

Power management (dual transistors)

EMF9

2SC5585 and 2SK3019 are housed independently in a EMT6 package.

●Application

Power management circuit

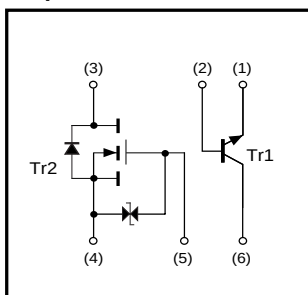
●Features

- 1) Power switching circuit in a single package.
- 2) Mounting cost and area can be cut in half.

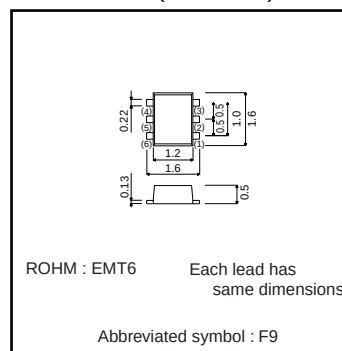
●Structure

Silicon epitaxial planar transistor

●Equivalent circuits



●Dimensions (Units : mm)



●Packaging specifications

Type	EMF9
Package	EMT6
Marking	F9
Code	T2R
Basic ordering unit (pieces)	8000

Transistors

●Absolute maximum ratings (Ta=25°C)

Tr1

Parameter	Symbol	Limits	Unit
Collector-base voltage	V _{CB0}	15	V
Collector-emitter voltage	V _{CE0}	12	V
Emitter-base voltage	V _{EB0}	6	V
Collector current	I _C	500	mA
	I _{CP}	1.0	A *
Junction temperature	T _j	150	°C
Range of storage temperature	T _{stg}	-55~+150	°C

* Single pulse P_w=1ms

Tr2

Parameter	Symbol	Limits	Unit
Drain-source voltage	V _{DSS}	30	V
Gate-source voltage	V _{GSS}	±20	V
Drain current	Continuous I _D	100	mA
	Pulsed I _{DP}	200	mA *
Reverse drain current	Continuous I _{DR}	100	mA
	Pulsed I _{DRP}	200	mA *
Channel temperature	T _{ch}	150	°C
Range of storage temperature	T _{stg}	-55~+150	°C

* P_w≤10ms Duty cycles≤50%

Tr1, Tr2

Parameter	Symbol	Limits	Unit
Total power dissipation	P _D	150(TOTAL)	mW *

* 120mW per element must not be exceeded. Each terminal mounted on a recommended land.

●Electrical characteristics (Ta=25°C)

Tr1

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-emitter breakdown voltage	BV _{CE0}	12	—	—	V	I _C =1mA
Collector-base breakdown voltage	BV _{CB0}	15	—	—	V	I _C =10μA
Emitter-base breakdown voltage	BV _{EB0}	6	—	—	V	I _E =10μA
Collector cut-off current	I _{CBO}	—	—	100	nA	V _{CB} =15V
Emitter cut-off current	I _{EB0}	—	—	100	nA	V _{EB} =6V
Collector-emitter saturation voltage	V _{CE(sat)}	—	100	250	mV	I _C =200mA, I _B =10mA
DC current gain	h _{FE}	270	—	680	—	V _{CE} =2V, I _C =10mA
Transition frequency	f _T	—	320	—	MHz	V _{CE} =2V, I _E =-10mA, f=100MHz
Collector output capacitance	C _{ob}	—	7.5	—	pF	V _{CB} =10V, I _E =0mA, f=1MHz

Tr2

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I _{GSS}	—	—	±1	μA	V _{GS} =±20V, V _{DS} =0V
Drain-source breakdown voltage	V _{(BR)DSS}	30	—	—	V	I _D =10μA, V _{GS} =0V
Zero gate voltage drain current	I _{DSS}	—	—	1.0	μA	V _{DS} =30V, V _{GS} =0V
Gate-threshold voltage	V _{GS(th)}	0.8	—	1.5	V	V _{DS} =3V, I _D =100μA
Static drain-source on-state resistance	R _{DS(on)}	—	5	8	Ω	I _D =10mA, V _{GS} =4V
		—	7	13	Ω	I _D =1mA, V _{GS} =2.5V
Forward transfer admittance	Y _{fs}	20	—	—	mS	V _{DS} =3V, I _D =10mA
Input capacitance	C _{iss}	—	13	—	pF	V _{DS} =5V, V _{GS} =0V, f=1MHz
Output capacitance	C _{oss}	—	9	—	pF	
Reverse transfer capacitance	C _{rss}	—	4	—	pF	
Turn-on delay time	t _{d(on)}	—	15	—	ns	
Rise time	t _r	—	35	—	ns	
Turn-off delay time	t _{d(off)}	—	80	—	ns	I _D =10mA, V _{DD} ≒5V, V _{GS} =5V, R _L =500Ω, R _{GS} =10Ω
Fall time	t _f	—	80	—	ns	

