

HM10N65D / HM10N65F

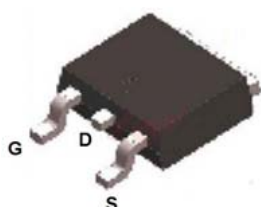
650V N-Channel MOSFET

General Description

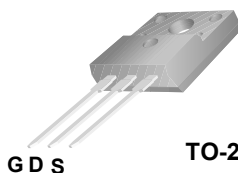
This Power MOSFET is produced using SL semi's advanced planar stripe DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies, active power factor correction based on half bridge topology.

Features

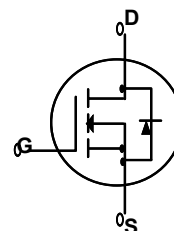
- 10A, 650V, $R_{DS(on)} = 1.09\Omega$ @ $V_{GS} = 10V$
- Low gate charge (typical 52nC)
- High ruggedness
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



TO-263-2L



TO-220F



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	HM10N65D	HM10N65F	Units
V_{DSS}	Drain-Source Voltage	650		V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	10	10*	A
	- Continuous ($T_C = 100^\circ\text{C}$)	7	7	A
I_{DM}	Drain Current - Pulsed (Note 1)	30	30 *	A
V_{GSS}	Gate-Source Voltage	± 30		V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	865		mJ
E_{AR}	Repetitive Avalanche Energy (Note 1)	23.1		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5		V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	231	54	W
	- Derate above 25°C	1.85	0.43	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150		$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300		$^\circ\text{C}$

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	HM10N65D	HM10N65F	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.54	2.33	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	--	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	62.5	$^\circ\text{C}/\text{W}$

Electrical Characteristics

T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 250 μA	650	--	--	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C	--	0.7	--	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 650 V, V _{GS} = 0 V	--	--	1	μA
		V _{DS} = 520 V, T _C = 125°C	--	--	10	μA
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} = 30 V, V _{DS} = 0 V	--	--	100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} = -30 V, V _{DS} = 0 V	--	--	-100	nA

On Characteristics

V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250 μA	2.0	--	4.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10 V, I _D = 6.0 A	--	0.87	1.09	Ω

Dynamic Characteristics

C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1.0 MHz	--	1850	--	pF
C _{oss}	Output Capacitance		--	180	--	pF
C _{rss}	Reverse Transfer Capacitance		--	20	--	pF

Switching Characteristics

t _{d(on)}	Turn-On Delay Time	V _{DD} = 325 V, I _D = 10 A, R _G = 25 Ω (Note 4, 5)	--	30	--	ns
t _r	Turn-On Rise Time		--	90	--	ns
t _{d(off)}	Turn-Off Delay Time		--	140	--	ns
t _f	Turn-Off Fall Time		--	90	--	ns
Q _g	Total Gate Charge	V _{DS} = 520 V, I _D = 10 A, V _{GS} = 10 V (Note 4, 5)	--	52	-	nC
Q _{gs}	Gate-Source Charge		--	8.5	--	nC
Q _{gd}	Gate-Drain Charge		--	20.0	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	10	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	30	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 10 A	--	--	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 10 A,	--	430	--	ns
Q _{rr}	Reverse Recovery Charge	dI _F / dt = 100 A/μs (Note 4)	--	5.0	--	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 11.0mH, I_{AS} = 10 A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C
3. I_{SD} ≤ 10 A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

