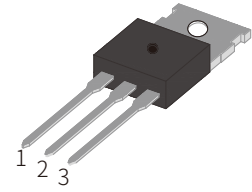


FEATURES

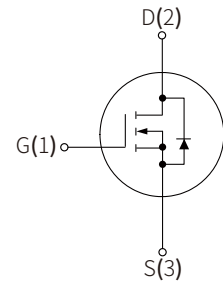
- | Advanced trench cell design
- | Low Thermal Resistance
- | Super Trench



TO-220C

APPLICATIONS

- | Motor drivers
- | DC - DC Converter



Schematic Symbol

APPROVALS

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

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain-source voltage	V_{DS}	$T_j = 25^\circ\text{C}$ to 150°C			500	V
Drain-gate voltage	V_{DGR}	$T_j = 25^\circ\text{C}$ to 150°C ; $R_{GS} = 20\text{ k}\Omega$			500	V
Gate-source voltage	V_{GS}				± 30	V
Continuous drain current	I_D	$T_{mb} = 25^\circ\text{C}$; $V_{GS} = 10\text{ V}$			8.5	A
		$T_{mb} = 100^\circ\text{C}$; $V_{GS} = 10\text{ V}$			5.4	
Pulsed drain current	I_{DM}	$T_{mb} = 25^\circ\text{C}$			34	A
Total dissipation	P_D	$T_{mb} = 25^\circ\text{C}$			147	W
Operating junction and storage temperature range	T_j, T_{stg}		-55		150	$^\circ\text{C}$
Non-repetitive avalanche energy	E_{AS}	Unclamped inductive load, $I_{AS} = 7.4\text{ A}$; $t_p = 0.22\text{ ms}$; T_j prior to avalanche = 25°C ; $V_{DD} \leq 50\text{ V}$; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$; refer to fig:17			531	mJ
Repetitive avalanche energy (Notes1)	E_{AR}	$I_{AR} = 8.5\text{ A}$; $t_p = 2.5\text{ }\mu\text{s}$; T_j prior to avalanche = 25°C ; $R_{GS} = 50\text{ }\Omega$; $V_{GS} = 10\text{ V}$; refer to fig:18			13	mJ
Repetitive and non-repetitive avalanche current	I_{AS}, I_{AR}				8.5	A
Thermal resistance junction	$R_{th\ j-mb}$	in free air			0.85	K/W
Thermal resistance junction	$R_{th\ j-a}$	in free air		60		K/W

Notes: (1) pulse width and repetition rate limited by T_j max.

ELECTRICAL CHARACTERISTICS($T_A=25^{\circ}\text{C}$)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain-source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=0.25mA$	500			V
Drain-source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}$	$V_{DS}=V_{GS}, I_D=0.25mA$		0.1		%/K
Drain-source On Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=4.8A$		0.6	0.85	Ω
Gate Threshold Voltage	$V_{GS(To)}$	$V_{DS}=V_{GS}, I_D=0.25mA$	2	3	4	V
Forward Transconductance	g_{fs}	$V_{DS}=30V, I_D=4.8A$	3.5	6		S
Drain-source Leakage Current	I_{DSS}	$V_{DS}=500V, V_{GS}=0V$		1	25	μA
		$V_{DS}=400V, V_{GS}=0V, T_J=125^{\circ}\text{C}$		40	250	
Gate-source Leakage Current	I_{GSS}	$V_{GS}=\pm 30V, V_{DS}=0V$		10	200	nA
Total Gate Charge	$Q_{G(tot)}$	$I_D = 8.5 A; V_{DD} = 400 V; V_{GS} = 10 V$		55	80	nC
Gate Source Charge	Q_{gs}			5.5	7	
Gate-drain (Miller) Charge	Q_{gd}			30	45	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 250 V; R_D = 30 \Omega; R_G = 9.1 \Omega$		18		ns
Turn-on Rise Time	t_r			37		
Turn-off Delay Time	$t_{d(off)}$			80		
Turn-off Fall Time	t_f			36		
Internal Drain Inductance	L_d	Measured from tab to centre of die		3.5		nH
Internal Drain Inductance	L_d	Measured from drain lead to centre of die		4.5		
Internal Source Inductance	L_s	Measured from source lead to source bond pad		7.5		
Input Capacitance	C_{iss}	$V_{GS}=0V, V_{DS}=25V, f=1MHz$		960		pF
Output Capacitance	C_{oss}			140		
Feedback Capacitance	C_{rss}			80		

