

VCRR P-Channel Enhancement Mode Power MOSFET

Description

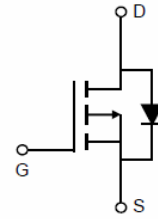
The VCRR60P10K uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is well suited for use as a load switch or in PWM applications.

General Features

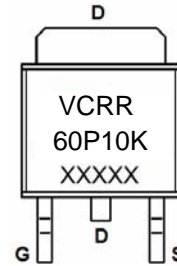
- $V_{DS} = -60V, I_D = -10A$
 $R_{DS(ON)} < 120m\Omega @ V_{GS} = -10V$
 $R_{DS(ON)} < 170m\Omega @ V_{GS} = -4.5V$
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation

Application

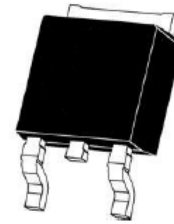
- Load switch
- PWM application



Schematic diagram



Marking and pin assignment



TO-252 -2L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VCRR60P10K	VCRR60P10K	TO-252-2L	330mm	16mm	2500 units

Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-60	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	-10	A
Pulsed Drain Current	I_{DM}	-40	A
Maximum Power Dissipation	P_D	45	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case ^(Note 2)	$R_{\theta JC}$	3.3	$^\circ C/W$
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Electrical Characteristics (T_C=25°C unless otherwise noted)

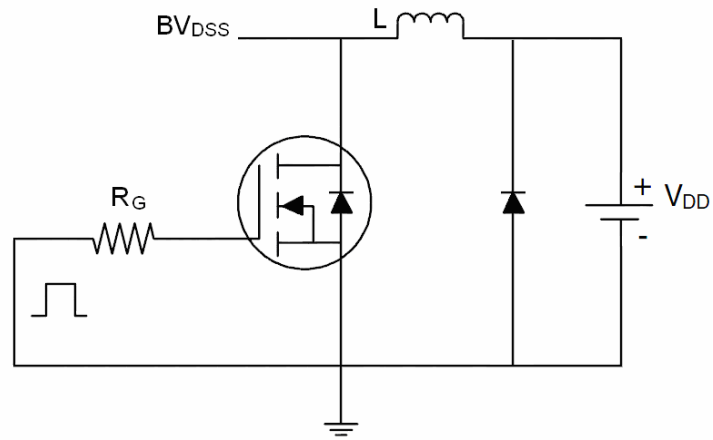
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =-250μA	-60	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-60V, V _{GS} =0V	-	-	-1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1.0		-2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-10A	-	106	120	mΩ
		V _{GS} =-4.5V, I _D =-5A	-	135	170	mΩ
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-10A	-	10	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C _{iss}	V _{DS} =-30V, V _{GS} =0V, F=1.0MHz	-	930	-	PF
Output Capacitance	C _{oss}		-	85	-	PF
Reverse Transfer Capacitance	C _{rss}		-	35	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-30V, R _L =7.5Ω, V _{GS} =-10V, R _G =3Ω	-	8	-	nS
Turn-on Rise Time	t _r		-	4	-	nS
Turn-Off Delay Time	t _{d(off)}		-	32	-	nS
Turn-Off Fall Time	t _f		-	7	-	nS
Total Gate Charge	Q _g	V _{DS} =-30, I _D =-10A, V _{GS} =-10V	-	25	-	nC
Gate-Source Charge	Q _{gs}		-	3	-	nC
Gate-Drain Charge	Q _{gd}		-	7	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =-10A	-		-1.2	V
Diode Forward Current	I _S		-	-	-10	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = -10A di/dt = -100A/μs (Note 3)	-	25		nS
Reverse Recovery Charge	Q _{rr}		-	31		nC

Notes:

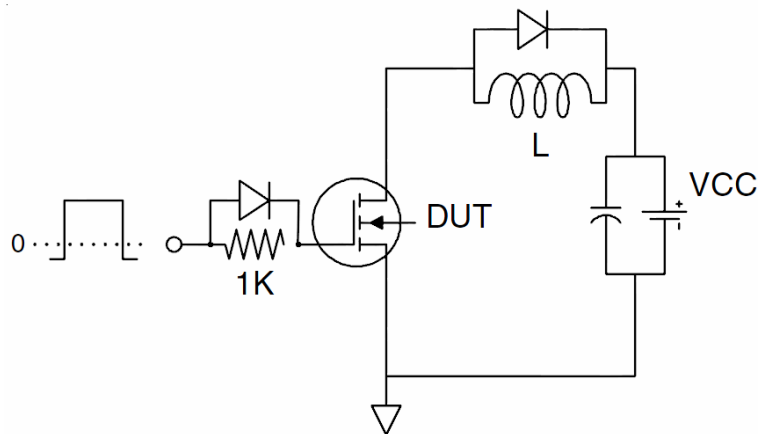
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production

Test Circuit

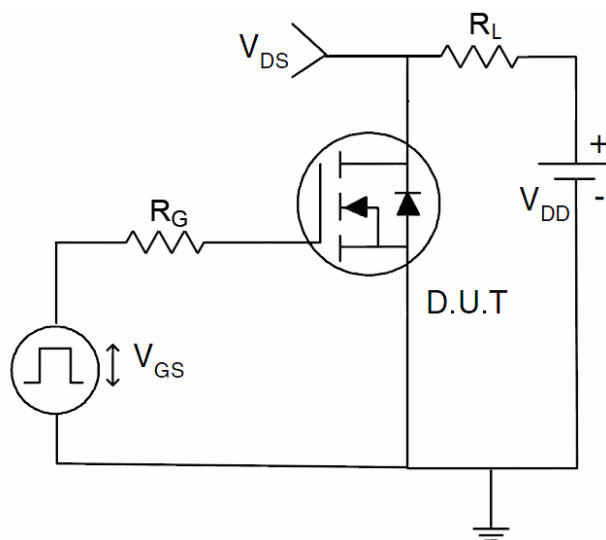
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

