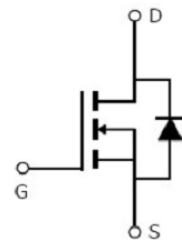


Main Product Characteristics:

V_{DSS}	25V
$R_{DS(on)}$	4.1mohm(typ.)
I_D	60A


TO-252 (D-PAK)

Marking and pin Assignment

Schematic diagram
Features and Benefits:

- Advanced trench MOSFET process technology
- Special designed for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- 175°C operating temperature


Description:

It utilizes the latest FRRMOS (fast reverse recovery MOS) trench processing techniques to achieve extremely low on resistance, fast switching speed and short reverse recovery time. These features combine to make this design an extremely efficient and reliable device for use in PWM, load switching and a wide variety of other applications.

Absolute max Rating:

Symbol	Parameter	Max.	Units
I_D @ TC = 25°C	Continuous Drain Current, VGS @ 10V ^①	60	A
I_D @ TC = 100°C	Continuous Drain Current, VGS @ 10V ^①	50	
I_{DM}	Pulsed Drain Current ^②	130	
I_{SM}	Pulsed Source Current (Body Diode) ^②	130	
PD @TC = 25°C	Power Dissipation ^③	45	W
PD @TC =100°C	Power Dissipation ^③	22	W
VDS	Drain-Source Voltage	25	V
VGS	Gate-to-Source Voltage	± 20	V
dv/dt	Peak diode recovery voltage	1.5	V/nS
EAS	Single Pulse Avalanche Energy @ L=0.1mH ^②	90	mJ
EAR	Repetitive avalanche energy	228	
IAR	Avalanche Current @ L=0.1mH ^②	42	A
TJ TSTG	Operating Junction and Storage Temperature Range	-55 to + 175	°C

Thermal Resistance

Symbol	Characterizes	Value	Unit
$R_{\theta JC}$	Junction-to-case ^③	2.5	$^{\circ}C/W$
$R_{\theta JA}$	Junction-to-ambient ($t \leq 10s$) ^④	13	$^{\circ}C/W$
	Junction-to-Ambient (PCB mounted, steady-state) ^④	36	$^{\circ}C/W$