Source-drain Diode Ratings And Characteristics

Continuous Source Current (Body Diode)	I_S	$T_{mb} = 25^{\circ}\text{C}$			8.5	A
Pulsed Source Current (Body Diode)	I_{SM}	$T_{mb} = 25^{\circ}\text{C}$			34	A
Diode Forward Voltage	V_{SD}	$I_S = 8.5 A; V_{GS} = 0 V$			1.2	V
Reverse Recovery Time	t_{rr}	$I_S = 8.5 A; V_{GS} = 0 V; dI/dt = 100 A/\mu s$		440		ns
Reverse Recovery Charge	Q_{rr}			6.4		μC

PARAMETER CHARACTERISTIC CURVE

Figure 1: Normalised power dissipation.
 $PD\% = 100 \cdot P_D / P_{D25^\circ C} = f(T_{mb})$

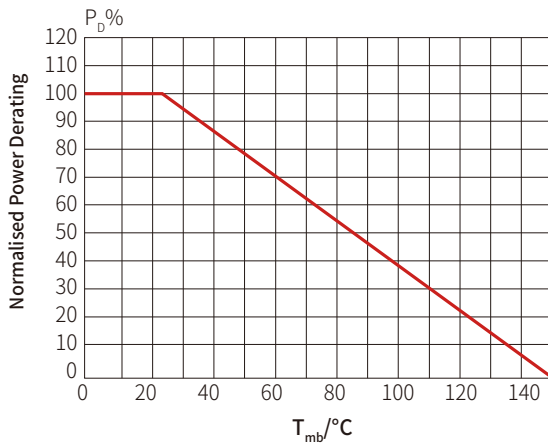


Figure 2: Normalised continuous drain current.
 $ID\% = 100 \cdot I_D / I_{D25^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10V$

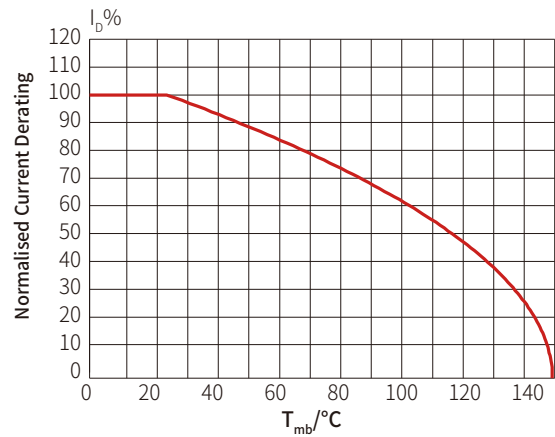


Figure 3: Safe operating area. $T_{mb} = 25^\circ C$
 I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

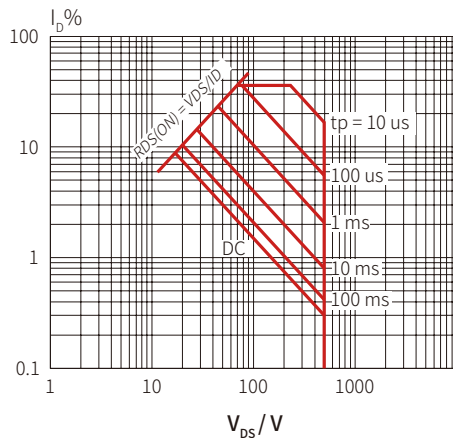


Figure 4: Transient thermal impedance.
 $Z_{thj-mb} = f(t)$; parameter $D = t_p / T$

