

## TGD N-Channel Enhancement Mode Power MOSFET

### Description

The TGD1490 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

### General Features

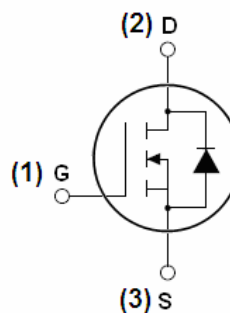
- $V_{DS} = 140V, I_D = 90A$   
 $R_{DS(ON)} < 13m\Omega @ V_{GS} = 10V$  (Typ: 10.5m $\Omega$ )
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

### Application

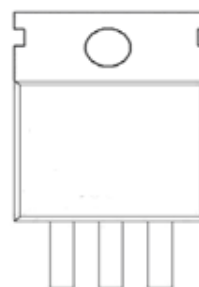
- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

**100% UIS TESTED!**

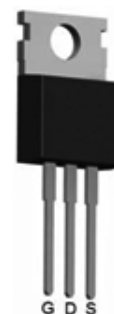
**100%  $\Delta V_{ds}$  TESTED!**



Schematic diagram



pin assignment



TO-220-3L top view

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
1490	1490	TO-220-3L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	140	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	90	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D (100^\circ C)$	63	A
Pulsed Drain Current	$I_{DM}$	260	A
Maximum Power Dissipation	$P_D$	310	W
Derating factor		2.07	W/ $^\circ C$
Single pulse avalanche energy (Note 5)	$E_{AS}$	1701	mJ



Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	°C
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**Thermal Characteristic**

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	0.48	°C/W
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**Electrical Characteristics ( $T_C=25^\circ\text{C}$  unless otherwise noted)**

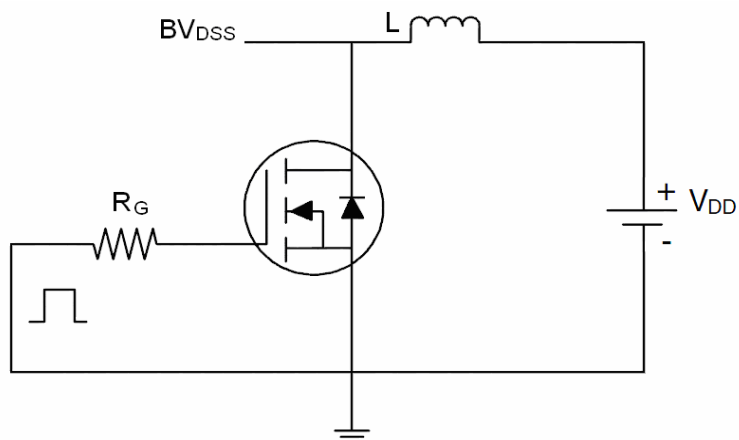
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	140	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =140V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
On Characteristics <sup>(Note 3)</sup>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2	3	4	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =30A	-	10.5	13	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =15V, I <sub>D</sub> =40A	120	-	-	S
Dynamic Characteristics <sup>(Note4)</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =50V, V <sub>GS</sub> =0V, F=1.0MHz	-	8000	-	PF
Output Capacitance	C <sub>oss</sub>		-	463	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	352	-	PF
Switching Characteristics <sup>(Note 4)</sup>						
Turn-on Delay Time	t <sub>d(on)</sub>	VDD=50V, ID=2A, RL=15Ω, RG=2.5Ω, VGS=10V	-	40	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	38	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	140	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	60	-	nS
Total Gate Charge	Q <sub>g</sub>	ID=30A, VDD=50V, VGS=10V	-	160	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	31	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	64	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage <sup>(Note 3)</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =40A	-	0.82	1.2	V
Diode Forward Current <sup>(Note 2)</sup>	I <sub>S</sub>		-	-	90	A
Reverse Recovery Time	t <sub>rr</sub>	TJ = 25°C, IF = 40A di/dt = 100A/μs <sup>(Note3)</sup>	-	42	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>		-	69	-	nC
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