Transistors

●Electrical characteristic curves

Tr1

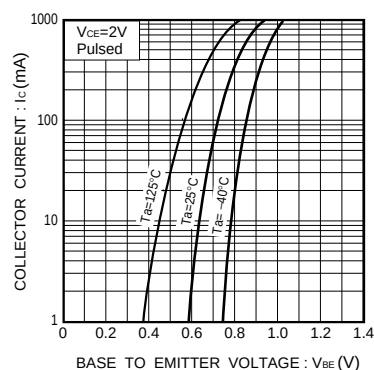


Fig.1 Grounded emitter propagation characteristics

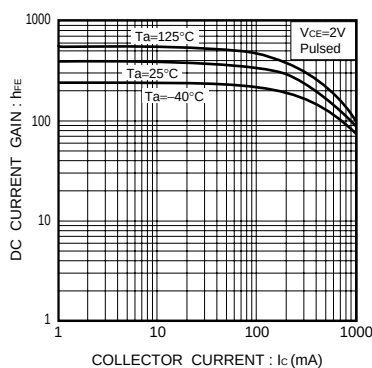


Fig.2 DC current gain vs. collector current

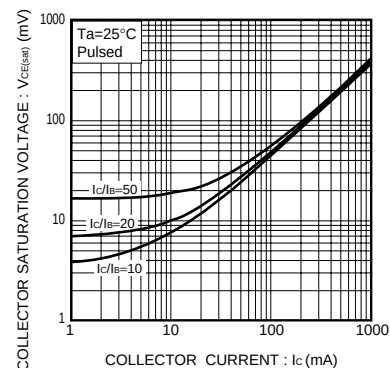


Fig.3 Collector-emitter saturation voltage vs. collector current (I)

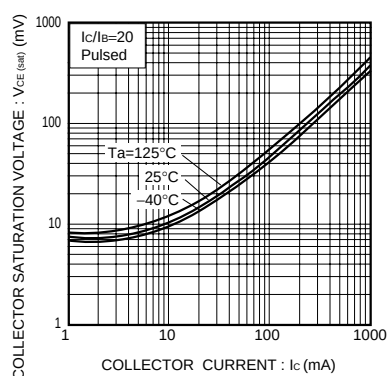


Fig.4 Collector-emitter saturation voltage vs. collector current (II)

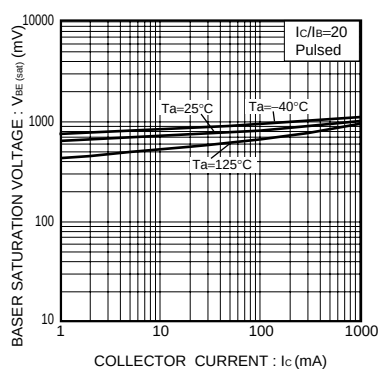


Fig.5 Base-emitter saturation voltage vs. collector current

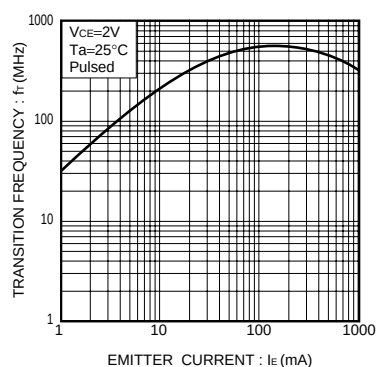
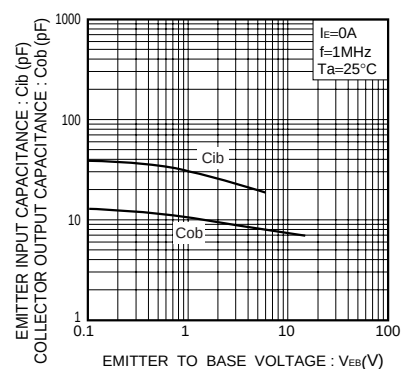


Fig.6 Gain bandwidth product vs. emitter current

Fig.7 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

Transistors

Tr2

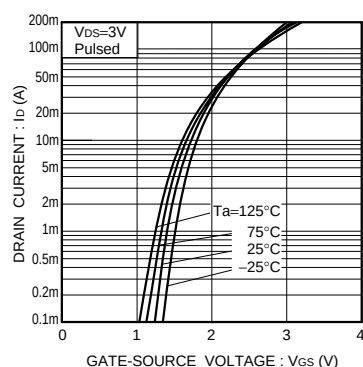


Fig.9 Typical transfer characteristics

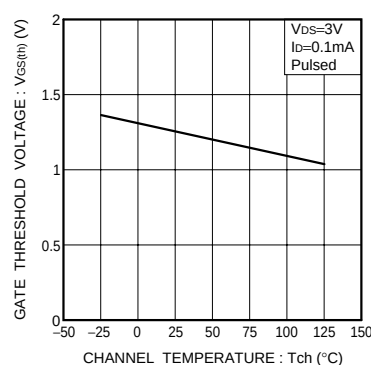


Fig.10 Gate threshold voltage vs. channel temperature

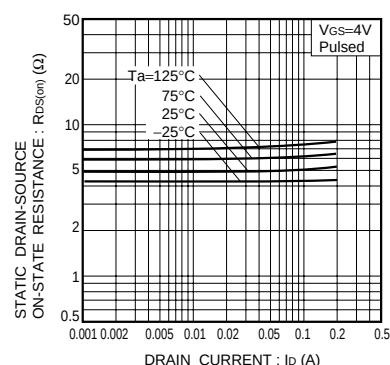


Fig.11 Static drain-source on-state resistance vs. drain current (I)

