40V 0.90mΩ N-Ch Power MOSFET

Features

- Ultra-low ON-resistance, $R_{DS(ON)}$
- Low Gate Charge, Q_g
- 100% UIS and R_g Tested
- Pb-free Lead Plating
- Halogen-free and RoHS-compliant

Applications

- Power Management in Computing, CE, IE 4.0, Communications
- Current Switching in DC/DC & AC/DC (SR) Sub-systems
- Load Switching, Quick/Wireless Charging, Motor Driving

Product Summary

Parameter	Value	Unit
V_{DS}	40	V
$V_{GS(th)\_Typ}$	2.8	V
I_D (@ V_{GS} = 10V) [1]	265	A
$R_{DS(ON)\_Typ}$ (@ V_{GS} = 10V)	0.90	mΩ

PDFN5x6-8L

Top View

Bottom View
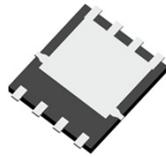
Pin Configuration
Top View

S	1	8	D
S	2	7	D
S	3	6	D
G	4	5	D
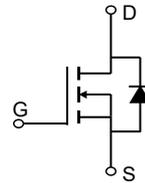
Ordering Information

Device	Package	# of Pins	Marking	MSL	T_J (°C)	Media	Quantity (pcs)
JMSH0401BG-13	PDFN5x6-8L	8	SH0401B	1	-55 to 150	13-inch Reel	5000

Absolute Maximum Ratings (@ T_A = 25°C unless otherwise specified)

Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		V_{DS}	40	V
Gate-to-Source Voltage		V_{GS}	±20	V
Continuous Drain Current [1]	T_C = 25°C	I_D	265	A
	T_C = 100°C		168	
Pulsed Drain Current [2]		I_{DM}	1022	A
Avalanche Current [3]		I_{AS}	42	A
Avalanche Energy [3]		E_{AS}	441	mJ
Power Dissipation [4]	T_C = 25°C	P_D	147	W
	T_C = 100°C		59	
Junction & Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

$R_{DS(ON)}$ vs. V_{GS}

I_D = 20A

x-axis: V_{GS} (V), y-axis: $R_{DS(ON)}$ (mΩ)

Gate Charge

V_{DS} = 20V
I_D = 20A

x-axis: Q_g (nC), y-axis: V_{GS} (V)
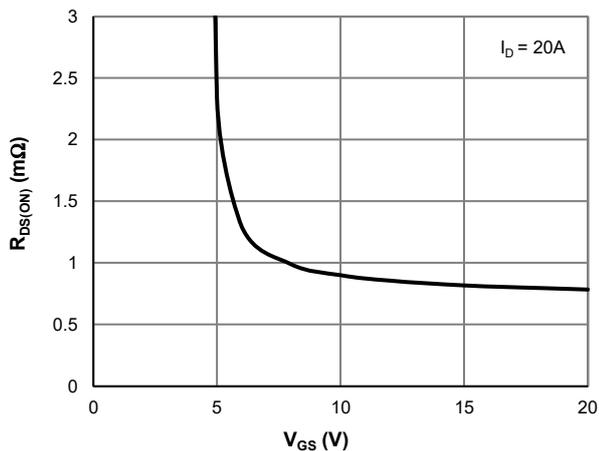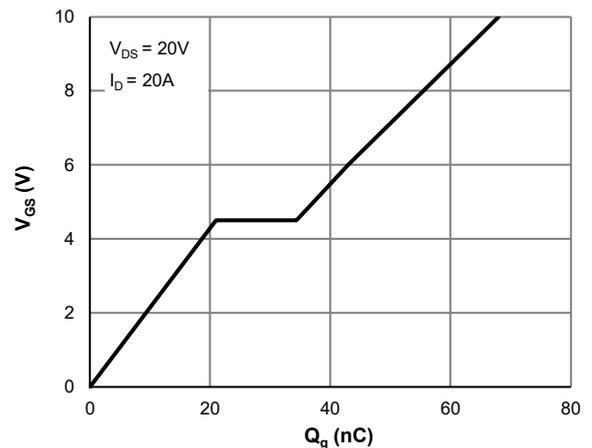
Electrical Characteristics (@ T_J = 25°C unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
STATIC PARAMETERS							
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	I_D = 250µA, V_{GS} = 0V		40			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 32V, V_{GS} = 0V				1.0	µA
			T_J = 55°C			5.0	
Gate-Body Leakage Current	I_{GSS}	V_{DS} = 0V, V_{GS} = ±20V				±100	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250µA		2.2	2.8	3.4	V
Static Drain-Source ON-Resistance	$R_{DS(ON)}$	V_{GS} = 10V, I_D = 20A			0.90	1.1	mΩ
Forward Transconductance	g_{FS}	V_{DS} = 5V, I_D = 20A			95		S
Diode Forward Voltage	V_{SD}	I_S = 1A, V_{GS} = 0V			0.68	1.0	V
Diode Continuous Current	I_S	T_C = 25°C				147	A
DYNAMIC PARAMETERS [5]							
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = 20V, f = 1MHz			5280		pF
Output Capacitance	C_{oss}				3405		pF
Reverse Transfer Capacitance	C_{rss}				71		pF
Gate Resistance	R_g	V_{GS} = 0V, V_{DS}= 0V, f = 1MHz			1.9		Ω
SWITCHING PARAMETERS [5]							
Total Gate Charge (@ V_{GS} = 10V)	Q_g	V_{GS} = 0 to 10V, V_{DS} = 20V, I_D = 20A			68		nC
Total Gate Charge (@ V_{GS} = 6.0V)	Q_g				43		nC
Gate Source Charge	Q_{gs}				21		nC
Gate Drain Charge	Q_{gd}				13.4		nC
Turn-On DelayTime	$t_{D(on)}$	V_{GS} = 10V, V_{DS} = 20V, R_L = 1.0Ω, R_{GEN} = 6Ω			27		ns
Turn-On Rise Time	t_r				88		ns
Turn-Off DelayTime	$t_{D(off)}$				68		ns
Turn-Off Fall Time	t_f				90		ns
Body Diode Reverse Recovery Time	t_{rr}	I_F = 20A, dI_F/dt = 100A/µS			70		ns
Body Diode Reverse Recovery Charge	Q_{rr}	I_F = 20A, dI_F/dt = 100A/µS			89		nC

