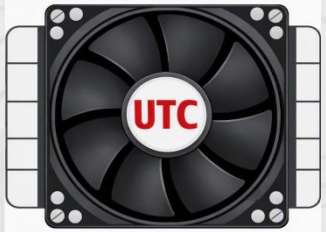


Analog IC &
Discrete Device

Power Semiconductor Solution
DC Fan

Oct, 2026



Power Semiconductor Solution – DC Fan

Direct Current Fan Block Diagram :



1 Power Line

- TVS 400, 600 & 1500W
- Schottky 40, 60 & 100V
- MOFET P-ch. 30, 60 & 100V

2 H Bridge / 3-phase Circuit

- Power MOS 30, 40 & 60V P+N, N+N
- Power MOS 100V P+N, N+N & N

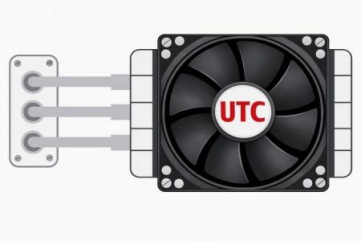
3 Control Circuit

- Switch Diode & Schottky Series
- TVS & Zener Series
- Signal MOSFET & Signal BJT

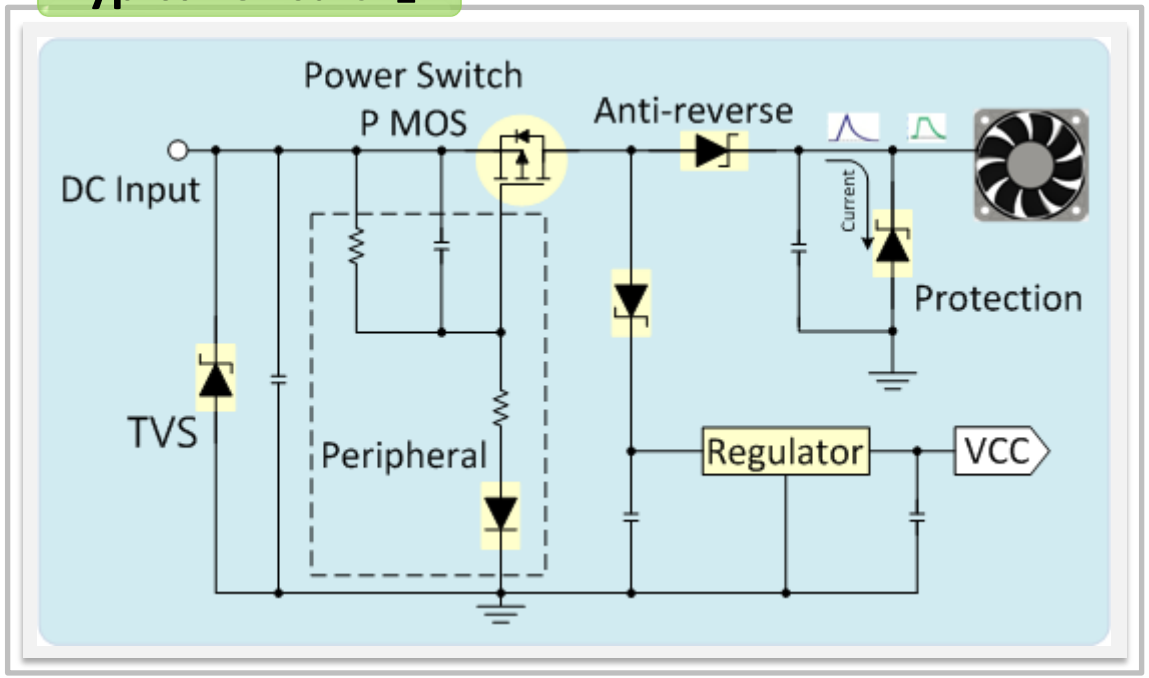
4 Regulator & Motor Driver

- LDO V_{IN} 6~36V, I_{OUT} 0.15~1A
- Single-phase DC Fan Motor

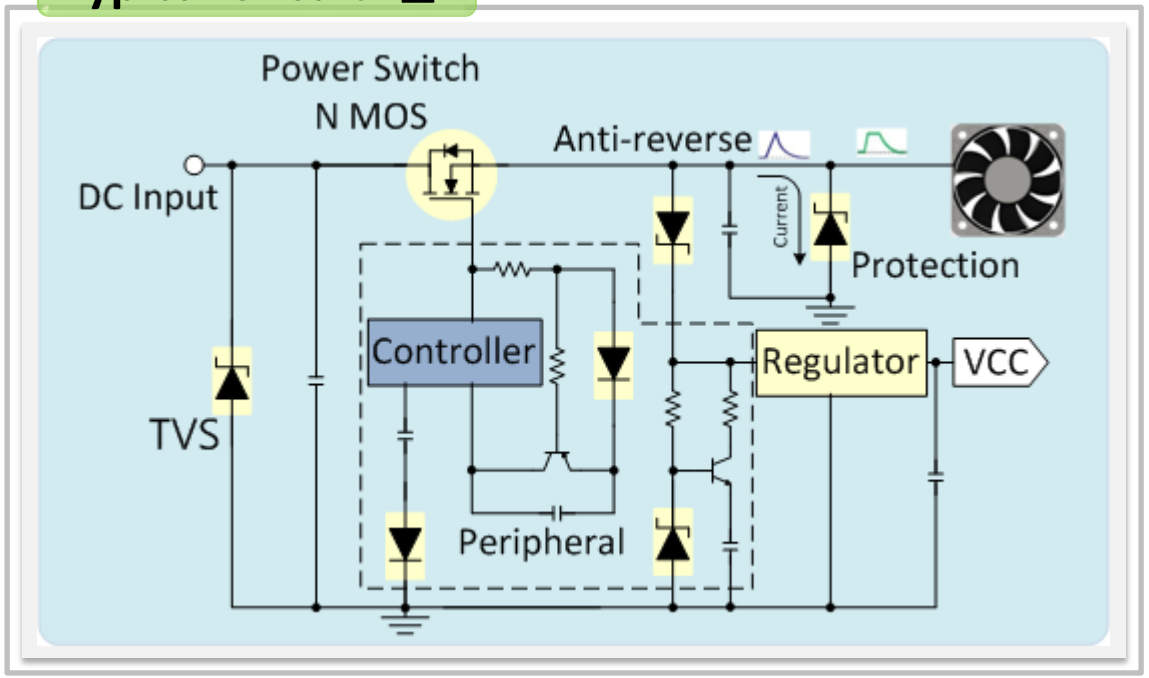
Power Supply Circuit – Power Component Solution