Typical Characteristics

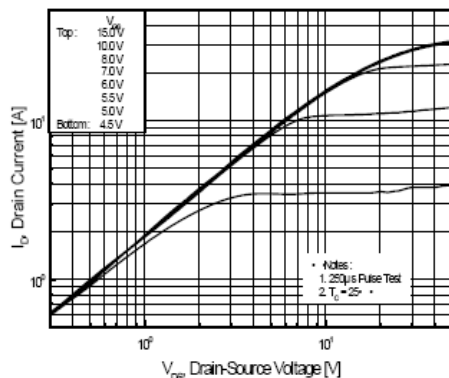


Figure 1. On-Region Characteristics

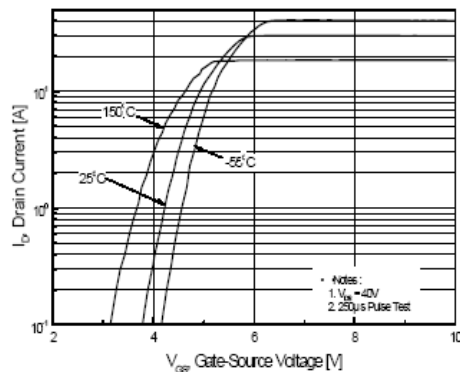


Figure 2. Transfer Characteristics

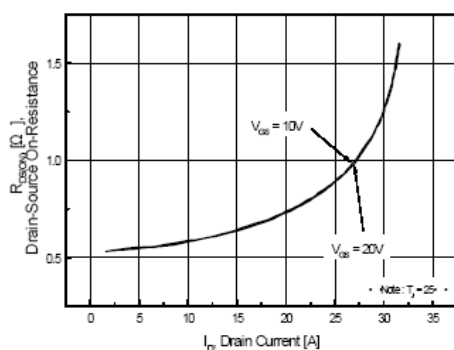


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

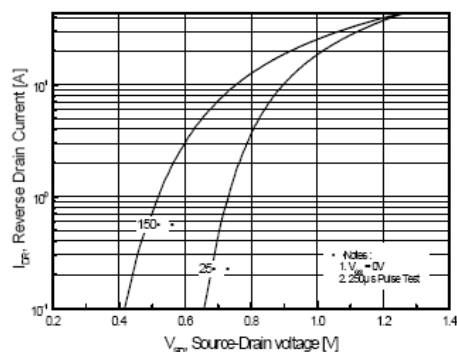


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

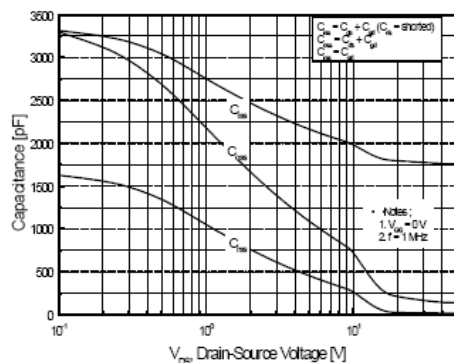


Figure 5. Capacitance Characteristics

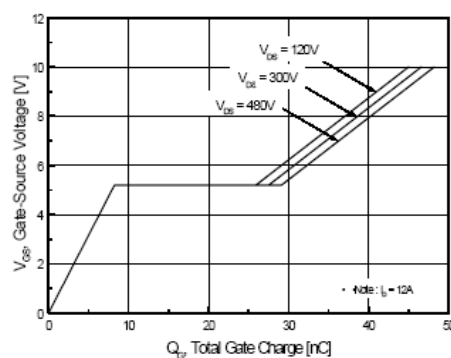


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

