

Power management, Dual-chip Bipolar Transistor

EMF33

●Applications

Power management circuit

●Features

- 1) DTB513Z (digital transistor) and 2SK3019 (MOS FET) are housed independently in the EMT6 package.
- 2) Power switching circuit in a single package.
- 3) Mounting cost and area can be cut in half.

●Structure

Epitaxial Planar Silicon Transistor

●Packaging specifications

Type	Package	Taping
	Code	T2R
	Basic ordering unit (pieces)	8000
EMF33		○

●Absolute maximum ratings (Ta=25°C)

<Tr1>				
Parameter	Symbol	Limits	Unit	
Supply voltage	V_{CC}	-12	V	
Input voltage	V_{IN}	-10 to +5	V	
Collector current	$I_{C(max)}$ *	-500	mA	

* Characteristics of built-in transistor.

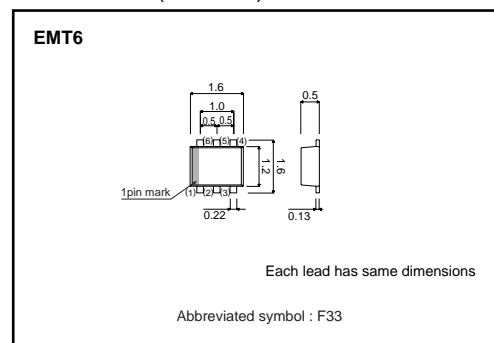
<Tr2>				
Parameter	Symbol	Limits	Unit	
Drain-source voltage	V_{DSS}	30	V	
Gate-source voltage	V_{GSS}	±20	V	
Drain current	Continuous	I_D	100	mA
	Pulsed	I_{DP} *	200	mA
Reverse drain current	Continuous	I_{DR}	100	mA
	Pulsed	I_{DRP} *	200	mA

* $PW \leq 10ms$ DUTY CYCLE $\leq 50\%$

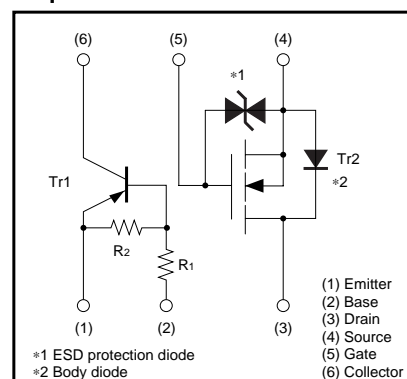
<Tr1, Tr2 in common>				
Parameter	Symbol	Limits	Unit	
Power dissipation	P_D *	150	mW / TOTAL	
		120	mW / ELEMENT	
Junction temperature	T_j	150	°C	
Range of storage temperature	T_{stg}	-55 to +150	°C	

* Each terminal mounted on a recommended land.

●Dimensions (Unit : mm)



●Equivalent circuit



Tr1 : R1/R2=1kΩ/10kΩ
Tr2 : MOS FET

Transistors

●Electrical characteristics (Ta=25°C)

<Tr1>

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	$V_{I(off)}$	–	–	–0.3	V	$V_{CC} = -5V, I_O = -100\mu A$
	$V_{I(on)}$	–2.5	–	–	V	$V_O = -0.3V, I_O = -20mA$
Output voltage	$V_{O(on)}$	–	–60	–300	mV	$V_O = -100mA, I_I = -5mA$
Input current	I_I	–	–	–6.4	mA	$V_I = -5V$
Output current	$I_{O(off)}$	–	–	–0.5	uA	$V_{CC} = -12V, V_I = 0V$
DC current gain	G_I	140	–	–	–	$V_O = -5V, I_O = -100mA$
Transition frequency	f_T *	–	260	–	–	$V_{CE} = -10V, I_E = 5mA, f = 100MHz$
Input resistance	R1	0.7	1	1.3	k Ω	
Resistance ratio	R2/R1	8	10	12	–	

* Characteristics of built-in transistor.

<Tr2>

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I_{GSS}	–	–	± 1	μA	$V_{GS} = \pm 20V, V_{DS} = 0V$
Drain-source breakdown voltage	$V_{(BR)DSS}$	30	–	–	–	$I_D = 10\mu A, V_{GS} = 0A$
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	$V_{DS} = 3V, I_D = 100\mu A$
Static drain-source on-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	$V_{DS} = 5V$
Output capacitance	C_{oss}	–	9	–	pF	$V_{GS} = 0V$
Reverse transfer capacitance	C_{rss}	–	4	–	pF	$f = 1MHz$
Turn-on delay time	$t_{d(on)}$	–	15	–	ns	$I_D = 10mA$
Rise time	t_r	–	35	–	ns	$V_{DD} = 5V$
Turn-off delay time	$t_{d(off)}$	–	80	–	ns	$V_{GS} = 5V$
Fall time	t_f	–	80	–	ns	$R_L = 500\Omega$ $R_{GS} = 10\Omega$

