

Features

- Enhancement mode
- Low on-resistance $R_{DS(on)}$ @ $V_{GS}=10\text{ V}$
- Super junction technology
- 100% Avalanche Tested, 100% Rg Tested

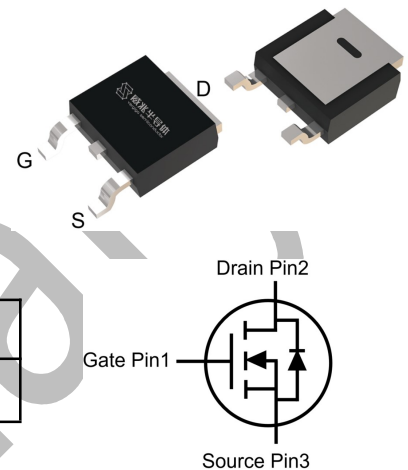
V_{DS}	600	V
$R_{DS(on),TYP} @ V_{GS}=10\text{ V}$	310	mΩ
$I_D(\text{Silicon limited})$	11	A



Halogen-Free

Part ID	Package Type	Marking	Packing
VSD60R360S	TO-252	D60R360S	2500pcs/Reel

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		600	V
VGS	Gate-source voltage		±30	V
IS	Diode continuous forward current (Silicon limited)	TC = 25°C	11	A
ID	Continuous drain current @VGS=10V (Silicon limited)	TC = 25°C	11	A
ID	Continuous drain current @VGS=10V (Silicon limited)	TC = 100°C	7	A
IDM	Pulse drain current tested ①	TC = 25°C	23	A
IDSM	Continuous drain current @VGS=10V	TA = 25°C	1.7	A
		TA = 70°C	1.3	A
EAS	Maximum Avalanche energy, single pulsed ②		101	mJ
PD	Maximum power dissipation ③	TC = 25°C	114	W
		TC = 100°C	45	W
PDSM	Maximum power dissipation ④	TA = 25°C	2.5	W
		TA = 70°C	1.6	W
TJ,TSTG	Operating junction and storage temperature range		-55 to 150	°C

Thermal Characteristics

Symbol	Parameter	Typical	Max	Unit
$R_{\theta JC}$	Thermal resistance, junction-to-case ⑤	0.94	1.1	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal resistance, junction-to-ambient ⑥	42	50	$^\circ\text{C/W}$

Electrical Characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
Static Electrical Characteristics @ T _J =25°C (unless otherwise stated)						
V(BR)DSS	Drain-source breakdown voltage	V _{GS} =0V, I _D =250μA	600	--	--	V
I _{DSS}	Zero gate voltage drain current(T _J =25°C)	V _{DS} =600V,V _{GS} =0V	--	--	1	μA
	Zero gate voltage drain current(T _J =125°C) ⑦	V _{DS} =600V,V _{GS} =0V	--	--	100	μA
I _{GSS}	Gate-body leakage current	V _{GS} =±30V,V _{DS} =0V	--	--	±100	nA
V _{GS(th)}	Gate threshold voltage	V _{DS} =V _{GS} ,I _D =250μA	2.5	3	3.5	V
R _{DS(on)}	Drain-source on-state resistance ⑧	V _{GS} =10V, I _D =5A	--	310	360	mΩ
		(T _J =100°C) ⑦	--	555	--	mΩ
G _{FS}	Forward transconductance	V _{DS} =15V, I _D =5A	--	7.7	--	S
Dynamic Electrical Characteristics @ T _J = 25°C (unless otherwise stated)						
C _{iss}	Input capacitance ⑦	V _{DS} =400V,V _{GS} =0V, f=100kHz	--	635	--	pF
C _{oss}	Output capacitance ⑦		--	15	--	pF
C _{rss}	Reverse transfer capacitance ⑦		--	1	--	pF
Co(er)	Output capacitance,energy related ⑦⑨	V _{DS} =0V to 400V	--	24	--	pF
Co(tr)	Output capacitance,time related ⑦⑩	V _{GS} =0V	--	140	--	pF
R _g	Gate resistance	f=1MHz	--	4.7	--	Ω
Q _g	Total gate charge ⑦	V _{DS} =400V,I _D =5A, V _{GS} =10V	--	13	--	nC
Q _{gs}	Gate-source charge ⑦		--	3.2	--	nC
Q _{gd}	Gate-drain charge ⑦		--	3.2	--	nC
Q _{oss}	Output charge ⑦	V _{DS} =0V to 400V V _{GS} =0V	--	56	--	nC
Switching Characteristics ⑦						
T _{d(on)}	Turn-on delay time	V _{DD} =400V, I _D =5A, R _G =10Ω, V _{GS} =10V	--	8	--	ns
T _r	Turn-on rise time		--	7.3	--	ns
T _{d(off)}	Turn-off delay time		--	33	--	ns
T _f	Turn-off fall time		--	26	--	ns
Source- Drain Diode Characteristics@ T _J = 25°C (unless otherwise stated)						
V _{SD}	Forward on voltage	I _{SD} =5A,V _{GS} =0V	--	0.83	1	V
T _{rr}	Reverse recovery time ⑦	V _{DD} =50V, I _{sd} =5A, V _{GS} =0V	--	177	--	ns
Q _{rr}	Reverse recovery charge⑦	dI/dt=100A/μs	--	1.4	--	uC