Thermal Performance

Parameter	Symbol	Typ.	Max.	Unit
Thermal Resistance, Junction-to-Ambient	$R_{θJA}$	42	50	°C/W
Thermal Resistance, Junction-to-Case	$R_{θJC}$	0.85	0.98	°C/W

Notes:

1. Computed continuous current assumes the condition of T_{J_Max} while the actual continuous current depends on the thermal & electro-mechanical application board design.

2. This single-pulse measurement was taken under T_{J_Max} = 150°C.

3. This single-pulse measurement was taken under the following condition [L = 300µH, V_{GS} = 10V, V_{DD} = 20V] while its value is limited by T_{J_Max} = 150°C.

4. The power dissipation P_D is based on T_{J_Max} = 150°C.

5. This value is guaranteed by design hence it is not included in the production test.

Typical Electrical & Thermal Characteristics
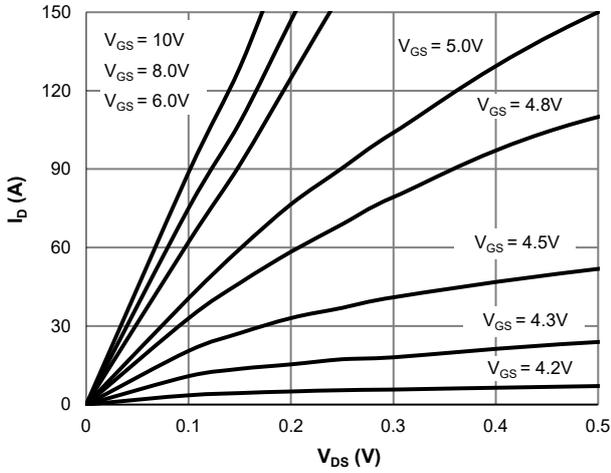
Figure 1: Saturation Characteristics
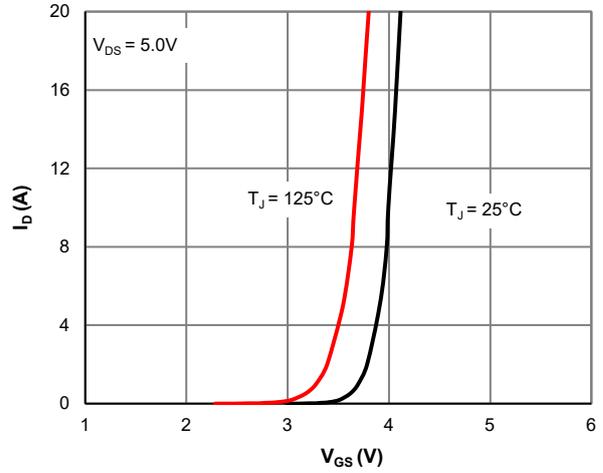
Figure 2: Transfer Characteristics
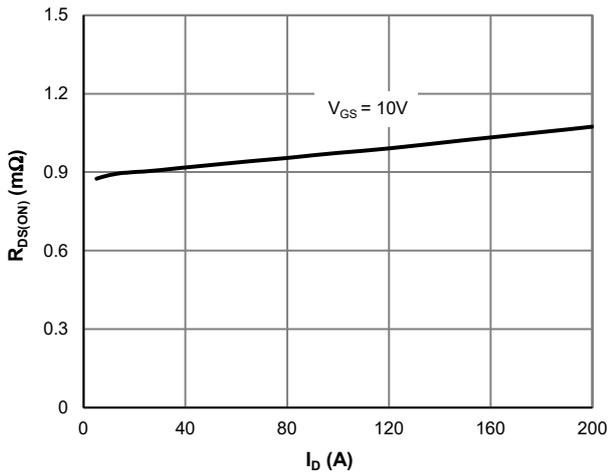
Figure 3: $R_{DS(ON)}$ vs. Drain Current
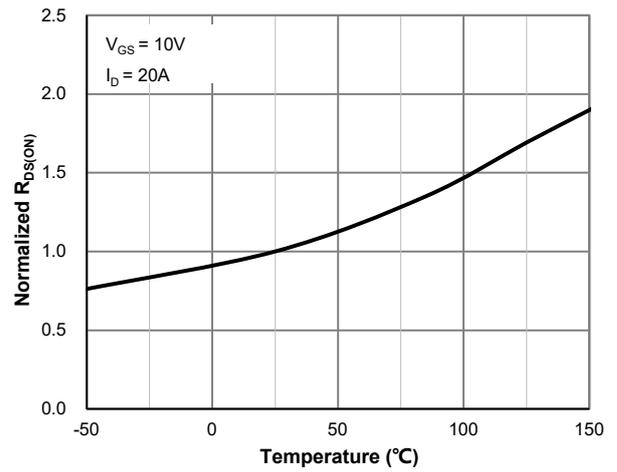
Figure 4: $R_{DS(ON)}$ vs. Junction Temperature
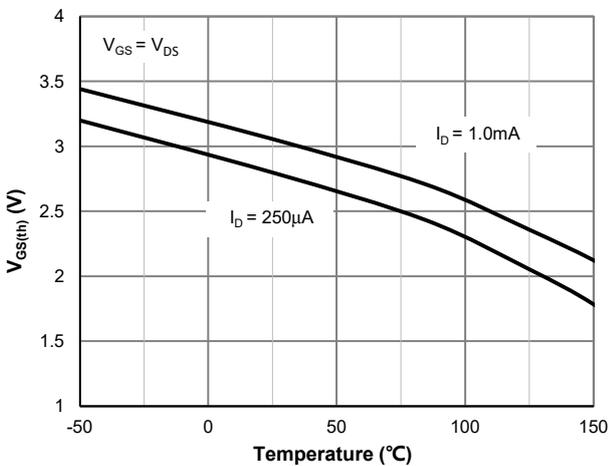
Figure 5: $V_{GS(th)}$ vs. Junction Temperature
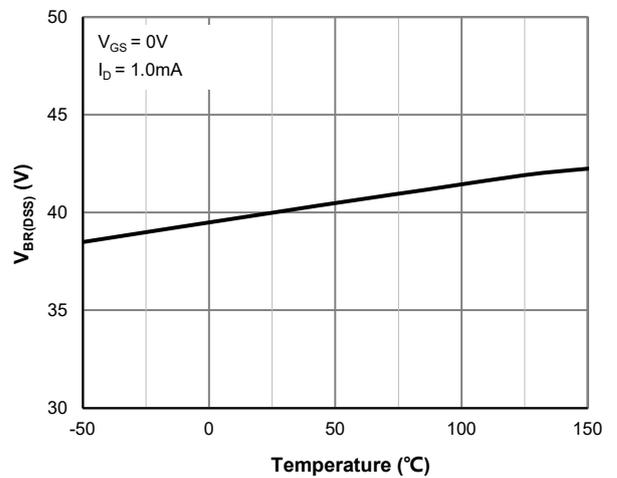
Figure 6: $V_{BR(DSS)}$ vs. Junction Temperature

