

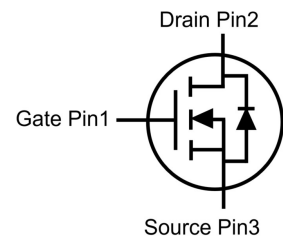
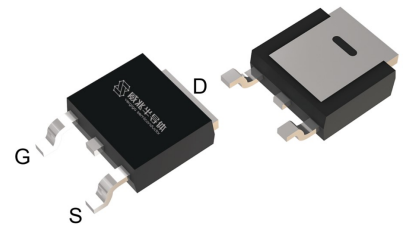
## Features

- N-Channel, 5V Logic Level Control
- Enhancement mode
- Low on-resistance  $R_{DS(on)}$  @  $V_{GS}=4.5\text{ V}$
- Fast Switching
- 100% Avalanche test
- Pb-free lead plating; RoHS compliant



Part ID	Package Type	Marking	Tape and reel information
VS3640AD	TO-252	3640AD	2500pcs/Reel

$V_{DS}$	30	V
$R_{DS(on),TYP}@ V_{GS}=10\text{ V}$	16	m $\Omega$
$R_{DS(on),TYP}@ V_{GS}=4.5\text{ V}$	24	m $\Omega$
$I_D$	28	A

**TO-252**


## Maximum ratings, at $T_A = 25^\circ\text{C}$ , unless otherwise specified

Symbol	Parameter	Rating	Unit	
$V_{(BR)DSS}$	Drain-Source breakdown voltage	30	V	
$I_S$	Diode continuous forward current	$T_C = 25^\circ\text{C}$	28	A
$I_D$	Continuous drain current @ $V_{GS}=10\text{V}$	$T_C = 25^\circ\text{C}$	28	A
		$T_C = 100^\circ\text{C}$	20	A
$I_{DM}$	Pulse drain current tested ①	$T_C = 25^\circ\text{C}$	112	A
EAS	Avalanche energy, single pulsed ②	15	mJ	
$P_D$	Maximum power dissipation	$T_C = 25^\circ\text{C}$	25	W
$V_{GS}$	Gate-Source voltage	$\pm 20$	V	
$T_{STG} T_J$	Storage and operating temperature range	-55 to 175	$^\circ\text{C}$	