**Notes:**

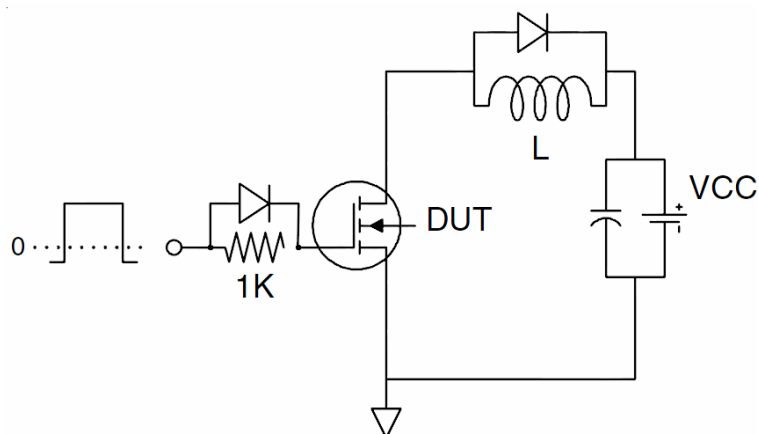
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5.  $E_{AS}$  condition :  $T_J=25^\circ\text{C}, V_{DD}=50V, V_G=10V, L=0.5mH, R_g=25\Omega$

