

## 650V SuperJunction Power MOSFET

**Features**

- Extremely Low Gate Charge
- Excellent Output Capacitance ( $C_{oss}$ ) Profile
- Fast Switching Capability
- 100% UIS Tested, 100% Rg Tested
- Pb-free Lead Plating
- Halogen-free and RoHS-compliant

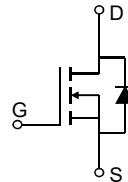
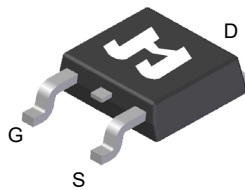
**Product Summary**

Parameter	Value	Unit
$V_{DS}$	650	V
$V_{GS(th\_Typ)}$	3.5	V
$I_D$ (@ $V_{GS} = 10V$ ) <sup>(1)</sup>	11.2	A
$R_{DS(ON\_Typ)}$ (@ $V_{GS} = 10V$ )	370	m $\Omega$
$E_{oss@400V}$	2.2	$\mu J$

**Applications**

- Telecom / Server Power Supplies
- Industrial Power Supplies
- UPS / Solar
- Lighting / Charger / Adapter

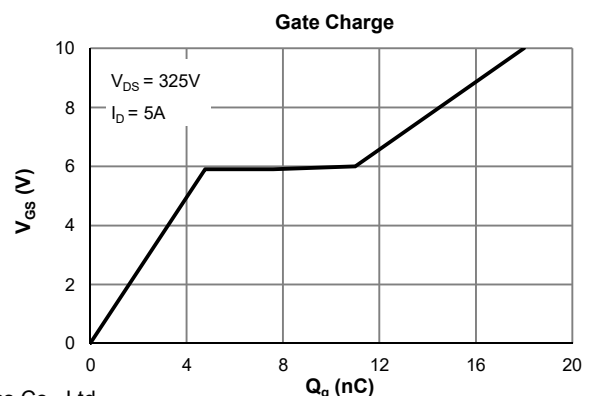
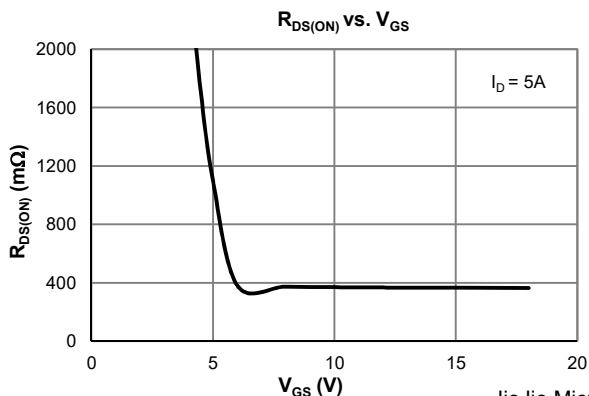
TO-252-3L Top View


**Ordering Information**

Device	Package	# of Pins	Marking	MSL	$T_J$ (°C)	Media	Quantity (pcs)
JMH65R430AK-13	TO-252-3L	3	H65R430A	1	-55 to 150	13-inch Reel	2500

**Absolute Maximum Ratings** (@  $T_A = 25^\circ C$  unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DS}$	650	V
Gate-to-Source Voltage	$V_{GS}$	$\pm 30$	V
Continuous Drain Current <sup>(1)</sup>	$I_D$	$T_C = 25^\circ C$	11.2
		$T_C = 100^\circ C$	7.1
Pulsed Drain Current <sup>(2)</sup>	$I_{DM}$	29	A
Avalanche Current <sup>(3)</sup>	$I_{AS}$	6.0	A
Avalanche Energy <sup>(3)</sup>	$E_{AS}$	180	mJ
Power Dissipation <sup>(4)</sup>	$P_D$	$T_C = 25^\circ C$	145
		$T_C = 100^\circ C$	58
Junction & Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	°C