Typical Circuit Ⅰ



Typical Circuit Ⅱ



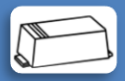
Power Supply Circuit – Transient Voltage Suppressor

Transient Voltage Suppressor (TVS):

App. [V]	Part No.	PPPM [W]	VRWM [V]	IR @MAX. [uA]	VC @MAX. [V]	IPP [A]	SMAF 	SMA 	SMB 	SMC 
12	SMAJ15A	400	15	1	24.4	16.39		•		
	SMAJ16A	400	16	1	26	15.38		•		
	SMA6L15A	600	15	1	24.4	24.6	•			
	SMBJ15A	600	15	1	24.4	24.6			•	
	P6SMB18A	600	15.3	1	25.2	23.81			•	
	SMA6L16A	600	16	1	26	23.1	•			
	SMBJ16A	600	16	1	26	23.1			•	
24	SMA6L24A	600	24	1	38.9	15.5	•			
	SMBJ24A	600	24	1	38.9	15.5			•	
	SMCJ28A	1500	28	1	45.4	33.04				•
	SMCJ30A	1500	30	1	48.4	30.99				•
	SMCJ33A	1500	33	1	53.3	28.14				•

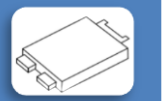
Power Supply Circuit – Transient Voltage Suppressor

Transient Voltage Suppressor (TVS):

App. [V]	Part No.	PPPM [W]	VRWM [V]	IR @MAX. [uA]	VC @MAX. [V]	IPP [A]	SMAF 	SMB 	SMC 
48	SMBJ60A	600	60	1	96.8	6.2		•	
	SMA6L60A	600	60	1	96.8	6.2	•		
	P6SMB75A	600	64	1	103	5.83		•	
	SMCJ60A	1500	60	1	96.8	15.5			•
	SMCJ64A	1500	64	1	103	14.56			•
	SMCJ70A	1500	70	1	113	13.27			•
	SMCJ75A	1500	75	1	121	12.4			•
	SMCJ78A	1500	78	1	126	11.9			•
	SMCJ80A	1500	80	1	129.6	11.57			•

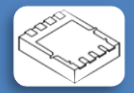
Power Supply Circuit – Reverse Current Protection

Power Schottky Diode :

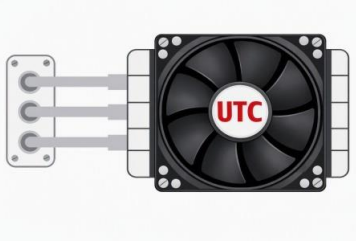
App. [V]	Part No.	VRRM [V]	IF [A]	IFSM [A]	VF MAX. [V]	IR MAX. [mA]	SOD-123F 	SOD-123 	SMA 	SMB 	TO-277 
12	MBR340	40	3	80	0.6	0.1		•	•		
	SK34	40	3	100	0.5	0.5	•		•	•	
	SB540	40	5	150	0.55	0.5			•	•	
	TGBR5V45	45	5	150	0.55	0.5					•
	TGBR10L45	45	10	310	0.6	0.3					•
24	SB260	60	2	50	0.7	0.5			•		
	MBR260	60	2	50	0.74	0.5			•		
	SK36	60	3	100	0.75	0.5	•		•		
	SB560	60	5	150	0.67	0.5				•	
	TGBR10S60	60	10	150	0.5	0.1					•
48	MBR3100	100	3	80	0.85	0.5			•		
	SK310	100	3	100	0.85	0.5			•	•	
	SB5100	100	5	150	0.8	0.5			•	•	•
	TGBR5L100	100	5	55	0.78	0.2					•
	TGBR10L100	100	10	200	0.8	0.1					•