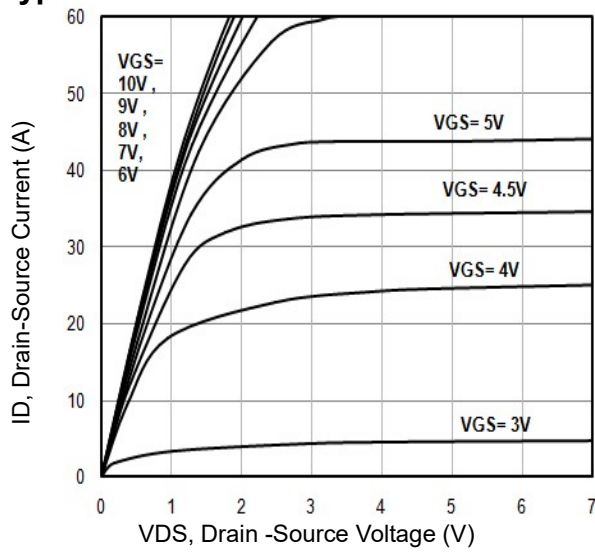
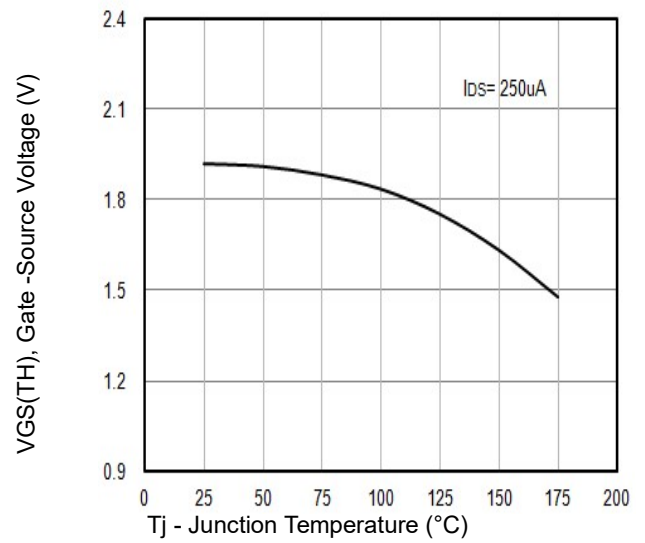
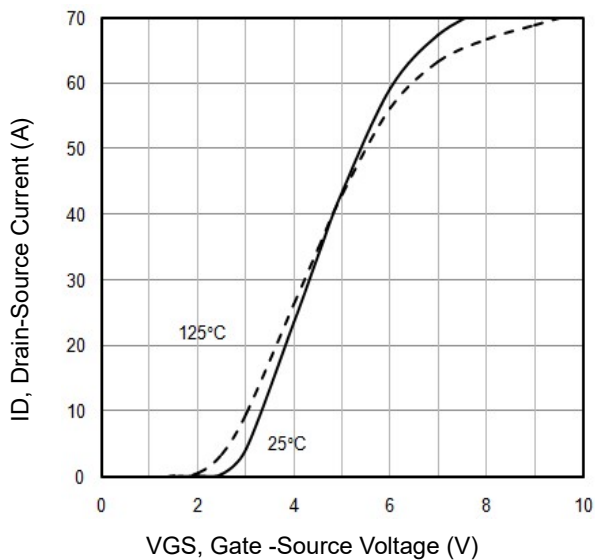
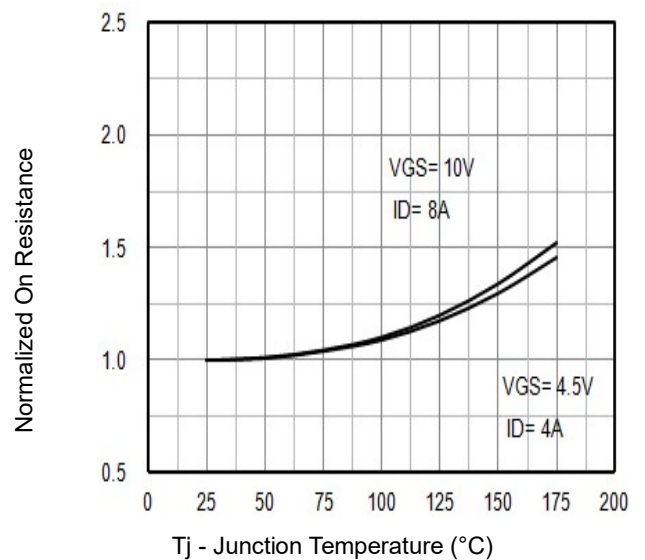
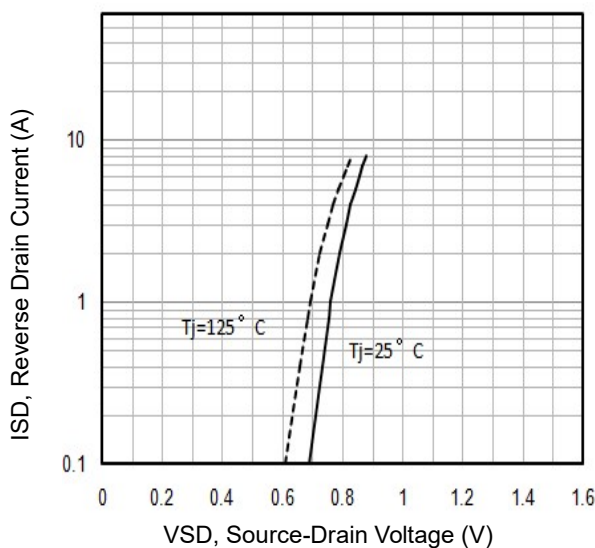
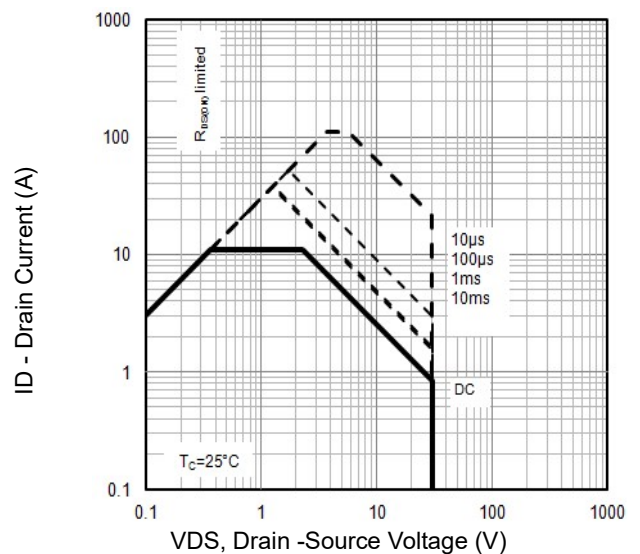
## Thermal Characteristics

