

650V N-CHANNEL POWER MOSFET

GENERAL DESCRIPTION

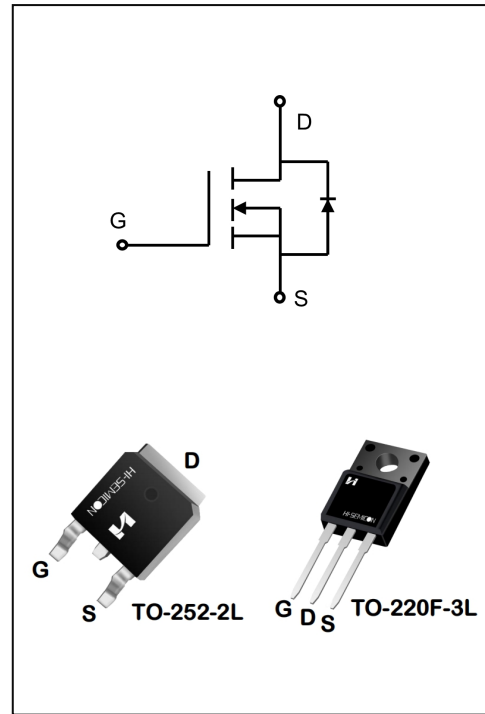
The Power MOSFET is fabricated using advanced super junction technology. The resulting device has extremely low on resistance, making it especially suitable for applications which require superior power density and outstanding efficiency.

Features

- ◆ $V_{DS}(V)=650V, I_D=7A$
- ◆ $R_{DS(ON)}$
 TYP: $523m\Omega @ V_{GS}=10V, I_D=3.5A$
 MAX: $640m\Omega$

Applications

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



ORDERING INFORMATION

Part No.	Package	Marking	Material	Packing
SCF65R640C	TO-220F-3L	SCF65R640C	Pb free	Tube
SCD65R640C	TO-252-2L	SCD65R640C	Pb free	Reel

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

Characteristics	Symbol	Ratings		Unit
		SCF65R640C	SCD65R640C	
Drain-Source Voltage	V _{DS}	650		V
Gate-Source Voltage	V _{GS}	±30		V
Drain Current	I _D	T _C = 25°C		A
		T _C = 100°C		
Drain Current Pulsed(Note 1)	I _{DM}	28		A
Power Dissipation(T _C =25°C) -Derate above 25°C	P _D	35	48	W
		0.28	0.38	W/°C
Single Pulsed Avalanche Energy (Note 2)	E _{AS}	249		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
		SCF65R640C	SCD65R640C	
Thermal Resistance, Junction-to-Case	R _{θJC}	2.08	4.17	°C/W
Thermal Resistance, Junction-to-Ambient	R _{θJA}	62.0	62.5	°C/W

ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain -Source Breakdown Voltage	B _{VDS}	V _{GS} =0V, I _D =250μA	650	--	--	V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =650V, V _{GS} =0V	--	--	100	nA
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	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{GS} = V _{DS} , I _D =250μA	2	3.4	4.0	V
Static Drain- Source On State Resistance	R _{DS(on)}	V _{GS} =10V, I _D =3.5A	--	523	640	mΩ
Forward Transconductance	g _{FS}	V _{DS} =25V, I _D =7A (Note 3)	--	4.9	--	S
Dynamic Characteristics						
Gate Rresistance	R _g	V _{GS} =0V; f=1.0MHZ	1	5.2	10	Ω
Input Capacitance	C _{iss}	V _{DS} =100V V _{GS} =0V f=1.0MHZ	--	423	--	pF
Output Capacitance	C _{oss}		--	26	--	
Reverse Transfer Capacitance	C _{rss}		--	1.7	--	pF

Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=325V; V_{GS}=10V$ $R_G=24\Omega; I_D=7A$ (Note 3.4)	--	11.2	--	ns
Turn-on Rise Time	t_r		--	28.6	--	
Turn-off Delay Time	$t_{d(off)}$		--	46.7	--	
Turn-off Fall Time	t_f		--	24.4	--	
Total Gate Charge	Q_g	$V_{DS}=520V, I_D=7A$ $V_{GS}=10V$ (Note 3.4)	--	16.4	--	nC
Gate-Source Charge	Q_{gs}		--	3.5	--	
Gate-Drain Charge	Q_{gd}		--	8.3	--	