Typical Electrical & Thermal Characteristics
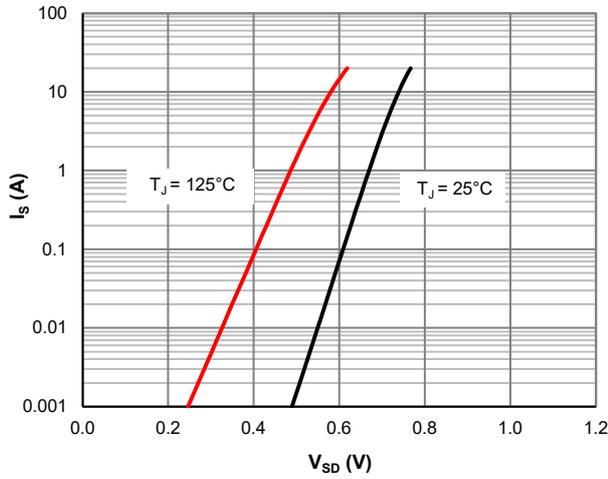
Figure 7: Body-Diode Characteristics
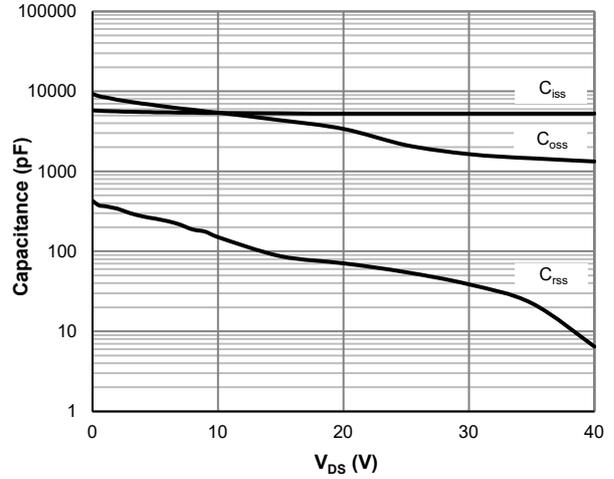
Figure 8: Capacitance Characteristics
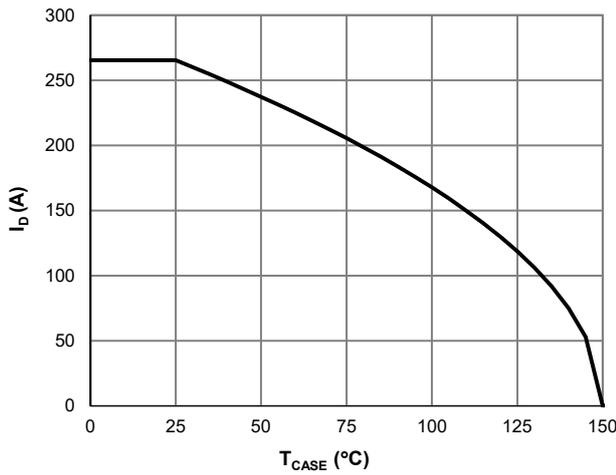
Figure 9: Current De-rating
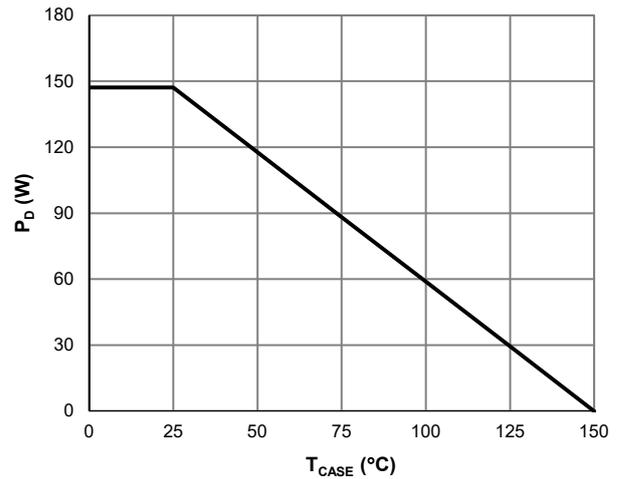
Figure 10: Power De-rating
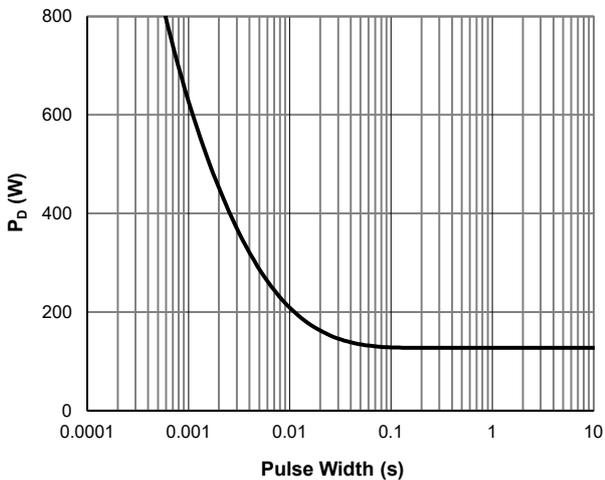
Figure 11: Single Pulse Power Rating, Junction-to-Case
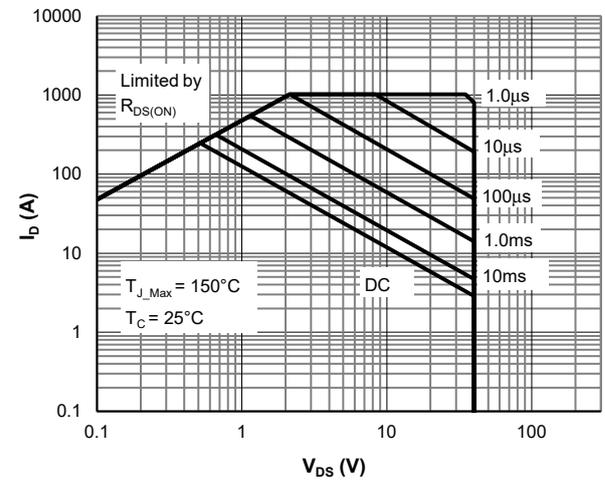
Figure 12: Maximum Safe Operating Area

