

# NTBGS4D1N15MC-VB Datasheet

## N-Channel 150V (D-S) MOSFET

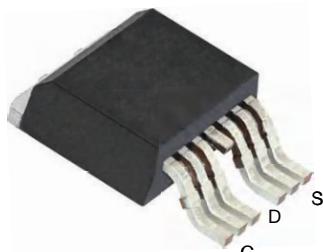
PRODUCT SUMMARY			
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω) MAX.	I <sub>D</sub> (A)	Q <sub>g</sub> (TYP.)
150	0.005atV <sub>GS</sub> =10V	160	75nC

### FEATURES

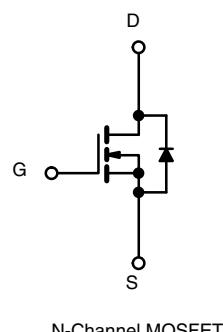
- SGT technology Power MOSFET
- Maximum 150 °C junction temperature
- 100 % R<sub>g</sub> and UIS tested



TO-263 7-Lead



Top View



### APPLICATIONS

- Power supplies:
  - Uninterruptible power supplies
  - AC/DC switch-mode power supplies
  - Lighting
- Synchronous rectification
- DC/DC converter
- Motor drive switch
- DC/AC inverter
- Solar micro inverter
- Class D audio amplifier

ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted)					
PARAMETER		SYMBOL	LIMIT	UNIT	
Drain-Source Voltage		V <sub>DS</sub>	150	V	
Gate-Source Voltage		V <sub>GS</sub>	± 20		
Continuous Drain Current (T <sub>J</sub> = 150 °C)		T <sub>C</sub> = 25 °C	I <sub>D</sub>	A	
		T <sub>C</sub> = 70 °C	160		
			128		
Pulsed Drain Current (t = 100 μs)		I <sub>DM</sub>	480	A	
Avalanche Current	L = 0.5 mH	I <sub>AS</sub>	102		
Single Avalanche Energy <sup>a</sup>		E <sub>AS</sub>	800	mJ	
Maximum Power Dissipation <sup>a</sup>		T <sub>C</sub> = 25 °C	P <sub>D</sub>	W	
		T <sub>C</sub> = 100 °C	300 <sup>b</sup>		
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	°C	

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-Ambient (PCB Mount) <sup>c</sup>		R <sub>thJA</sub>	40	°C/W
Junction-to-Case (Drain)		R <sub>thJC</sub>	0.5	

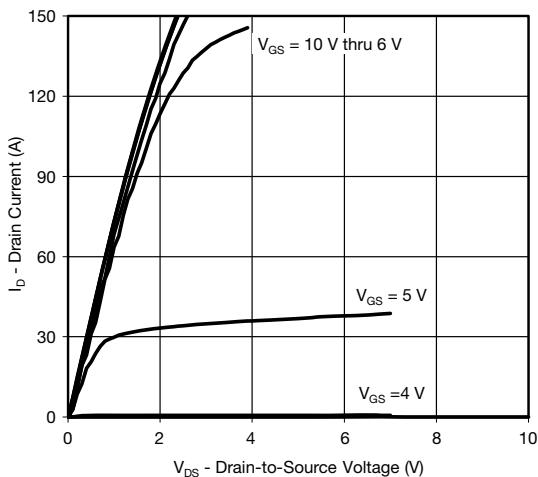
#### Notes

- Duty cycle ≤ 1 %.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR4 material).