## Test Circuit

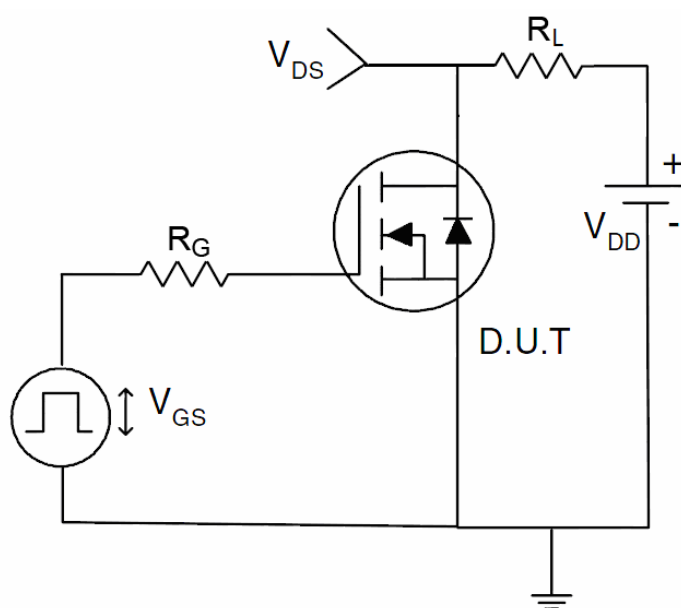
### 1) $E_{AS}$ test Circuit



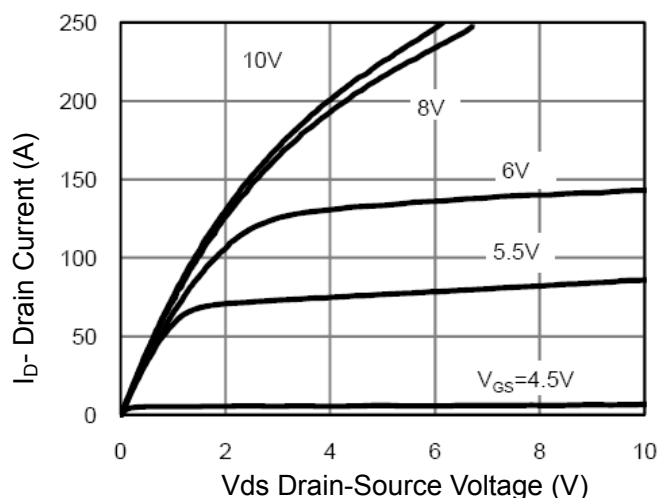
### 2) Gate charge test Circuit



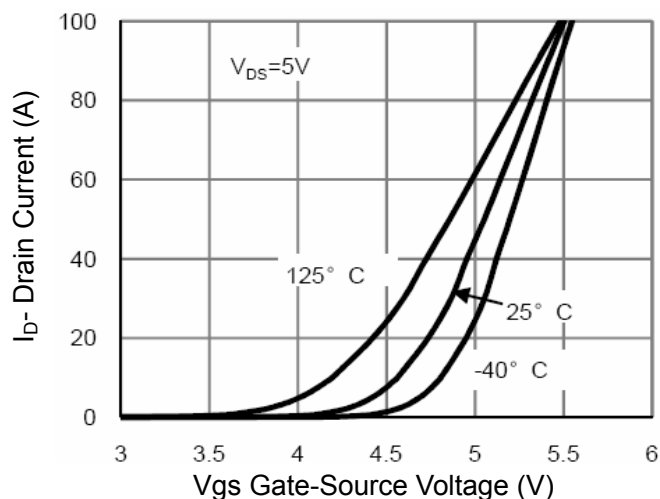
### 3) Switch Time Test Circuit



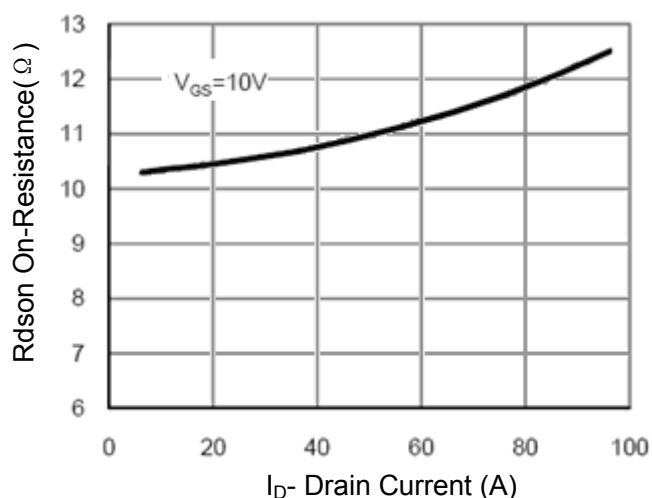
## Typical Electrical and Thermal Characteristics (Curves)