**Electrical Characteristics** (@  $T_J = 25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>STATIC PARAMETERS</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	650			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 650\text{V}, V_{GS} = 0\text{V}$			1.0	$\mu\text{A}$
Gate-Body Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{V}, V_{GS} = \pm 30\text{V}$			$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	2.5	3.5	4.5	V
Static Drain-Source ON-Resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{V}, I_D = 10\text{A}$		370	430	$\text{m}\Omega$
Diode Forward Voltage	$V_{SD}$	$I_S = 1\text{A}, V_{GS} = 0\text{V}$		0.75	1.0	V
Diode Continuous Current	$I_S$	$T_C = 25^\circ\text{C}$			145	A

**DYNAMIC PARAMETERS** <sup>(5)</sup>

Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{V}, V_{DS} = 100\text{V}, f = 1\text{MHz}$		703		pF
Output Capacitance	$C_{oss}$			25		pF
Reverse Transfer Capacitance	$C_{rss}$			2.1		pF
Effective output capacitance, energy related	$C_{o(er)}$	$V_{GS} = 0\text{V}, V_{DS} = 0 \text{ to } 400\text{V}$		28		pF
Effective output capacitance, time related	$C_{o(tr)}$			119		pF
Gate Resistance	$R_g$	$V_{GS} = 0\text{V}, V_{DS} = 0\text{V}, f = 1\text{MHz}$		8.5		$\Omega$