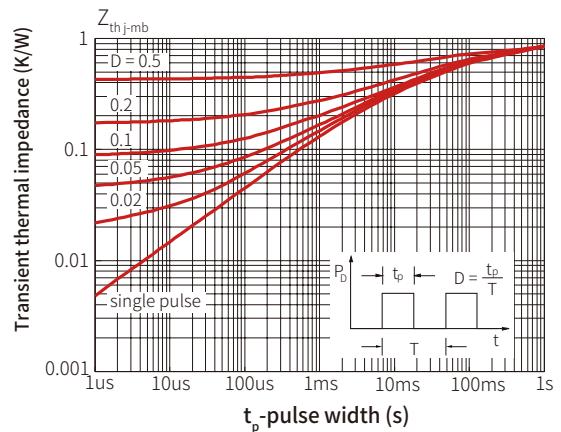


Figure 5: Typical output characteristics.
 $I_D = f(V_{DS})$; parameter V_{GS}

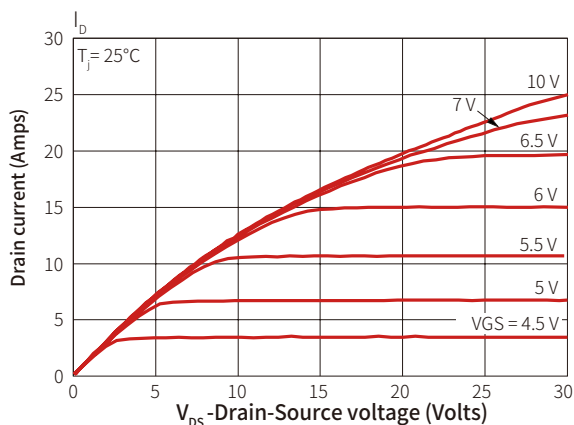


Figure 6: Typical on-state resistance.
 $R_{DS(on)} = f(I_D)$; parameter V_{GS}

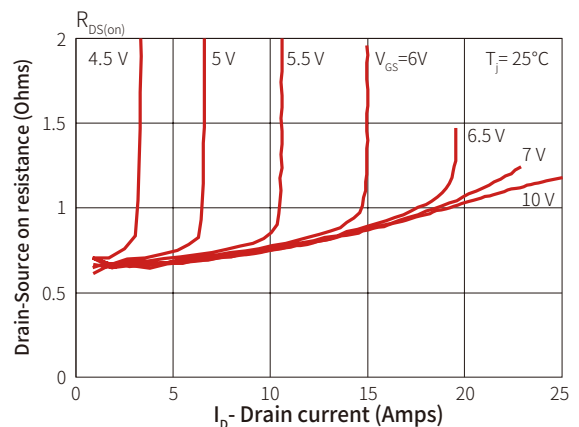


Figure 7: Typical transfer characteristics.
 $I_D = f(V_{GS})$; parameter T_j

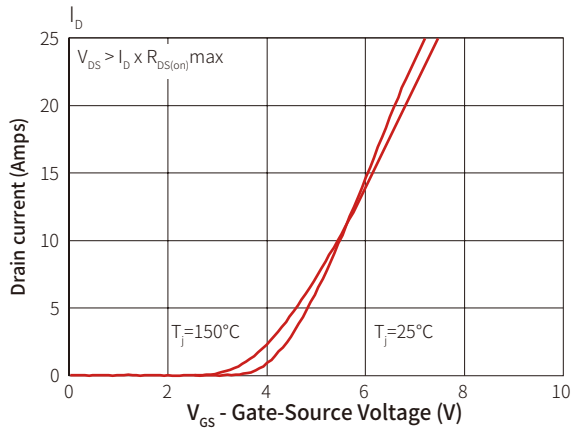


Figure 8: Typical transconductance.
 $g_{fs} = f(I_D)$; parameter T_j

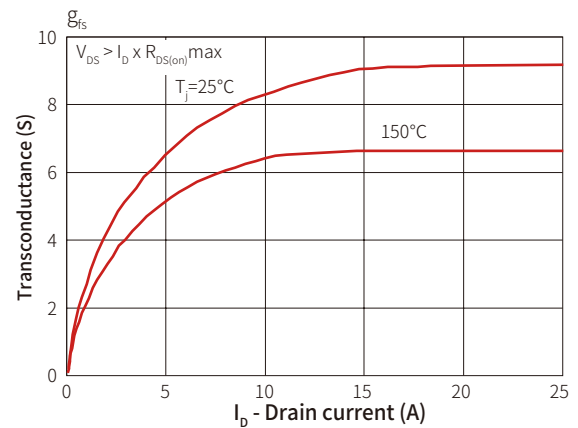


Figure 9: Normalised drain-source on-state resistance.
 $a = R_{DS(ON)} / R_{DS(ON)} 25^\circ\text{C} = f(T_j)$; $I_D = 4.25 \text{ A}$; $V_{GS} = 10 \text{ V}$

