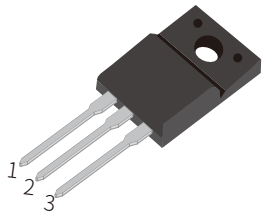
FEATURES

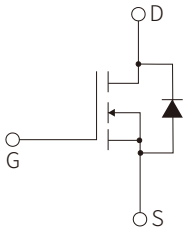
- Low Gate Charge
- Low ON Resistance
- Improved dv/dt Capability
- 100% Avalanche Tested



TO-220F

APPLICATION

- Switching Mode Power Supplies (SMPS)
- PWM Motor Controls
- AC to DC Converters
- LED Lighting
- Adapter



Schematic Symbol

APPROVALS

RoHS	Compliance with 2011/65/EU
HF	Compliance with IEC61249-2-21:2003

ABSOLUTE MAXIMUM RATINGS (T_A=25°C)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DSS}	650	V
Continuous Drain Current	T_C=25°C	I_D	12(1)	A
	T_C=100°C		7.5(1)	A
Drain current pulsed (2)		I_{DM}	40(1)	A
Gate-Source Voltage		V_{GS}	±30	V
Single pulsed Avalanche Energy (3)		E_{AS}	576	mJ
Peak diode Recovery dv/dt (4)		dv/dt	5	V/ns
Total power dissipation (@T_C=25°C)		P_D	24	W
Derating Factor above 25°C		P_D	0.19	W/°C
Operating Junction Temperature & Storage Temperature		T_{STG}, T_J	-55 to +150	°C
Maximum lead temperature for soldering purpose		T_L	260	°C
Thermal resistance, Junction to case (Maximum)		R_{thjc}	5.1	°C/W
Thermal resistance, Junction to ambient (Maximum)		R_{thja}	62	°C/W

Notes
1. Drain current is limited by maximum junction temperature.
2. Repetitive rating : pulse width limited by junction temperature.
3 . L = 12mH, I_{AS} = 3A, V_{DD} = 50V, R_G=25Ω, Starting at T_J = 25°C
4. I_{SD} ⩽ I_D, di/dt = 100A/us, V_{DD} ⩽ BV_{DSS}, Starting at T_J =25°C

ELECTRICAL CHARACTERISTICS (T_A=25°C)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain-source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_D=250μA	650			V
Breakdown voltage temperature coefficient	ΔBV_{DSS} / ΔT_J	I_D=250uA, referenced to25°C		0.65		V/°C
Zero Gate Voltage Drain current	I_{DSS}	V_{DS}=650V, V_{GS}=0V			1	uA
		V_{DS}=520V, T_C=125°C			50	uA
Gate Leakage Current	I_{GSS}	V_{GS}=30V ,V_{DS}=0V			100	nA
		V_{GS}=-30V ,V_{DS}=0V			-100	nA
Off Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250μA	2.5	3.5	4.5	V
Drain-Source On-Resistance (note2)	$R_{DS(on)}$	V_{GS}=10V, I_D=2A		0.65	0.8	Ω
Forward Tran conductance	gFS	V_{DS}=10V, I_D=2A		9.6		S
Dynamic Characteristics						
Input capacitance	C_{ISS}	V_{DS} = 25V, V_{GS} = 0V, f=1MHz		1890		pF
Output capacitance	C_{OSS}			144		pF
Reverse Transfer capacitance	C_{rss}			9.9		pF
Turn-on Delay Time	td(on)	V_{DS}=325V,I_D=4A, R_G=25Ω V_{GS}=10V		33		ns
Rising time	tf			41		ns
Turn-off Delay Time	td(off)			102		ns
Input capacitance	tf			37		ns
Total gate charge	Q_g	V_{DS}=325V,I_D=4A,V_{GS}=10V		38		nC
Gate-source charge	Q_{gs}			9		nC
Gate-drain charge	Q_{gd}			13		nC
Gate Resistance	R_g	V_{DS}=0V,Scan F mode		1.4		Ω
Continuous source current	I_S	Integral reverse p-n Junction diode in the MOSFET			12	A
Pulsed source current	I_{SM}				48	A
Diode forward voltage drop.	V_{SD}	I_S=4A, V_{GS}=0V			1.3	V
Reverse recovery time	Trr	I_S=4A, V_{GS}=0V, dI_F/dt=100A/us		480		ns
Reverse recovery Charge	Qrr			4.5		uC
Peak Reverse Recovery Current	Irrm	I_S=7A, dI_F/dt=100A/us		18.5		A