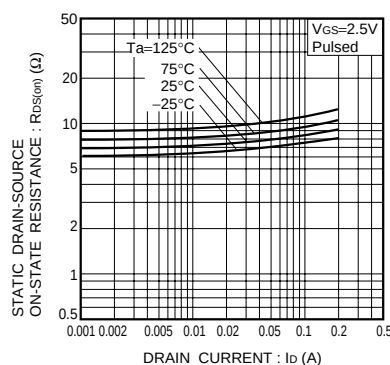


Fig.12 Static drain-source on-state resistance vs. drain current (II)

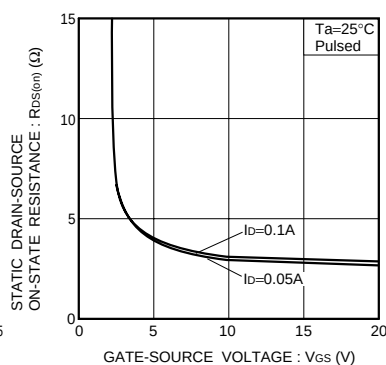


Fig.13 Static drain-source on-state resistance vs. gate-source voltage

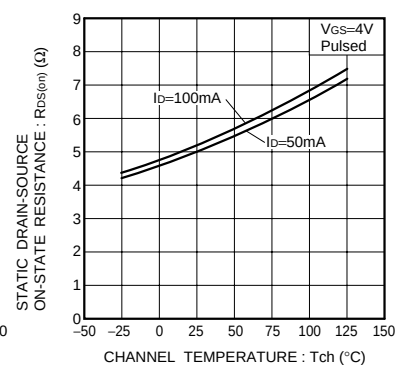


Fig.14 Static drain-source on-state resistance vs. channel temperature

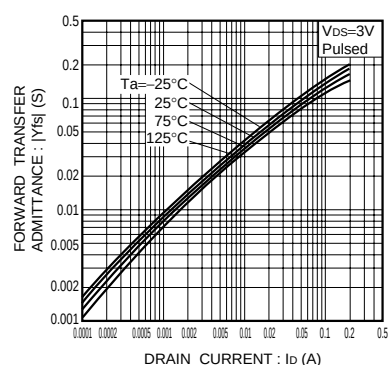


Fig.15 Forward transfer admittance vs. drain current

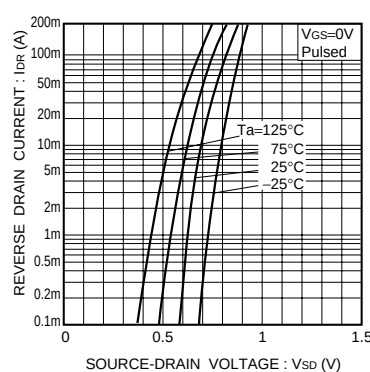


Fig.16 Reverse drain current vs. source-drain voltage (I)

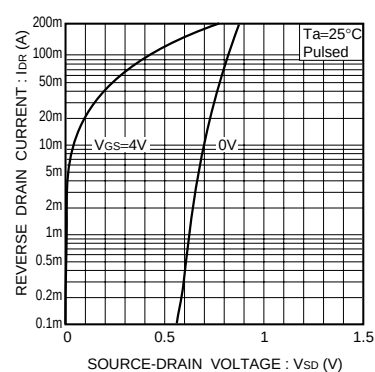


Fig.17 Reverse drain current vs. source-drain voltage (II)

Transistors

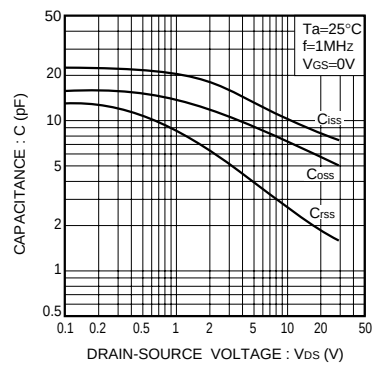


Fig.18 Typical capacitance vs. drain-source voltage

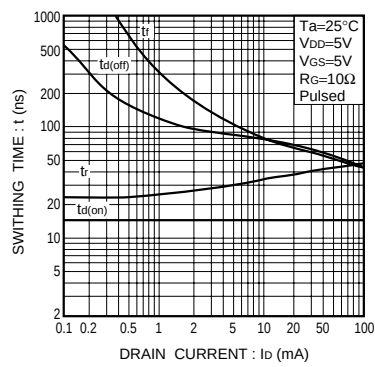


Fig.19 Switching characteristics

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