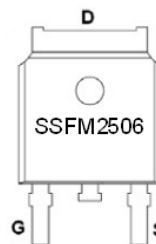


Main Product Characteristics:

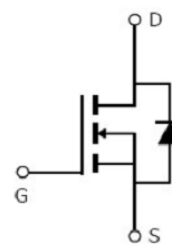
V_{DSS}	25V
$R_{DS(on)}$	4.1mohm(typ.)
I_D	60A



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

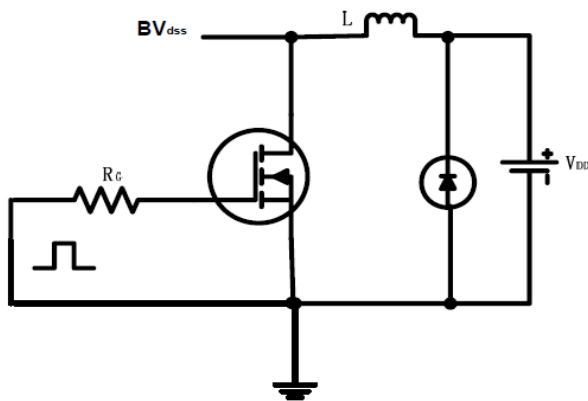
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
BVDSS	Drain-to-Source breakdown voltage	25	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	4.1	6	m Ω	$V_{GS}=10V$ $I_D = 30A$
		—	6.5	—		$T_J = 125^{\circ}C$
$V_{GS(th)}$	Gate threshold voltage	1.2	1.9	2.5	V	$V_{DS} = V_{GS},$ $I_D = 250\mu A$
		—	1.2	—		$T_J = 125^{\circ}C$
I_{DSS}	Drain-to-Source leakage current	—	—	10	μA	$V_{DS} = 25V,$ $V_{GS} = 0V$
		—	—	50		$V_{DS} = 25V, V_{GS} = 0V,$ $T_J = 55^{\circ}C$
I_{GSS}	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

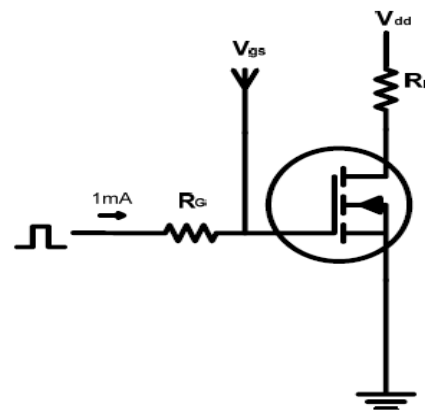
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
IS	Maximum Body-Diode Continuous Current	—	60	—	A	
VSD	Diode Forward Voltage	—	0.69	1	V	IS=1A, VGS=0V
trr	Reverse Recovery Time	—	18.3	—	ns	TJ = 25°C, IF =30A, di/dt = 150A/μs
Qrr	Reverse Recovery Charge	—	6.4	—	nC	

Test circuits and Waveforms

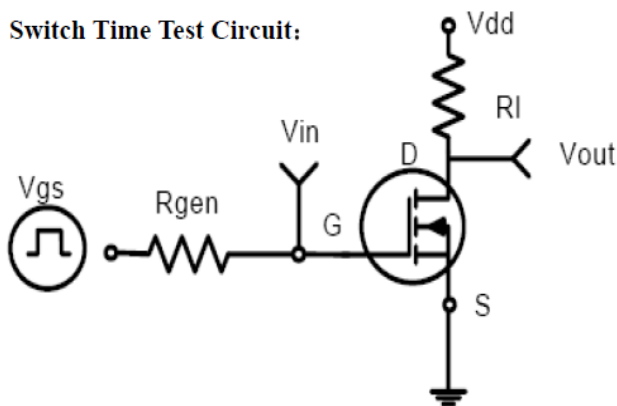
EAS test circuits:



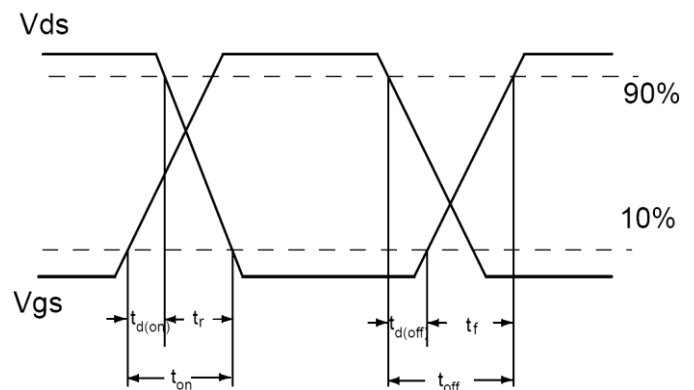
Gate charge test circuit:



Switch Time Test Circuit:



Switch Waveforms:



Typical electrical and thermal characteristics

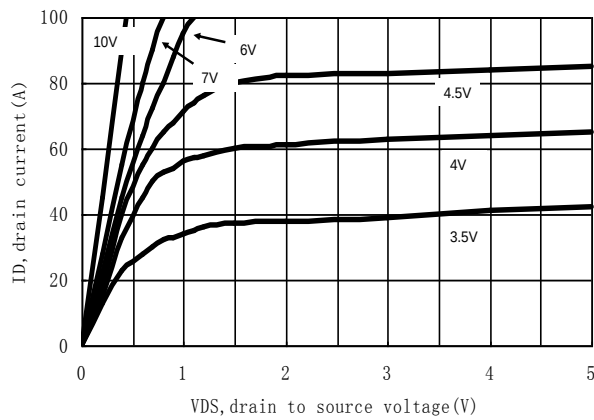


Figure 1: Typical Output Characteristics

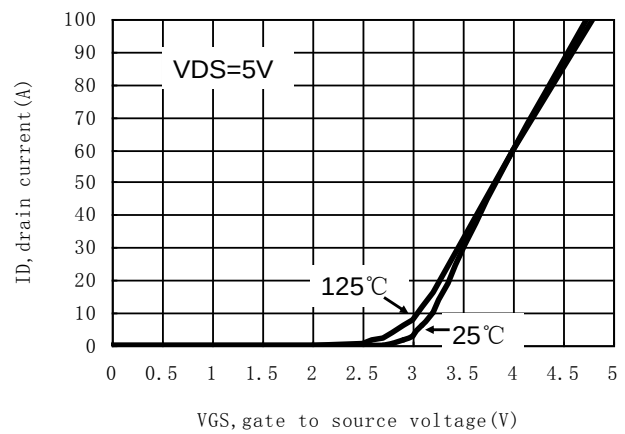


Figure 2: Typical Transfer Characteristics

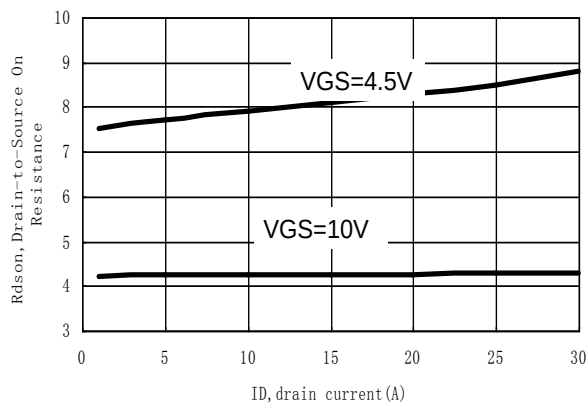