Transistors

●Electrical characteristic curves

<Tr1>

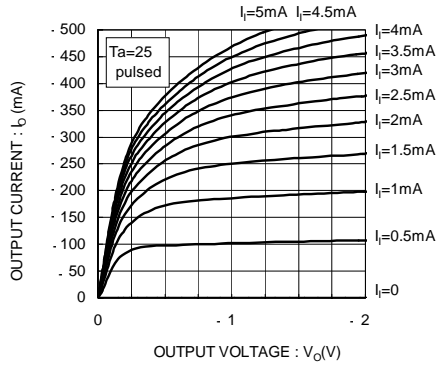


Fig.1 Output Current vs. Output Voltage

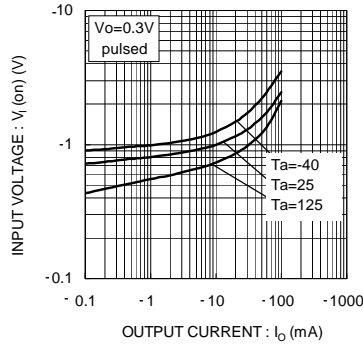


Fig.2 Input Voltage vs. Output Current

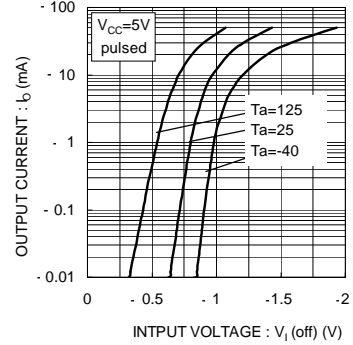


Fig.3 Output Current vs. Input Voltage

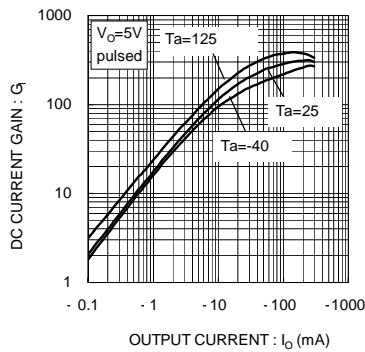


Fig.4 DC Current Gain vs. Output Current

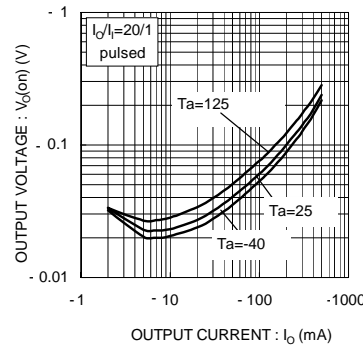


Fig.5 Output Voltage vs. Output Current

<Tr2>

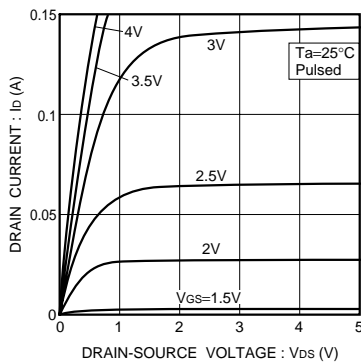


Fig.1 Typical output characteristics

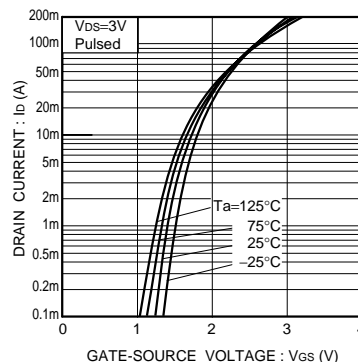


Fig.2 Typical transfer characteristics

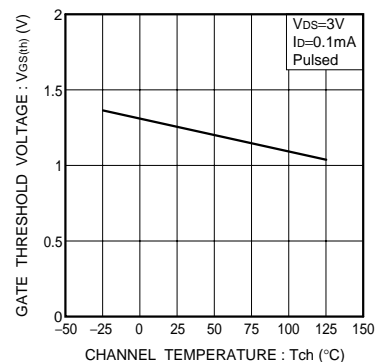


Fig.3 Gate threshold voltage vs. channel temperature

Transistors

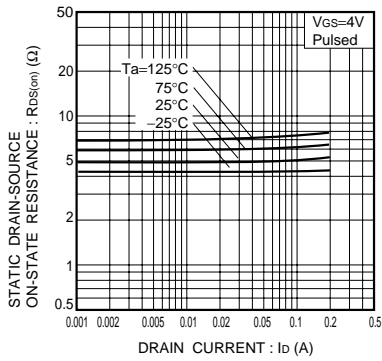


Fig.4 Static drain-source on-state resistance vs. drain current (I)

