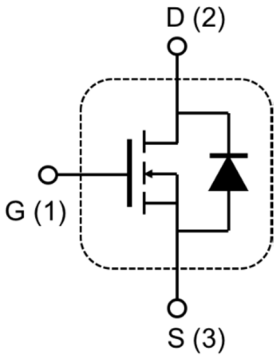
H1M065B200

Silicon Carbide Power MOSFET

N-CHANNEL ENHANCEMENT MODE

TO-220-3L

Inner Circuit



Product Summary

V_{DS}	650V
$I_{D(@25°C)}$	16A
$R_{DS(on)}$	200mΩ

RoHS COMPLIANT

Halogen free

Features

- Low On-Resistance
- Low Capacitance
- Avalanche Ruggedness
- Halogen Free, RoHS Compliant

Benefits

- Higher System Efficiency
- Parallel Device Convenience
- High Temperature Application
- High Frequency Operation

Applications

- SMPS / UPS / PFC
- EV Charging station & Motor Drives
- Power Inverters & DC/DC Converters
- Solar/ Wind Renewable Energy

Maximum Ratings (T_c=25°C)

Parameter	Symbol	Test Conditions	Value	Unit
Drain – Source Voltage	$V_{DS, max}$	V_{GS}=0V, I_{DS}=100μA	650	V
Continuous Drain Current	I_D	V_{GS}=20V, T_C=25°C	16	A
		V_{GS}=20V, T_C=110°C	10	
Pulse Drain Current	$I_{D, pulse}$	t_{PW} limitation per Fig.16	28	
Avalanche energy, Single Pulse	E_{AS}	V_{DD}=100V, I_D=5A	312	mJ
Power Dissipation	P_D	T_C=25°C	89	W
Recommend Gate Source Voltage	$V_{GS, op}$		-5/+20	V
Maximum Gate Source Voltage	$V_{GS, max}$		-10/+25	
Junction & Storage Temperature	T_j , T_{stg}		-55/+150	°C
Soldering Temperature	T_L		260	

Electrical Characteristics (T_j=25°C)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_{DS}=100μA	650			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=10V, I_{DS}=2.5mA		2.2		V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=650V, V_{GS}=0V		<1	50	μA
		V_{DS}=650V, V_{GS}=0V T_j=150°C		5	200	
Gate-Source Leakage Current	I_{GSS}	V_{GS}=20V, V_{DS}=0V			250	nA
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS}=20V, I_{DS}=5A		200	260	mΩ
		V_{GS}=20V, I_{DS}=5A, T_j=150°C		270		
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=400V f=1MHz, V_{AC}=25mV		515		pF
Output Capacitance	C_{oss}			67		
Reverse Transfer Capacitance	C_{rss}			16		
Effective Output Capacitance, Energy Related	$C_{o(er)}$	V_{GS}=0V, V_{DS}=0 to 400V		72		
Effective Output Capacitance, Time Related	$C_{o(tr)}$	I_D=const., V_{GS}=0V, V_{DS}=0 to 400V		88		
Turn On Delay Time	$t_{d(on)}$	V_{DS}=400V, V_{GS}=-4/+20V, I_D=5A, R_L=80Ω, $R_{G(ext)}$= 2.7 Ω		15		ns
Rise Time	t_r			17		
Turn Off Delay Time	$t_{d(off)}$			17		
Fall Time	t_f			20		
C_{oss} Stored Energy	E_{oss}	V_{GS}=0V, V_{DS}=400V f=1MHz, V_{AC}=25mV		7*		μJ
Turn-on Switching Energy	E_{on}	V_{DS}=400V, V_{GS}=0/20V, I_D=5A, $R_{G(ext)}$= 2.7 Ω		4*		
Turn-off Switching Energy	E_{off}			5*		
Internal Gate Resistance	$R_{G(int.)}$	f=1MHz, V_{AC}=25mV		3.6		Ω

*Base on the results of calculation, note that the energy loss caused by the reverse recovery of FWD is not included in E_{on}.