NOTE:

- ① Single pulse; pulse width ≤ 100μs.
- ② This maximum value is based on starting T_J = 25°C, L = 10mH, R_G = 25Ω, I_{AS} = 4.5A, V_{GS} = 10V; 100% FT tested at L = 10mH, I_{AS} = 3.5A.
- ③ The power dissipation P_d is based on T_J(max), using junction-to-case thermal resistance RθJC.
- ④ The power dissipation P_{dsm} is based on T_J(max), using junction-to-ambient thermal resistance RθJA.
- ⑤ Thermal resistance from junction to soldering point (on the exposed drain pad). These tests are performed on a cold plate.
- ⑥ These tests are performed with the device mounted on 1 in2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C.
- ⑦ Guaranteed by design, not subject to production testing.
- ⑧ Pulse width ≤ 380μs; duty cycles ≤ 2%.
- ⑨ Equivalent capacitance to give same stored energy from 0V to 400V.
- ⑩ Equivalent capacitance to give same charging time from 0V to 400V.

Typical Characteristics

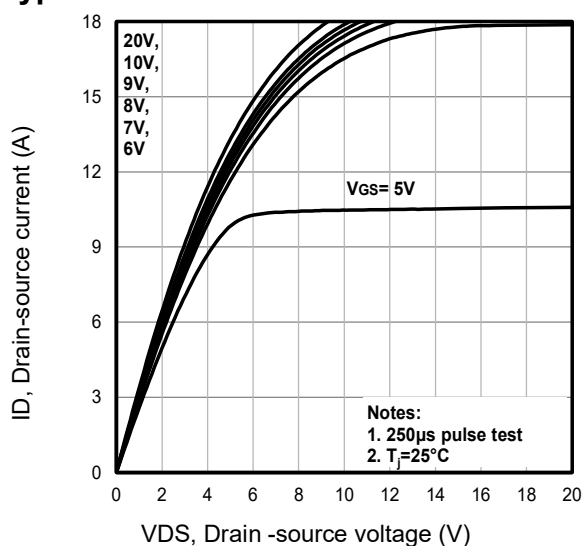


Fig1. Typical output characteristics

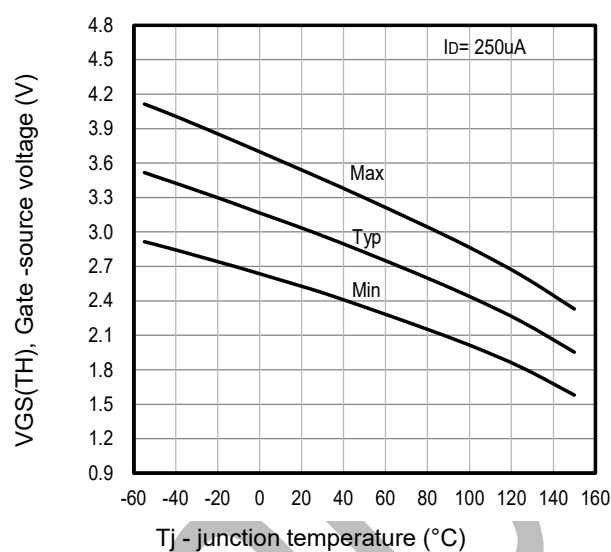


Fig2. Typical V_{GS(TH)} gate-source voltage Vs. T_j

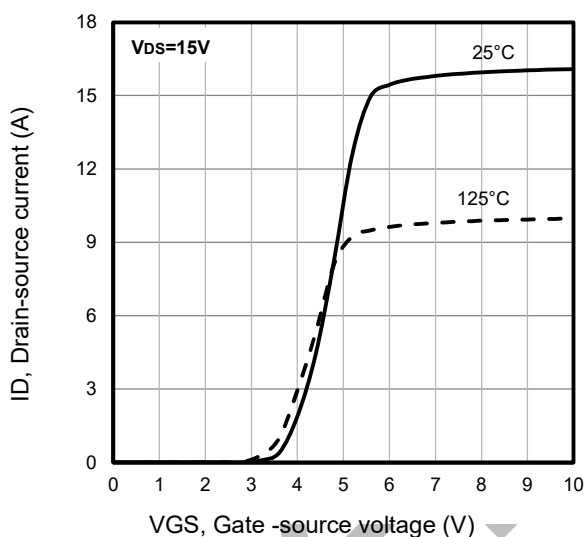


Fig3. Typical transfer characteristics

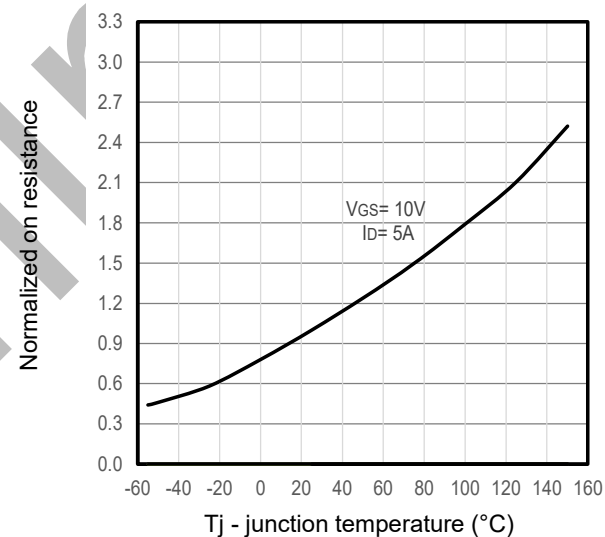


Fig4. Typical normalized on-resistance Vs. T_j

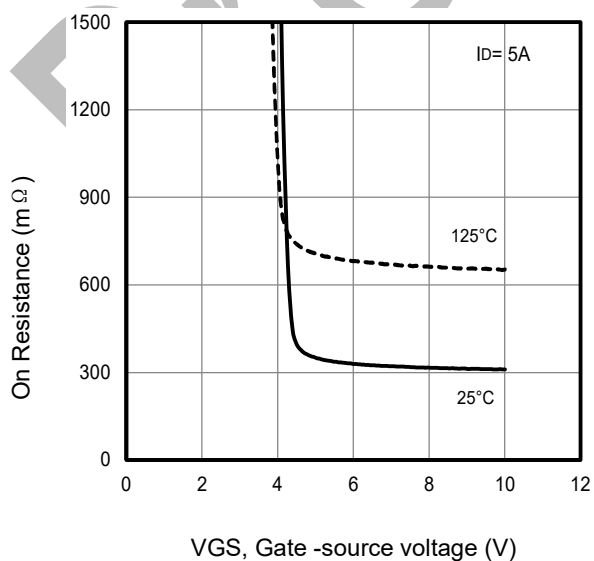


Fig5. Typical on resistance Vs gate-source voltage