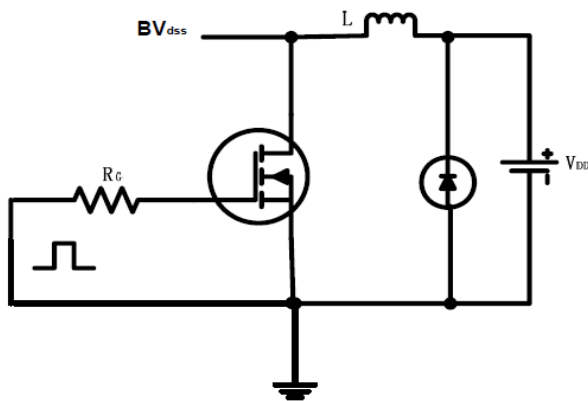
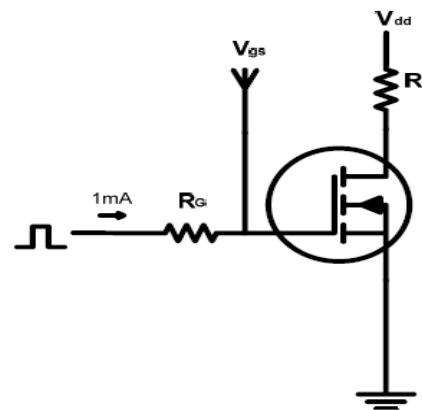
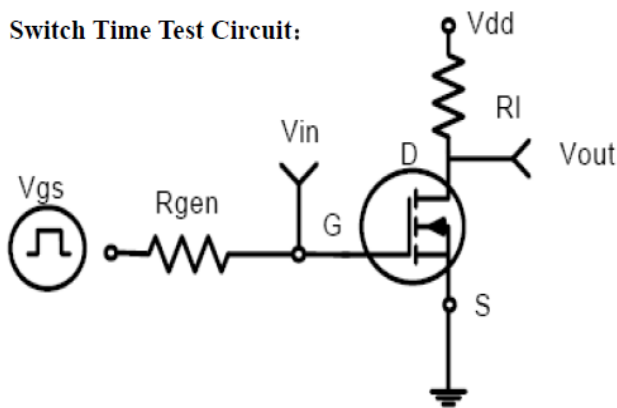
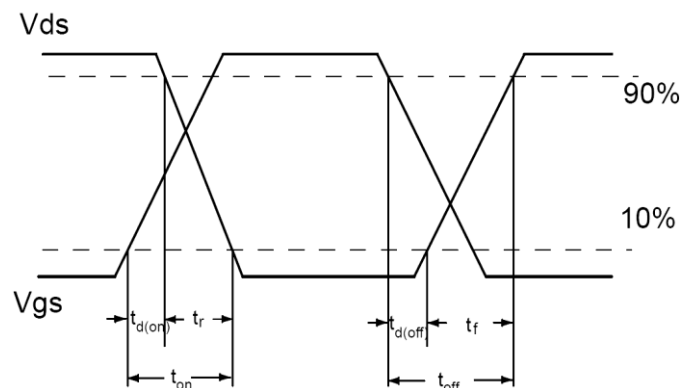
Electrical Characterizes @ $T_A=25^{\circ}C$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
BVDSS	Drain-to-Source breakdown voltage	25	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
RDS(on)	Static Drain-to-Source on-resistance	—	4.1	6	m Ω	$V_{GS}=10V$ $I_D = 30A$
		—	6.5	—		$T_J = 125^{\circ}C$
VGS(th)	Gate threshold voltage	1.2	1.9	2.5	V	$V_{DS} = V_{GS},$ $I_D = 250\mu A$
		—	1.2	—		$T_J = 125^{\circ}C$
IDSS	Drain-to-Source leakage current	—	—	10	μA	$V_{DS} = 25V,$ $V_{GS} = 0V$
		—	—	50		$V_{DS} = 25V, V_{GS} = 0V,$ $T_J = 55^{\circ}C$
IGSS	Gate-to-Source forward leakage	—	—	100	nA	$V_{GS} = 20V$
	Gate-to-Source reverse leakage	-100	—	—		$V_{GS} = -20V$
Qg	Total gate charge	—	35.8	40	nC	$I_D = 30A,$ $V_{DS}=12.5V,$ $V_{GS} = 10V$
Qgs	Gate-to-Source charge	—	3.8	6		
Qgd	Gate-to-Drain("Miller") charge	—	13.1	15		
td(on)	Turn-on delay time	—	10.5	—	ns	$V_{GS}=10V, V_{DS}=12.5V,$ $R_L=0.42\Omega,$ $R_{GEN}=3\Omega$
tr	Rise time	—	65.7	—		
td(off)	Turn-Off delay time	—	27.0	—		
tf	Fall time	—	8.2	—		
Ciss	Input capacitance	—	1732	—	pF	$V_{GS} = 0V,$ $V_{DS} = 12.5V,$ $f = 1.0MHz$
Coss	Output capacitance	—	512	—		
Crss	Reverse transfer capacitance	—	323	—		
Rg	Gate resistance	—	1.4	—	Ω	$V_{GS}=0V, V_{DS}=0V,$ $f=1MHz$