Built-in SiC Diode Characteristics (T_j=25°C)

Parameter	Symbol	Test Conditions	Typ.	Unit
Inverse Diode Forward Voltage	V_{SD}	V_{GS}=-5V, I_{SD}=1.25A	4.5	V
Reverse Recovery Time	t_{rr}	V_{GS}=0V, I_{SD}=5A, V_{DS}=400V, di/dt=300A/μs	50	ns
Reverse Recovery Charge	Q_{rr}		35	nC
Peak Reverse Recovery Current	I_{rrm}		1.8	A

Gate Charge Characteristics (T_j=25°C)

Parameter	Symbol	Test Conditions	Value	Unit
Gate to Source Charge	Q_{GS}	V_{DS}=400V, V_{GS}=-5/+20V, I_D=5A	10	nC
Gate to Drain Charge	Q_{GD}		19	
Total Gate Charge	Q_G		43	
Gate plateau voltage	V_{pl}		8.7	V

Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta,JC}$	1.4	K/W
Thermal Resistance, Junction to Ambient	$R_{\theta,JA}$	TBD	

Typical Device Performance

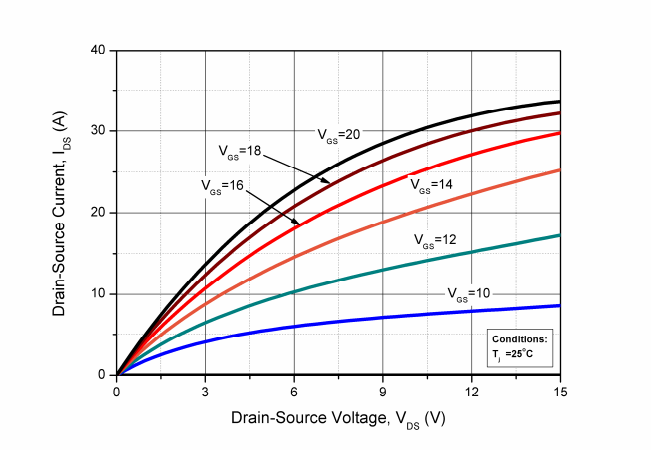


Fig. 1 Forward Output Characteristics at T_j = 25°C