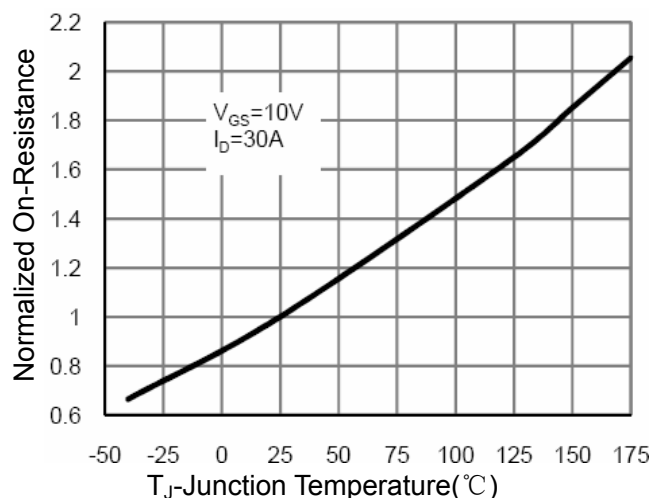
**Figure 1 Output Characteristics**



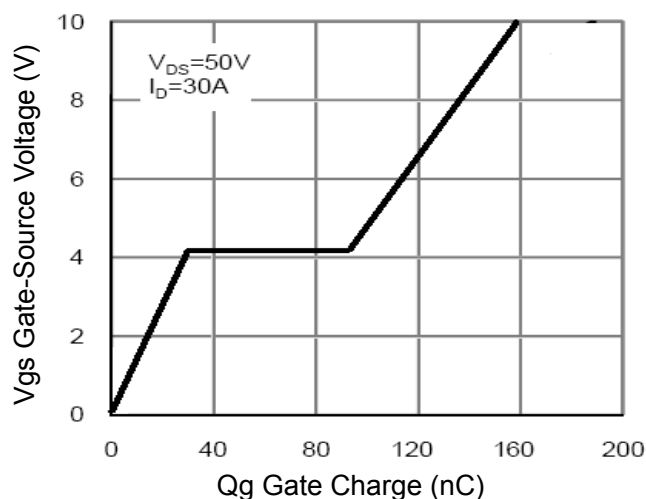
**Figure 2 Transfer Characteristics**



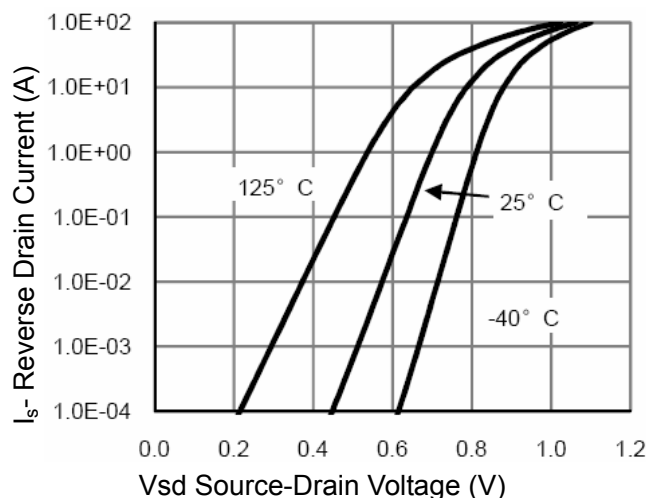
**Figure 3  $R_{DS(on)}$ - Drain Current**



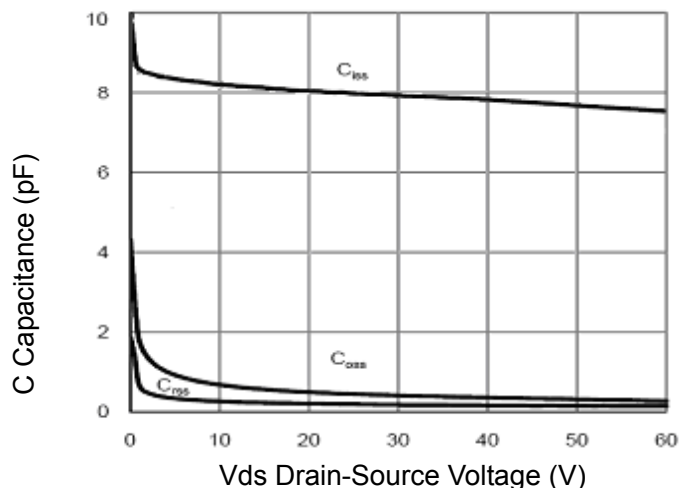
**Figure 4  $R_{DS(on)}$ -Junction Temperature**