**SWITCHING PARAMETERS** <sup>(5)</sup>

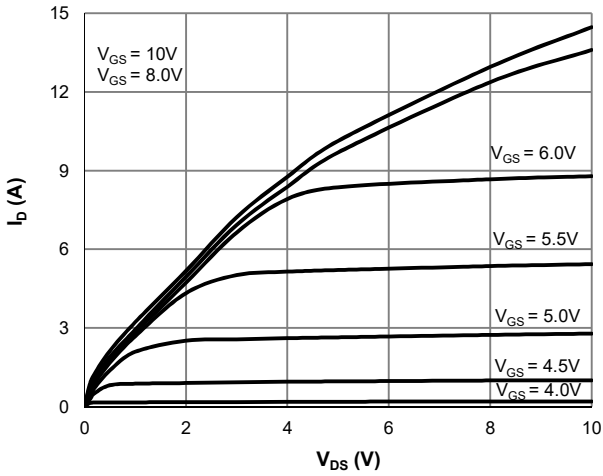
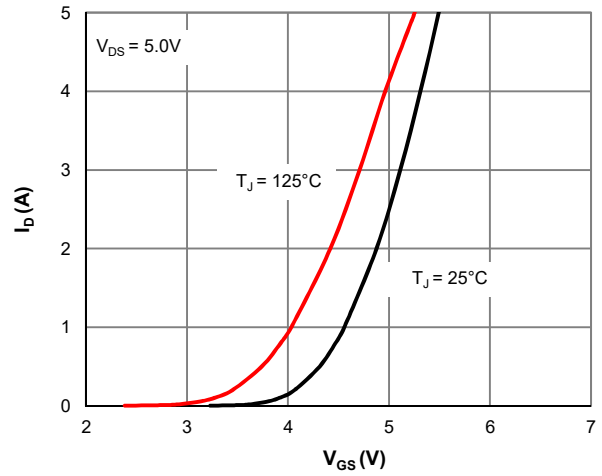
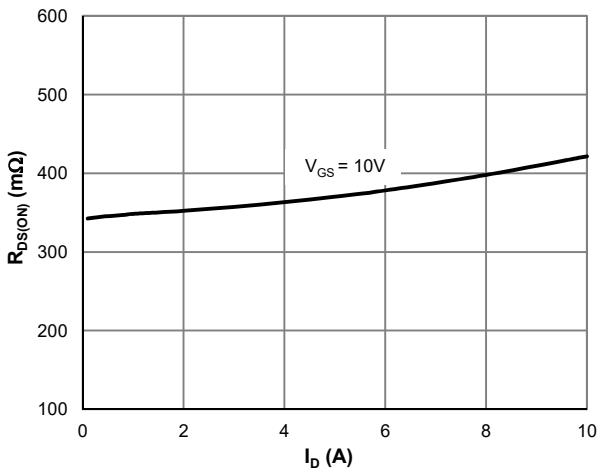
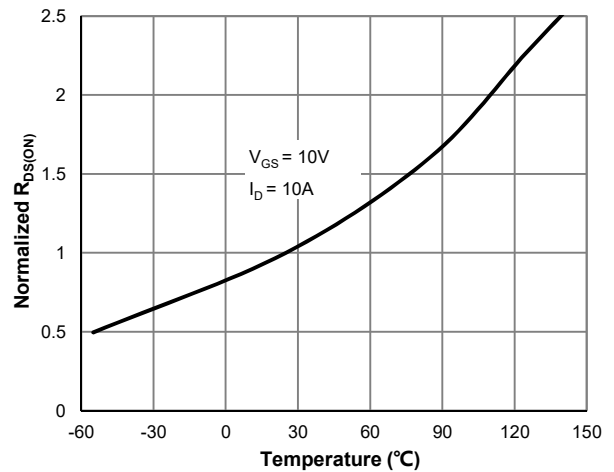
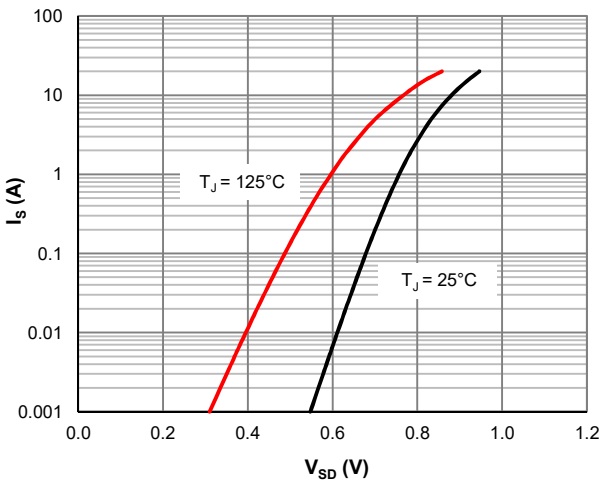
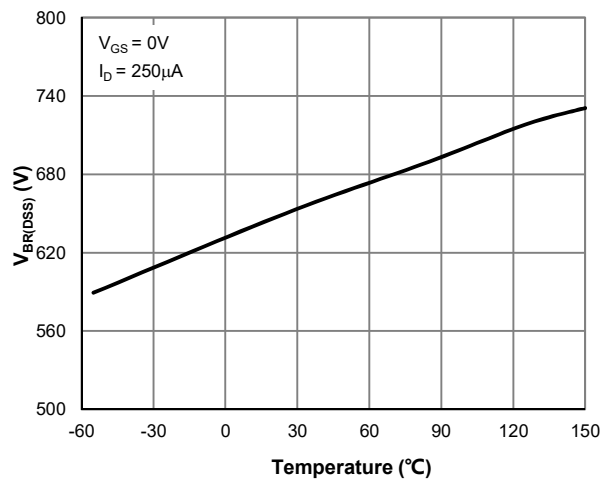
Total Gate Charge (@ $V_{GS} = 10\text{V}$ )	$Q_g$	$V_{GS} = 0 \text{ to } 10\text{V}$ $V_{DS} = 325\text{V}, I_D = 5\text{A}$		18.4		nC
Total Gate Charge (@ $V_{GS} = 6.0\text{V}$ )	$Q_g$			11.0		nC
Gate Source Charge	$Q_{gs}$			4.8		nC
Gate Drain Charge	$Q_{gd}$			7.6		nC
Turn-On DelayTime	$t_{D(on)}$	$V_{GS} = 10\text{V}, V_{DS} = 325\text{V}$ $R_L = 65\Omega, R_{GEN} = 6\Omega$		27		ns
Turn-On Rise Time	$t_r$			16.8		ns
Turn-Off DelayTime	$t_{D(off)}$			104		ns
Turn-Off Fall Time	$t_f$			31		ns
Body Diode Reverse Recovery Time	$t_{rr}$		$I_F = 5\text{A}, di/dt = 100\text{A}/\mu\text{s}$		239	
Body Diode Reverse Recovery Charge	$Q_{rr}$	$I_F = 5\text{A}, di/dt = 100\text{A}/\mu\text{s}$		2513		nC
Peak Diode Recovery Voltage Slope	$dv/dt$	$I_F \leq 10\text{A}, di/dt = 200\text{A}/\mu\text{s}, V_{DS} = 400\text{V}$		15		V/ns
MOSFET $dv/dt$ Ruggedness	$dv/dt$	$V_{DS} = 0 \dots 400\text{V}$		50		V/ns