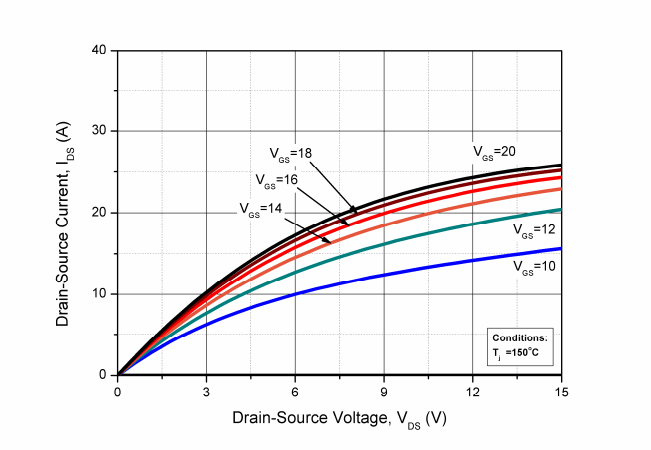


Fig. 2 Forward Output Characteristics at T_j = 150°C

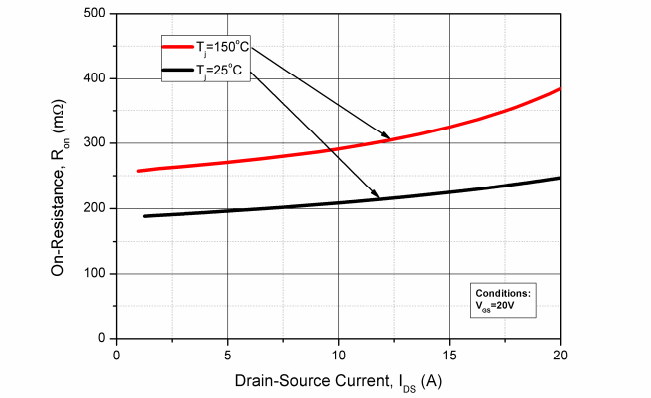


Fig. 3 On-Resistance vs. Drain Current for Various T_j

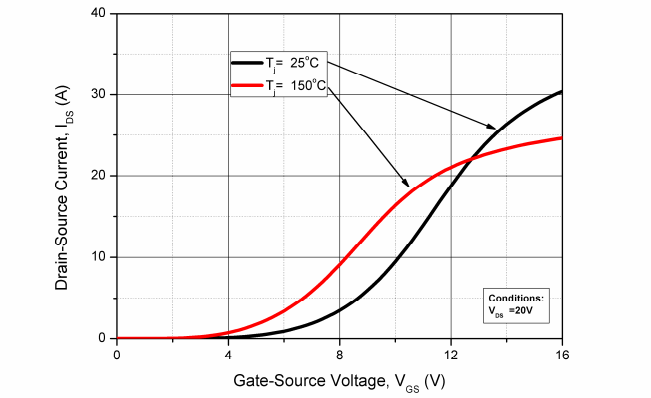


Fig. 4 Transfer Characteristics for Various T_j

Typical Device Performance

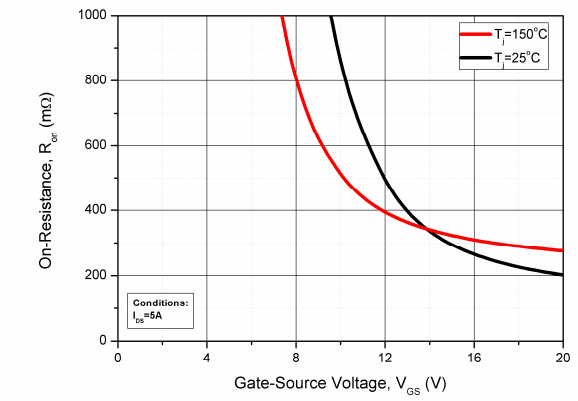


Fig. 5 On-Resistance vs. Gate Voltage for Various T_j

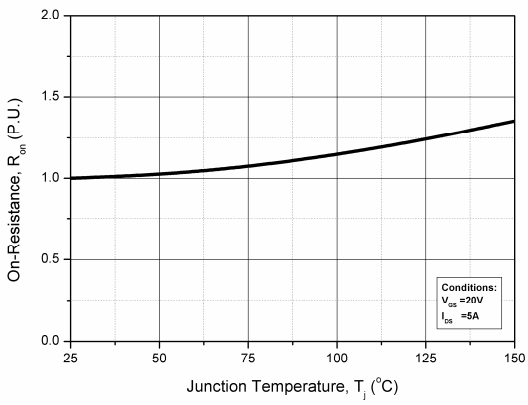


Fig. 6 Normalized On-Resistance vs. Temperature

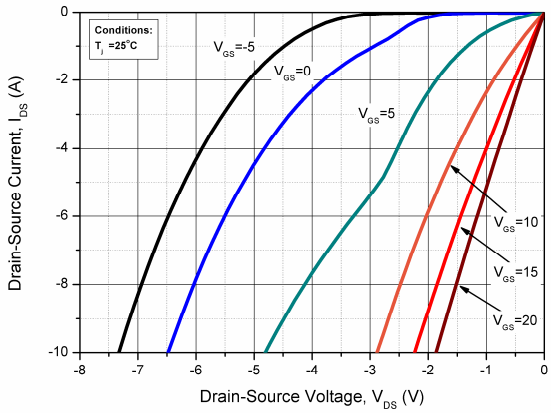


Fig. 7 Reverse Output Characteristics at T_j = 25°C

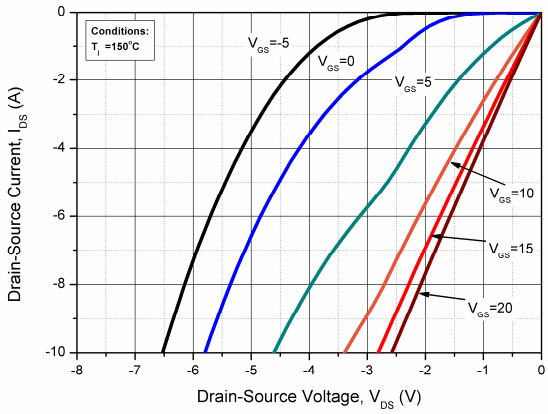


Fig. 8 Reverse Output Characteristics at T_j = 150°C

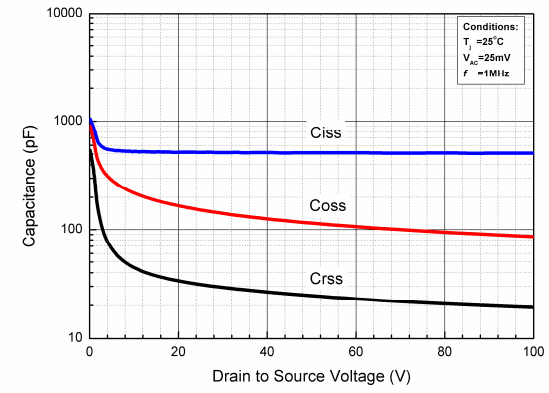


Fig. 9 Capacitances vs. Drain to Source Voltage (0 - 100V)