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

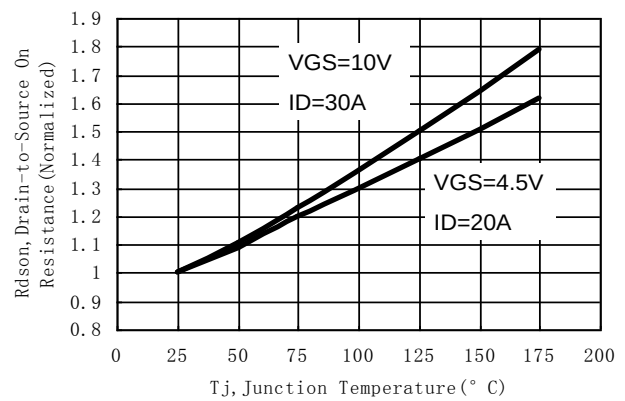


Figure 4: On-Resistance vs. Junction Temperature

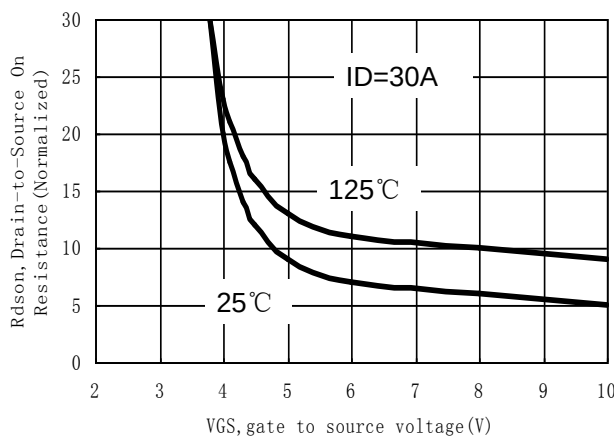


Figure 5: On-Resistance vs. Gate-Source Voltage

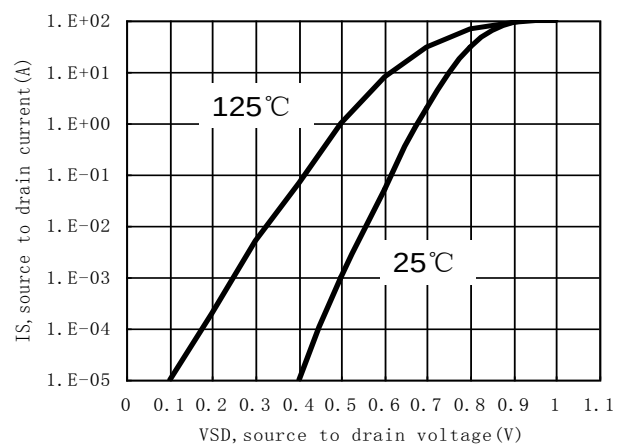


Figure 6: Body-Diode Characteristics

Typical electrical and thermal characteristics