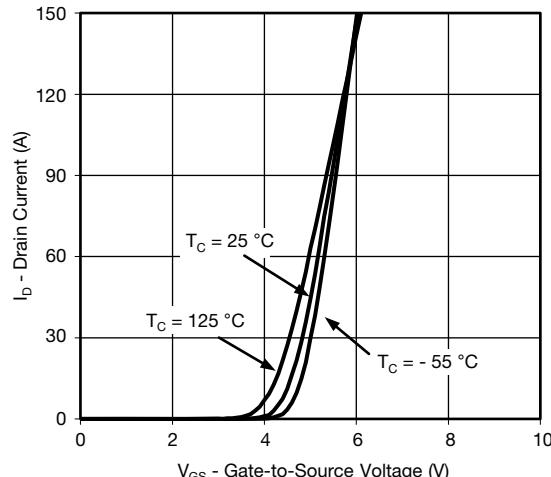
SPECIFICATIONS ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$	150	-	-	V
Gate Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$	2.5	-	4.5	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0 \text{ V}$ , $V_{GS} = \pm 20 \text{ V}$	-	-	$\pm 250$	$\text{nA}$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 80 \text{ V}$ , $V_{GS} = 0 \text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 120 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 125^\circ\text{C}$	-	-	150	
		$V_{DS} = 120 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 150^\circ\text{C}$	-	-	5	$\text{mA}$
On-State Drain Current <sup>a</sup>	$I_{D(\text{on})}$	$V_{DS} \geq 10 \text{ V}$ , $V_{GS} = 10 \text{ V}$	90	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$ , $I_D = 30 \text{ A}$	-	0.005	-	$\Omega$
		$V_{GS} = 4.5 \text{ V}$ , $I_D = 20 \text{ A}$	-	0.008	-	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15 \text{ V}$ , $I_D = 30 \text{ A}$	-	75	-	S
<b>Dynamic <sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0 \text{ V}$ , $V_{DS} = 100 \text{ V}$ , $f = 1 \text{ MHz}$	-	6500	-	$\text{pF}$
Output Capacitance	$C_{oss}$		-	246	-	
Reverse Transfer Capacitance	$C_{rss}$		-	21	-	
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 100 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 60 \text{ A}$	-	75	80	$\text{nC}$
Gate-Source Charge <sup>c</sup>	$Q_{gs}$		-	16.7	-	
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$		-	16.9	-	
Gate Resistance	$R_g$	$f = 1 \text{ MHz}$	1.5	3	5	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(\text{on})}$	$V_{DD} = 100 \text{ V}$ , $R_L = 1.66 \Omega$ $I_D \geq 60 \text{ A}$ , $V_{GEN} = 10 \text{ V}$ , $R_g = 1 \Omega$	-	15	25	$\text{ns}$
Rise Time <sup>c</sup>	$t_r$		-	15	20	
Turn-Off Delay Time <sup>c</sup>	$t_{d(\text{off})}$		-	12	25	
Fall Time <sup>c</sup>	$t_f$		-	10	18	
<b>Drain-Source Body Diode Ratings and Characteristics <sup>b</sup> (<math>T_C = 25^\circ\text{C}</math>)</b>						
Pulsed Current ( $t = 100 \mu\text{s}$ )	$I_{SM}$		-	-	480	A
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 10 \text{ A}$ , $V_{GS} = 0 \text{ V}$	-	0.8	1.2	V
Reverse Recovery Time	$t_{rr}$	$I_F = 30 \text{ A}$ , $\text{di}/\text{dt} = 100 \text{ A}/\mu\text{s}$	-	15	-	$\text{ns}$
Peak Reverse Recovery Charge	$I_{RM(\text{REC})}$		-	11	20	A
Reverse Recovery Charge	$Q_{rr}$		-	0.9	1.8	$\mu\text{C}$

**Notes**

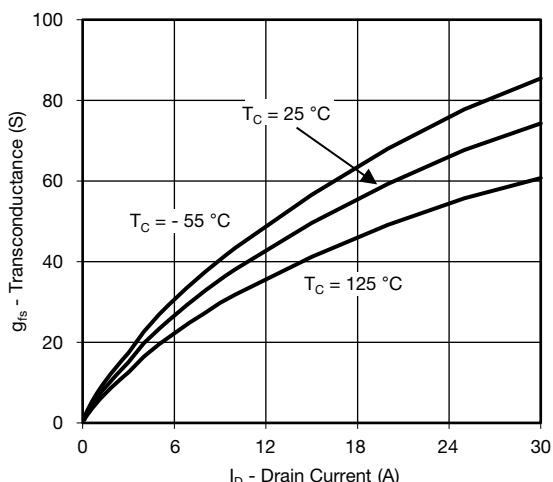
- a. Pulse test; pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2 \%$ .
- b. Guaranteed by design, not subject to production testing.
- c. Independent of operating temperature.

**TYPICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)


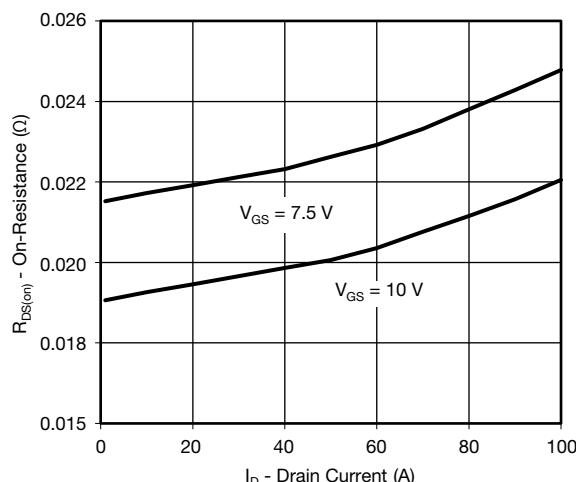
Output Characteristics



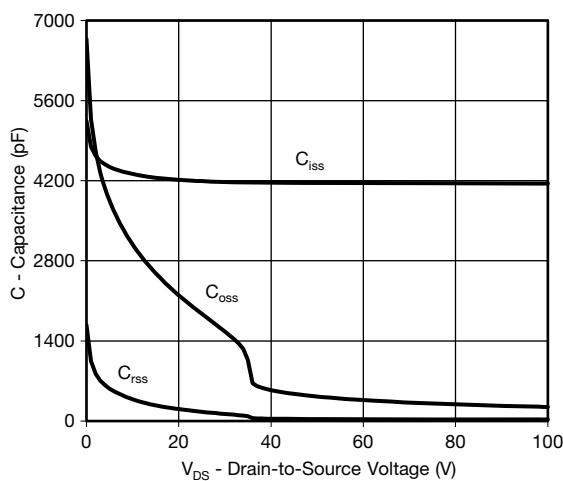
Transfer Characteristics



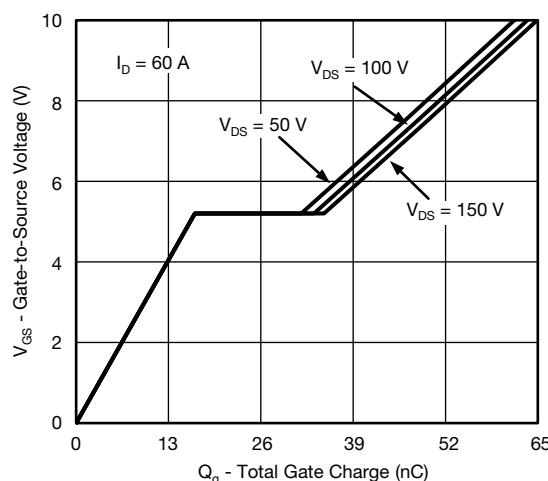
Transconductance