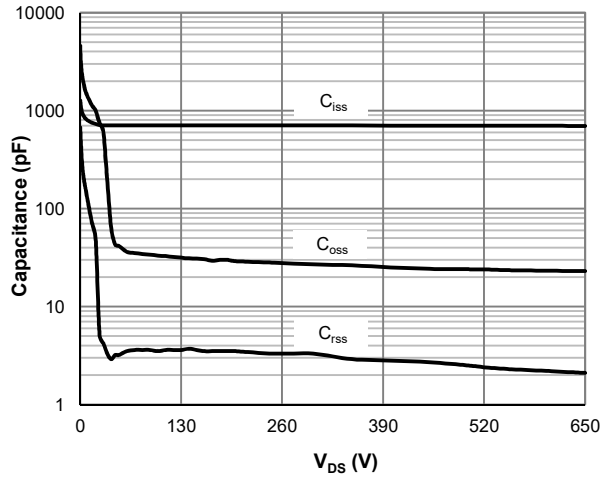
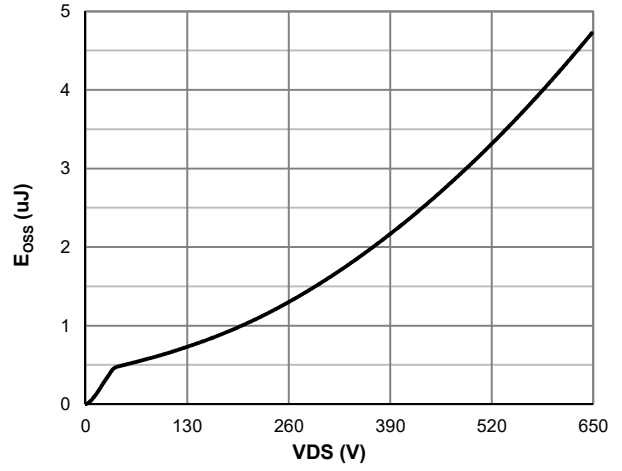
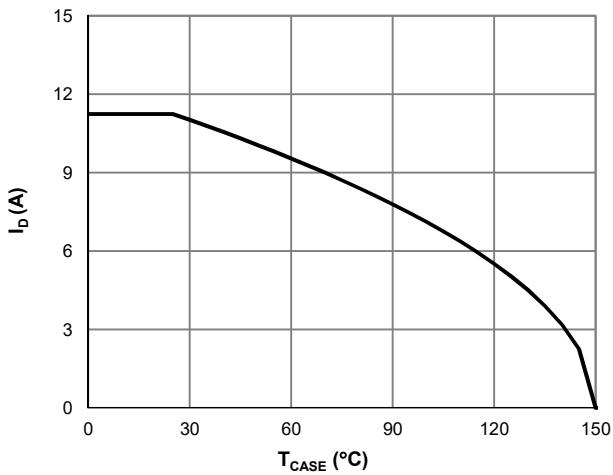
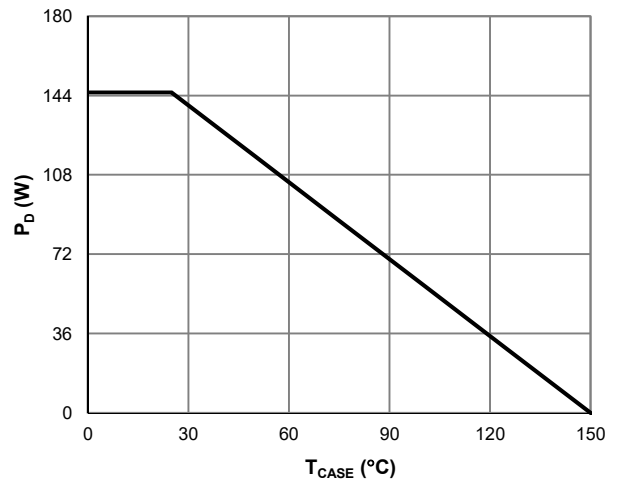
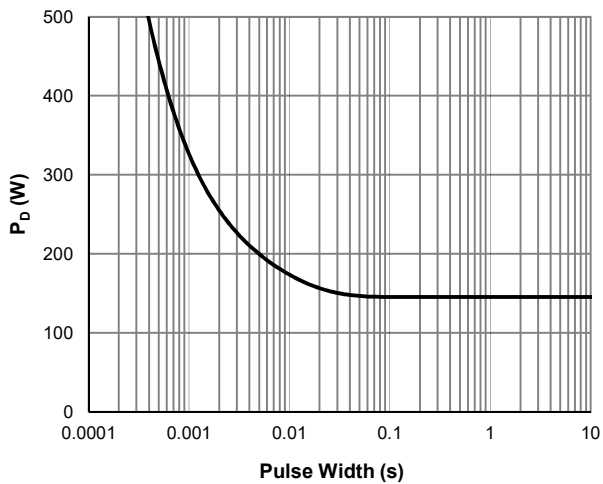
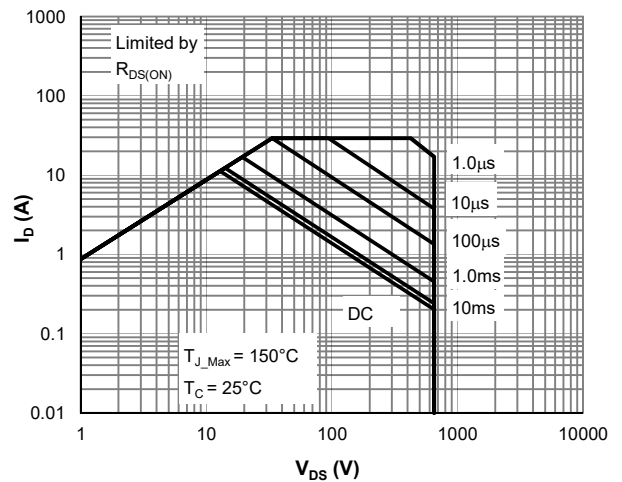
**Thermal Performance**