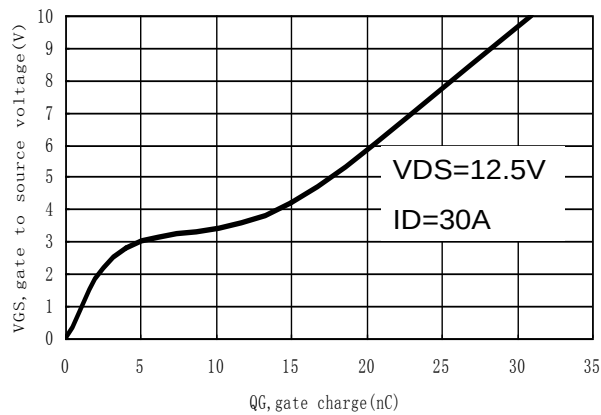


Figure 7: Gate-Charge Characteristics

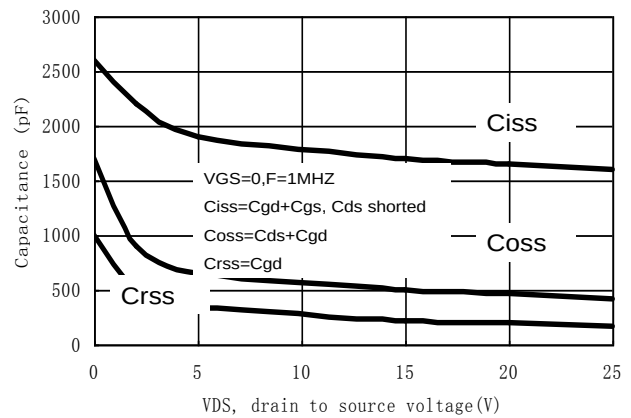


Figure 8: Capacitance Characteristics

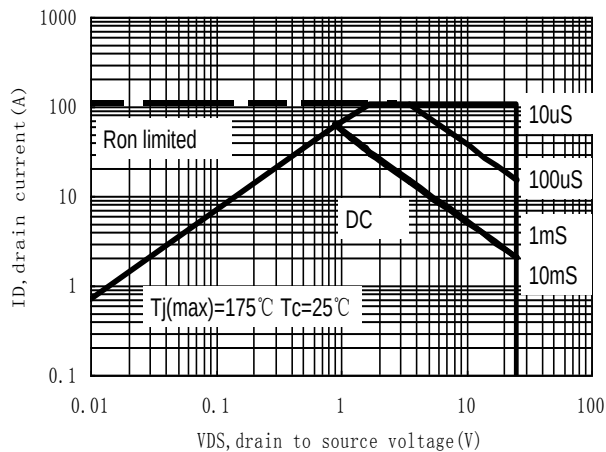


Figure 9: Maximum Forward Biased Safe Operating Area⑤

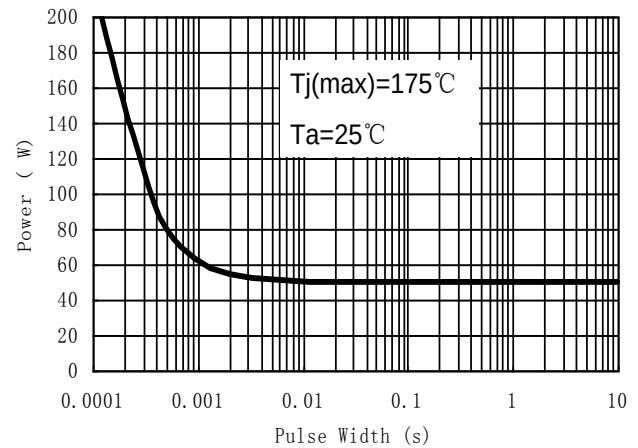


Figure 10: Single Pulse Power Rating Junction-to-Case⑤