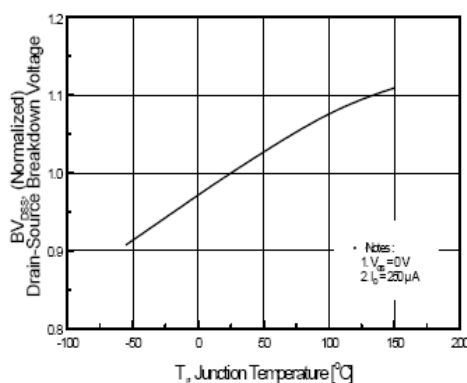


Figure 7. Breakdown Voltage Variation vs Temperature

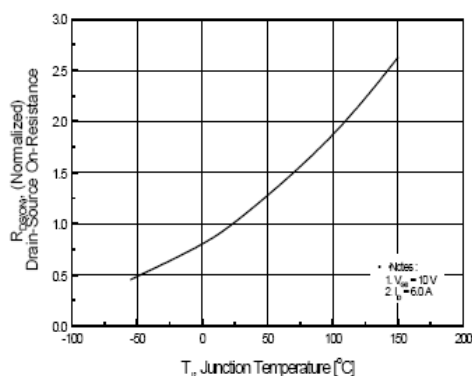


Figure 8. On-Resistance Variation vs Temperature

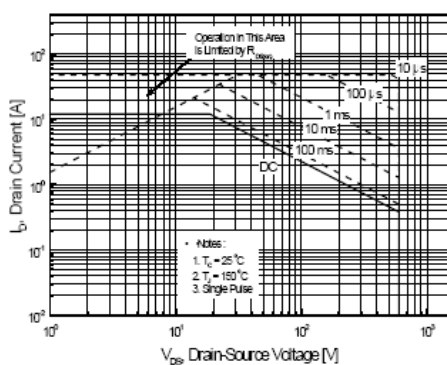


Figure 9-1. Maximum Safe Operating Area for HM10N65D

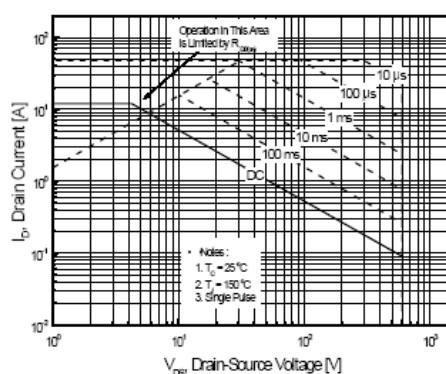


Figure 9-2. Maximum Safe Operating Area for HM10N65F

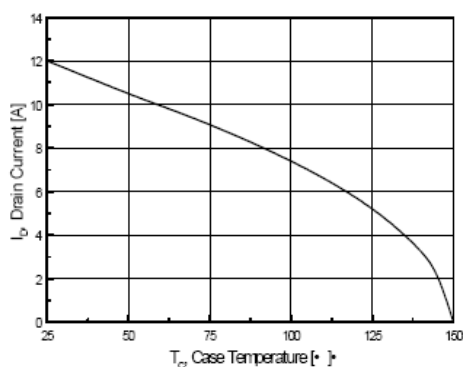
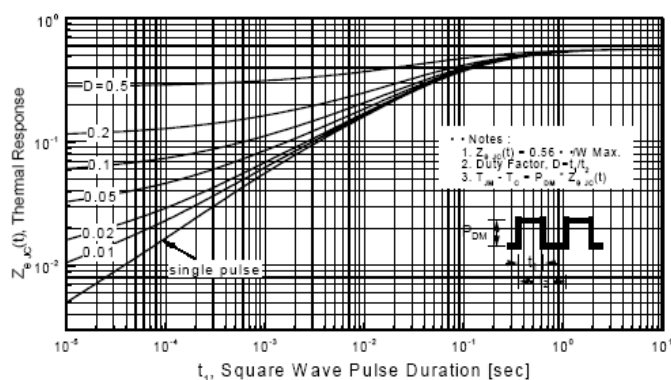
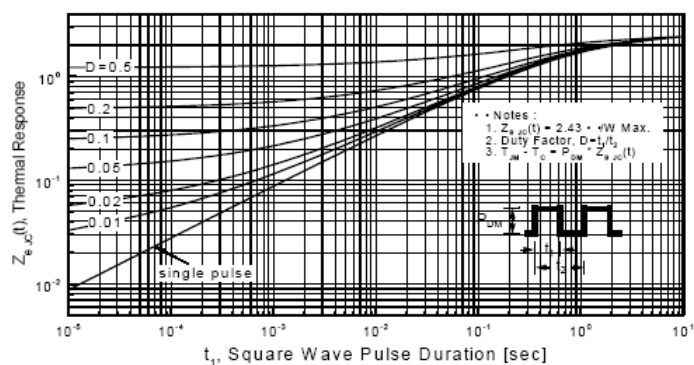


Figure 10. Maximum Drain Current vs Case Temperature

Typical Characteristics (Continued)