Symbol	Parameter	Typical	Unit
$R_{\theta JC}$	Thermal Resistance-Junction to Case	6	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	100	$^\circ\text{C/W}$

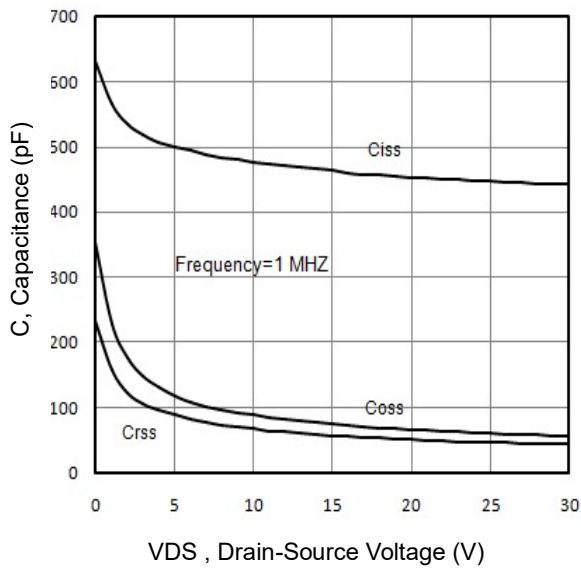
Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
<b>Static Electrical Characteristics @ T<sub>j</sub>=25°C (unless otherwise stated)</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	30	--	--	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V	--	--	1	μA
	Zero Gate Voltage Drain Current(T <sub>j</sub> =125°C)	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V	--	--	100	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	--	--	±100	nA
V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.3	1.9	2.4	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance <sup>③</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =8A	--	16	22	mΩ
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance <sup>③</sup>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =4A	--	24	31	mΩ
<b>Dynamic Electrical Characteristics @ T<sub>j</sub> = 25°C (unless otherwise stated)</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz	420	465	500	pF
C <sub>oss</sub>	Output Capacitance		50	75	100	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		35	55	75	pF
R <sub>g</sub>	Gate Resistance	f=1MHz	--	5.5	--	Ω
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =15V, I <sub>D</sub> =8A, V <sub>GS</sub> =10V	--	11	--	nC
Q <sub>gs</sub>	Gate-Source Charge		--	3	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	4	--	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> =15V, I <sub>D</sub> =8A, R <sub>G</sub> =3Ω, V <sub>GS</sub> =10V	--	7	--	ns
t <sub>r</sub>	Turn-on Rise Time		--	10	--	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	22	--	ns
t <sub>f</sub>	Turn-Off Fall Time		--	7	--	ns
<b>Source- Drain Diode Characteristics@ T<sub>j</sub> = 25°C (unless otherwise stated)</b>						
V <sub>SD</sub>	Forward on voltage	I <sub>SD</sub> =8A, V <sub>GS</sub> =0V	--	0.9	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	T <sub>j</sub> =25°C, I <sub>sd</sub> =8A, V <sub>GS</sub> =0V di/dt=100A/μs	--	9.5	--	ns
Q <sub>rr</sub>	Reverse Recovery Charge		--	12	--	nC