Power Supply Circuit – Power Switch / Load Switch

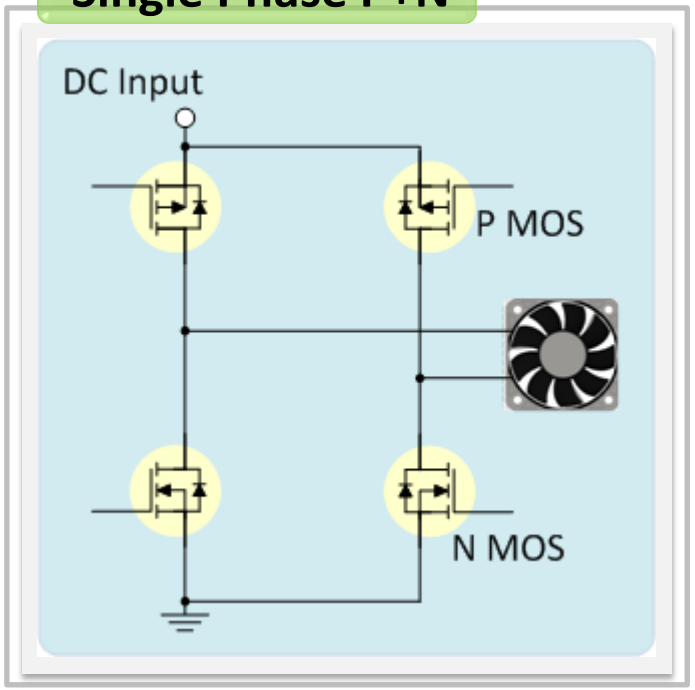
P-channel Power MOSFET :

App. [V]	Part No.	Ch #	VDS	VGS	VTH [V]		RDS(ON) MAX. [mΩ]		PDFN3x3 	PDFN5x6 
			[V]	[V]	MIN.	MAX.	[10V]	[4.5V]		
12	UT8P03M	P	-30	±20	-1	-3	45	70	•	
	UT4435	P	-30	±25	-1	-3	20	35	•	•
	UT45P03M	P	-30	±25	-1	-3	20	32	•	
	UT45P03	P	-30	±20	-1	-3	14	21	•	
	UT50P03	P	-30	±20	-1	-3	12	18	•	
24	UT4421	P	-60	±20	-1	-3	48	63		•
	UT35P06M	P	-60	±20	-1	-3	35	40	•	
48	UTT18P10	P	-100	±20	-1	-3	180	210		•
	UTT25P10	P	-100	±20	-1	-3	98	110		•

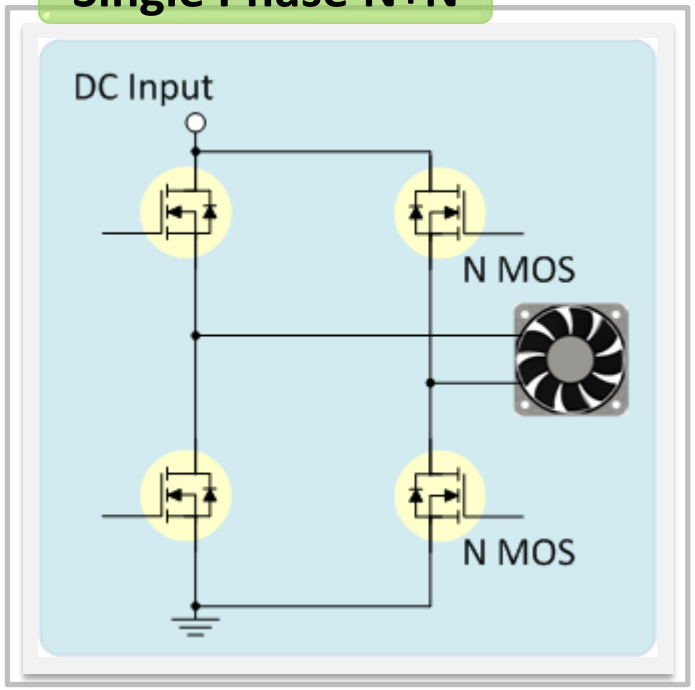
Motor Driving – Power Component Solution



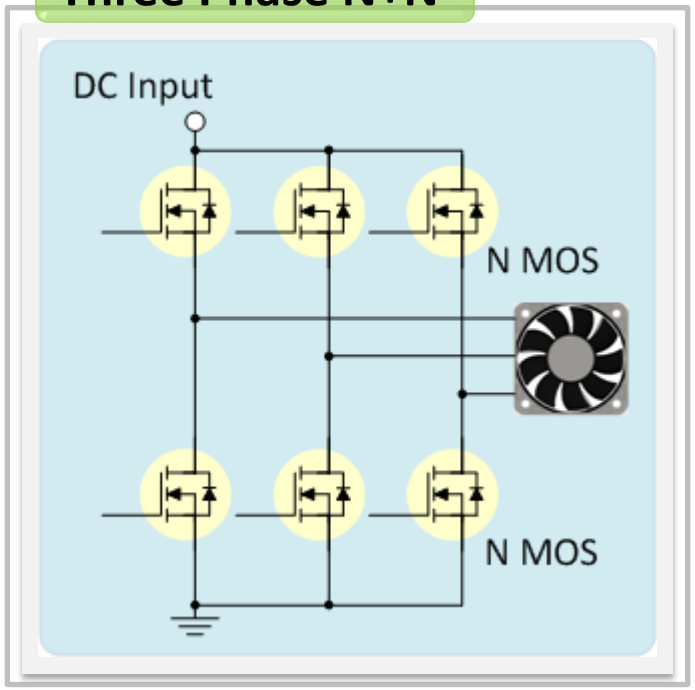
Single Phase P+N



Single Phase N+N



Three Phase N+N



12V Motor Driving

30V P+N, N+N & N Channel Power MOSFET :