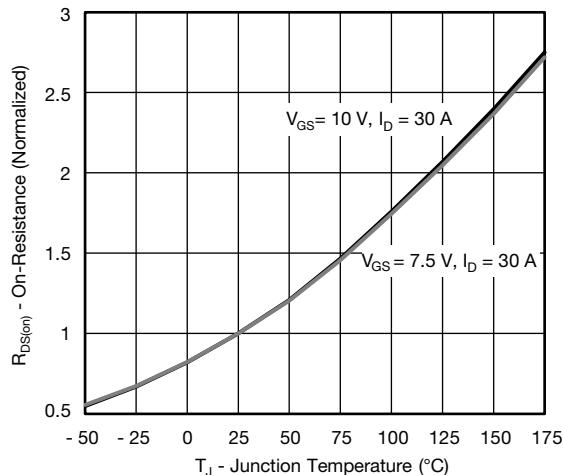
On-Resistance vs. Drain Current



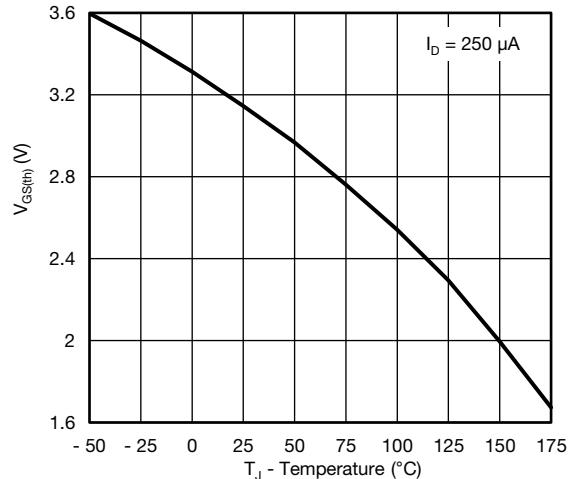
Capacitance



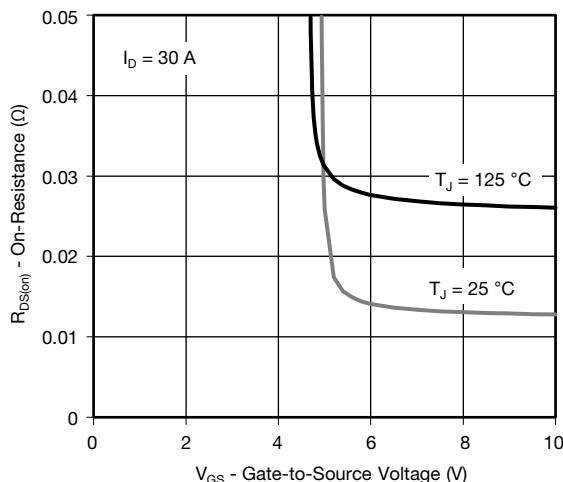
Gate Charge

**TYPICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)


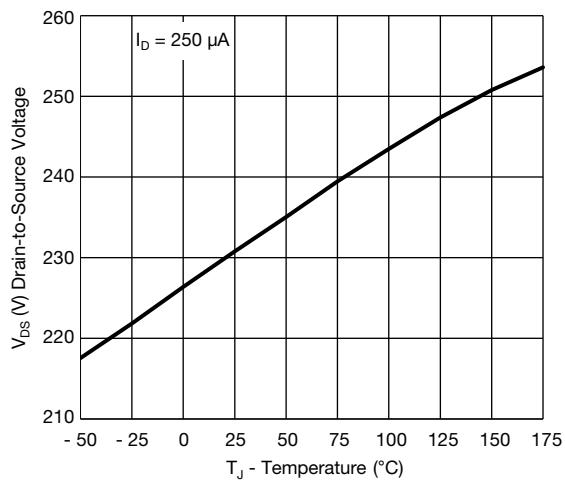