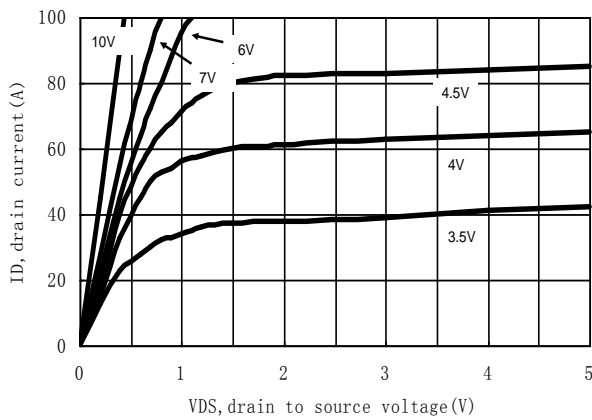
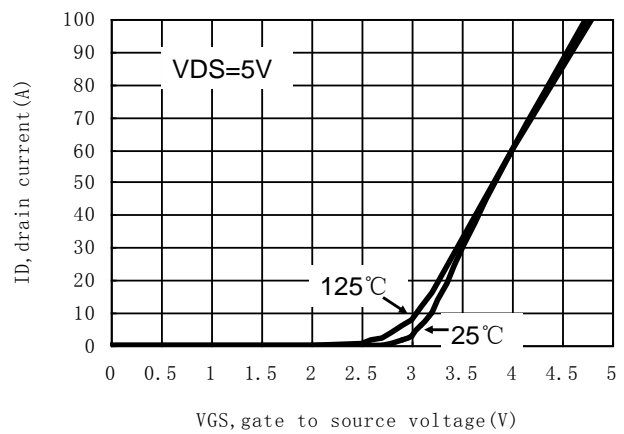
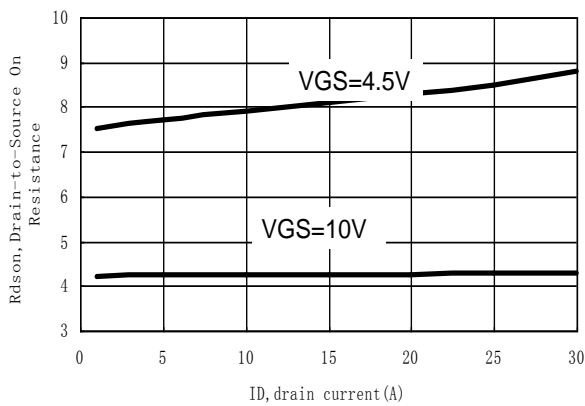
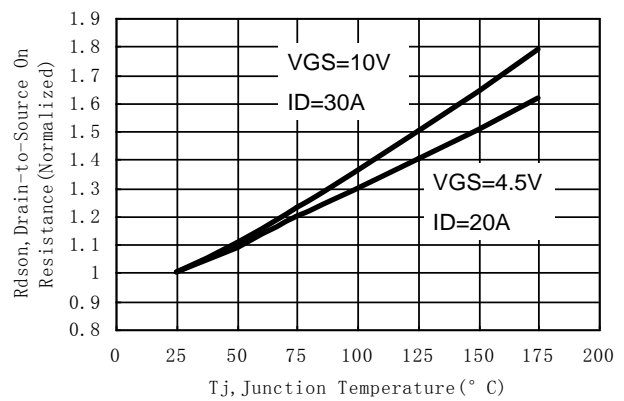
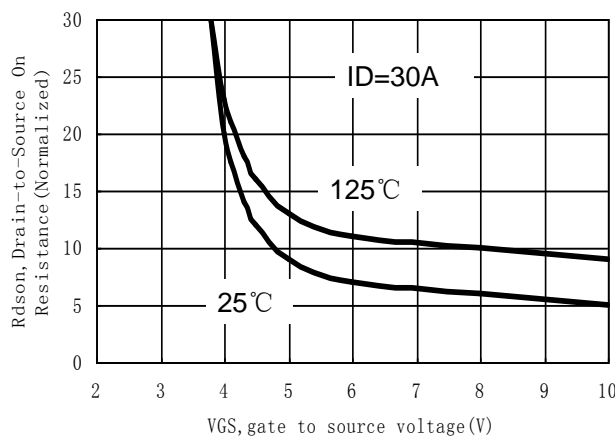
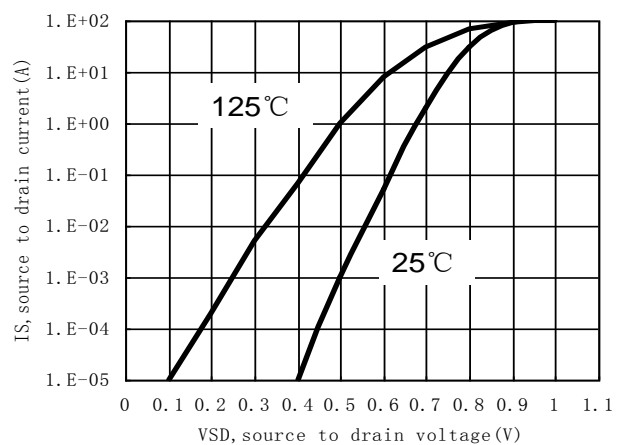
Source-Drain Ratings and Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
IS	Maximum Body-Diode Continuous Current	—	60	—	A	
VSD	Diode Forward Voltage	—	0.69	1	V	IS=1A, VGS=0V
trr	Reverse Recovery Time	—	18.3	—	ns	TJ = 25°C, IF =30A, di/dt =
Qrr	Reverse Recovery Charge	—	6.4	—	nC	150A/μs