App. [V]	Part No.	Ch #	VDS	VGS	VTH [V]		RDS(ON) MAX. [mΩ]		PDFN3×3	PDFN3×3	PDFN5×6	PDFN5×6	SOP-8	TO-252-4
			[V]	[V]	MIN.	MAX.	[10V]	[4.5V]						
12	UD4606-Q	P + N	-30 / 30	±20	-1.2 / 1	-2.4 / 3	58 / 28	78 / 42					•	•
	UTT12NP03	P + N	-30 / 30	±10	-1 / 0.5	-3 / 2	44 / 26	55 / 31		•			•	
	20NP03	P + N	-30 / 30	±20	-1 / 1	-2.5 / 2.5	38 / 18	64 / 28						•
	UT5003	P + N	-30 / 30	±20	-1 / 1	-2.5 / 2.5	38 / 16	65 / 23		•			•	
	UT25NP03	P + N	-30 / 30	±20	-1 / 1	-3 / 3	24 / 16	32 / 22						•
	UTT21NN03	N + N	30	±20	1	3	23	35		•		•	•	
	UT4822	N + N	30	±20	1	3	19	26		•		•	•	
	UT20N03	N	30	±20	1	3	20	31	•		•		•	
	UT40N03	N	30	±20	1	3	14	23	•					
	UT50N03	N	30	±20	1	2.5	10	15	•					
	UTT50N03L	N	30	±20	1	3	7.8	13	•		•		•	
	UT100N03-Q	N	30	±20	1	3	5.3	8			•			

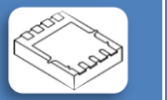
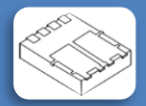
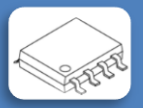
24V Motor Driving

40V P+N, N+N & N Channel Power MOSFET :

App. [V]	Part No.	Ch #	VDS	VGS	VTH [V]		RDS(ON) MAX. [mΩ]		PDFN3×3	PDFN3×3	PDFN5×6	PDFN5×6	SOP-8
			[V]	[V]	MIN.	MAX.	[10V]	[4.5V]					
24	UT20NP04	P + N	-40 / 40	±20	-1 / 1	-3 / 3	73 / 45	150 / 65		•			•
	UTM4052	P + N	-40 / 40	±20	-1.3 / 1.3	-2.5 / 2.5	50 / 38	73 / 62				•	•
	UD606	P + N	-40 / 40	±20	-1 / 1	-3 / 3	50 / 33	70 / 55				•	•
	UT25NP04	P + N	-40 / 40	±20	-1 / 1	-3 / 3	40 / 15	55 / 22				•	•
	UD12N04Z	N + N	40	±12	1	2.5	38	54		•			•
	UT12NN04M	N + N	40	±20	1	3	36	60		•			
	UT20NN04	N + N	40	±20	1	3	20	32		•			•
	UT40N04	N	40	±20	1	3	12	16	•		•		•
	UT45N04	N	40	±20	1	3	8.5	12	•		•		•
	UT50N04	N	40	±20	1	3	6.5	8	•		•		•

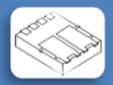
24V Motor Driving

60V P+N, N+N & N Channel Power MOSFET :

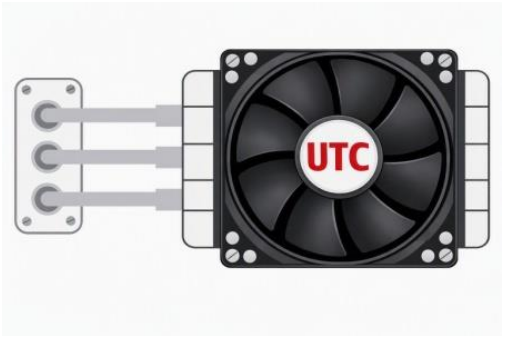
App. [V]	Part No.	Ch #	VDS	VGS	VTH [V]		RDS(ON) MAX. [mΩ]		PDFN3×3	PDFN5×6	PDFN5×6	SOP-8
			[V]	[V]	MIN.	MAX.	[10V]	[4.5V]				
24	UT3NP06	P + N	-60 / 60	±20	-1 / 1	-3 / 3	120 / 56	95 / 66				•
	UTT10NP06	P + N	-60 / 60	±20	-1 / 1	-3 / 3	68 / 56	88 / 64			•	•
	UT17NP06M	P + N	-60 / 60	±20	-1 / 1	-3 / 3	70 / 50	84 / 64			•	
	UT20NP06	P + N	-60 / 60	±20	-1 / 1	-3 / 3	63 / 30	76 / 46			•	•
	UT30NP06M	P + N	-60 / 60	±20	-1 / 1	-3 / 3	40 / 30	50 / 38			•	
	UT32NP06	P + N	-60 / 60	±20	-1 / 1	-3 / 3	65 / 18	112 / 20			•	
	UT20NN06	N + N	60	±20	1	3	35	47			•	•
	UT30NN06	N + N	60	±20	1	3	32	40			•	
	UTT48NN06-Q	N + N	60	±20	1	3	18	21				•
	UT30N06	N	60	±20	1	3	25	35	•	•		•
	UT32N06	N	60	±20	1	3	18	22		•		•
	UTT50N06	N	60	±20	1	3	15	20		•		
	UTT50N06M	N	60	±20	1	3	12	15		•		
	USG06R096M	N	60	±20	1	2.5	9.6	15		•		

48V Motor Driving

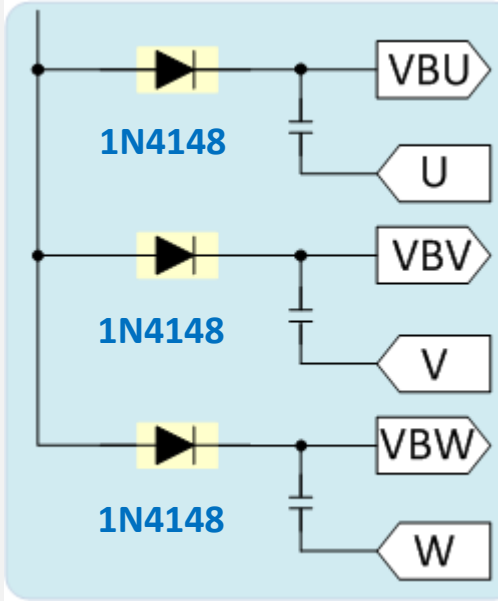
➢ 100V P+N, N+N & N Channel Power MOSFET :