**NOTE:**

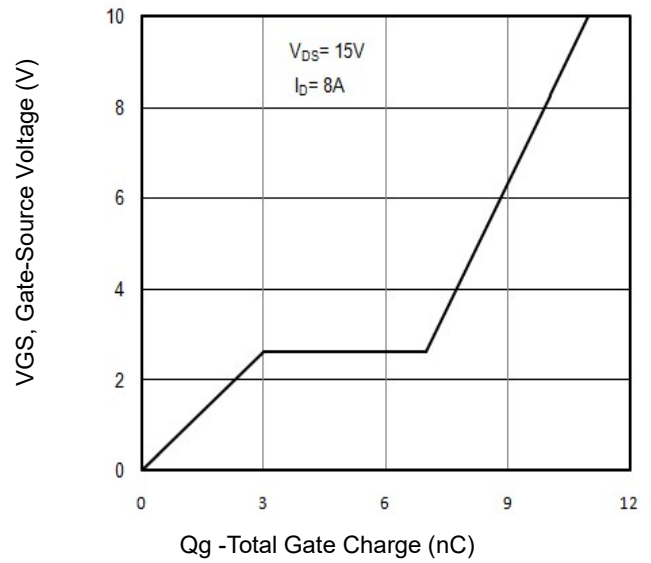
- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Limited by T<sub>jmax</sub>, starting T<sub>j</sub> = 25°C, L = 0.5mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 6A, V<sub>GS</sub> = 10V. Part not recommended for use above this value
- ③ Pulse width ≤ 300μs; duty cycle ≤ 2%.