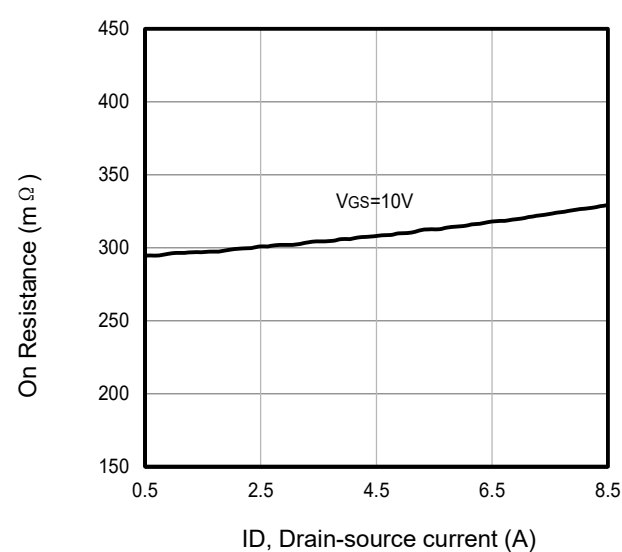


Fig6. Typical on resistance Vs drain current

Typical Characteristics

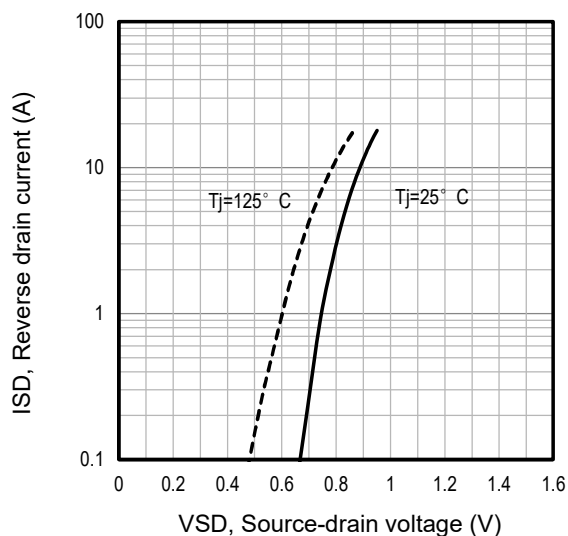


Fig7. Typical source-drain diode forward voltage

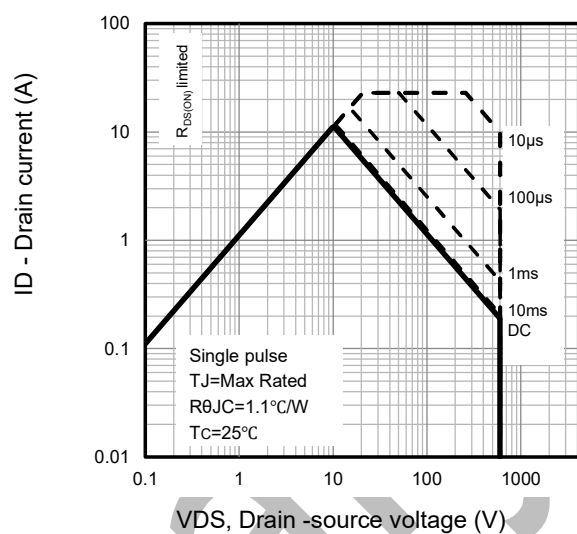


Fig8. Maximum safe operating area

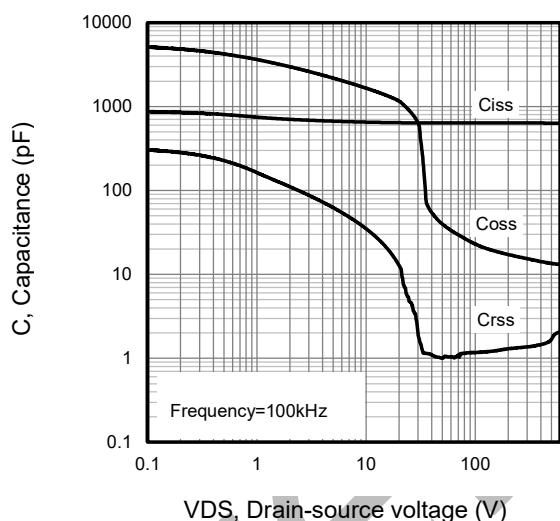


Fig9. Typical capacitance Vs. drain-source voltage

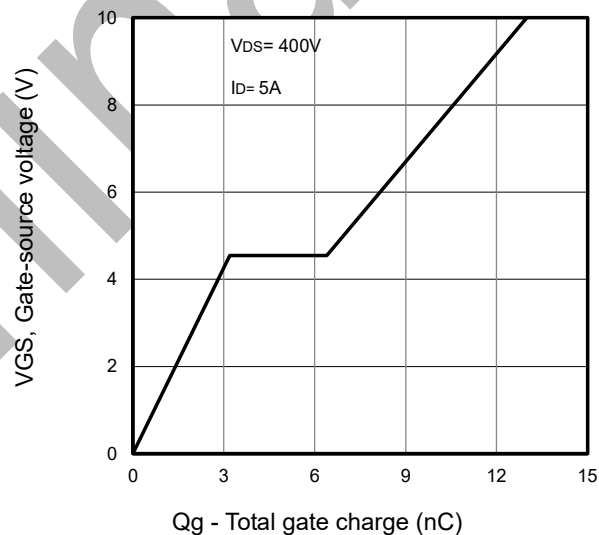