Test circuits and Waveforms

EAS test circuits:

Gate charge test circuit:

Switch Time Test Circuit:

Switch Waveforms:


Typical electrical and thermal characteristics


Figure 1: Typical Output Characteristics

Figure 2: Typical Transfer Characteristics

Figure 3: On-Resistance vs. Drain Current and Gate Voltage

Figure 4: On-Resistance vs. Junction Temperature

Figure 5: On-Resistance vs. Gate-Source Voltage

Figure 6: Body-Diode Characteristics

Typical electrical and thermal characteristics

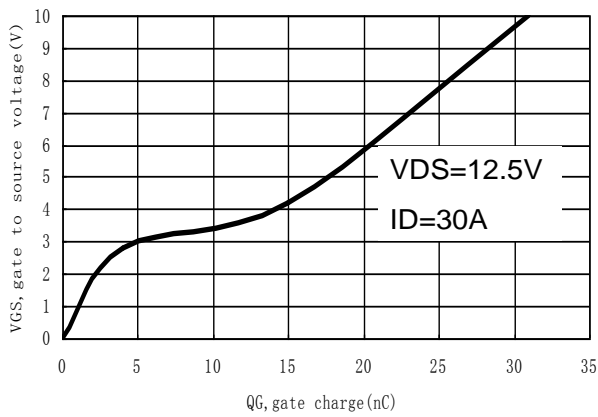


Figure 7: Gate-Charge Characteristics Figure

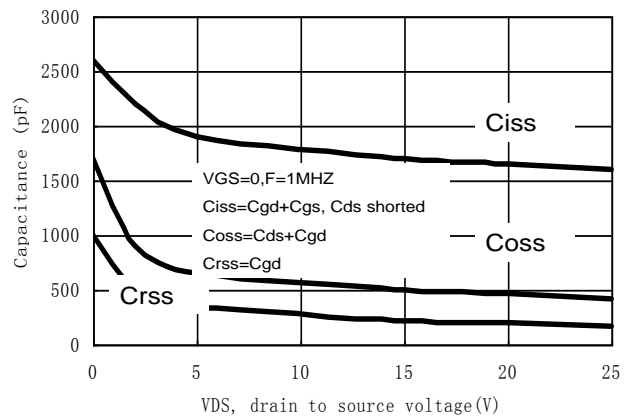


Figure 8: Capacitance Characteristics

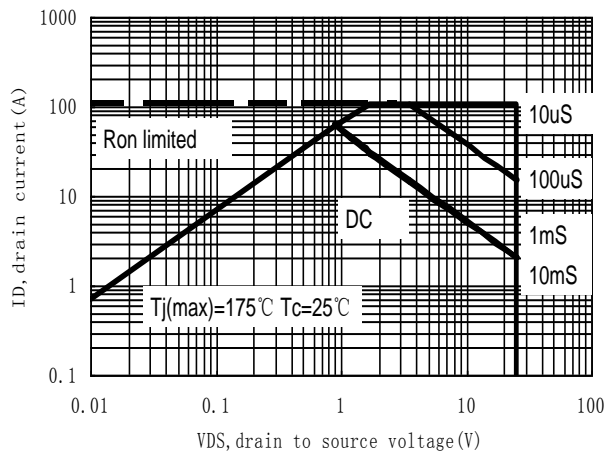


