


Package Dimensions of TO-220F-3L







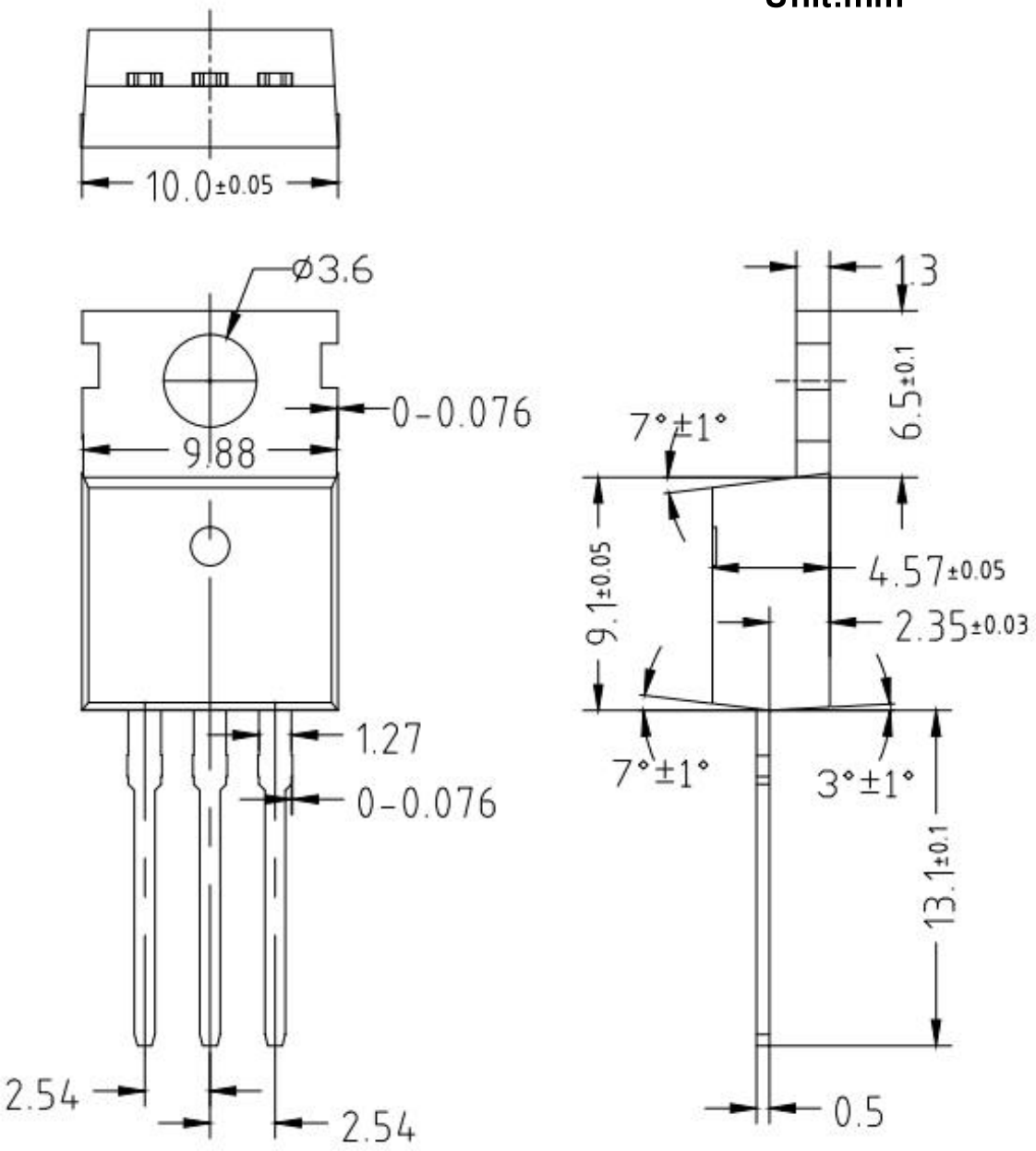


COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

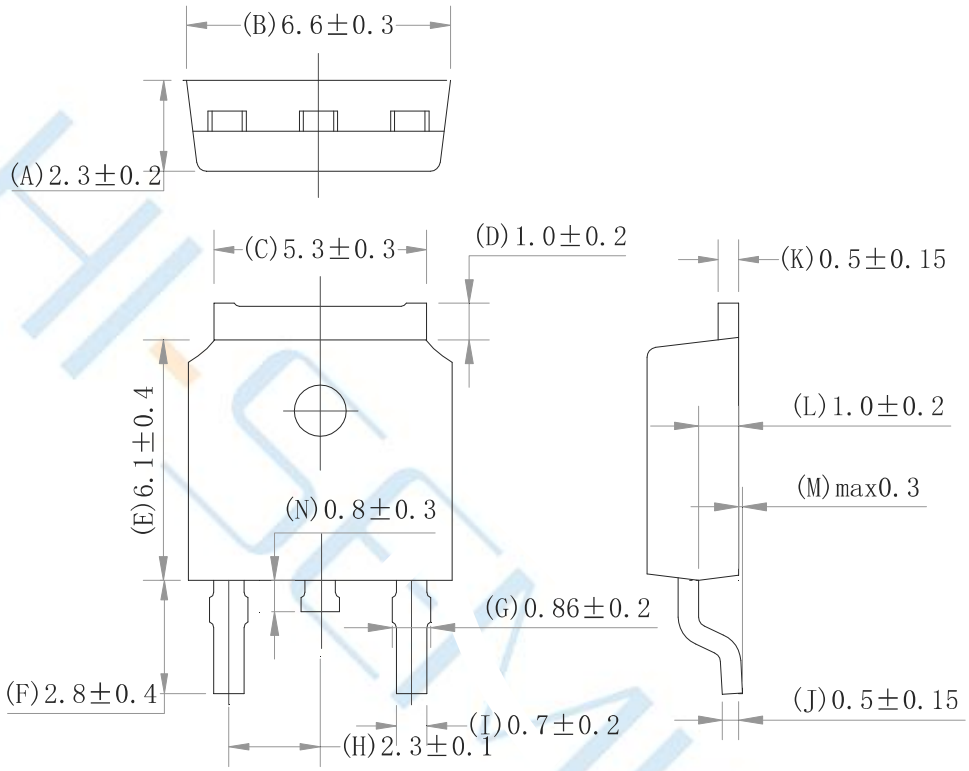
SYMBOL	MIN	NOM	MAX
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2		0.70 REF	
A3	2.56	2.76	2.96
b	0.70	0.80	0.90
b1	1.17	1.2	1.25
b2	1.17	1.2	1.25
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.55	15.75	15.95
D2	10.0	10.2	10.4
E	9.96	10.16	10.36
e		2.54BSC	
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	-	-	3.50
L2		6.50REF	
ΦP	3.08	3.18	3.28
Q	3.20	3.30	3.40
θ 1	1°	3°	5°
A4	0.53	0.56	0.59

Package Dimensions of TO-220-3L

Unit:mm



Package Dimensions of TO-252-2L



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