App. [V]	Part No.	Ch #	VDS	VGS	VTH [V]		RDS(ON) MAX. [mΩ]		PDFN3×3 	PDFN5×6 	PDFN5×6 	TO-252 
			[V]	[V]	MIN.	MAX.	[10V]	[4.5V]				
48	UT12NP10	P + N	-100 / 100	±20	-1 / 1	-3 / 3	165 / 100	190 / 125			•	
	UT30NN10H	N + N	100	±20	2	4	38	-			•	
	UT25N10	N	100	±20	1	3	60	75	•	•		•
	UTT30N10	N	100	±20	1	3	40	52	•	•		•
	UT32N10M	N	100	±20	1	3	22	24		•		•
	UTT60N10M	N	100	±20	1	3	18	25		•		•
	USG10R100M	N	100	±20	1	2.5	10	14		•		•
	USG10R072M	N	100	±20	1	2.5	7.2	9.5		•		•
	USG10R044M	N	100	±20	1	2.5	4.4	5.9		•		•
	USG10R030M	N	100	±20	1	2.5	3	5.5		•		

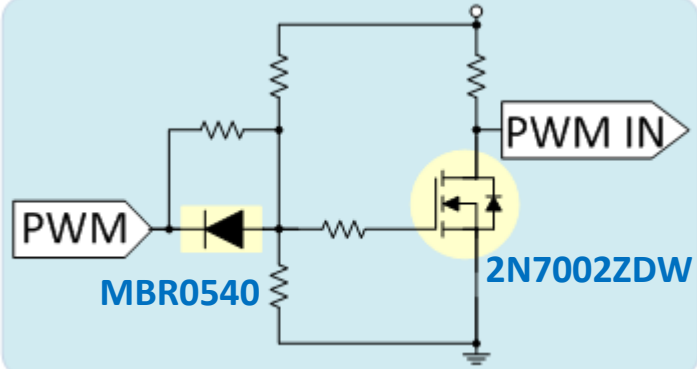
Discrete Components for Analog Circuits



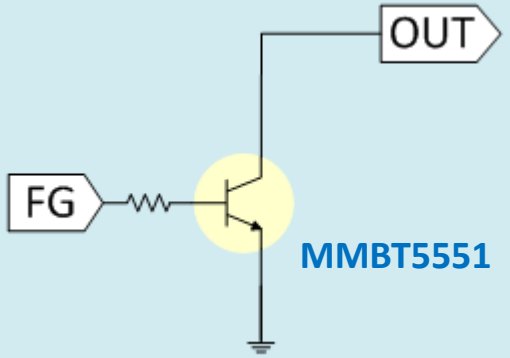
Boost Circuit



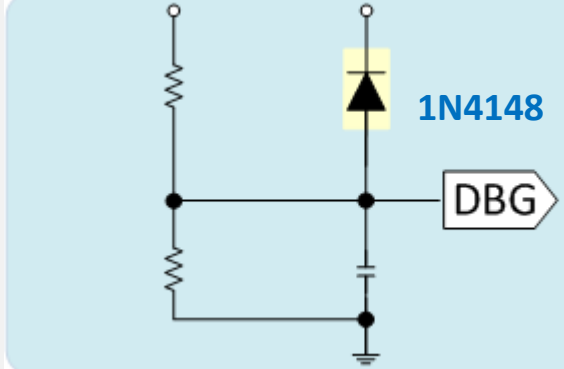
PWM Signal



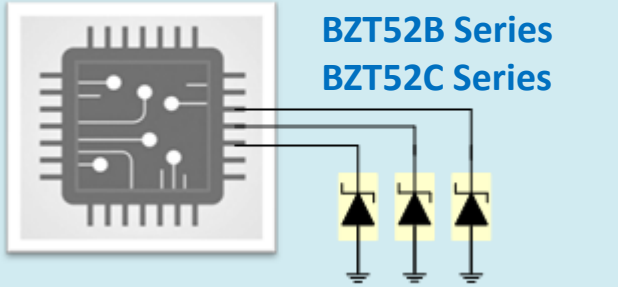
FG Signal Output



Diagnostic

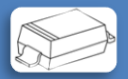


I/O pins



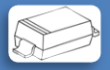
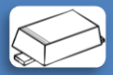
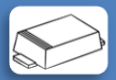
Control Circuit – Switching Diode

Small Signal Switch Diode :

Application	Part No.	VRRM [V]	IF [mA]	Trr MAX. [nS]	IFSM [A]	VF MAX. [V]	IR MAX. [uA]	CJ MAX. [pF]	SOD-523 	SOD-323 	SOD-123 
·Boost Circuit ·PWM Signal ·FG Signal ·Diagnostic	1N4148	100	200	4	1	1	5	4	•	•	•
	MMBD4148	100	250	4	1	0.855	5	4		•	•
	BAS16	100	250	4	0.5	0.855	0.5	2.1	•	•	•
	BAV20W	200	200	50	1	1	0.1	1.5		•	•
	BAS21	250	200	50	1.7	1	0.05	5		•	•

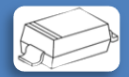
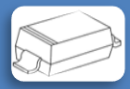
Control Circuit – Schottky Diode