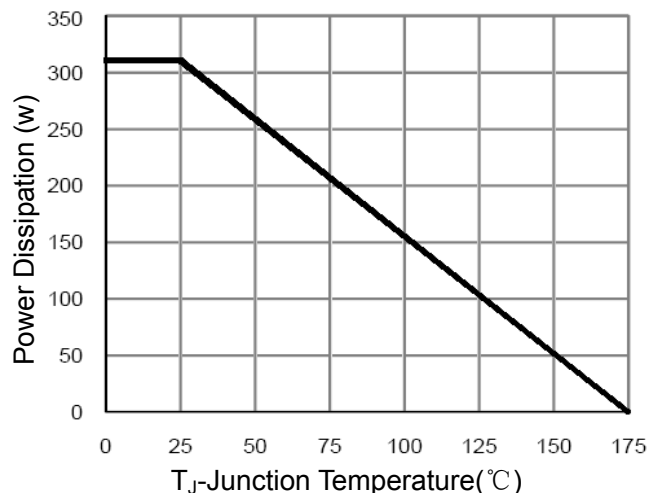
**Figure 5 Gate Charge**



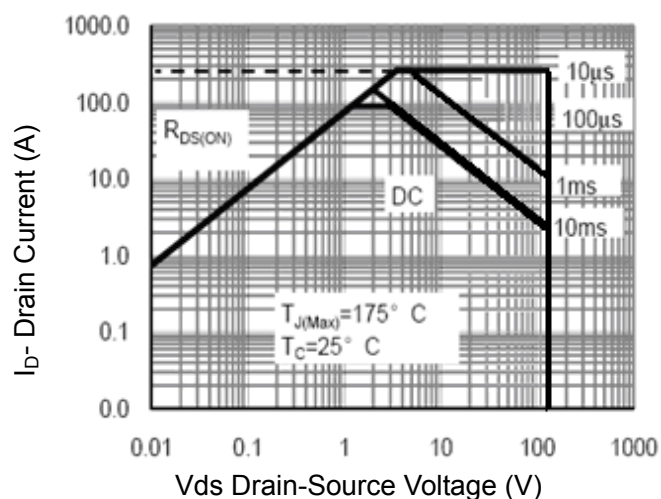
**Figure 6 Source- Drain Diode Forward**