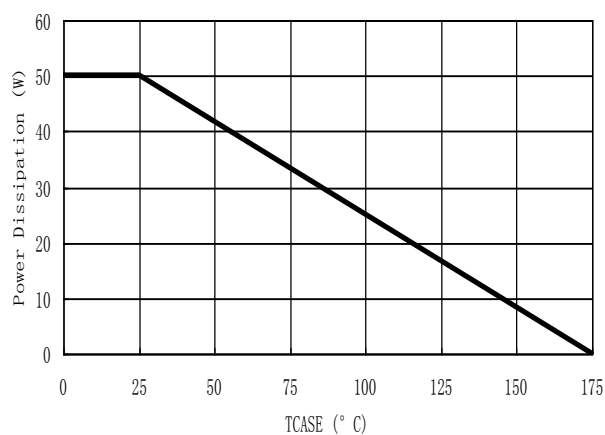


Figure 11: Power De-rating③

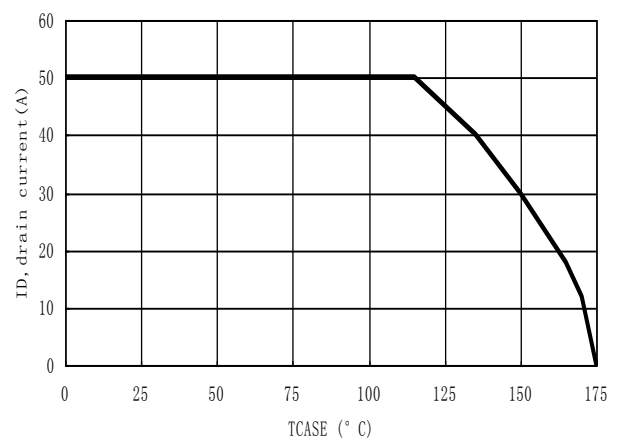


Figure 12: Current De-rating③

Typical electrical and thermal characteristics

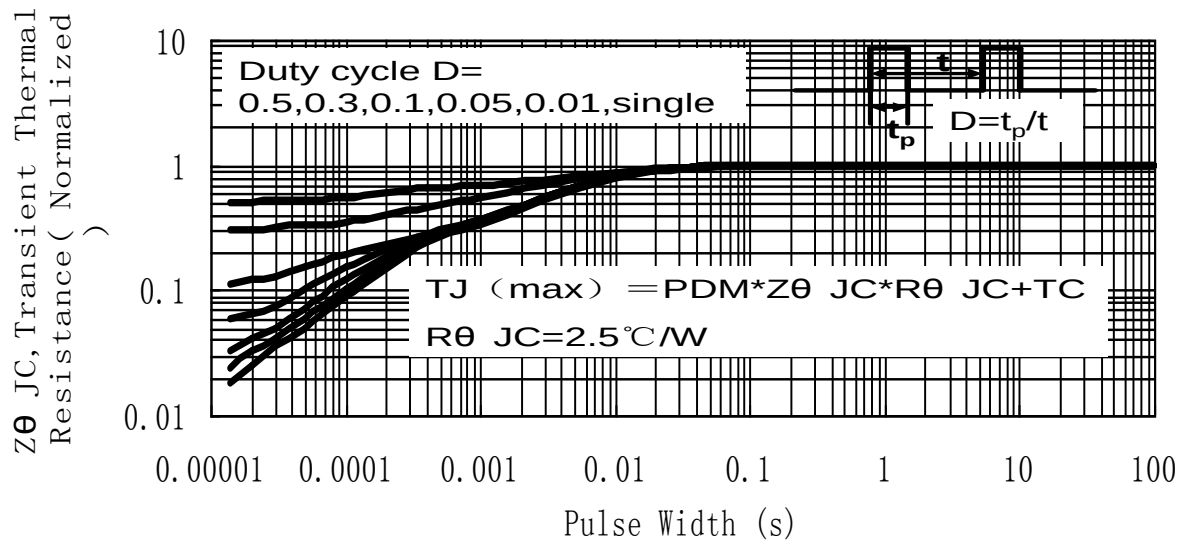


Figure 13: Normalized Maximum Transient Thermal Impedance⑤

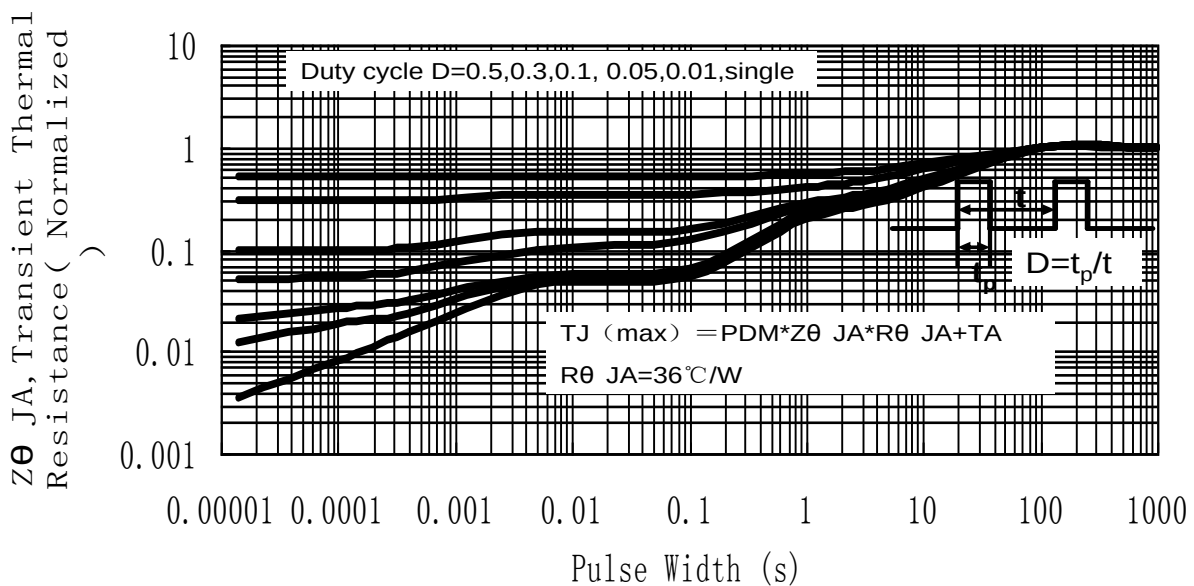
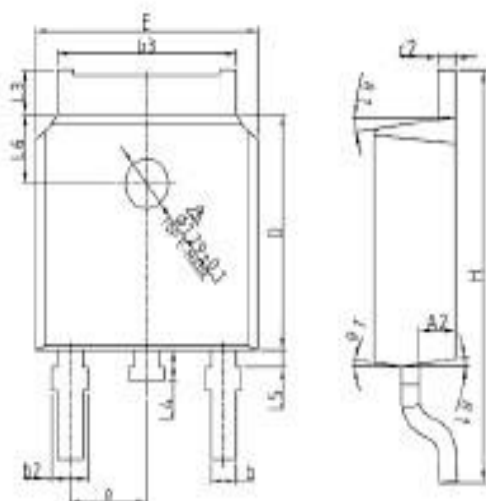