On-Resistance vs. Junction Temperature



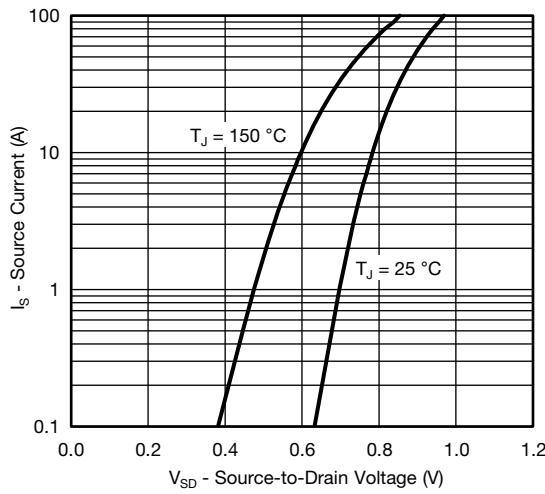
Threshold Voltage



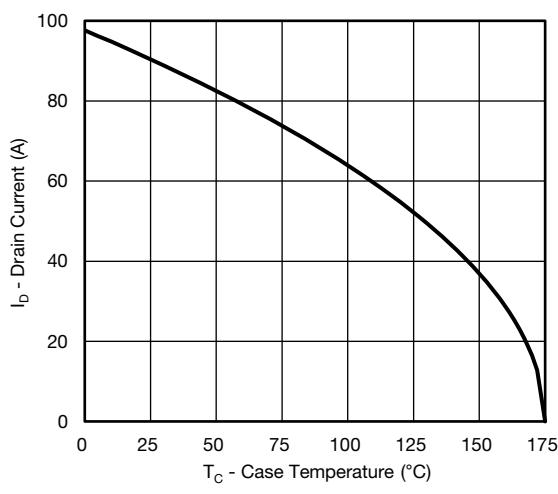
On-Resistance vs. Gate-to-Source Voltage



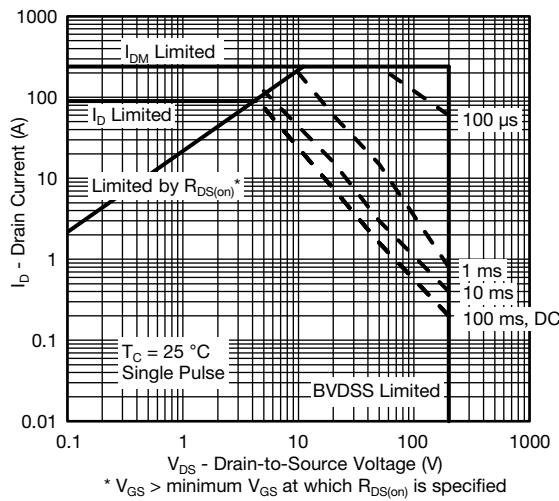
Drain Source Breakdown vs. Junction Temperature