Fig10. Typical gate charge Vs. gate-source voltage

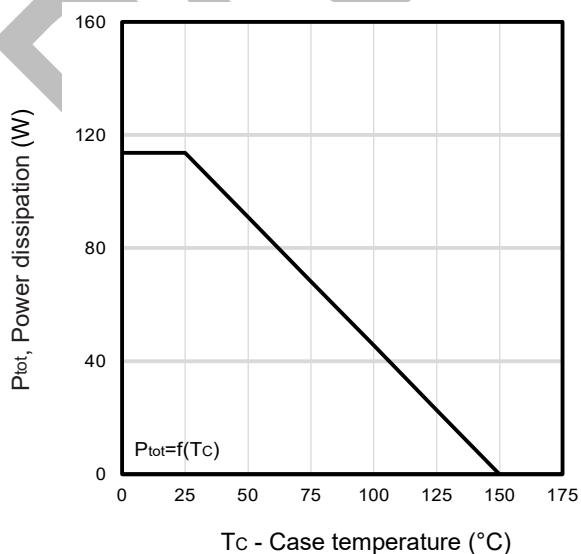


Fig11. Power dissipation Vs. case temperature

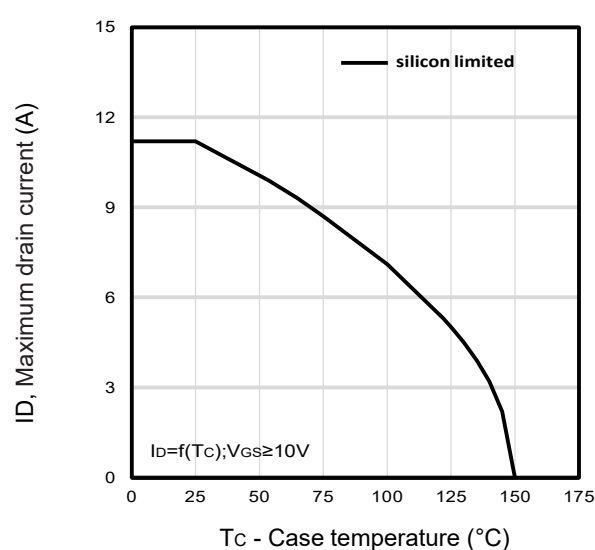


Fig12. Maximum drain current Vs. case temperature

Typical Characteristics

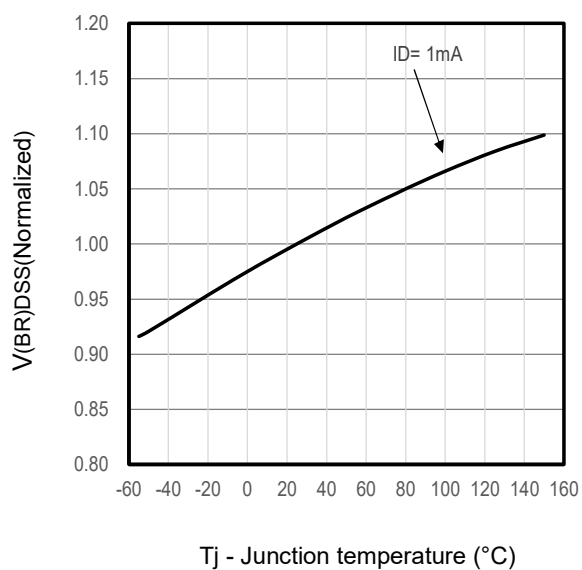


Fig13. Typical $V(BR)_{DSS}$ Vs T_j

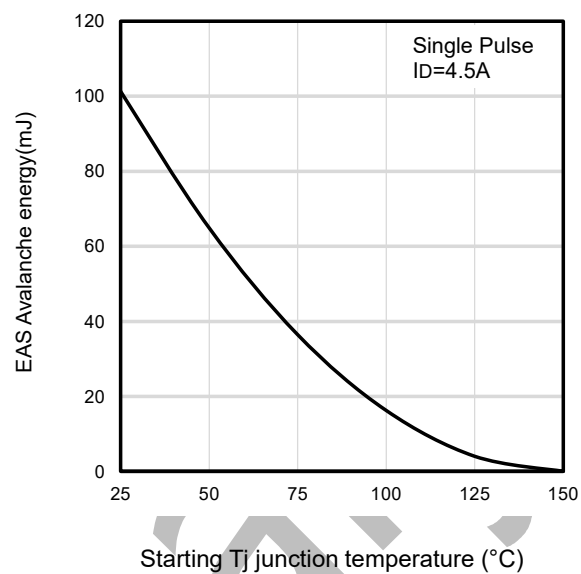


Fig14. Maximum avalanche energy vs temperature ($^{\circ}C$)