Typical Electrical & Thermal Characteristics

Duty Cycle = T_{on}/T_{Peak}

$T_J = T_C + P_D \times Z_{\theta JC} \times R_{\theta JC}$

$R_{\theta JC} = 0.85°C/W$

Duty = 0.5, 0.3, 0.1, 0.05, 0.02, 0.01, single pulse

Pulse Width (s)

Normalized Transient Thermal Resistance, $Z_{\theta JC}$
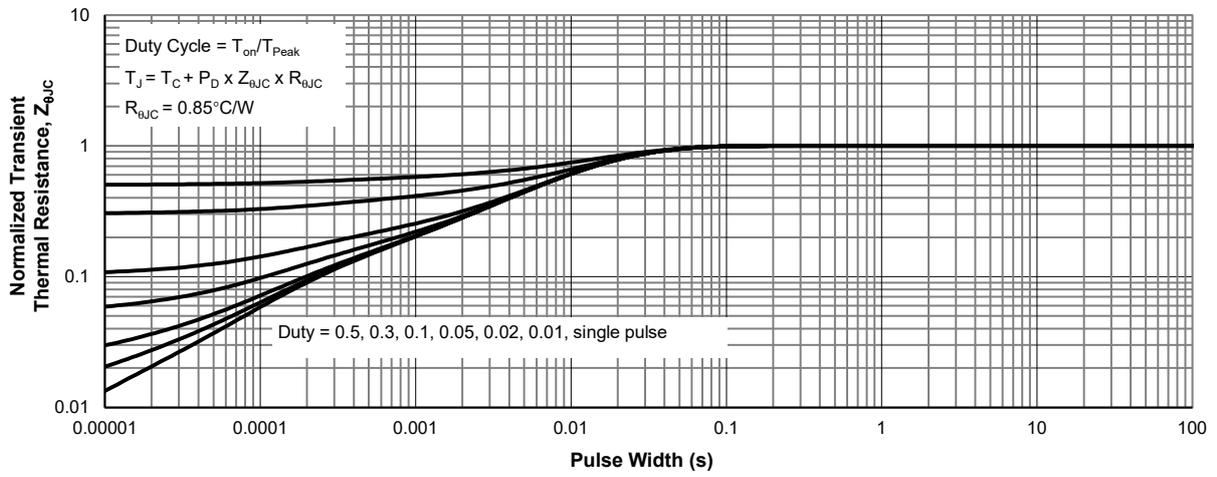
Figure 13: Normalized Maximum Transient Thermal Impedance