Figure 9: Maximum Forward Biased Safe Operating Area⑤

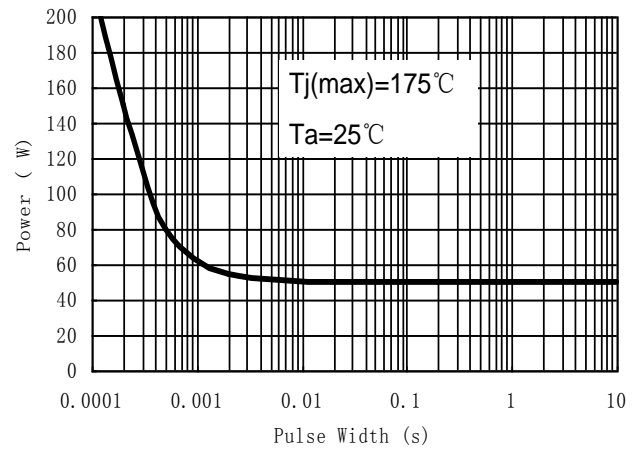


Figure 10: Single Pulse Power Rating Junction-to-Case⑤

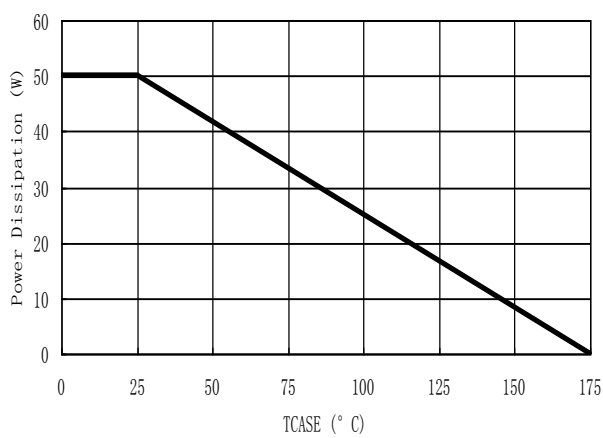


Figure 11: Power De-rating③

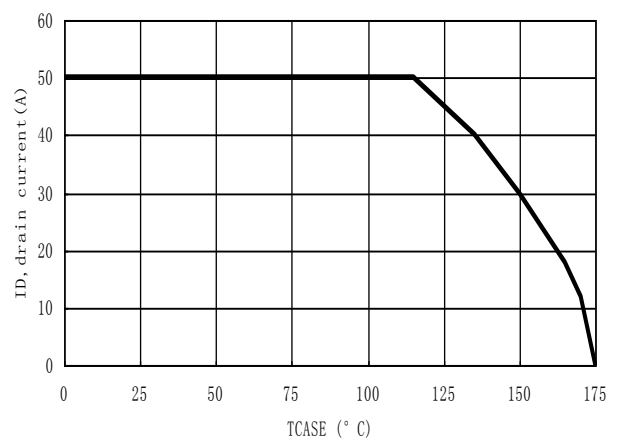
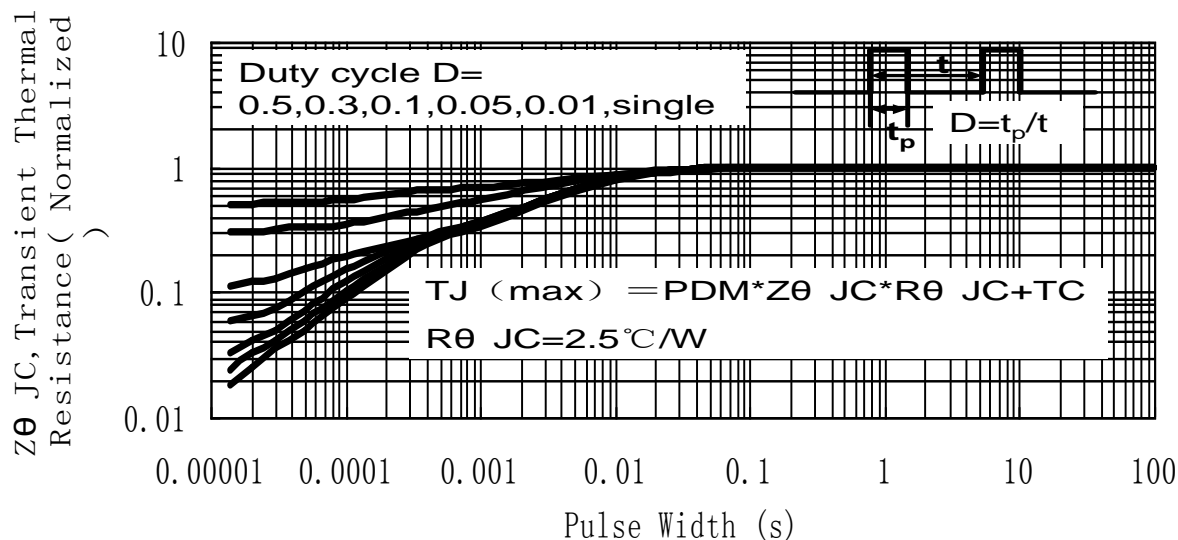
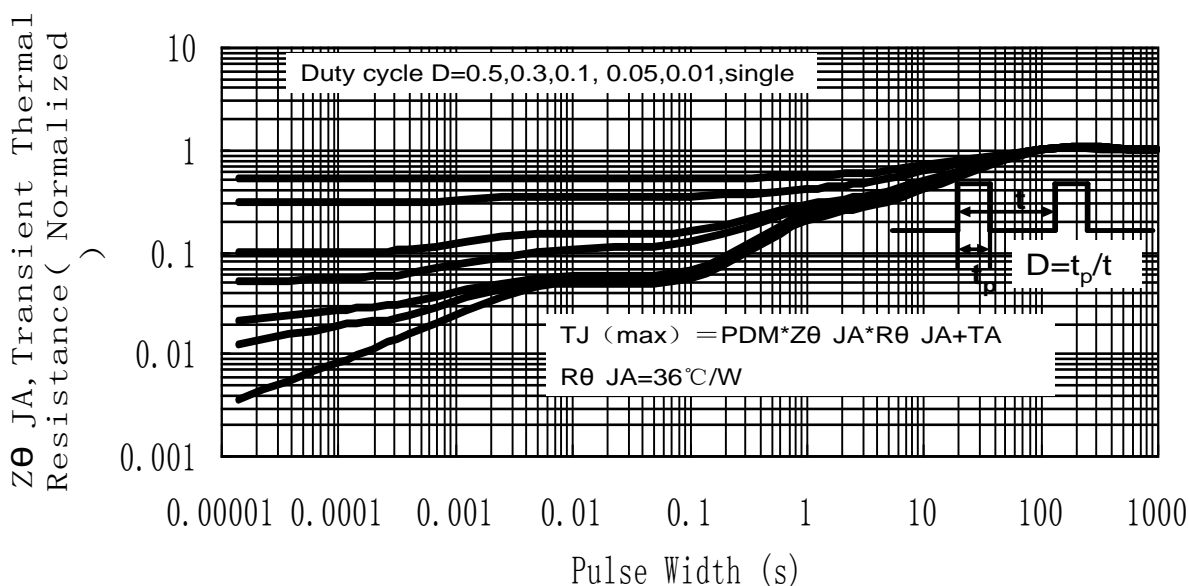
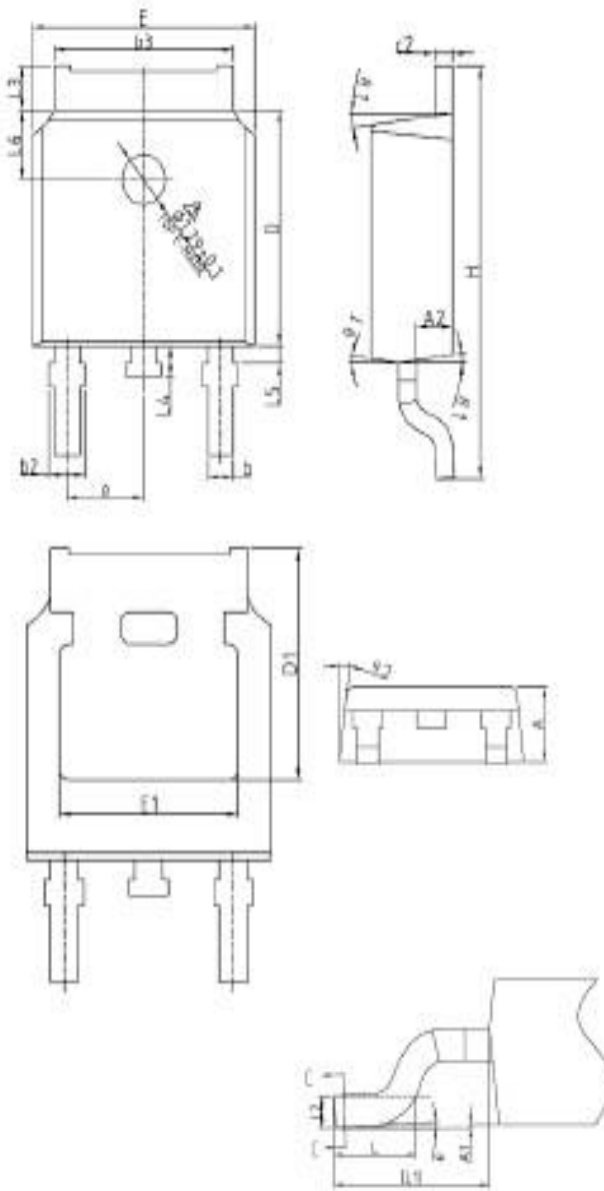