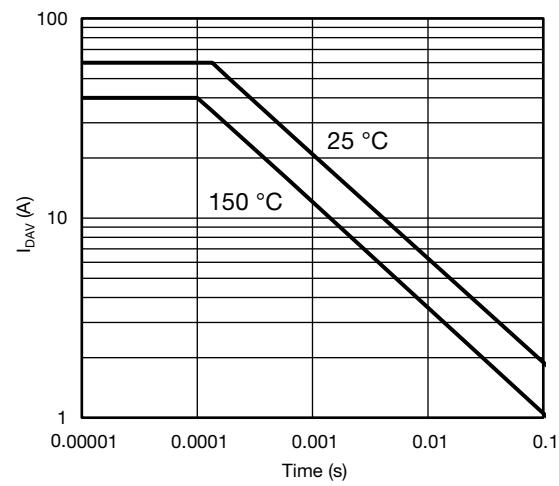
Source Drain Diode Forward Voltage



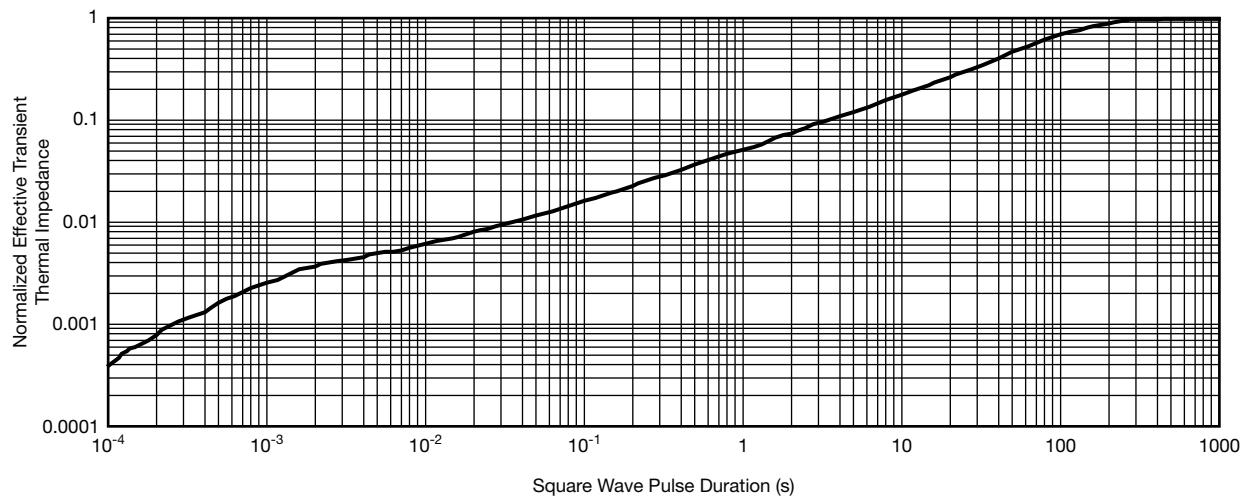
Current De-rating

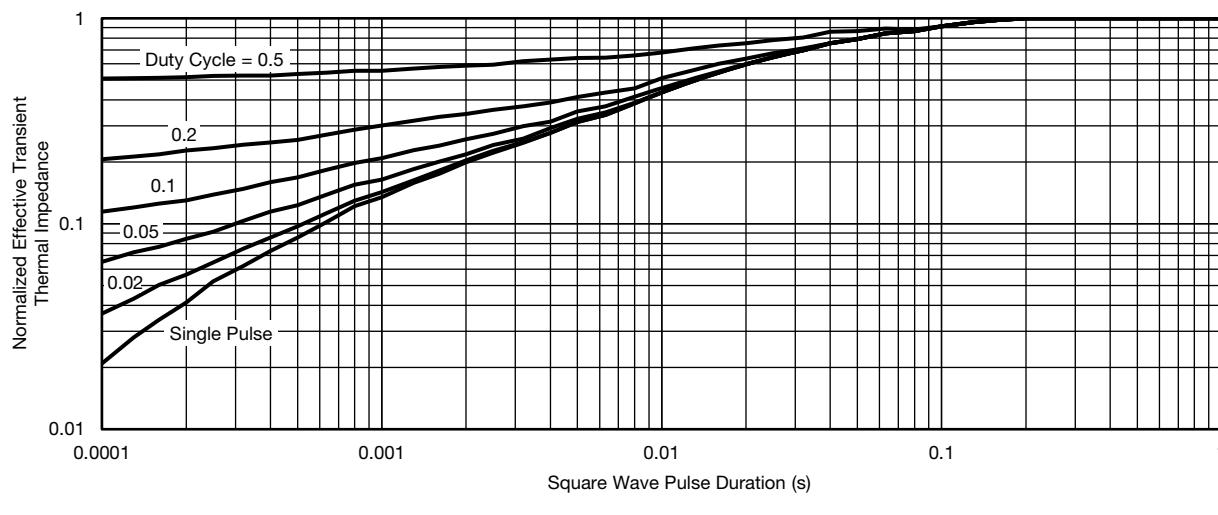
**THERMAL RATINGS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)