CHARACTERISTIC CURVES

Fig.1 Output characteristics

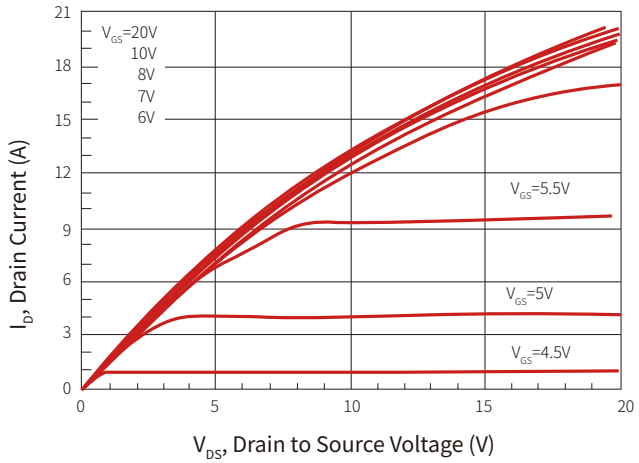


Fig.2 Reverse Characteristics

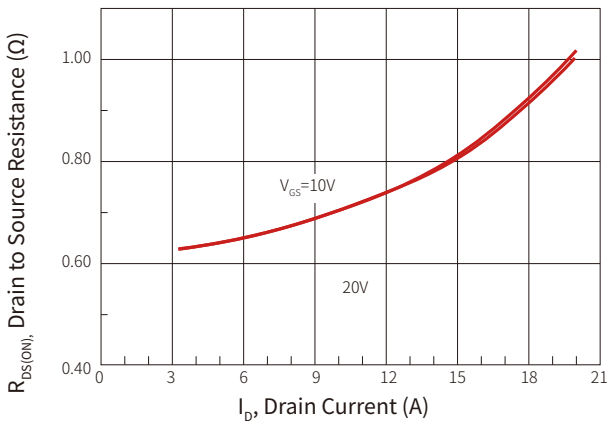


Fig.3 Gate charge characteristics

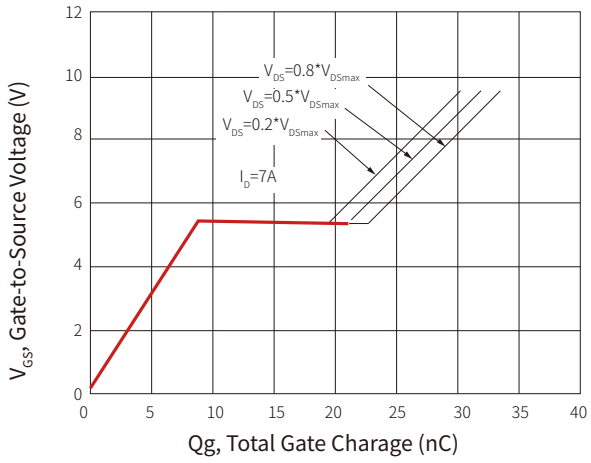


Fig.4 Capacitance Characteristics

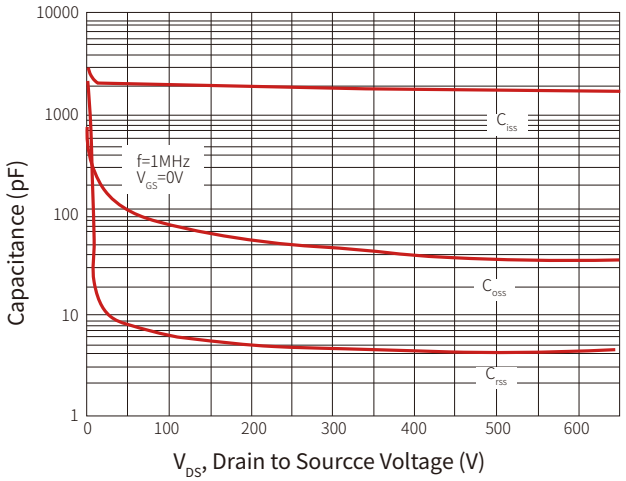


Fig.5 $R_{DS(ON)}$ vs junction temperature