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	--	--	7	A
Pulsed Source Current	I_{SM}		--	--	28	
Diode Forward Voltage	V_{SD}	$I_S=7A, V_{GS}=0V$	--	0.87	1.4	V
Reverse Recovery Time	T_{rr}	$I=7A, V_{GS}=0V,$ $dI/dt=100A/\mu S$ (Note 3)	--	340	--	ns
Reverse Recovery Charge	Q_{rr}		--	2.5	--	μC

NOTE:

- 1.Pulse width limited by maximum junction temperature
- 2.L=79mH, $I_{AS}=2.2A, V_{DD}=100V, V_G=10V, R_G=25\Omega$, starting $T_J=25^\circ C$
- 3.Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$
- 4.Essentially independent of operating temperature

Typical Performance Characteristics

Figure 1. On-Region Characteristics

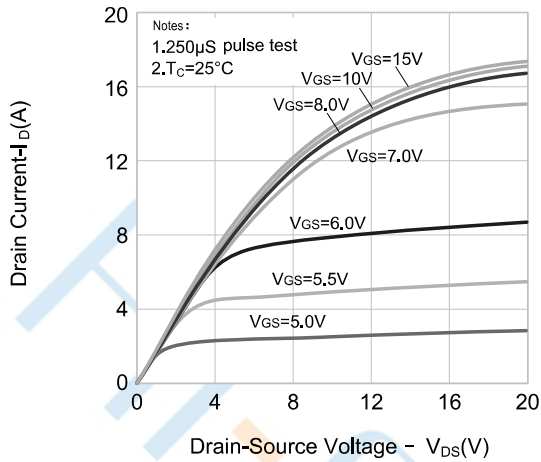