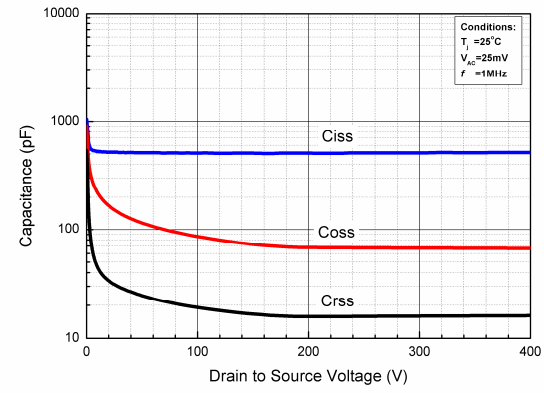


Fig. 10 Capacitances vs. Drain to Source Voltage (0 - 400V)

Typical Device Performance

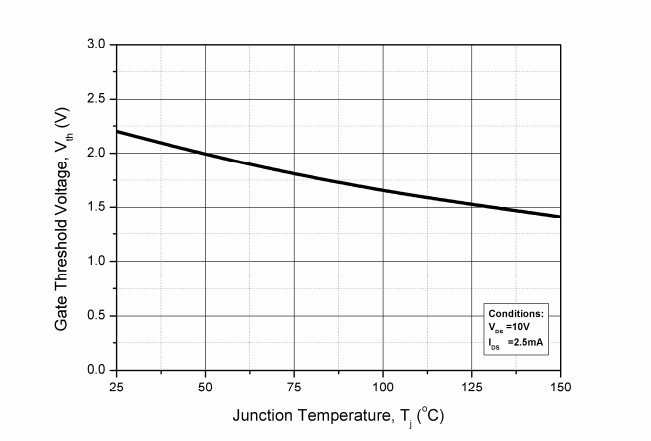


Fig. 11 Threshold Voltage vs. Temperature

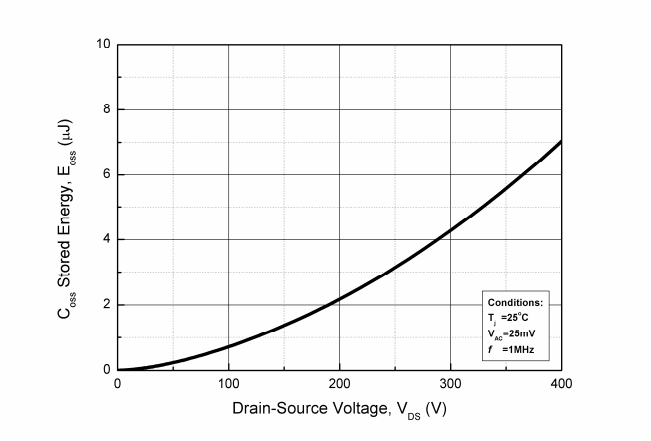


Fig. 12 Output Capacitor Stored Energy*

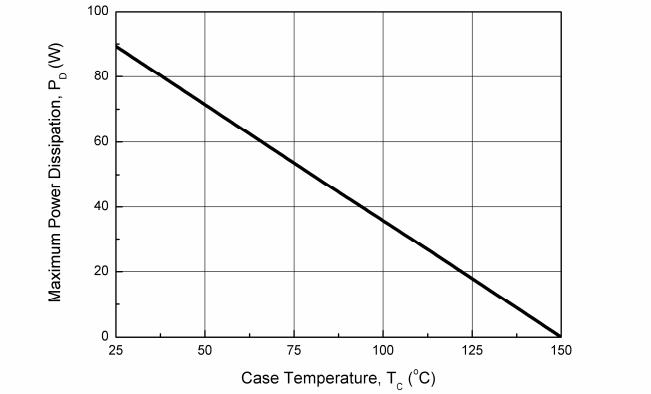


Fig. 13 Maximum Power Dissipation Derating vs. Case Temperature

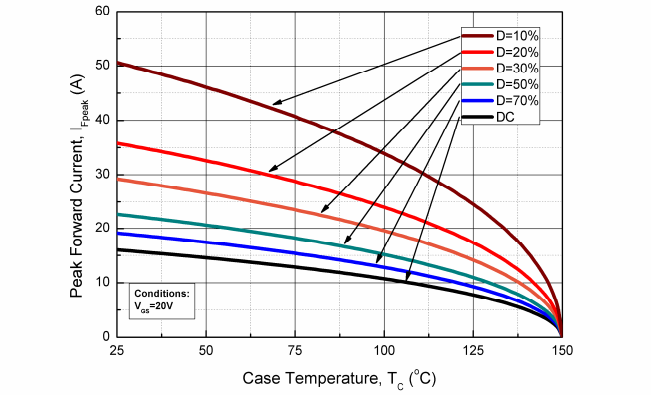