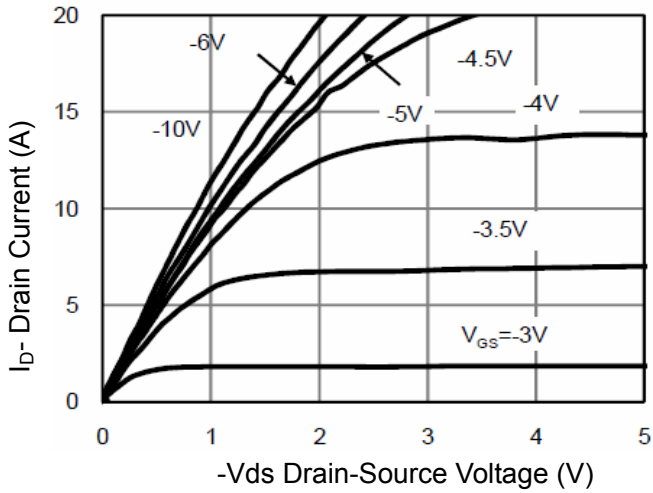


Figure 1 Output Characteristics

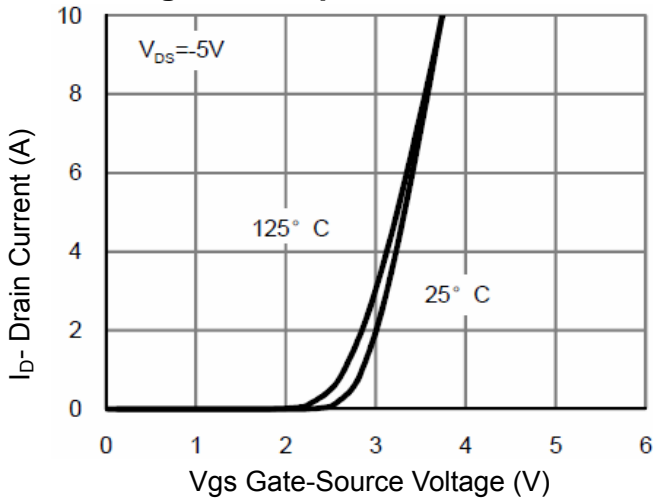


Figure 2 Transfer Characteristics

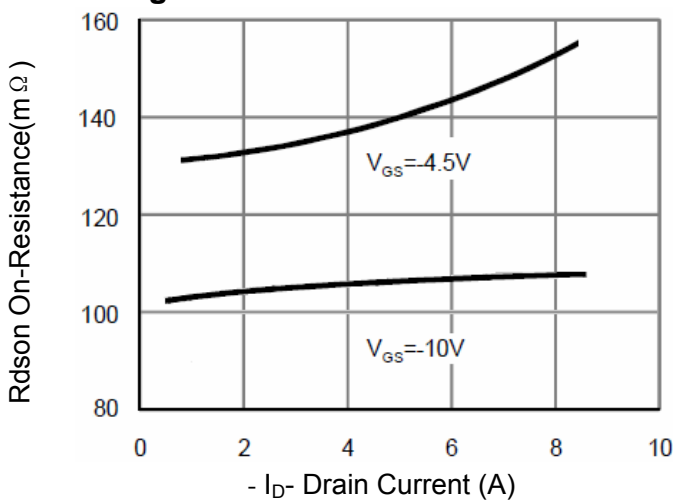


Figure 3 Rdson- Drain Current

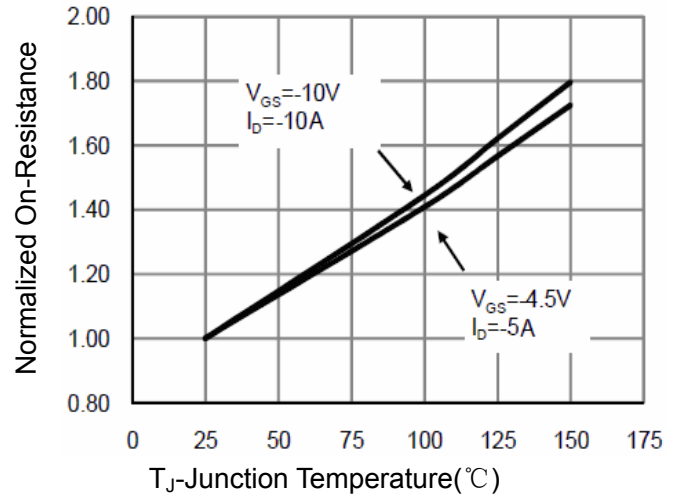