Figure 2. Transfer Characteristics

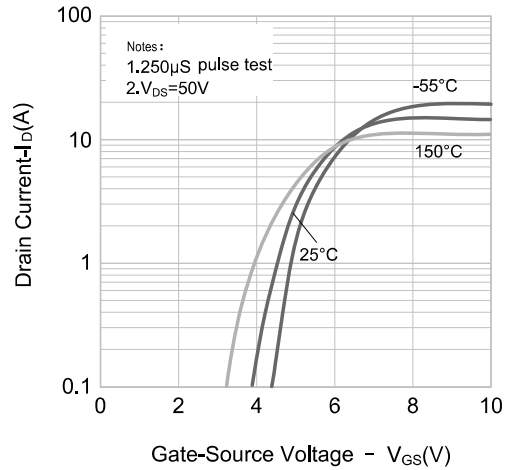


Figure 3. On-Resistance Variation vs. Drain-Current, Gate Voltage

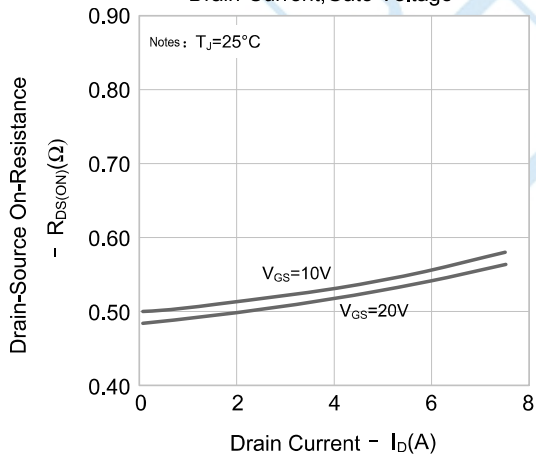


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

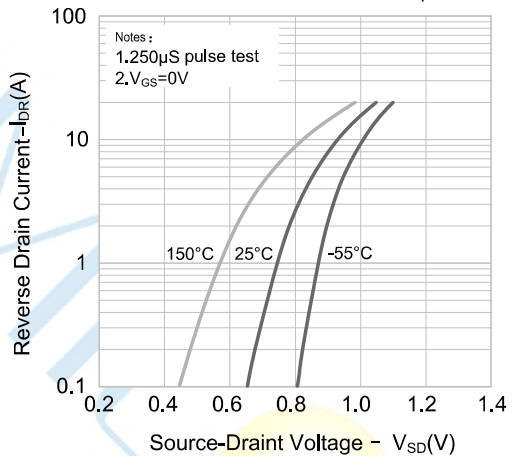


Figure 5. Capacitance Characteristics

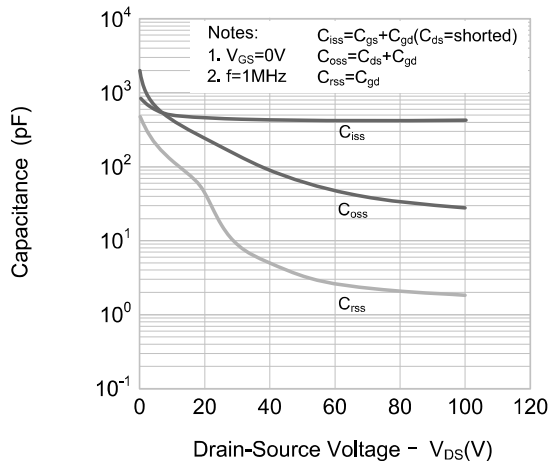
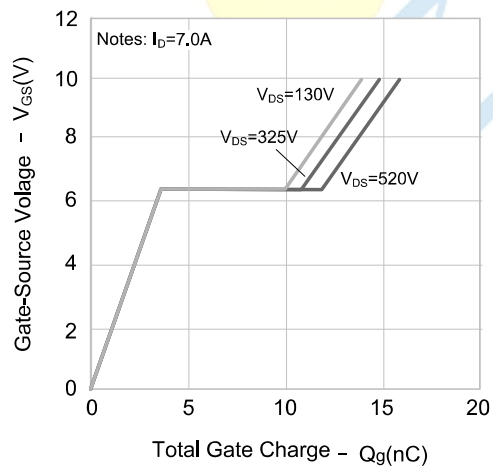


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics

Figure 7. Breakdown Voltage Variation vs. Temperature

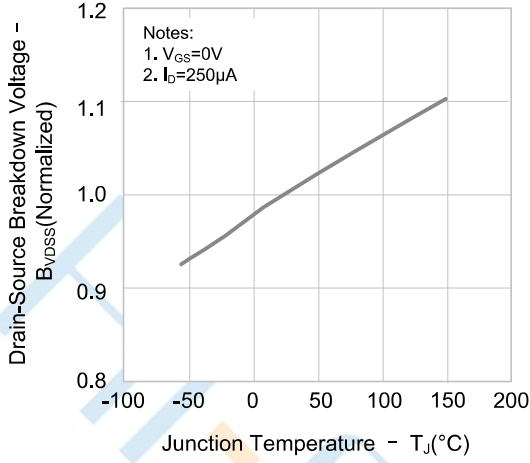


Figure 8. On-resistance Variation vs. Temperature

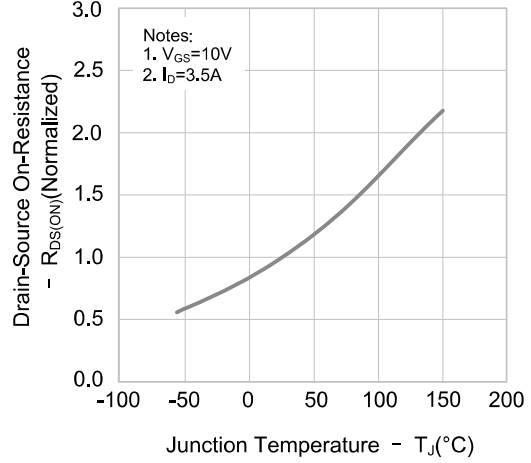


Figure 9.1 Max. Safe Operating Area (SCD65R640C)