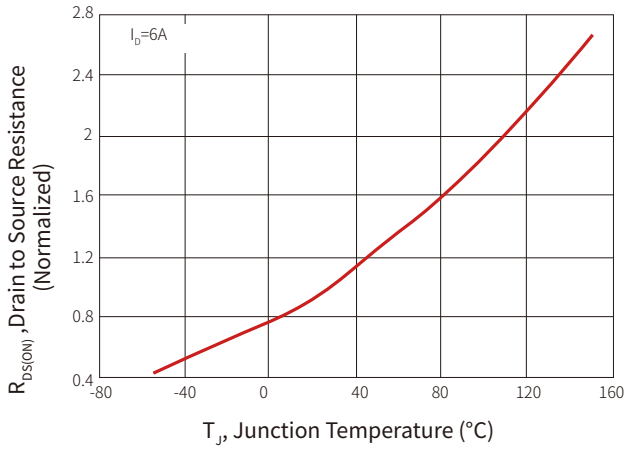


Fig. 6 BV_{DSS} vs junction temperature

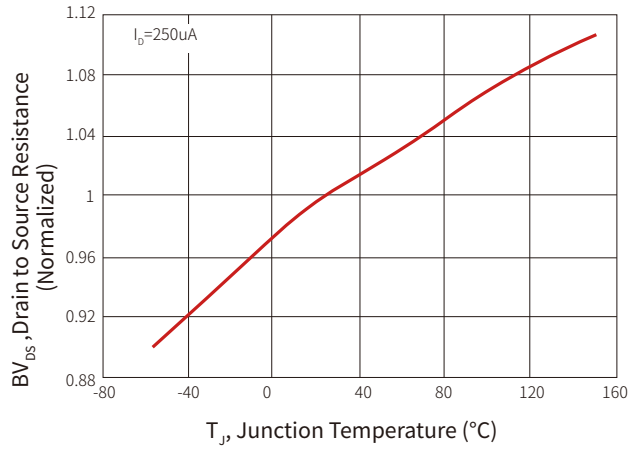


Fig.7 Forward characteristics of reverse diode

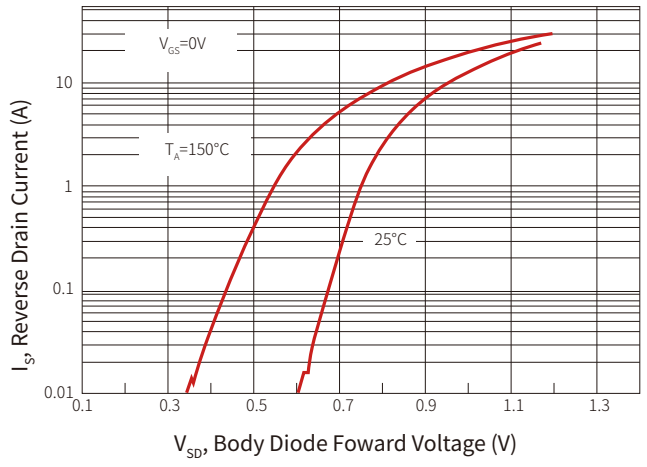


Fig.8 Transfer characteristics

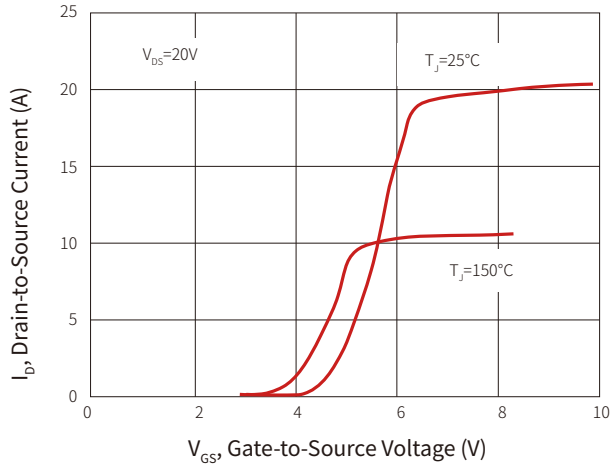


Fig.9 $V_{GS(TH)}$ vs junction temperature

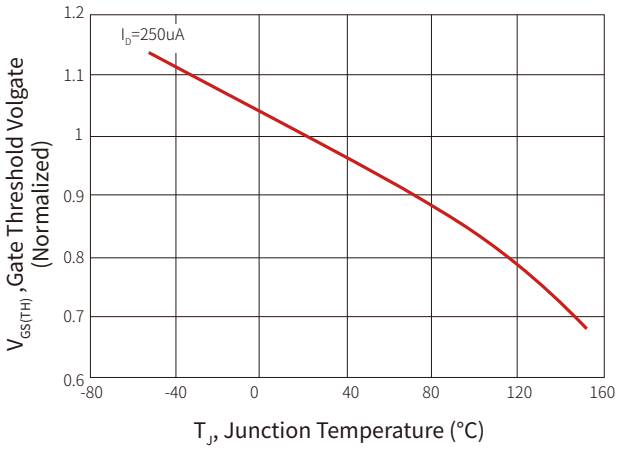