**Typical Characteristics**

**Fig1.** Typical Output Characteristics

**Fig2.**  $V_{GS(TH)}$  Gate -Source Voltage Vs.  $T_j$ 

**Fig3.** Typical Transfer Characteristics

**Fig4.** Normalized On-Resistance Vs.  $T_j$ 

**Fig5.** Typical Source-Drain Diode Forward Voltage

**Fig6.** Maximum Safe Operating Area

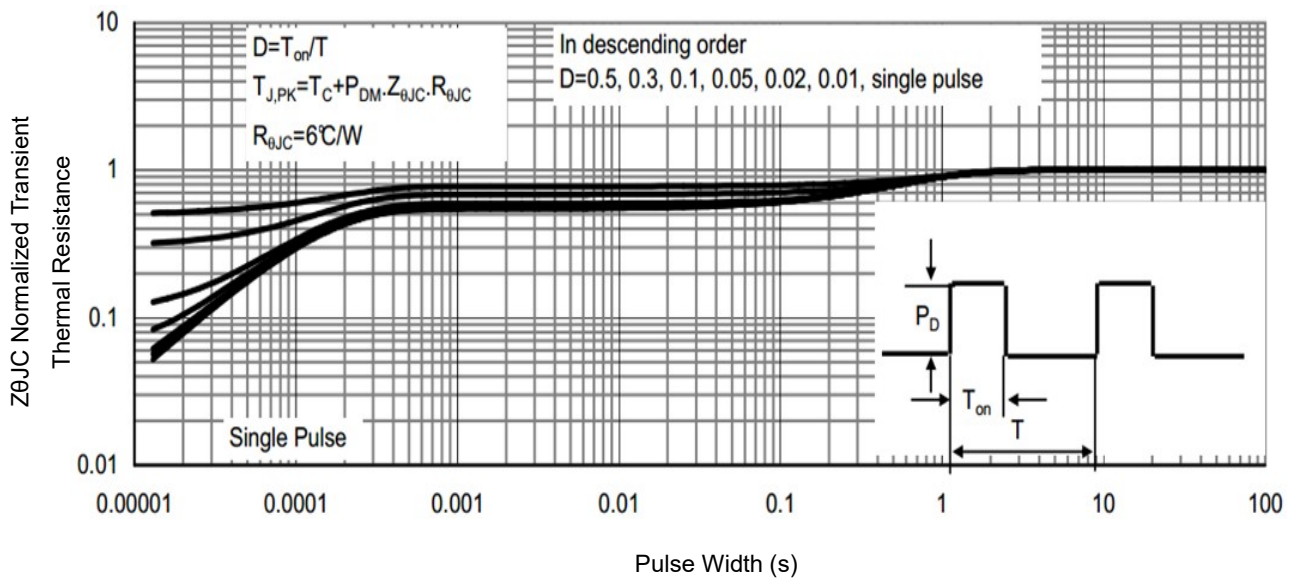
**Typical Characteristics**



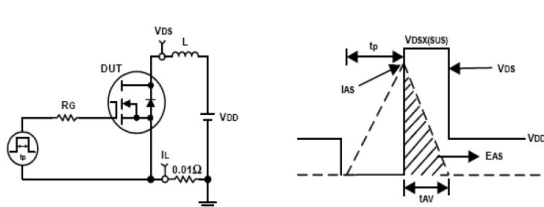
**Fig7.** Typical Capacitance Vs.Drain-Source Voltage



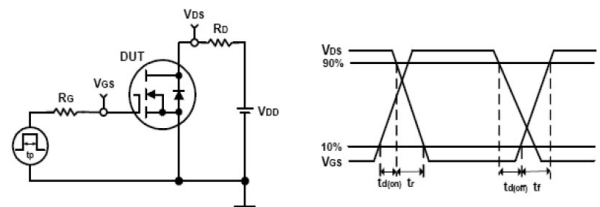
**Fig8.** Typical Gate Charge Vs.Gate-Source Voltage



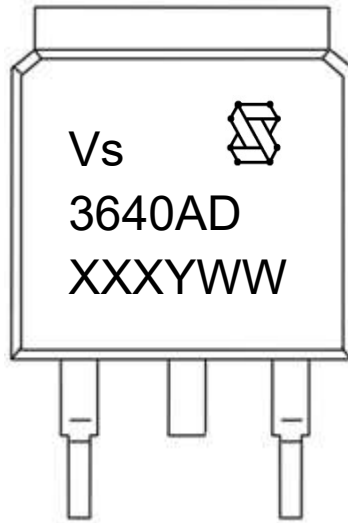
**Fig9.** Normalized Maximum Transient Thermal Impedance



**Fig10.** Unclamped Inductive Test Circuit and waveforms



**Fig11.** Switching Time Test Circuit and waveforms

**Marking Information**


1st line: Vergiga Code (Vs), Vergiga Logo

2nd line: Part Number (3640AD)