Safe Operating Area



Single Pulse Avalanche Current Capability vs. Time

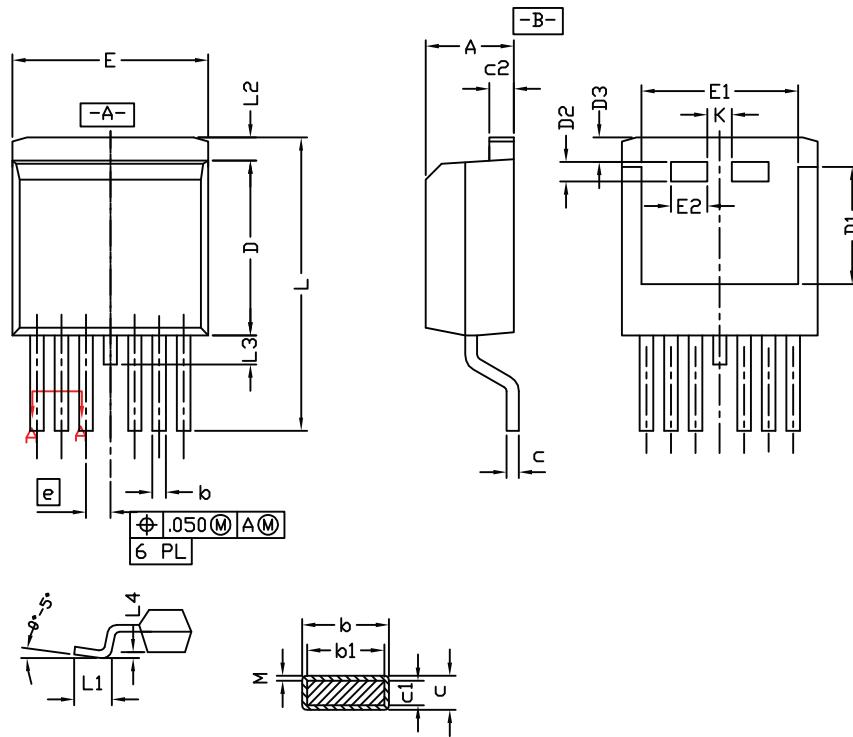


**THERMAL RATINGS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

**Normalized Thermal Transient Impedance, Junction-to-Case**
**Note**

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction to Ambient ( $25^\circ\text{C}$ )
  - Normalized Transient Thermal Impedance Junction to Case ( $25^\circ\text{C}$ )

are given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

## D<sup>2</sup>PAK (TO-263-7L) Case Outline



DETAIL A (ROTATED 90°) SECTION A-A

### Notes

1. Plane B includes maximum features of heat sink tab and plastic.
2. No more than 25 % of L1 can fall above seating plane by max. 8 mils.
3. Pin to pin coplanarity max. 4 mils.
4. Lead thickness 25 mils.
5. For SUM part numbers lead thickness is 24 mils to 29 mils.
6. For reference only.
7. Use inches as the primary measurement.
8. This feature is only for SUM.

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.160	0.190	4.064	4.826
b	0.020	0.039	0.508	0.990
b1	0.020	0.035	0.508	0.889
b2	0.045	0.055	1.143	1.397
c* SUB	0.012	0.018	0.305	0.457
c* SUM	0.022	0.028	0.559	0.711
c1	0.018	0.025	0.457	0.635
c2	0.045	0.055	1.143	1.397
D	0.340	0.380	8.636	9.652
D1	0.220	0.240	5.588	6.096
D2	0.038	0.042	0.965	1.067
D3	0.045	0.055	1.143	1.397
E	0.380	0.410	9.652	10.414
E1	0.245	-	6.223	-
E2	0.072	0.078	1.829	1.981
e	0.050 BSC		1.27 BSC	
K	0.045	0.055	1.143	1.397
L	0.575	0.625	14.605	15.875
L1	0.090	0.110	2.286	2.794
L2	0.040	0.055	1.016	1.397
L3	0.050	0.070	1.270	1.778
L4	0.010 BSC		0.254 BSC	
M	-	0.002	-	0.050
ECN: T13-0709-Rev. B, 30-Sep-13				
DWG: 6006				

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