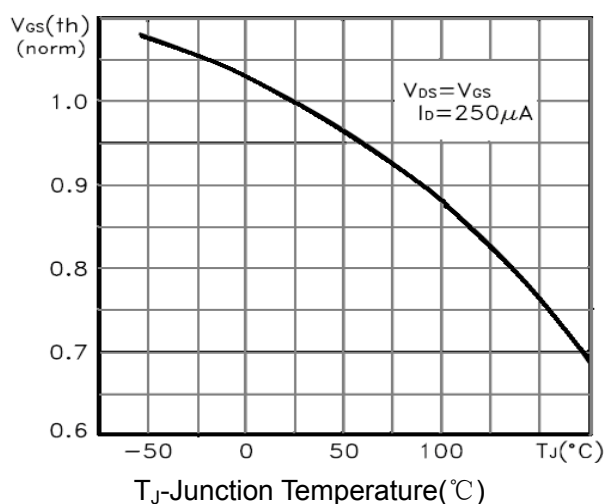
**Figure 7 Capacitance vs Vds**



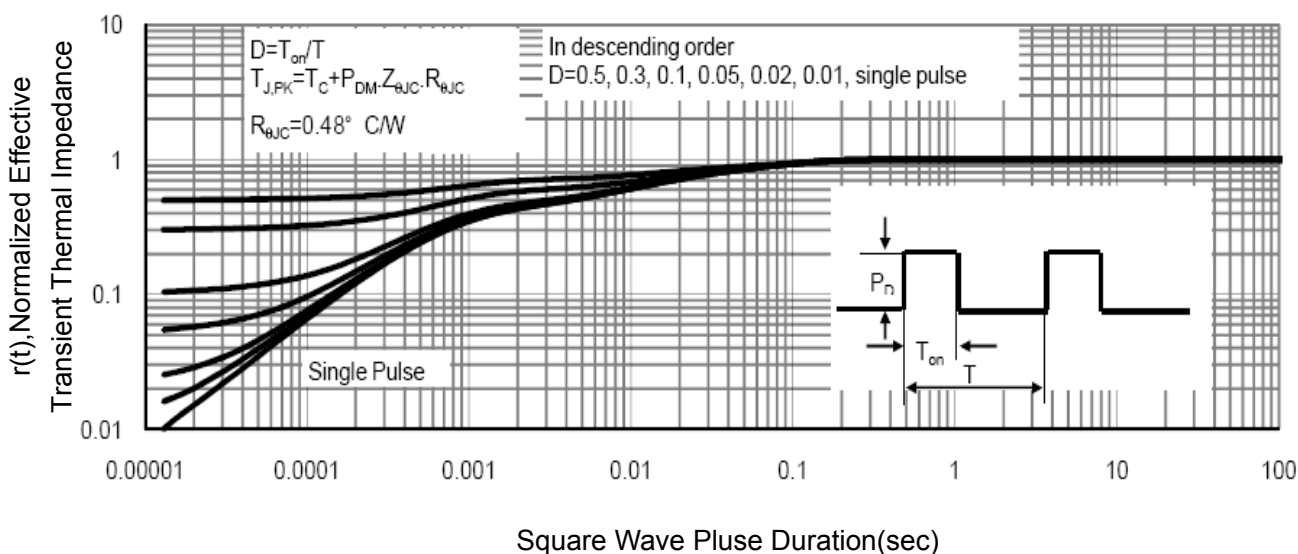
**Figure 9 Power De-rating**



**Figure 8 Safe Operation Area**

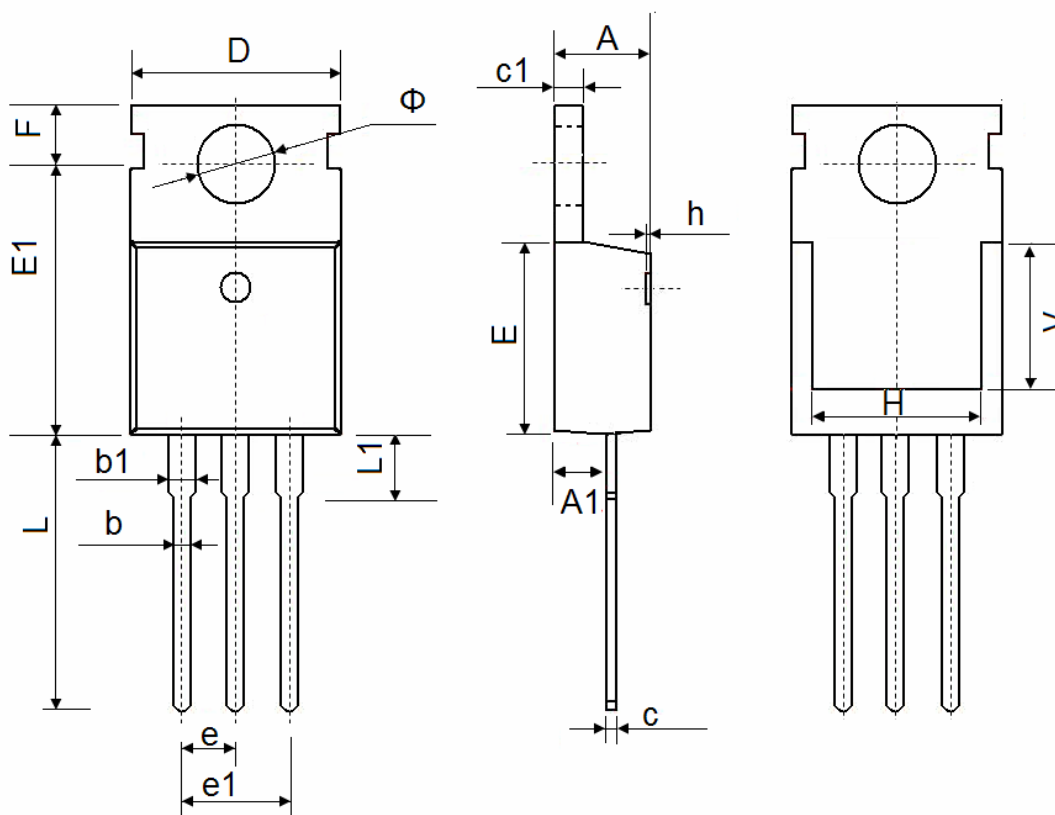


**Figure 10  $V_{GS(\text{th})}$  vs Junction Temperature**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

## TO-220-3L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.9500	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	7.500 REF.		0.295 REF.	
$\Phi$	3.400	3.800	0.134	0.150