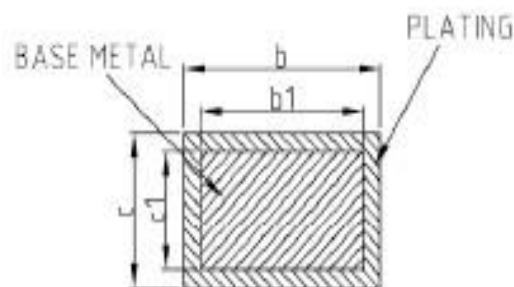
Figure 12: Current De-rating③

Typical electrical and thermal characteristics

Figure 13: Normalized Maximum Transient Thermal Impedance^⑤

Figure 14: Normalized Maximum Transient Thermal Impedance^⑥
Notes:

- ① The maximum current rating is limited by bond-wires.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ The power dissipation PD is based on max. junction temperature, using junction-to-case thermal resistance.
- ④ The value of $R_{\theta JA}$ is measured with the device mounted on 1in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^\circ\text{C}$
- ⑤ These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_J(\text{MAX}) = 175^\circ\text{C}$.
- ⑥ The maximum current rating is limited by bond-wires.

Mechanical Data:
TO-252E-2-M PACKAGE INFORMATION
Dimensions in Millimeters


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	2.90REF		
L2	0.51BSC		
L3	0.90	—	1.25
L4	0.60	0.80	1.00
L5	0.15	—	0.75
L6	1.80REF		
θ	0°	—	8°
θ 1	5°	7°	9°
θ 2	5°	7°	9°



Ordering and Marking Information**Device Marking: SSFM2506****Package (Available)**

T0-252

Operating Temperature Range

C : -55 to 175 °C

Devices per Unit

Package Type	Units/Tube	Tubes/Inner Box	Units/Inner Box	Inner Boxes/Carton Box	Units/Carton Box
TO-252	-	-	-	-	-

Reliability Test Program

Test Item	Conditions	Duration	Sample Size
High Temperature Reverse Bias(HTRB)	Tj=125°C to 175°C @ 80% of Max VDSS/VCES/VR	168 hours 500 hours 1000 hours	3 lots x 77 devices
High Temperature Gate Bias(HTGB)	Tj=150°C or 175°C @ 100% of Max VGSS	168 hours 500 hours 1000 hours	3 lots x 77 devices

ATTENTION:

- Any and all Silikron products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your Silikron representative nearest you before using any Silikron products described or contained herein in such applications.
- Silikron assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all Silikron products described or contained herein.
- Specifications of any and all Silikron products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- Silikron Semiconductor CO.,LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all Silikron products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of Silikron Semiconductor CO.,LTD.
- Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. Silikron believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the Silikron product that you intend to use.
- This catalog provides information as of Dec, 2008. Specifications and information herein are subject to change without notice.

Customer Service

Worldwide Sales and Service:

Sales@silikron.com

Technical Support:

Technical@silikron.com

Suzhou Silikron Semiconductor Corp.

2-B501, 328 Xinghu Street, Suzhou Industrial Park, P.R.China

TEL: (86-512) 62560688

FAX: (86-512) 65160705

E-mail: Sales@silikron.com