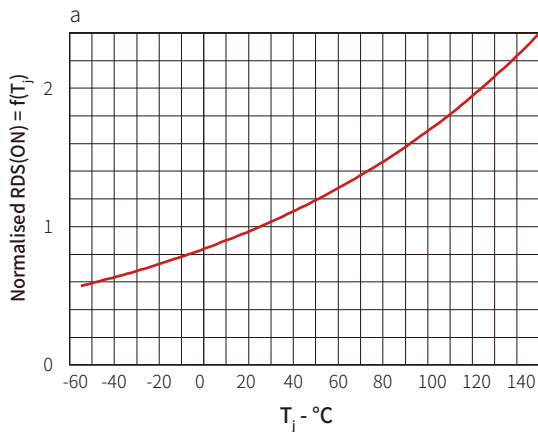


Figure 10: Gate threshold voltage.
 $V_{GS(TO)} = f(T_j)$; conditions: $I_D = 0.25 \text{ mA}$; $V_{DS} = V_{GS}$

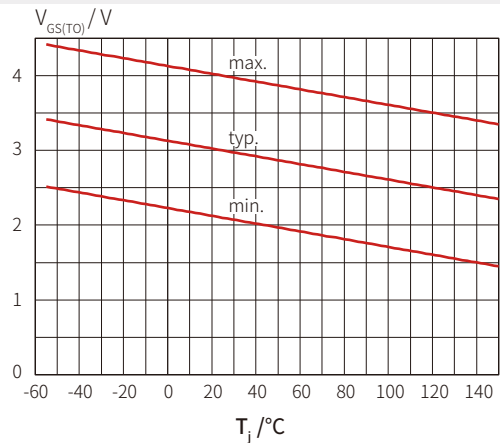


Figure 11: Sub-threshold drain current.
 $I_D = f(V_{GS})$; conditions: $T_j = 25^\circ\text{C}$; $V_{DS} = V_{GS}$

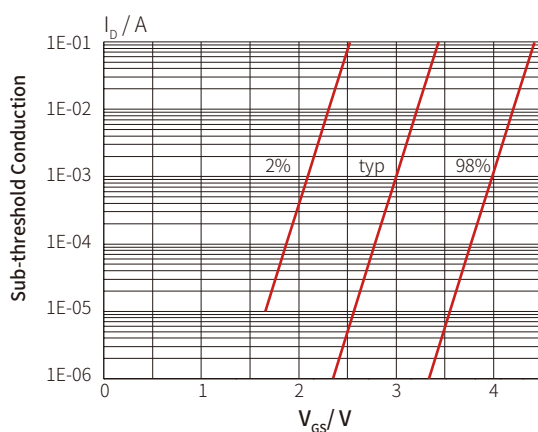


Figure 12: Typical capacitances, C_{iss} , C_{oss} , C_{rss} .
 $C = f(V_{DS})$; conditions: $V_{GS} = 0 \text{ V}$; $f = 1 \text{ MHz}$

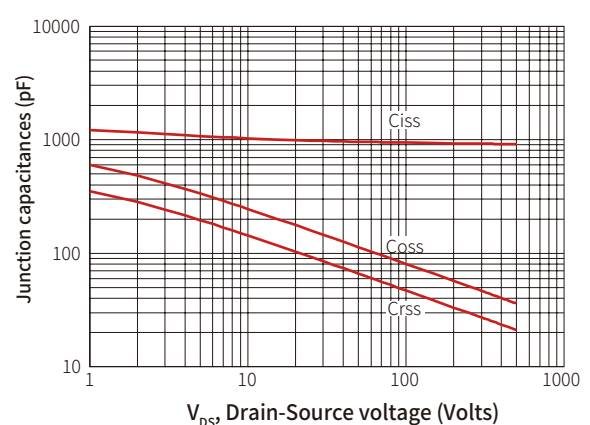


Figure 13: Typical turn-on gate-charge characteristics. $V_{GS} = f(Q_G)$; parameter V_{DS}

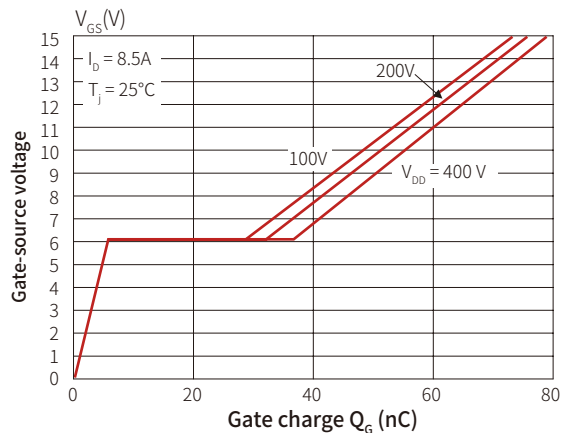


Figure 14: Typical switching times; $t_{d(on)}$, t_r , $t_{d(off)}$, $t_f = f(R_G)$