PDFN5x6-8L Package Information

Package Outline

Top View

Side View

Bottom View

Front View
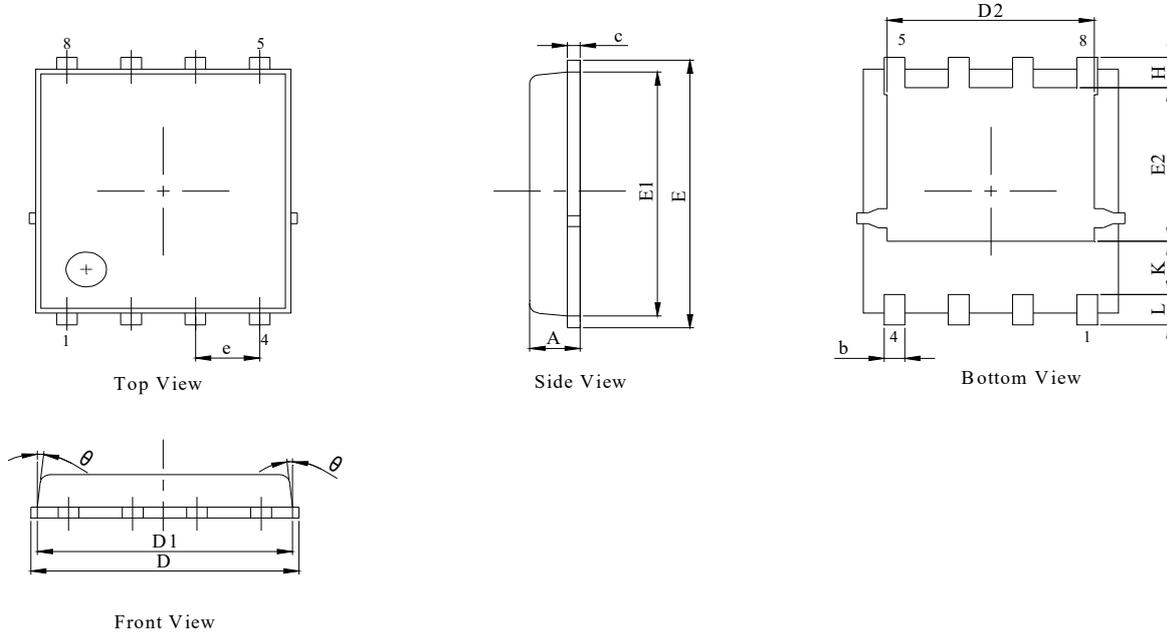
NOTES:
1. Dimension and tolerance per ASME Y14.5M, 1994.
2. All dimensions in millimeter (angle in degree).
3. Dimensions D1 and E1 do not include mold flash protrusions or gate burrs.

DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
b	0.31	0.41	0.51
c	0.20	0.25	0.30
D	5.00	5.20	5.40
D1	4.95	5.05	5.15
D2	4.00	4.10	4.20
E	6.05	6.15	6.25
E1	5.50	5.60	5.70
E2	3.42	3.53	3.63
e	1.27BSC		
H	0.60	0.70	0.80
L	0.50	0.70	0.80
K	1.23 REF		
θ	-	-	10°

Recommended Soldering Footprint
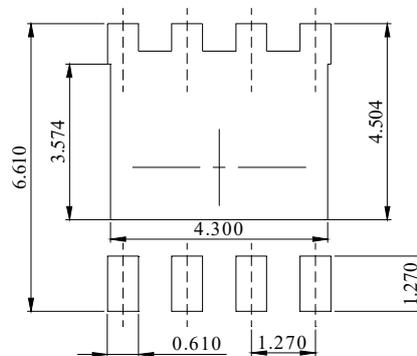
DIMENSIONS:MILLIMETERS