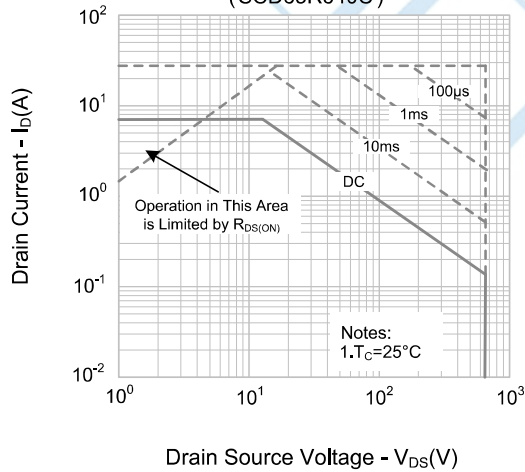
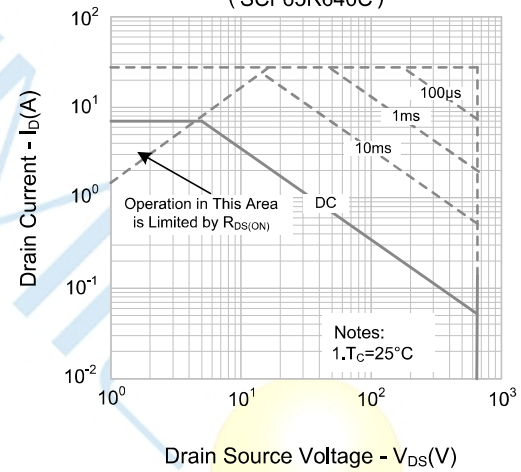
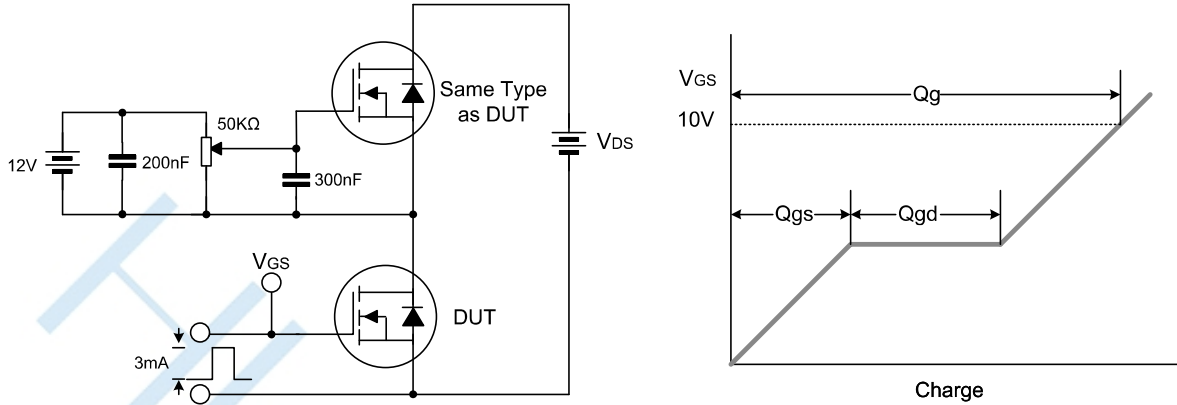


Figure 9.2 Max. Safe Operating Area (SCF65R640C)