Figure 4 Rdson-Junction Temperature

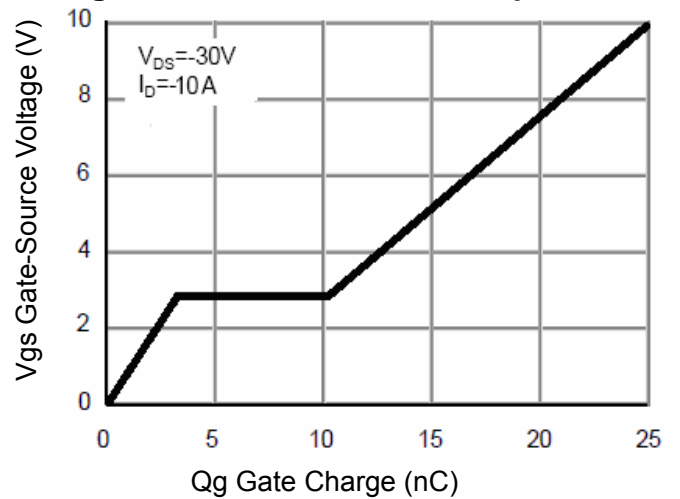


Figure 5 Gate Charge

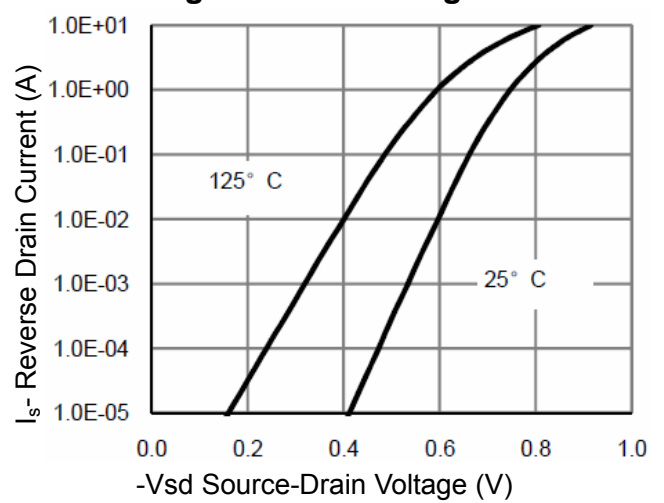


Figure 6 Source- Drain Diode Forward

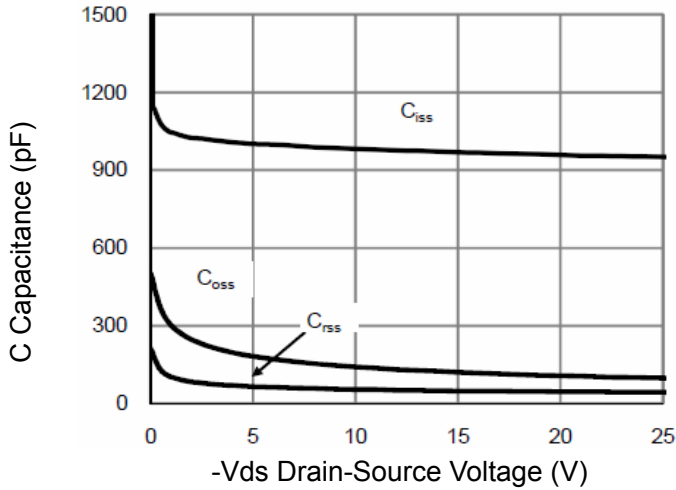


Figure 7 Capacitance vs Vds

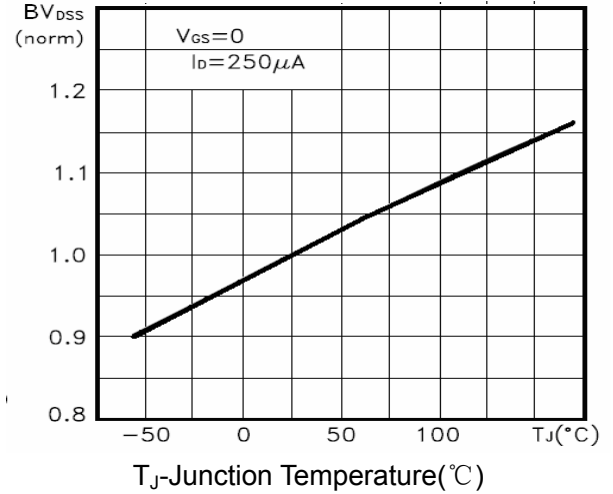