Fig. 10 Safe operating area

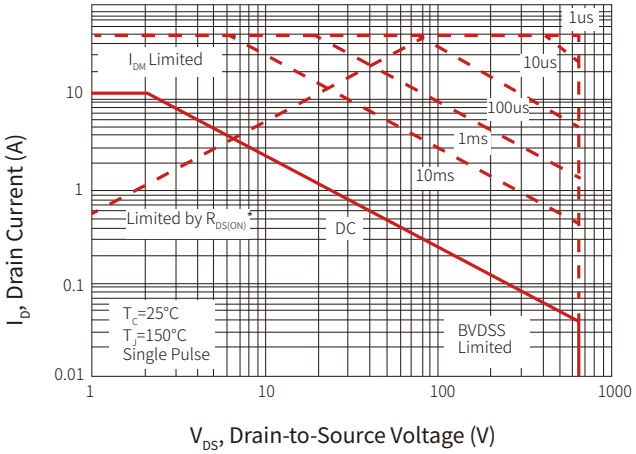


Fig.11 Transient thermal impedance

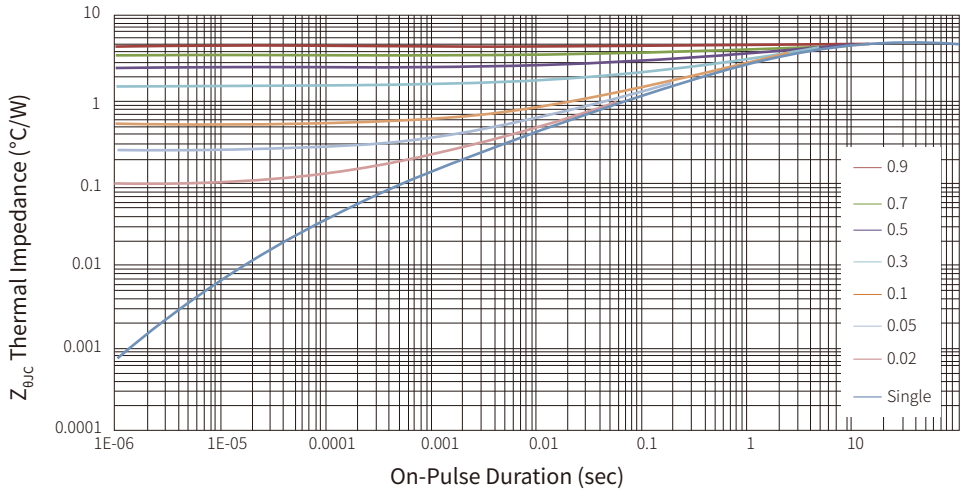


Fig.12 Gate charge test circuit & waveform

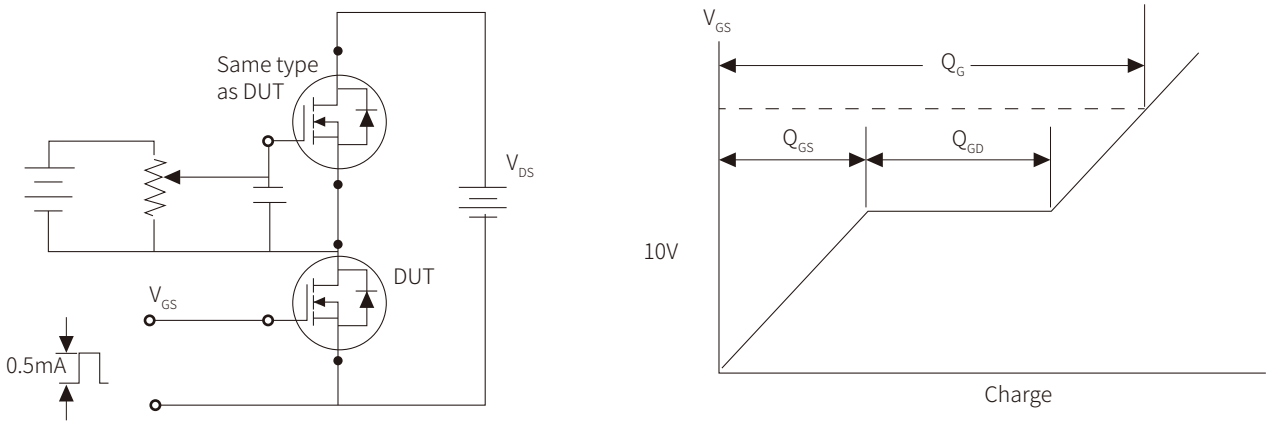


Fig.13 Switching time test circuit & waveform

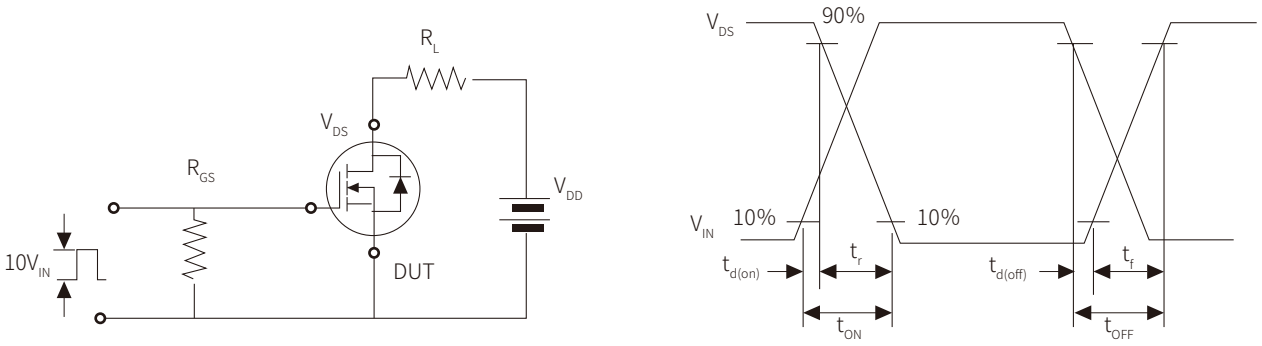


Fig.14 Unclamped Inductive switching test circuit & waveform