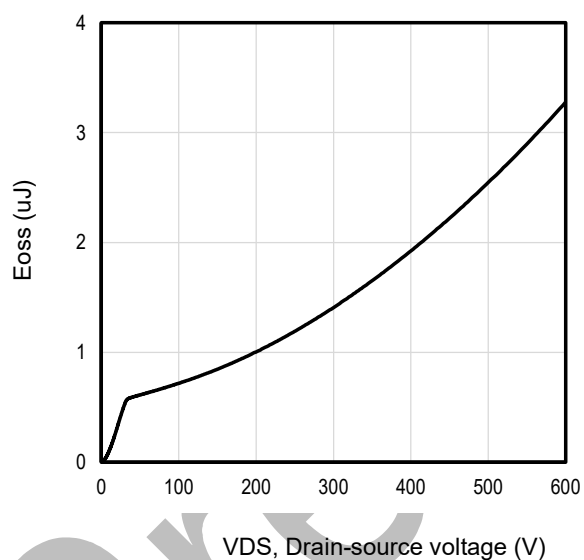


Fig15. Typical C_{oss} stored energy

Typical Characteristics

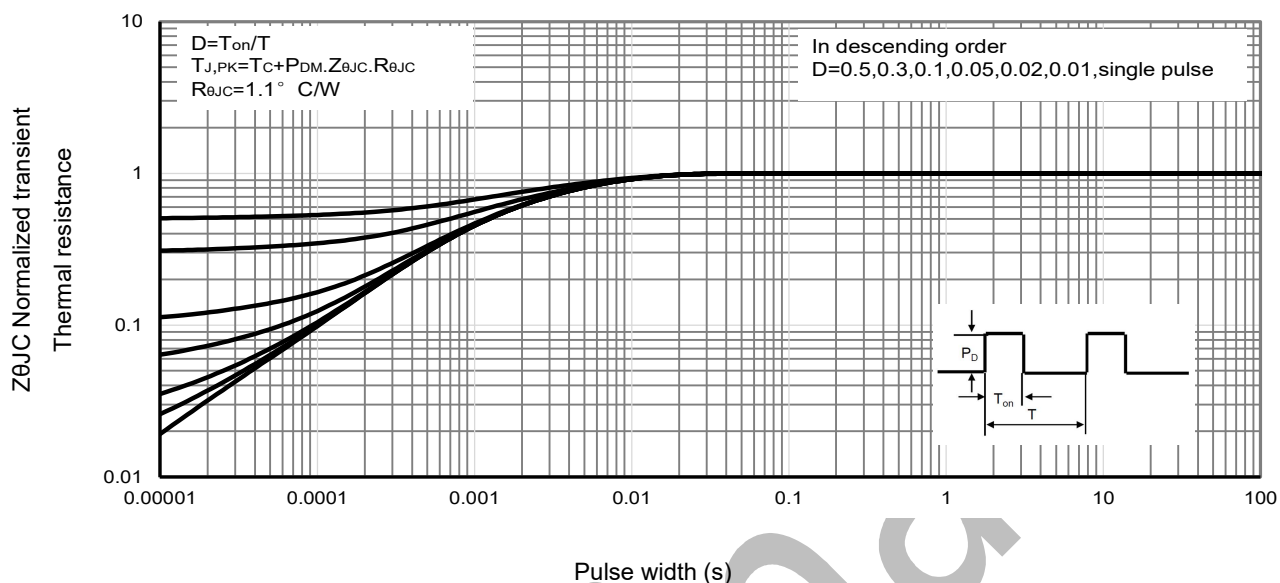


Fig16 . Normalized maximum transient thermal impedance

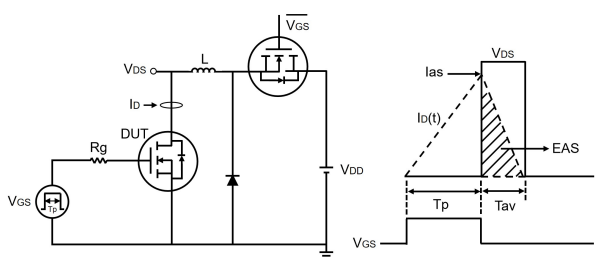


Fig17. Unclamped inductive test circuit and waveforms

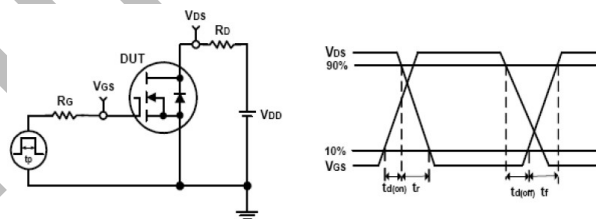
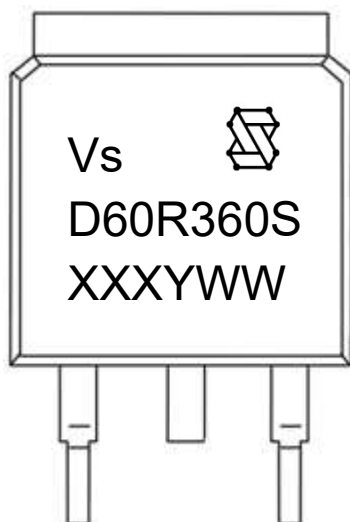


Fig18. Switching time test circuit and waveforms

Marking Information