Fig. 14 Drain Current Derating vs. Case Temperature

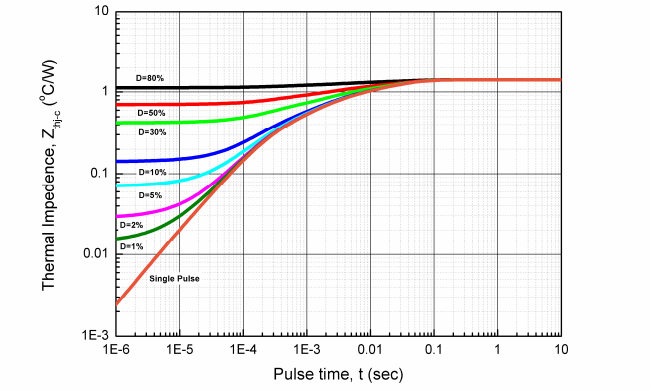


Fig. 15 Transient Junction to Case Thermal Impedance

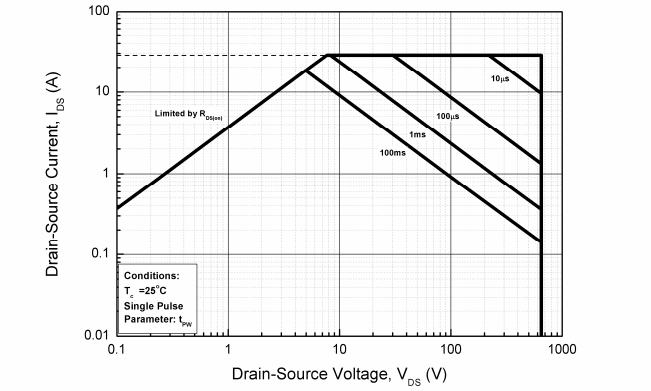


Fig. 16 Safe Operating Area

Typical Device Performance

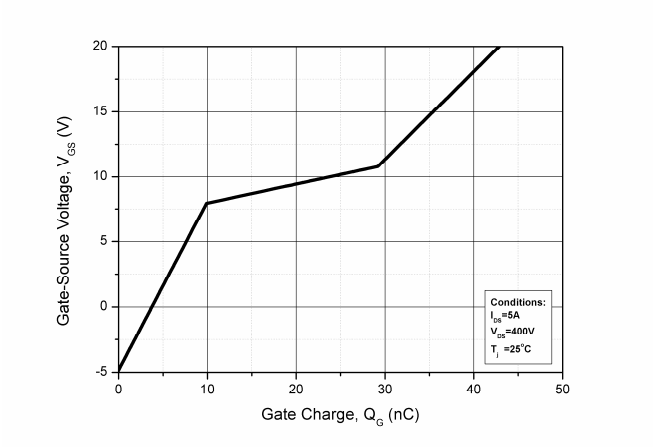


Fig. 17 Gate Charge Characteristics

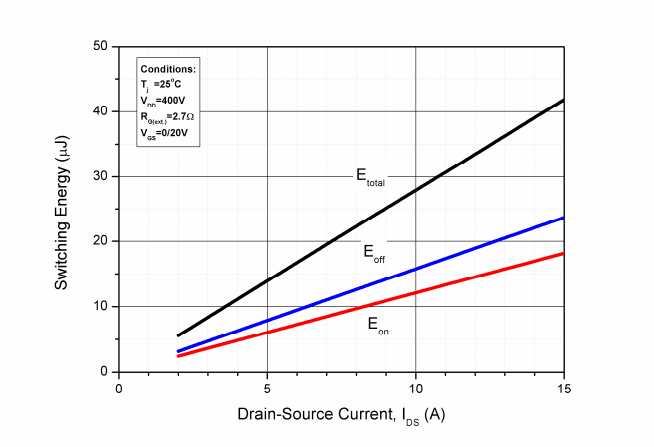


Fig. 18 Clamped Inductive Switching Energy vs. Drain Current (V_{DD}=400V)*