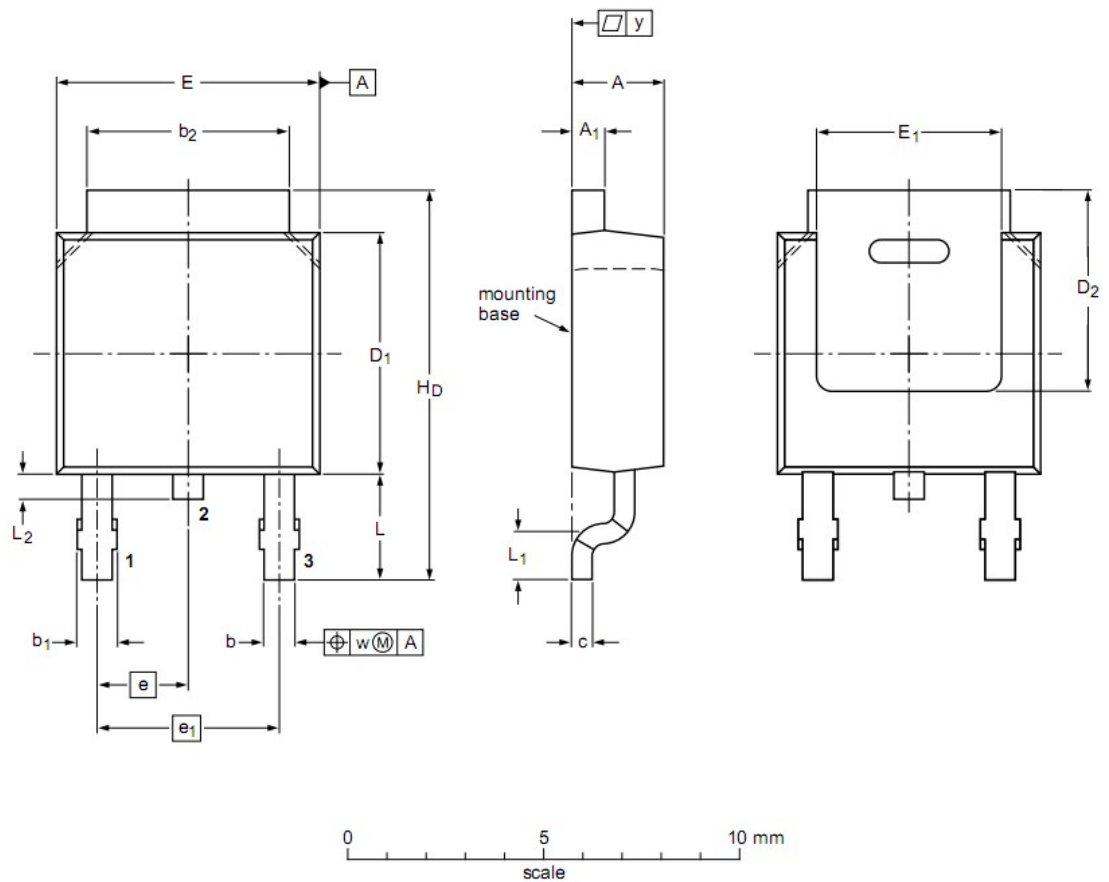
3rd line: Date code (XXXYWW)

XXX: Wafer Lot Number Code , code changed with Lot Number

Y: Year Code , refer to table below

WW: Week Code (01 to 53)

Code	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T
Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030

**TO-252 Package Outline Data**


Symbol	Dimensions (unit: mm)		
	Min	Typ	Max
<b>A</b>	2.20	2.30	2.38
<b>A<sub>1</sub></b>	0.46	0.50	0.63
<b>b</b>	0.64	0.76	0.89
<b>b<sub>1</sub></b>	0.77	0.85	1.14
<b>b<sub>2</sub></b>	5.00	5.33	5.46
<b>c</b>	0.458	0.508	0.558
<b>D<sub>1</sub></b>	5.98	6.10	6.223
<b>D<sub>2</sub></b>	5.21	--	--
<b>E</b>	6.40	6.60	6.731
<b>E<sub>1</sub></b>	4.40	--	--
<b>e</b>	2.286 BSC		
<b>e<sub>1</sub></b>	--	4.57	--
<b>H<sub>b</sub></b>	9.40	10.00	10.40
<b>L</b>	2.743 REF		
<b>L<sub>1</sub></b>	1.40	1.52	1.77
<b>L<sub>2</sub></b>	0.50	0.80	1.01
<b>w</b>	--	0.20	--
<b>y</b>	--	--	0.20

**Notes:**

1. Refer to JEDEC TO-252 variation AA
2. Dimension "E" does NOT include mold flash, protrusions or gate burrs. Mold flash, protrusions or gate burrs shall not exceed 0.1524mm per side.
3. Dimension "D1" does NOT include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.1524mm per end.