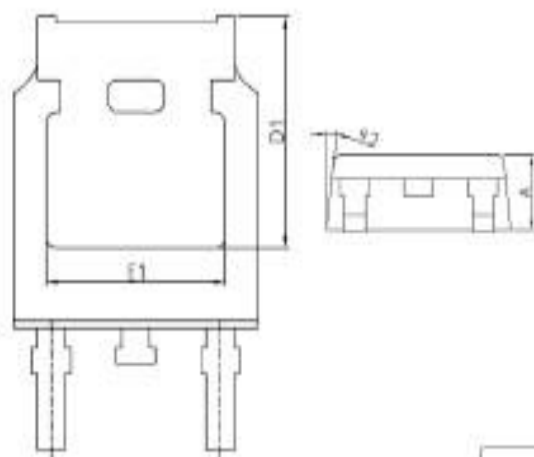
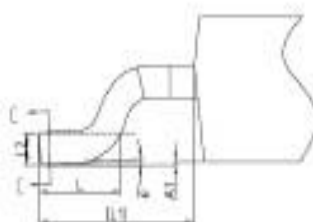


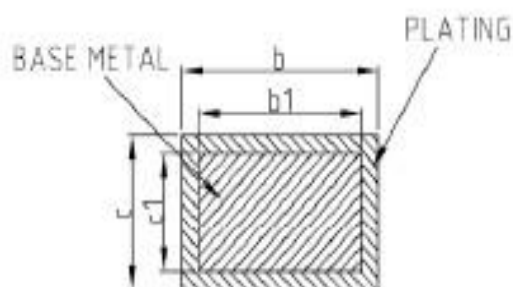
Figure 14: Normalized Maximum Transient Thermal Impedance⑥

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)

TO-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

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