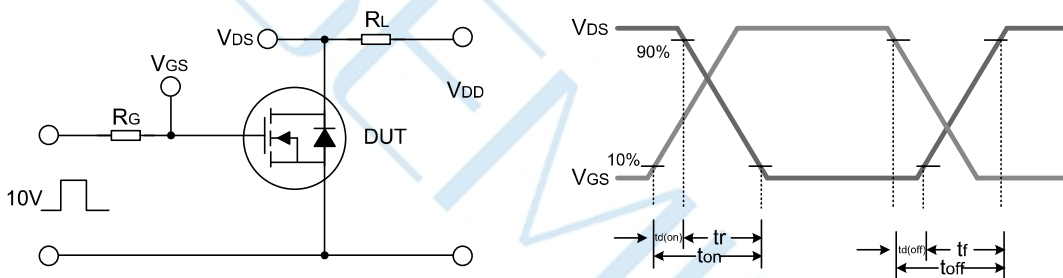


Test Circuit

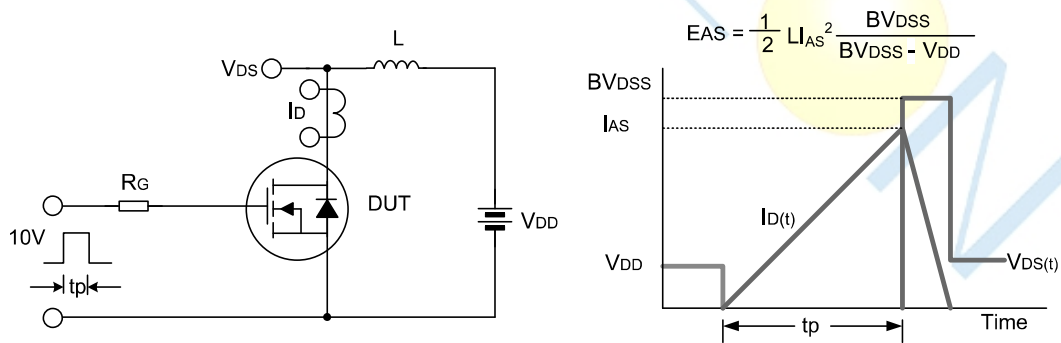
Gate Charge Test Circuit & Waveform



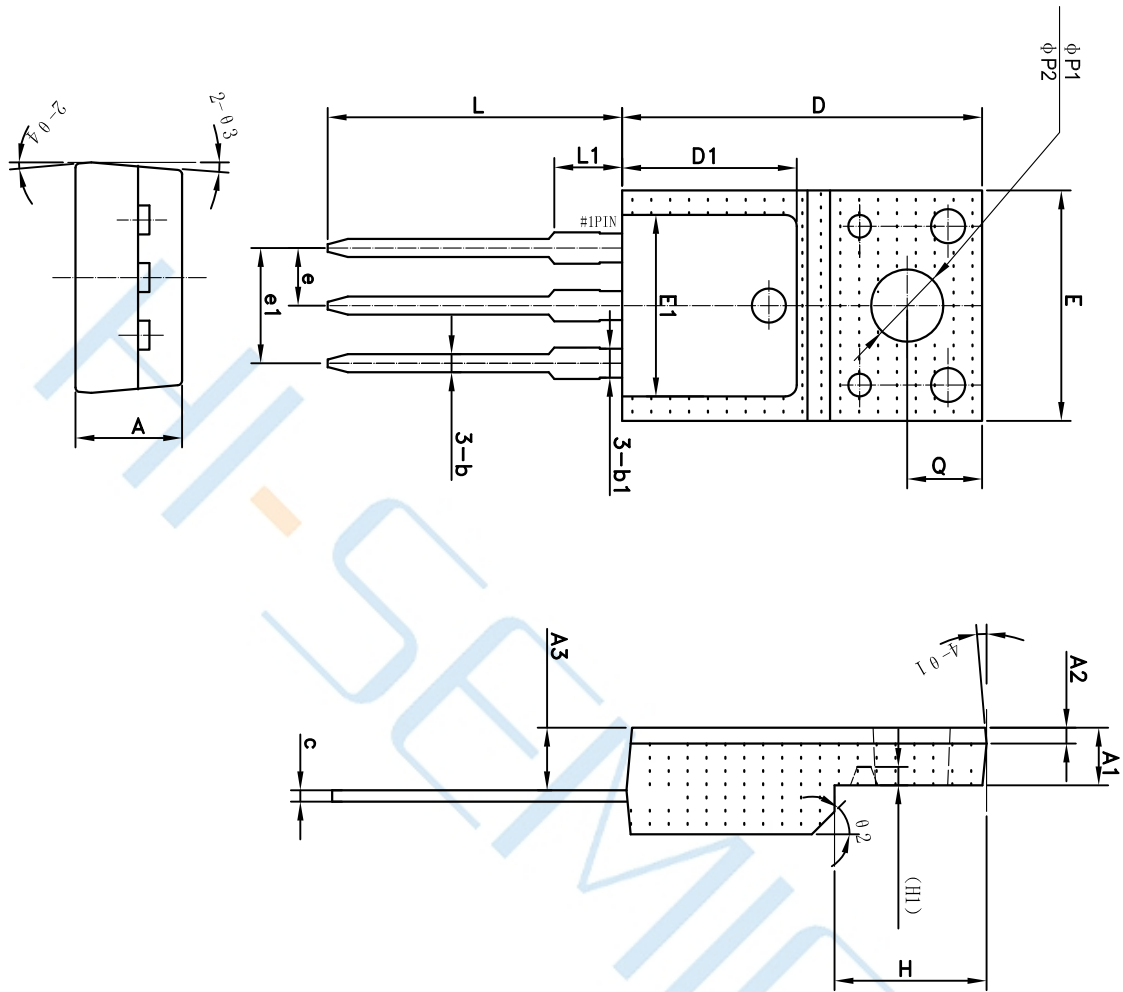
Resistive Switching Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveform