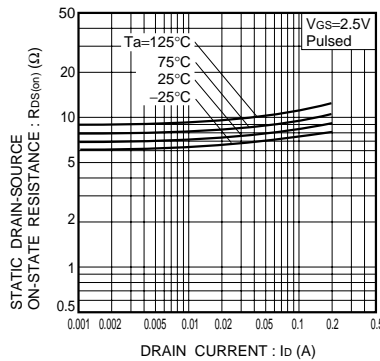


Fig.5 Static drain-source on-state resistance vs. drain current (II)

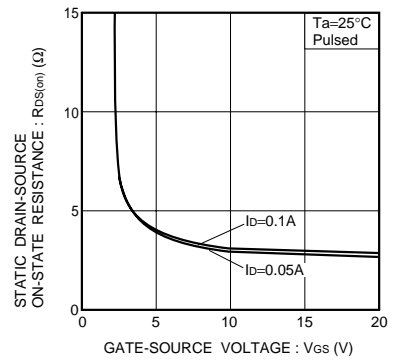


Fig.6 Static drain-source on-state resistance vs. gate-source voltage

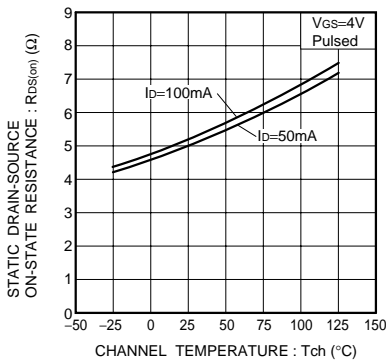


Fig.7 Static drain-source on-state resistance vs. channel temperature

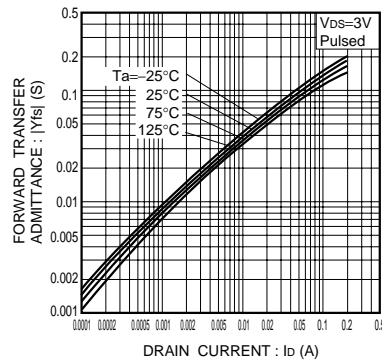


Fig.8 Forward transfer admittance vs. drain current

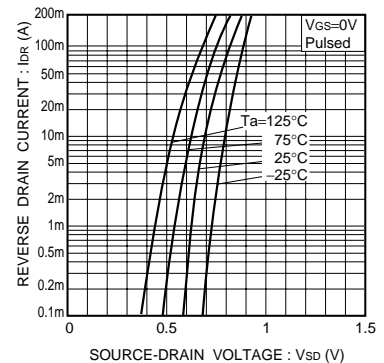


Fig.9 Reverse drain current vs. source-drain voltage (I)

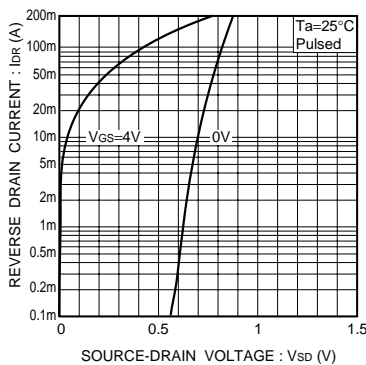


Fig.10 Reverse drain current vs. source-drain voltage (II)

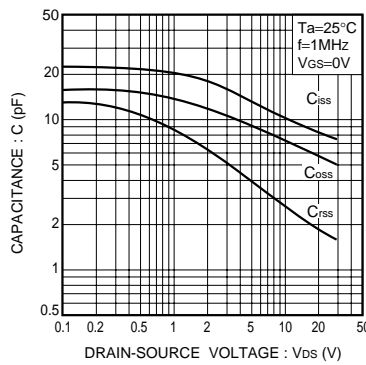


Fig.11 Typical capacitance vs. drain-source voltage

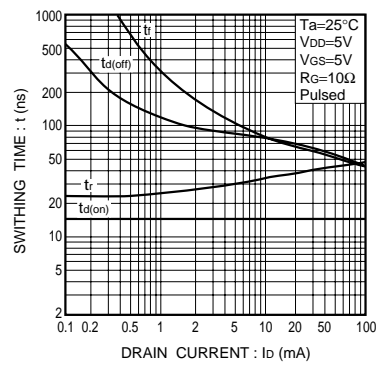


Fig.12 Switching characteristics

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