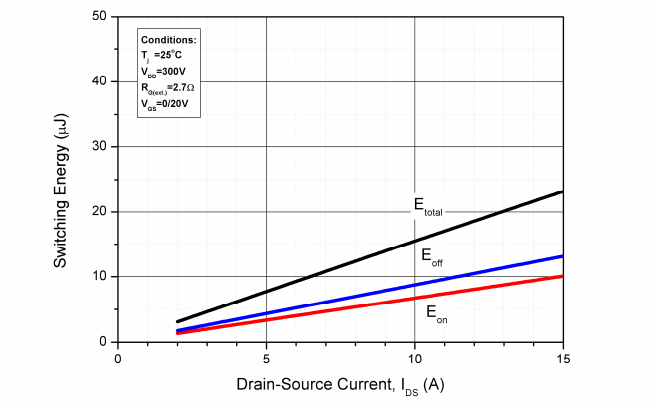


Fig. 19 Clamped Inductive Switching Energy vs. Drain Current (V_{DD}=300V)*

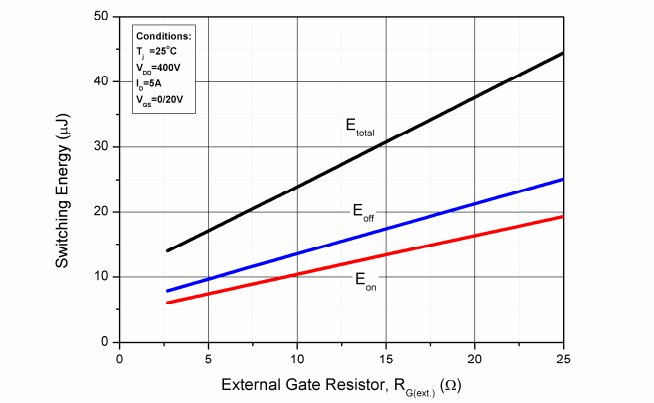
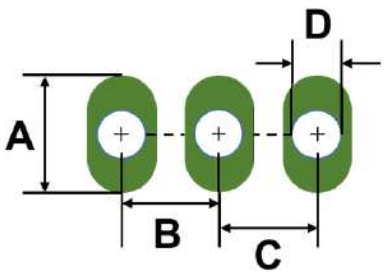


Fig. 20 Clamped Inductive Switching Energy vs. External Gate Resistor ($R_{G(ext.)}$)*

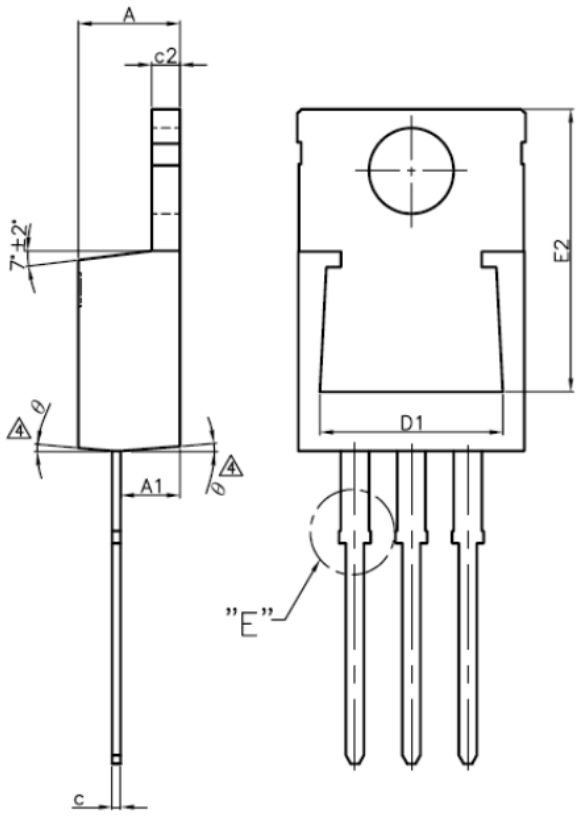
*Base on the results of calculation, note that the energy loss caused by the reverse recovery of FWD is not included in E_{on}.