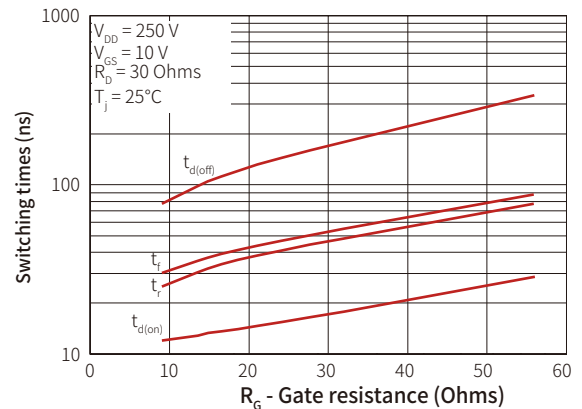


Figure 15: Normalised drain-source breakdown voltage; $V_{(BR)DSS}/V_{(BR)DSS 25^\circ C} = f(T_J)$

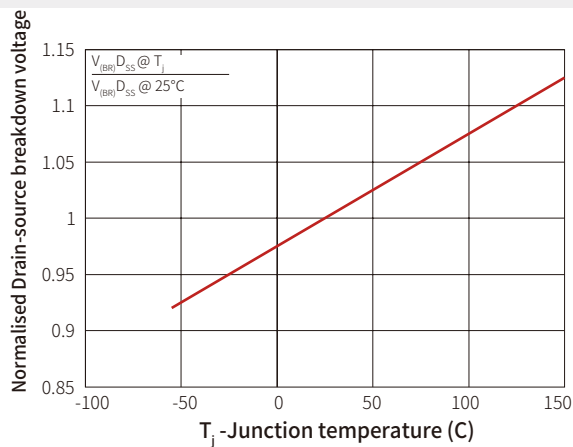


Figure 16: Source-Drain diode characteristic. $I_F = f(V_{SDS})$; parameter T_J

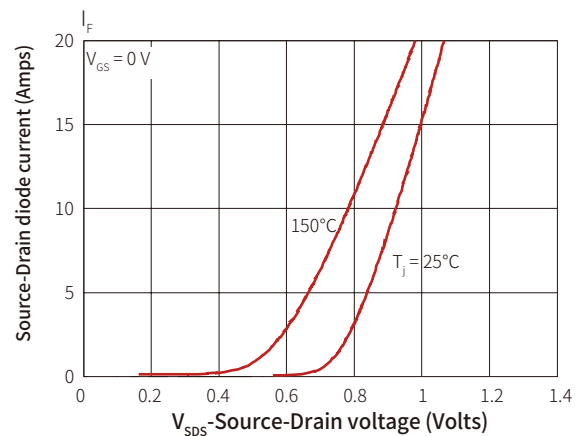


Figure 17: Maximum permissible non-repetitive avalanche current (I_{AS}) versus avalanche time (t_p); unclamped inductive load