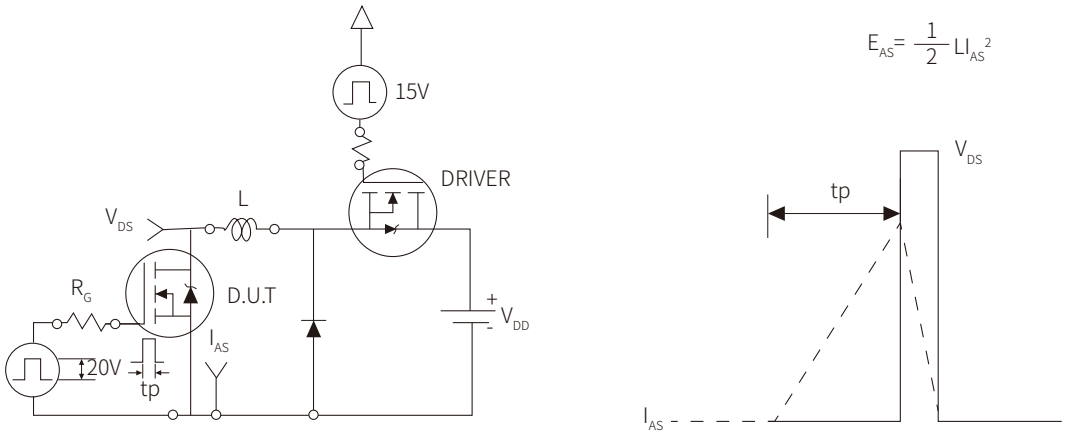
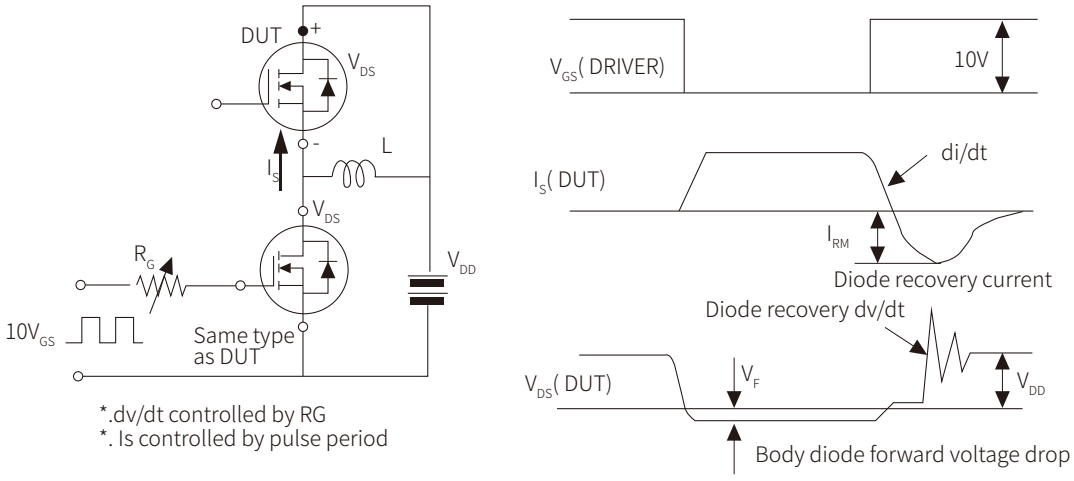
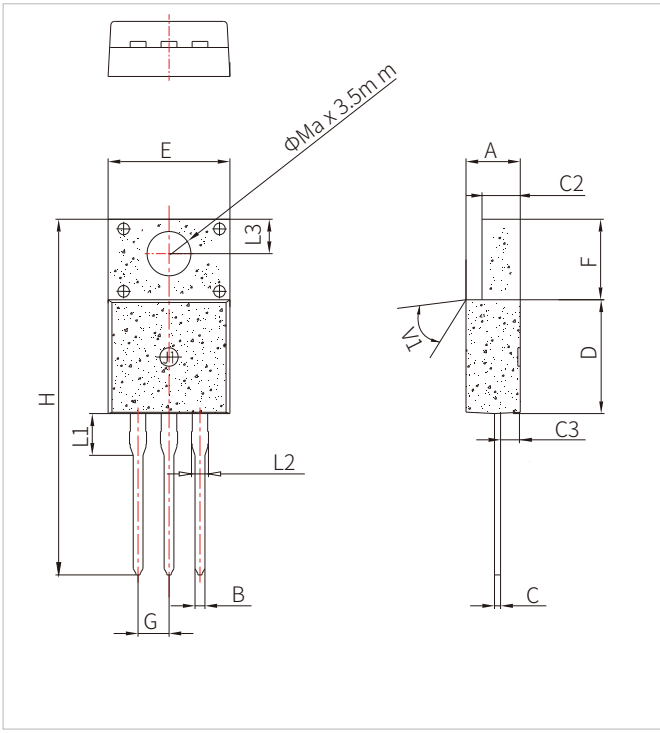


Fig.15 Peak diode recovery dv/dt test circuit & waveform



TO-220F PACKAGE MECHANICAL DATA



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.90	0.173		0.193
B	0.74	0.80	0.83	0.029		0.033
C	0.45		0.75	0.018		0.030
C2	2.40		2.70	0.094		0.106
C3	2.60		3.00	0.102		0.118
D	8.80		9.30	0.346		0.366
E	9.70		10.4	0.382		0.409
F	6.40		7.00	0.252		0.276
G		2.54			0.1	
H	28.0		30.0	1.102		1.181
L1		3.55			0.140	
L2	1.14		1.70	0.045		0.067
L3		3.30			0.130	
V1		45°			45°	

ORDERING INFORMATION

Part Number	Component Package	Marking	QTY/Tube	Box
SNMF12N65	TO-220F	PDI12N65P2	50PCS	1000PCS

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