Small Signal Schottky Diode :

Application	Part No.	VRRM [V]	IF [A]	IFSM [A]	VF MAX. [V]	IR MAX. [uA]	SOD-323S 	SOD-323 	SOD-123S 	SOD-123F 	SOD-123 
·Boost Circuit ·PWM Signal ·Diagnostic	BAT54WS	30	0.2	0.6	0.8	2		•			
	MBR0530	30	0.5	5.5	0.43	130		•			•
	RB501V-40	40	0.1	0.5	0.55	10		•			
	SD103AWS	40	0.35	1.5	0.6	5		•			
	MBR0540	40	0.5	5.5	0.51	20	•	•			•
	MBR0560	60	0.5	5.5	0.7	200				•	•
	RB160M-60	60	1	5	0.67	50		•			•
	MBR160	60	1	30	0.74	50		•		•	
	MBR1100	100	1	8	0.83	50				•	•
	MBR2100	100	2	40	0.79	100			•	•	

Control Circuit – Transient Voltage Suppressor

Transient Voltage Suppressor (TVS):

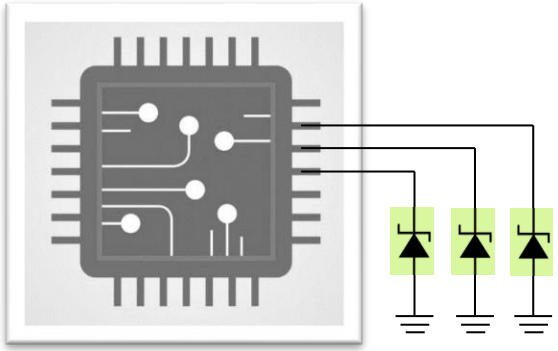
App. [V]	Part No.	PPPM (8/20us)	VRWM	IR @ MAX.	VC @ MAX.	IPP	SOD-323	SOD-123
		[W]	[V]	[uA]	[V]	[A]		
5	USD05W	320	5	10	9.8	1	•	•
12	USD12W	320	12	1	19	1	•	•
	USD15W	320	15	1	24	1	•	•
24	USD24W	320	24	1	43	1	•	•
	USD36W	320	36	1	60	1	•	•

Power Supply Circuit – Zener Diode

Zener Diode :

Part No.	VZ @ IZT [V]		VZ	IZT [mA]	IR@VR [uA]	PD [mW]			SOD-523	SOD-323	SOD-123
	MIN.	MAX.	[%]	MIN.	MIN.	SOD-523	SOD-323	SOD-123			
UMMSZ52xxB	2.4	51	5%	2.5	0.1	250	330	500	•	•	•
BZT52BxxxS	2.4	75	2%	2.5	0.1	250	330	500	•	•	•
BZT52CxxxS	2.4	75	6%	2	0.05	250	330	500	•	•	•

- Popular VZ : 3.3 / 3.6 / 5.1 / 5.6 / 6.8 / 12 / 13 / 14 / 15 / 30V Version
- Place : Gate Drive Output / Supplies / SDI, SCK Inputs / STRn Input / Enable / Reset / DIAG Output / SDO, SxL Output / CSxx IO



Power Supply Circuit – MOSFET

➢ Small Signal MOSFET :

Application	Part No.	Ch#	VDS	VGS	VTH [V]		RDS(ON) MAX. [Ω]			SOT-323	SOT-23-3	SOT-363	SOT-26
			[V]	[V]	MIN.	MAX.	[10V]	[4.5V]	[2.5V]				
·PWM Signal ·FG Signal ·Control	BSS138-Q	N	50	±20	0.5	1.5	2.2	2.8	6		•		
	BSS138W-Q	N	50	±20	0.5	1.5	2.2	2.8	6	•			
	BSS139Z	N(ESD)	50	±20	0.5	1.5	1.8	2.4	6.5		•		
	2N7002	N	60	±20	1	2.5	3	4	-		•		
	2N7002W	N	60	±20	1	2.5	13.5	7.5	-	•			
	2N7002Z	N(ESD)	60	±20	1	2.5	4	6	-		•		
	BSS138DW-Q	N+N	50	±20	0.5	1.5	2.2	2.8	6			•	
	2N7002DW-Q	N+N	60	±20	1	2.5	2.5	4	-			•	
	2N7002ZDW	N+N(ESD)	60	±20	1	2.5	4	6	-			•	•

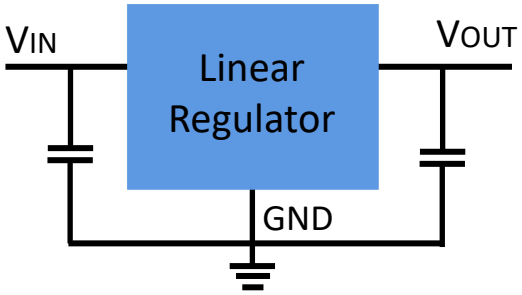
Power Supply Circuit – Bipolar Junction Transistor