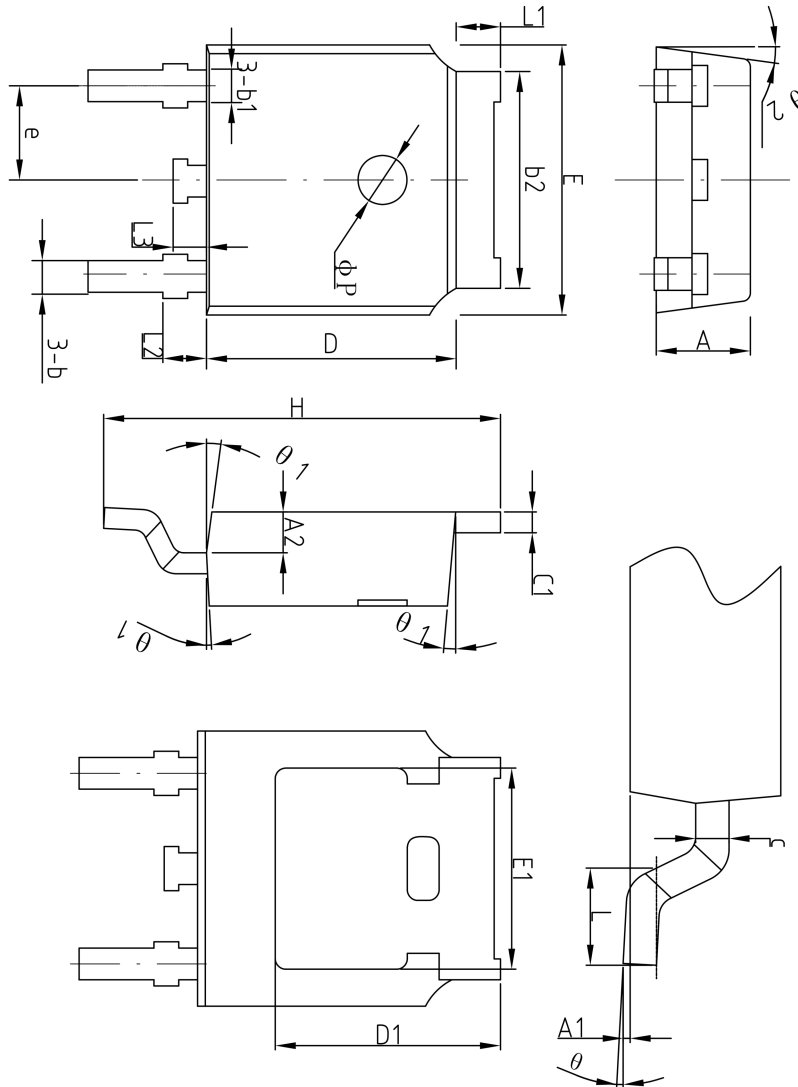


Package Dimensions of TO-220F-3L



Symbol	Dechemical Dimension(mm)		
	Min	Typ	Max
A	4.50	4.70	4.90
A1	2.44	2.54	2.64
A2	0.80	0.70	0.80
A3	2.56	2.76	2.96
b	0.70	0.80	0.95
b1		1.28	
c	0.45	0.50	0.65
D	15.67	15.87	16.07
D1		7.70	
E	9.96	10.16	10.36
E1		8.00	
e		2.54	
e1		5.08	
H	6.50	6.70	6.90
(H1)		(0.81)	
L	12.48	12.98	13.20
L1		2.93	
phi P1	2.98	3.18	3.38
phi P2	3.20	3.40	3.60
Q	3.10	3.30	3.50
theta 1		5°	
theta 2		45°	
theta 3		5°	
theta 4		5°	

Package Dimensions of TO-252-2L



SYMBOL	MIN	NOM	MAX
A	2.2	2.30	2.38
A1	0	-	0.10
A2	0.90	1.01	1.10
b	0.71	0.76	0.86
b1		0.76	
b2	5.13	5.33	5.46
c	0.47	0.50	0.60
c1	0.47	0.50	0.60
D	6.0	6.10	6.20
D1	-	5.30	-
E	6.50	6.60	6.70
E1	-	4.80	-
e	2.286BSC		
H	9.70	10.10	10.40
L	1.40	1.50	1.70
L1	0.90	-	1.25
L2		1.05	
L3		0.8	
phi P		1.2	
theta 1	0°	-	8°
theta 2	5°	7°	9°
theta 2	5°	7°	9°

COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

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