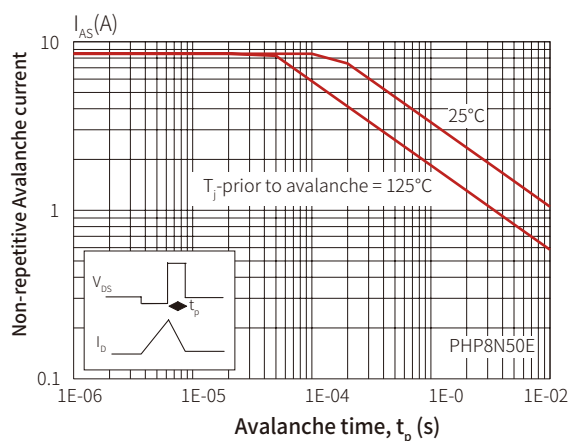
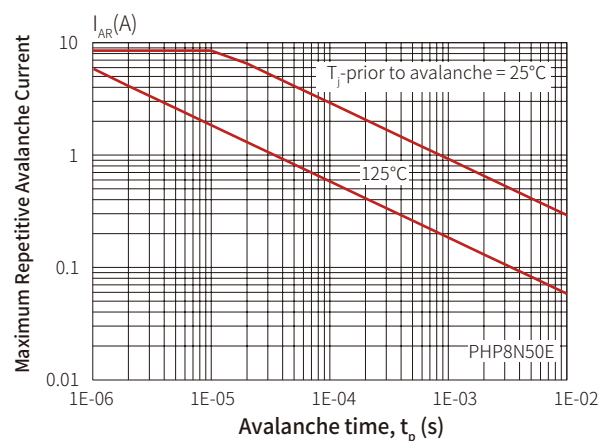
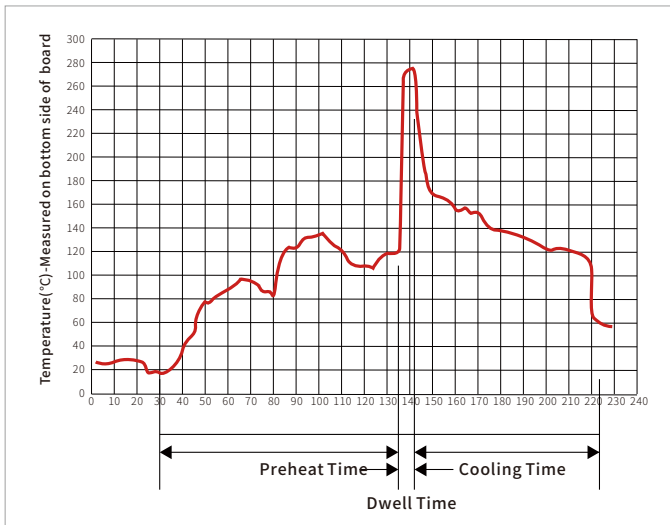


Figure 18: Maximum permissible repetitive avalanche current (I_{AR}) versus avalanche time (t_p)

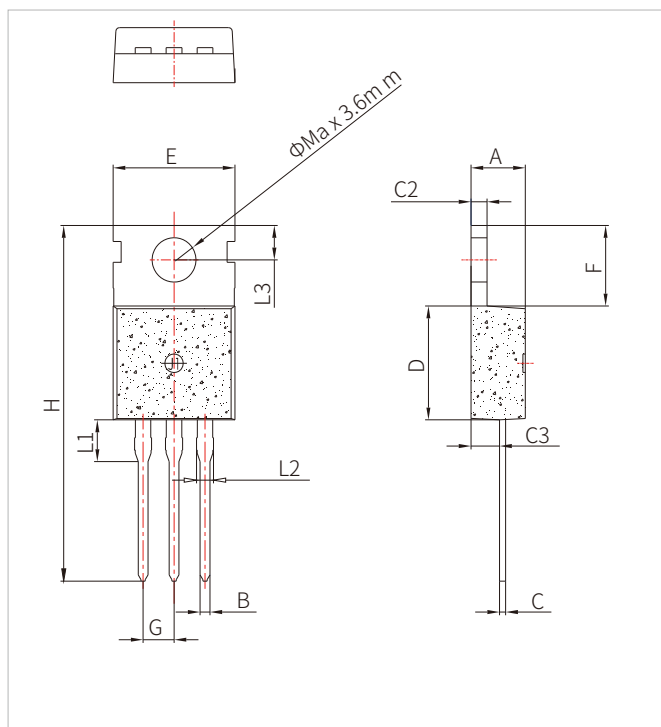


WAVE SOLDERING



Wave Parameter		Lead-free assembly
Pre Heat	Temperature Min	100°C
	Temperature Max	150°C
	Time(min to max)	60 – 180 secs
Solder pot Temperature		280°C Max
Solder Dwell Time		2-5 seconds

TO-220C PACKAGE MECHANICAL DATA



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.30		4.70	0.169		0.185
B	0.70		0.90	0.028		0.035
C	0.45		0.60	0.018		0.024
C2	1.23		1.32	0.048		0.052
C3	2.20		2.60	0.087		0.102
D	8.80		10.0	0.346		0.394
E	9.90		10.3	0.390		0.406
F	6.30		6.90	0.248		0.272
G		2.54			0.1	
H	28.0		30.0	1.102		1.181
L1		3.65			0.144	
L2	1.14		1.70	0.045		0.067
L3	2.65		2.95	0.104		0.116
Φ		3.6			0.142	

ORDERING INFORMATION

Part Number	Package	Qty/pcs		
		Tube	Inner Box	Carton
IRF840	TO-220C	50	1000	5000

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