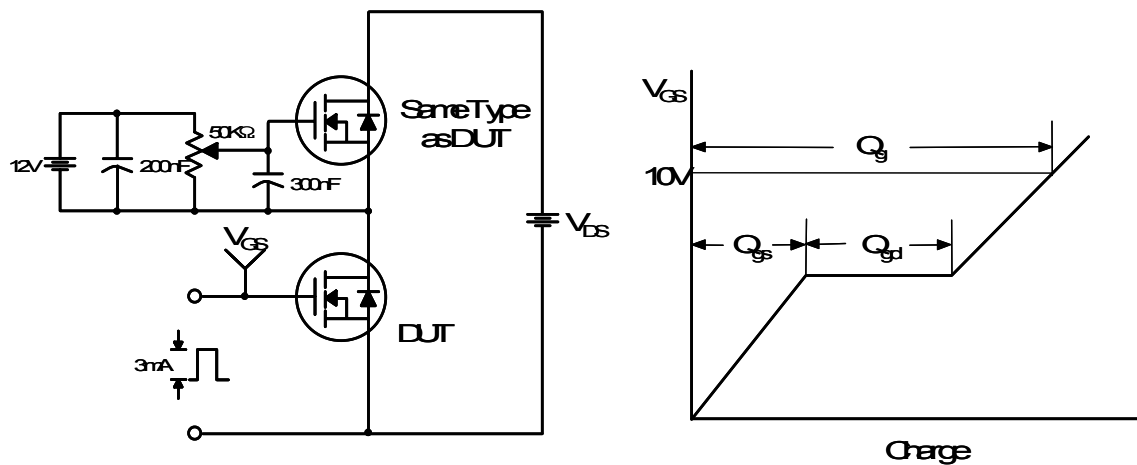


**Figure 11-1. Transient Thermal Response Curve
for HM10N65D**

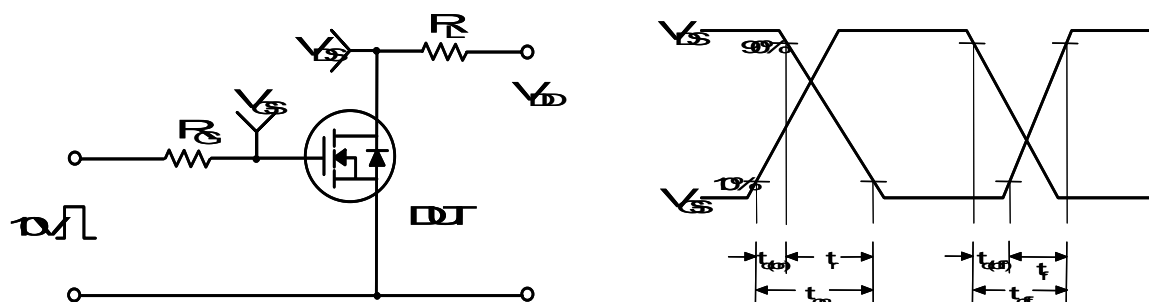


**Figure 11-2. Transient Thermal Response Curve
for HM10N65F**