Figure 9 BV_{DSS} vs Junction Temperature

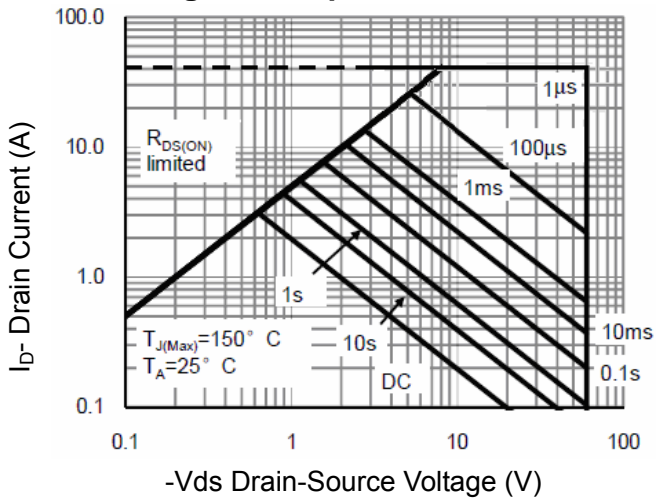


Figure 8 Safe Operation Area

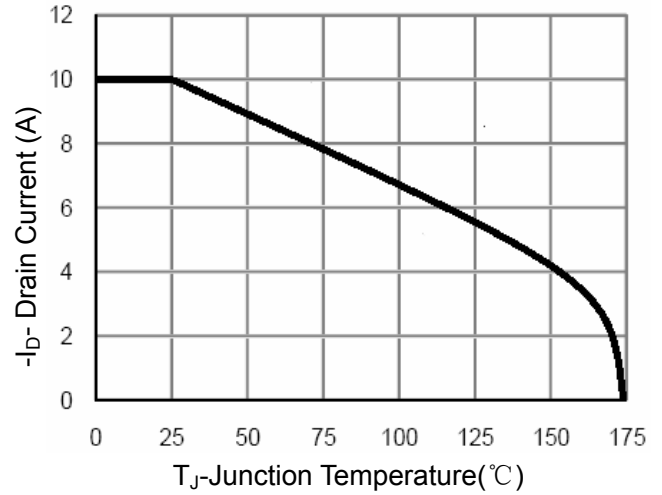


Figure 10 I_D Current De-rating

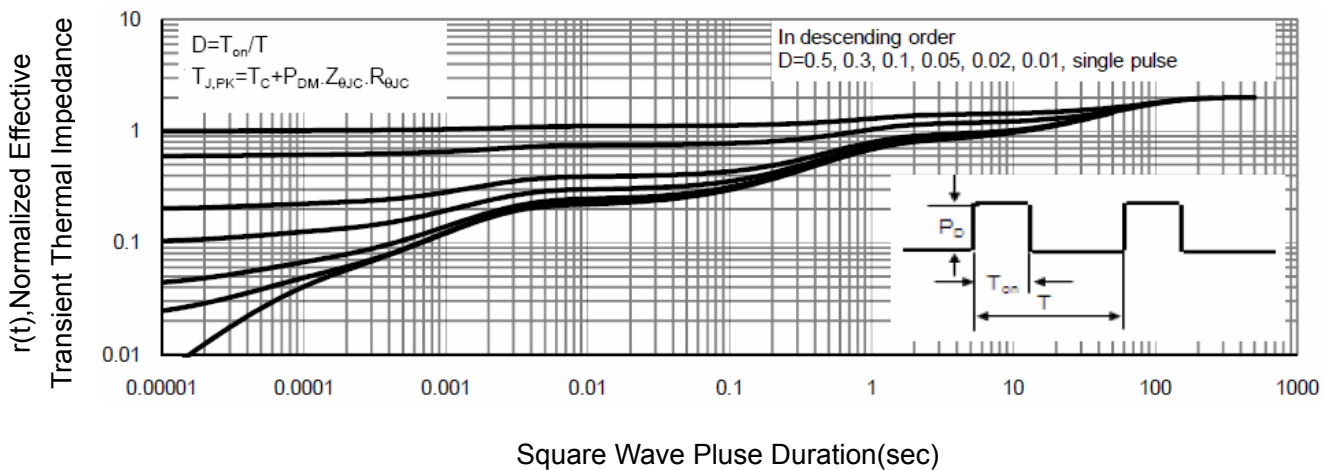
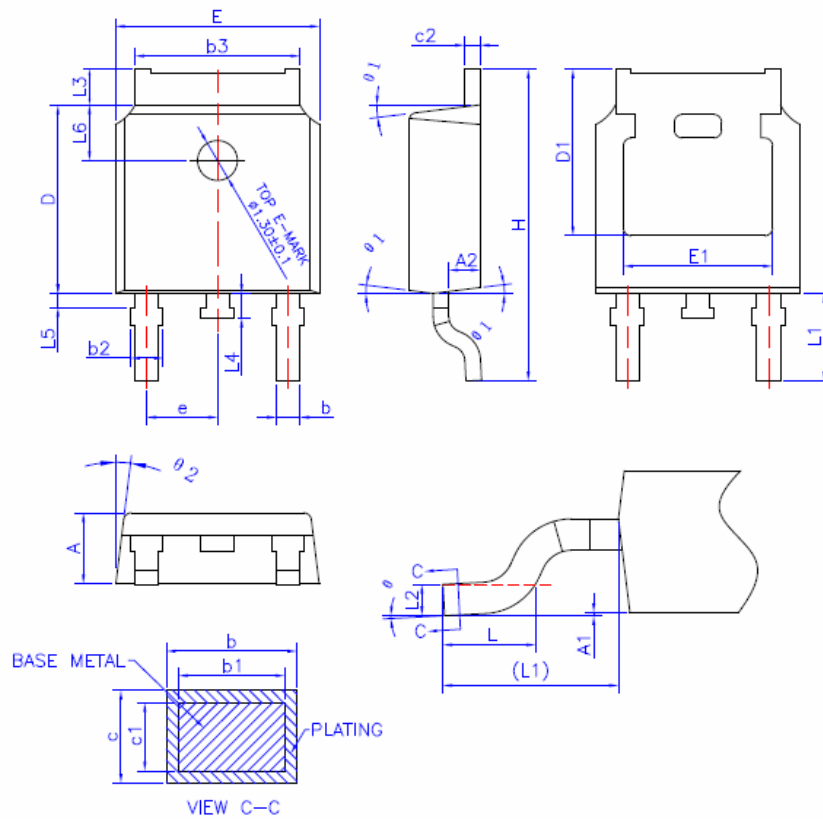