Parameter	Symbol	Typ.	Max.	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	48	58	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.86	1.1	$^\circ\text{C}/\text{W}$

**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  $T_{J\_Max} = 150^\circ\text{C}$ .
3. This single-pulse measurement was taken under the following condition [ $L = 10\text{mH}, V_{GS} = 10\text{V}, V_{DS} = 50\text{V}$ ] while its value is limited by  $T_{J\_Max} = 150^\circ\text{C}$ .
4. The power dissipation  $P_D$  is based on  $T_{J\_Max} = 150^\circ\text{C}$ .
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 7: Body-Diode Characteristics**

**Figure 6:  $V_{BR(DSS)}$  vs. Junction Temperature**

**Typical Electrical & Thermal Characteristics**

**Figure 8: Capacitance Characteristics**

**Figure 8: Coss Stoted Energy**

**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

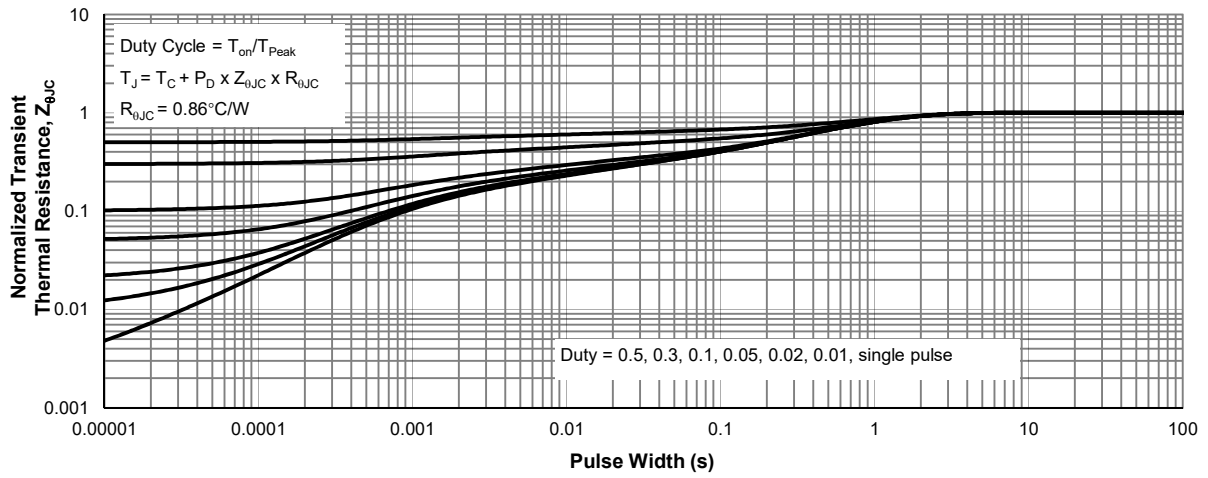
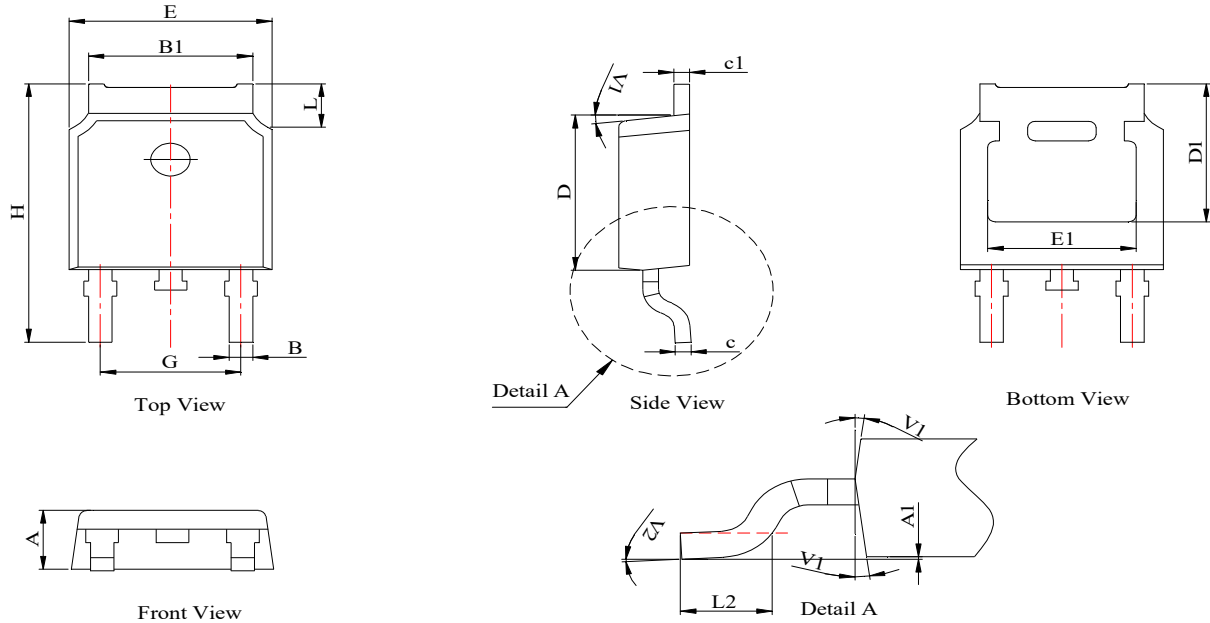
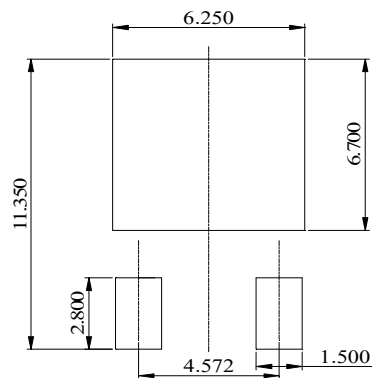


Figure 13: Normalized Maximum Transient Thermal Impedance

**TO-252-3L Package Information**
**Package Outline**


DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	2.10		2.50
A1	0	-	0.10
B	0.66		0.86
B1	5.18		5.48
c	0.40		0.60
c1	0.44		0.58
D	5.90		6.30
D1	5.30REF		
E	6.40		6.80
E1	4.63		
G	4.47		4.67
H	9.50		10.70
L	1.09		1.21
L2	1.35		1.65
V1		7°	
V2	0°	-	6°

**Recommend Soldering Footprint**


DIMENSIONS: MILLIMETERS