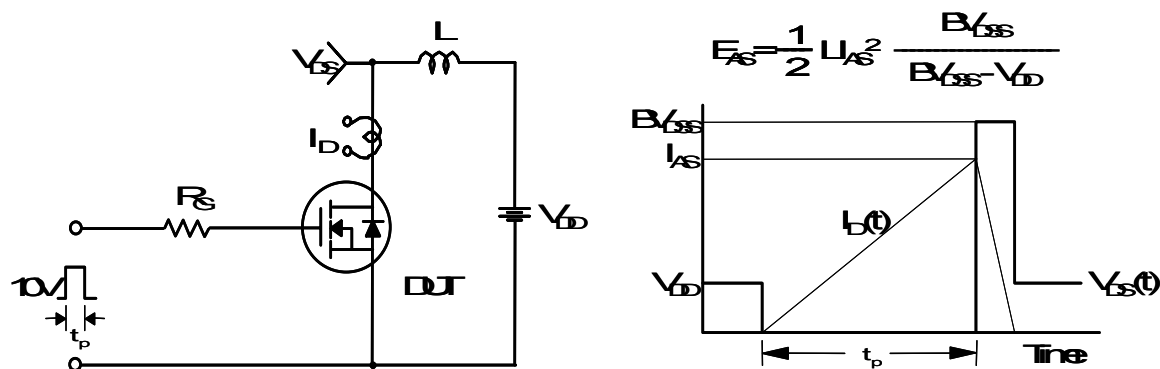
Gate Charge Test Circuit & Waveform



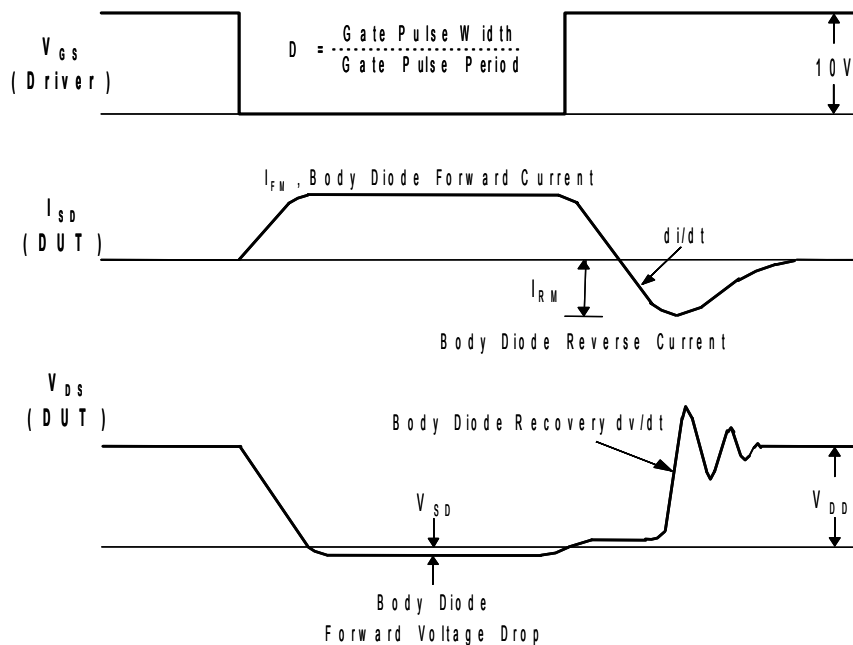
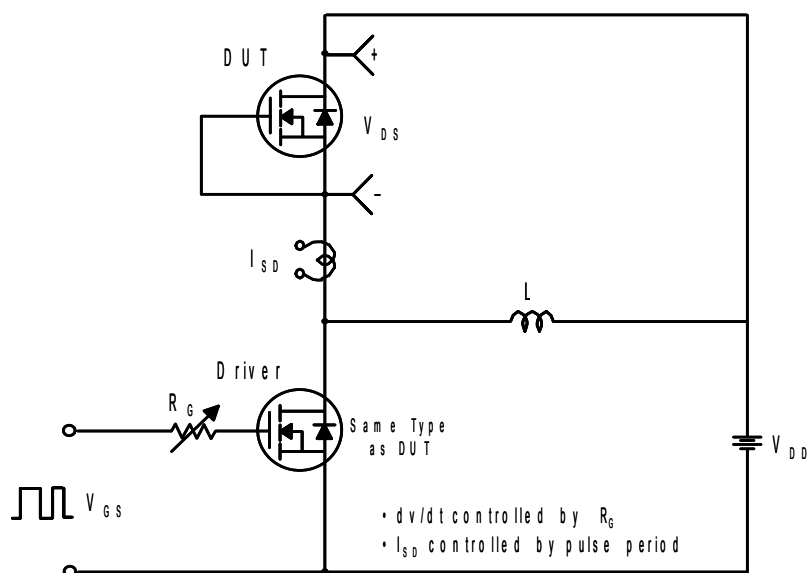
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