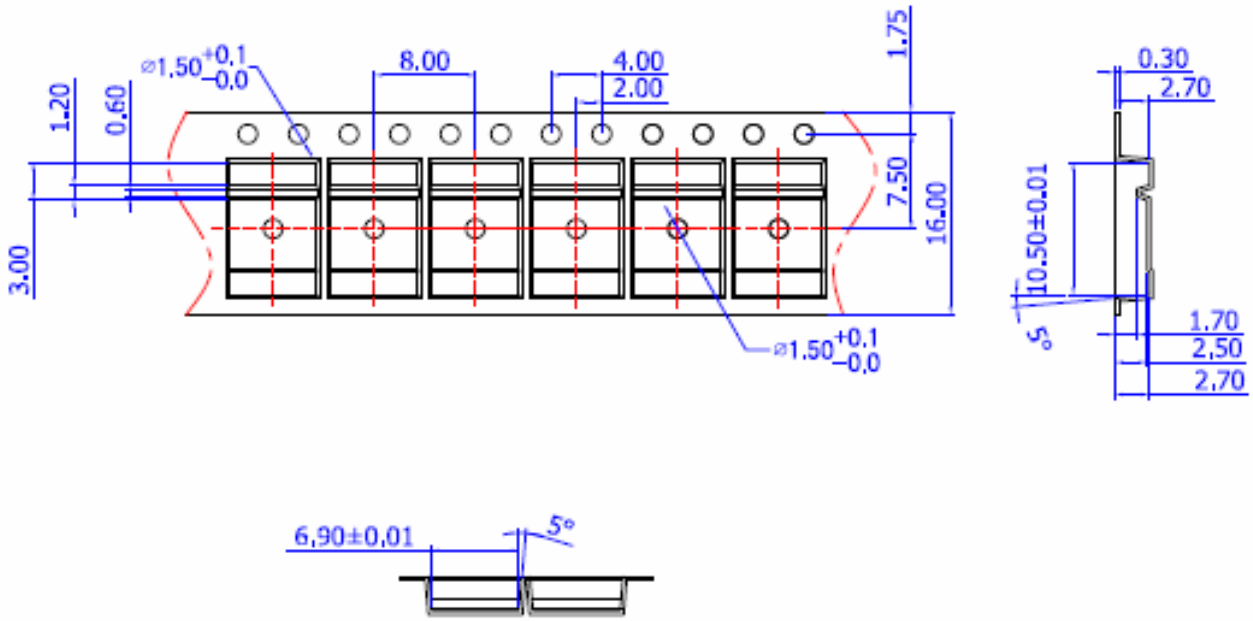
Figure 11 Normalized Maximum Transient Thermal Impedance

TO-252 Package Information



COMMON DIMENSIONS
(UNITS OF MEASURE =MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0	—	0.10
A2	0.90	1.01	1.10
b	0.72	—	0.85
b1	0.71	0.76	0.81
b2	0.72	—	0.90
b3	5.13	5.33	5.46
c	0.47	—	0.60
c1	0.46	0.51	0.56
c2	0.47	—	0.60
D	6.00	6.10	6.20
D1	5.25	—	—
E	6.50	6.60	6.70
E1	4.70	—	—
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90 REF		
L2	0.508 BSC		
L3	0.90	—	1.25
L4	0.60	0.80	1.00
L5	0.15	—	0.75
L6	1.80 REF		
θ	0°	—	8°
θ_1	5°	7°	9°
θ_2	5°	7°	9°



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