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

2nd line: Part Number (D60R360S)

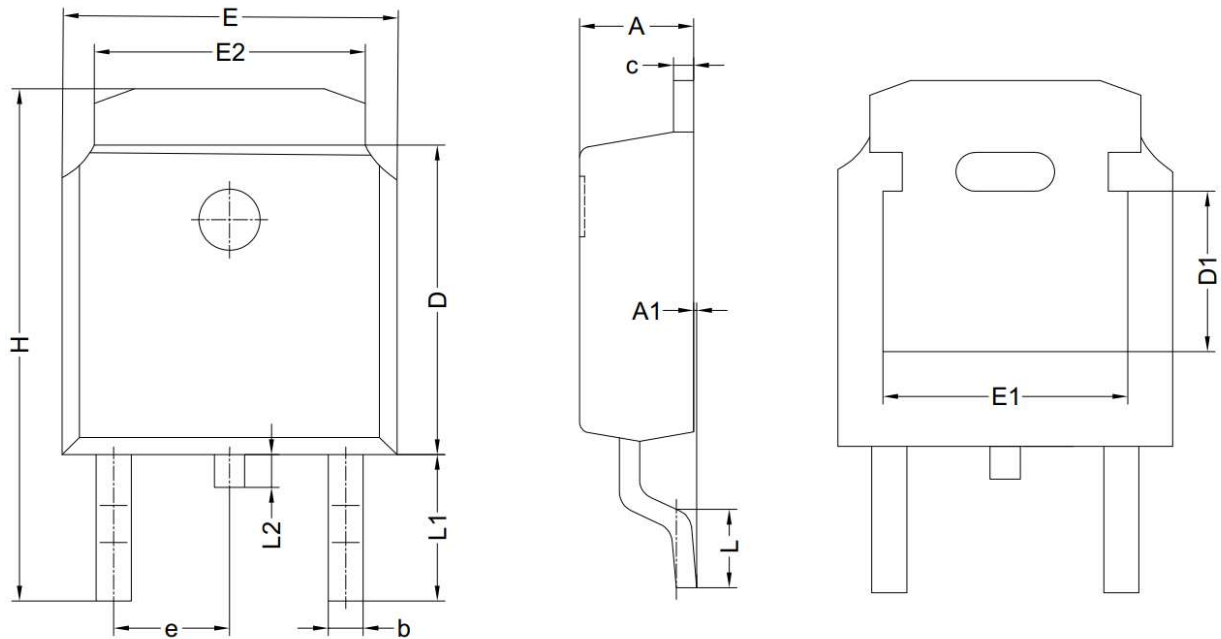
3rd line: Date code (XXXYWW)

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
A	2.200	2.300	2.400
A1	--	--	0.127
b	0.640	0.690	0.740
c	0.460	0.520	0.580
D	6.000	6.100	6.200
D1	3.166 REF		
E	6.500	6.600	6.700
E1	4.826 REF		
E2	5.334 REF		
e	--	2.286	--
H	9.900	10.100	10.300
L	1.400	1.550	1.700
L1	2.888 REF		
L2	0.600	0.800	1.000