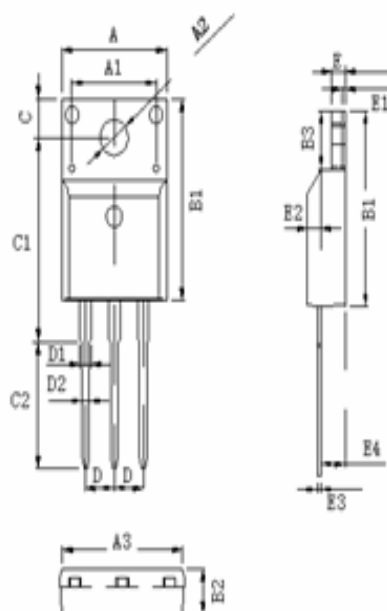
Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimensions

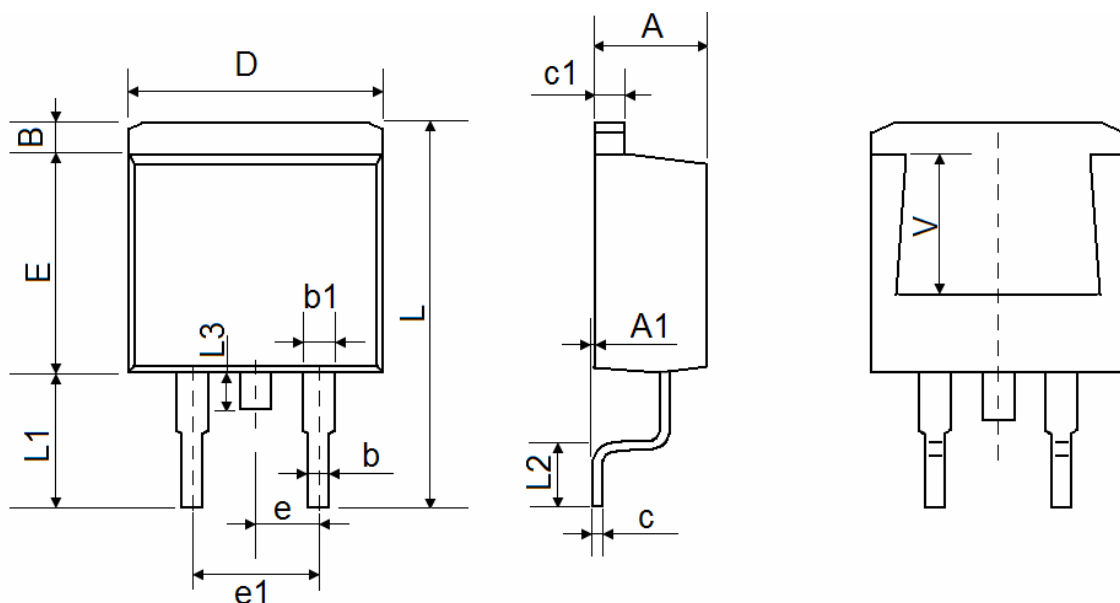
TO-220F

TO-220F 外形尺寸图



DIM.	MILLIMETERS
A	10.03 ± 0.20
A1	7.00
A2	3.12 ± 0.10
A3	9.70 ± 0.20
B1	15.75 ± 0.20
B2	4.72 ± 0.20
B3	6.70 ± 0.20
C	3.30 ± 0.10
C1	15.80 ± 0.20
C2	9.80 ± 0.2
D	Typical 2.54
D1	1.47 (MAX)
D2	0.80 ± 0.10
E	2.55 ± 0.20
E1	0.70
E2	1.00 × 45°
E3	0.50
	+0.1 -0.05
E4	2.80 ± 0.20

TO-263-2L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.470	4.670	0.176	0.184
A1	0.000	0.150	0.000	0.006
B	1.170	1.370	0.046	0.054
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
L	15.050	15.450	0.593	0.608
L1	5.080	5.480	0.200	0.216
L2	2.340	2.740	0.092	0.108
L3	1.300	1.700	0.051	0.067
V	5.600 REF		0.220 REF	