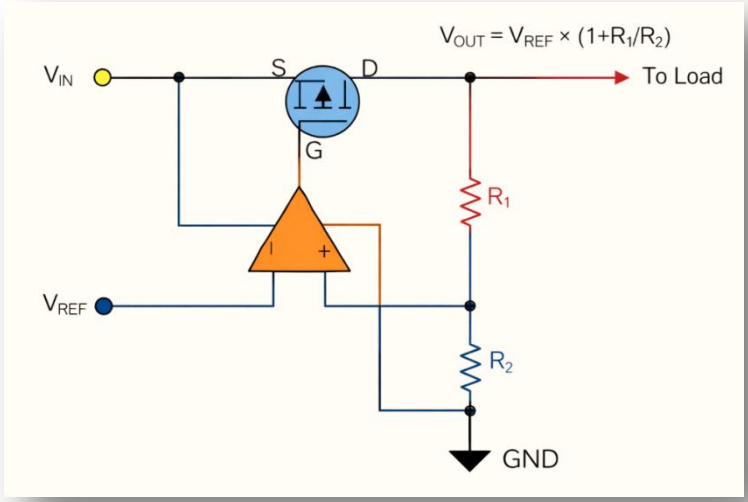
General Bipolar Transistor :

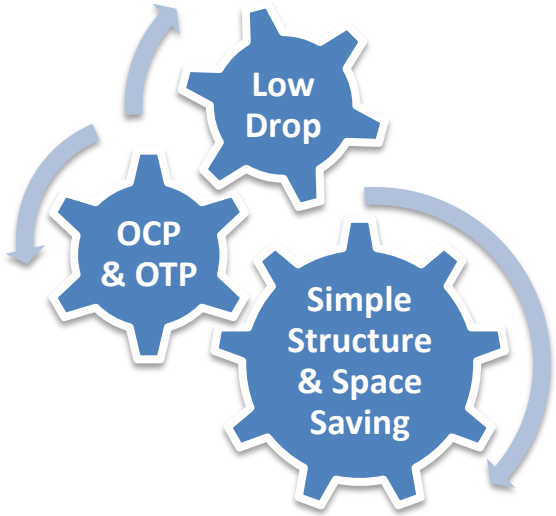
Application	Part No.	Polarity	VCEO MAX. [V]	VCBO MAX. [V]	IC MAX. [A]	VCE(sat) MAX. [V]	hFE MIN.	hFE MAX.	SOT-523 	SOT-323 	SOT-23 
·Control Circuit	MMBT3904B	NPN	40	60	0.2	0.2	100	300	•		•
	MMBT4401	NPN	40	60	0.6	0.4	100	300		•	•
	MMBT2222A	NPN	40	75	0.6	0.3	100	300	•	•	•
	MMBTA06	NPN	80	80	0.5	0.25	100	-			•
	2SD1782	NPN	80	80	0.5	0.5	120	390			•
	MMBT3906	PNP	-40	-40	-0.2	-0.25	100	300	•	•	•
	MMBT5401	PNP	-150	-160	-0.6	-0.2	80	400			•
·FG Signal	MMBT5551B	NPN	160	180	0.6	0.15	80	250			•
·dv/dt Start Up	MMBT5401	PNP	-150	-160	-0.6	-0.2	80	400			•

Power Supply Circuit – Linear Regulator

Linear Regulator for 5 /12 /24V App.







Regulator Solution:

App. [V]	Part No.	VIN [V]		VOUT [V]		IO [A]	IQ [mA]	SOT-353	SOT-23-3	SOT-25	SOT-89
		MIN.	MAX.	MIN.	MAX.	MAX.	MAX.				
5	LR9280	2.5	6	1	4	0.15	0.0015	•	•	•	•
	LR9103	2.2	6	1	3.3	0.15	0.06			•	
	LR9102	2	6	1	3.6	0.3	0.09	•	•	•	
	LR9133	2.1	6.5	1.1	5	0.3	0.06	•	•	•	
	LR9282	2	7	0.8	5	0.3	0.0015		•	•	•
	LR9153	2.1	6	1.1	5	0.5	0.08			•	•
	LR9284	2.5	7	1.5	4	0.5	0.0007			•	•

Power Supply Circuit – Linear Regulator

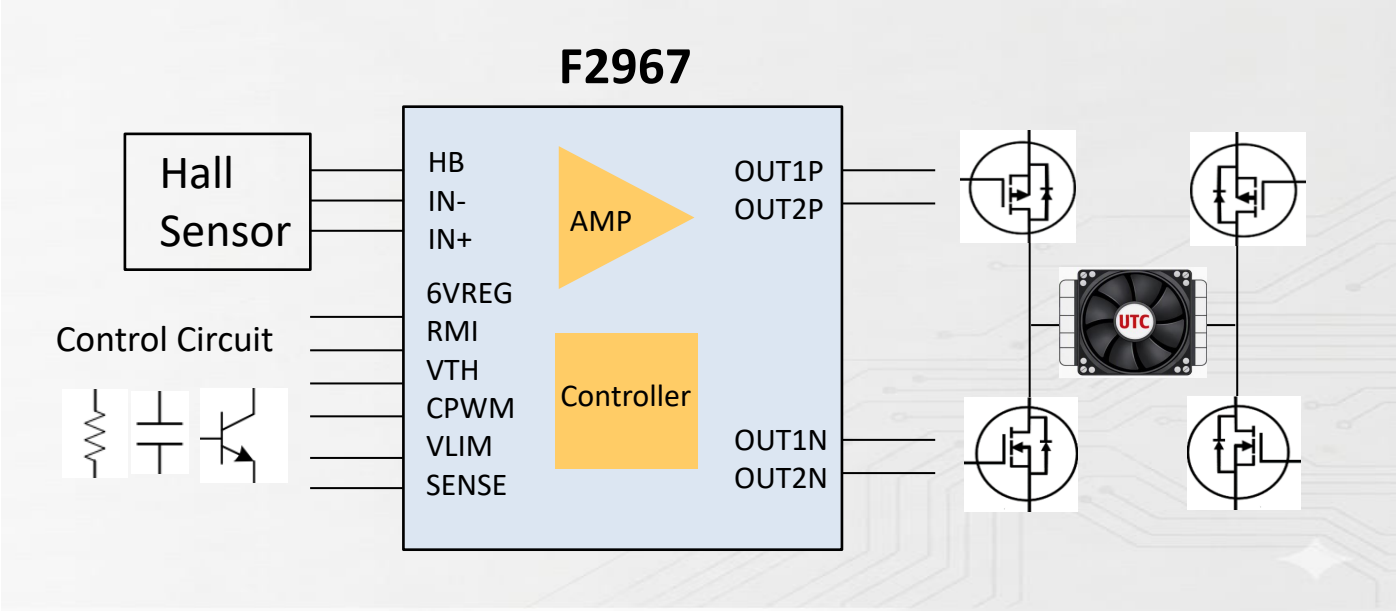
Regulator Solution:

App. [V]	Part No.	VIN [V]		VOUT [V]		IO [A]	IQ [mA]	SOT-353	SOT-23-3	SOT-25	SOT-89	SOT-223
		MIN.	MAX.	MIN.	MAX.	MAX.	MAX.					
12	LL1117A	2.7	15	1.2	5	1	10		•	•	•	•
	LD2985	2.5	16	1.5	5	0.15	0.1			•		
	UR56xxH	2.5	18	3.3	5	0.5	0.003				•	
	UR56xx	2.5	18	1.5	12	0.5	0.005		•	•	•	•
	UR56xxCE	2.5	18	3.3	5	0.5	0.01			•		
24	78DxxS	10	35	5	24	0.5	8					•
	78DxxAS	10	35	5	24	1	8					•
	UR75xx	2.5	36	1.5	12	0.1	0.004	•	•	•	•	•
	UR76xx	2.5	36	1.5	12	0.5	0.003		•	•	•	
	UR76xxH	2.5	36	3.3	5	0.5	0.01		•	•	•	•
	UR76xxCE	2.5	36	3.3	5	0.5	0.01			•		

Motor Driver IC – Full-wave Pre-driver

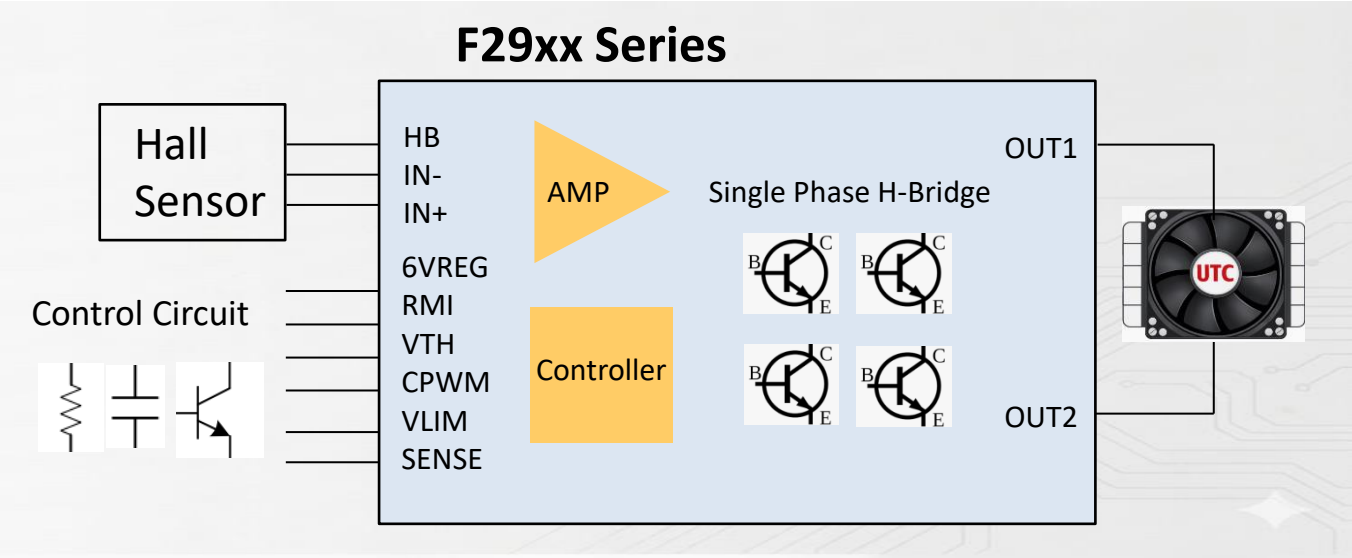
» F2967, Single-phase DC Fan Motor Pre-Driver :

- Power Supply Range 6~16V
- Set & Sensor Current Limit
- Lowest Speed Setting Voltage
- Variable Speed Function (V_{TH})
- PWM Frequency Setting (CPWM)
- Speed Detection Output (FG)
- Lock Detection Output (RD)
- Setting Lock Protection Time
- TSSOP-20 & SSOP-20 Package Available



Motor Driver IC – Full-wave Driver

Single-phase DC Fan Motor Drivers:



Motor Driver Solution:

Part No.	VCC [V]	IOUT [A]	Function							TSSOP-16	TSSOP-20	SSOP-16	SOP-18
			VTH Set	CPWM Set	Current Limit	FG Output	RD Output	Lock Protection	Thermal Shut down				
F2961	4.5 ~ 16	1	✔	✔		✔	✔	✔	✔	•	•	•	
F2970	4.5 ~ 16	1.2	✔	✔	✔	✔		✔	✔				•
F2962	4.5 ~ 16	2	✔	✔		✔	✔	✔	✔	•	•		

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Thank you



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