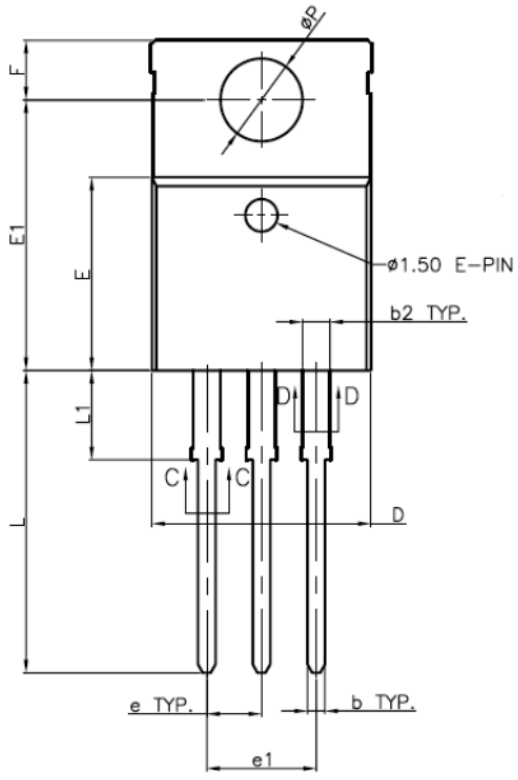
Recommended Solder Pad Layout (TO-220-3L)



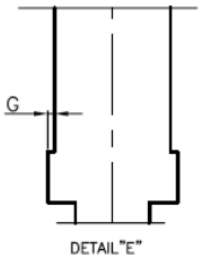
Mechanical Parameters			
Parameter	Symbol	Typical	Unit
Length	A	3.048	mm
	B	2.540	
	C	2.540	
	D	1.270	

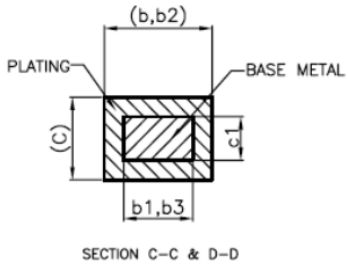
Mechanical Parameters





	SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
		MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
	A	4.470	---	4.670	0.176	---	0.184
	A1	2.520	---	2.820	0.099	---	0.111
4	b	0.711	0.813	0.910	0.028	0.032	0.036
	b1	0.711	---	0.914	0.028	---	0.036
	b2	1.170	1.270	1.370	0.046	0.050	0.054
	b3	1.168	---	1.372	0.046	---	0.054
	c	0.279	0.381	0.483	0.011	0.015	0.019
	c1	0.279	---	0.432	0.011	---	0.017
4	c2	1.168	1.270	1.370	0.046	0.050	0.054
	D	10.010	---	10.310	0.394	---	0.406
	D1	7.595	---	8.230	0.299	---	0.324
	E	8.763	8.890	9.017	0.345	0.350	0.355
4	E1	12.294	12.446	12.586	0.484	0.490	0.496
	E2	11.913	---	12.548	0.469	---	0.494
	e	---	2.540	---	---	0.100	---
	e1	4.980	---	5.180	0.196	---	0.204
	F	2.642	2.743	2.946	0.104	0.108	0.116
4	G	0.000	---	0.152	0.000	---	0.006
	L	13.700	---	14.100	0.539	---	0.555
4	L1	3.980	4.107	4.230	0.157	0.162	0.167
4	ØP	3.770	---	3.890	0.148	---	0.153
4	θ	1°	---	5°	1°	---	5°





NOTES:
1.All dimension are in mm[inch].
2.Tolerance : ±0.004inch.

*The information provided herein is subject to change without notice.