Multifunction regulator MF-28V/6

- § FULLY MONOLITHIC DESIGN
- § HIGH SIDE FIELD DRIVER
- § THERMAL PROTECTION
- § FIELD SHORT CIRCUIT PROTECTION
- § PROTECTED DIAGNOSTIC LAMP DRIVER
- § COMPLEX DIAGNOSTICS
- § LOAD RESPONSE CONTROL

Description

The MF-28V/6 is a monolithic multifunction alternator voltage regulator intended for use in automotive application. It includes the control section, the field power stage, fault diagnostic circuit which drives a warning lamp.

PIN FUNCTION

N°	Pin	Description
1	L	Lamp terminal low side driver; relay terminal high side driver
2	W	Phase sense input
3	B-	Ground
4	DF	Field high side driver output
5	B+	Alternator output sense and voltage supply

THERMAL DATA

Symbol	Parameter	Value	Unit
T_{case}	Case Temperature	-40 to 125	°C
T_{stg}	Storage Temperature	-40 to 150	°C
T_{sh}	Thermal shutdown	150 ±15	°C

ELECTRICAL CHARACTERISTCS (T_{case} = -40°C to +25°C; unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_{bat}	Operating Supply Voltage		20		33	V
I_{beink}	Supply Battery Current				50	mA
I_{bstby}	Stand-by Current	V_{bat} = 24V, T = 25°C			10	mA
		V_{bat} = 24V, T = 40°C			15	
V_{reg}	Regulated Voltage & Therm. Drift (standard version)	Ialt = 0.5 · Inom; rpm = 0.5 · RPMMAX; T = 20°C	28.2 -8	28.5 -6	28.8 -4	V mV/°C
f_{sw}	Switching Frequency	in FSDF	30		400	Hz
V_{rpm}	Delta V_{rpm}	1800 < rpm < 12000; Ialt = 0.3 · Inom			400	mV
V_{load}	Delta V_{load}	0.1 · Inom < Ialt < 0.9 · Inom; rpm = 0.5 · rpmmax			400	mV
V_{reg}	Reg. Voltage without Battery	Ialt = 3A resistive			32	V
T_{j-sd}	Thermal Shut-down	DF = OFF STATE L = OFF STATE	170		200	°C
$T_{j-sd-hys}$	Thermal Shut-down Hysteresis	DF, L = from off state (due to thermal shutdown) to on	2		10	°C
V_F	Freewheeling Diode DF	IF = 1A			2	V
If_{SC}	Short Circuit Threshold DF	DF = 28V; T = -40 to 25°C	8.5		18	A
If_{SC}	Short Circuit Threshold DF	DF = 28V; T = 25 to 125°C	7		18	A
FS_{DF}	Pre-excitation F.S.D.F	f = 348Hz ±15%	10.6	12.5	14.3	%

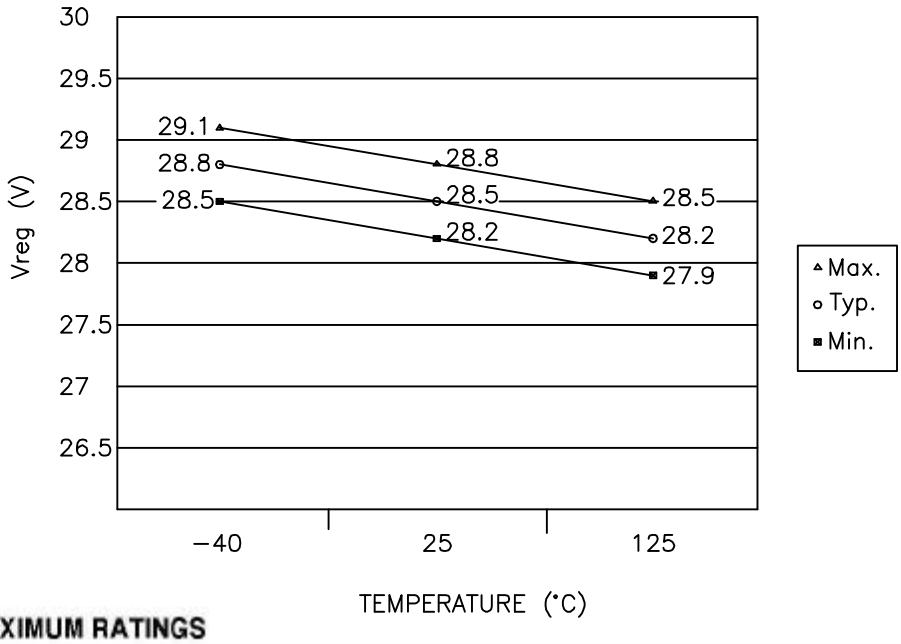
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
t_{SI}	Soft Start Delay Time	activated at first running-on only		0		s
t_{SI}	Soft Attack Time	from 0 to 100% field duty cycle	2.5	2.83	3.39	s
BI	Soft Attack Blind Zone	% of maximum D.C. immediate variation of soft attak	0		10	%
t_{risu}	Output Voltage Rise Time	I_{field} = 3A resistive	5		50	µs
t_{fall}	Output Voltage Fal Time		5		50	µs
I_{fik}	Output Field Driver Leakage Current	DF = 24V			1	mA
VL_S	Low Side Driver Saturatior Voltage	I_{sink} = 0.25A			1.5	V
V_{thD+}	Enable Regulator Voltage L		0.8	'	'.15	V
I_{HD+}	Enable Regulator Pull-down Current		0.4		3.5	mA
DISAB	Soft Attak Inhibition Frequency		265	3'3	360	Hz
EN_1	Soft start delay time erable frequercy		88	104	120	Hz
EN_{1_hy}	Soft start delay time erable frequercy hysteresis		E_{N1}-8	E_{N1}-10	E_{N1}-12	I Iz
VPHL1	Enable Control Voltage W high threshcld	Square wave 1KHz	0.67	0.795	0.92	V
VPHL2	Enable Control Voltage W low threshcld		VPH_1 -0.43	VPHL1 -0.57	VPHL1 -0.66	V
t_{PH}	W Filtering Time		15		120	µs
VPHH1	Diag. Phase Loss High Voltage		18	20.5	23	V
VPHH2	Diag. Phase Loss Low Voltage		8	10	12	V
t_{PHD}	Diagnostic W Filtering Time		50		200	µs
I_{PH}	Phase Pull-down Current		1		8	mA
t_D	Diagnostic Alarm Delay		0.48	0.575	0.65	s

THERMAL COMPENSATION (Vreg, standard version)

Temperature [°C]	V_{reg}		
	Min. [V]	Typ. [V]	Max. [V]
-40	28.5	28.8	29.1
25	28.2	28.5	28.8
125	27.9	28.2	28.5

Figure 1. Thermal Compensation (Vreg, standard version)

W-O.K.
L-O.K.
S-NO
DFM-NO
L/R-NO



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_S	DC Supply Voltage (2 min. @ 25°)	54	V
	Transient Supply Voltage (load dump); t < 0.5s @ 25°C	54	V
	Transient Supply Voltage (low energy spikes pulse ISO7637/2)	70	V
I_O	Output Current Capability	internally limited	A
P_{tot}	Power Dissipation(@ T_{case} = 150°C, I_{field} = 5A)	tbd	
	Reverse Voltage all pins @ 25°C, T = 15s	-2.5	V
	DC Pin Current (bonding limitation) on DF, B+, B- pins	11	A
	EDS Voltage (Human body model)	±4	KV

Figure 2. Load Transient Example.

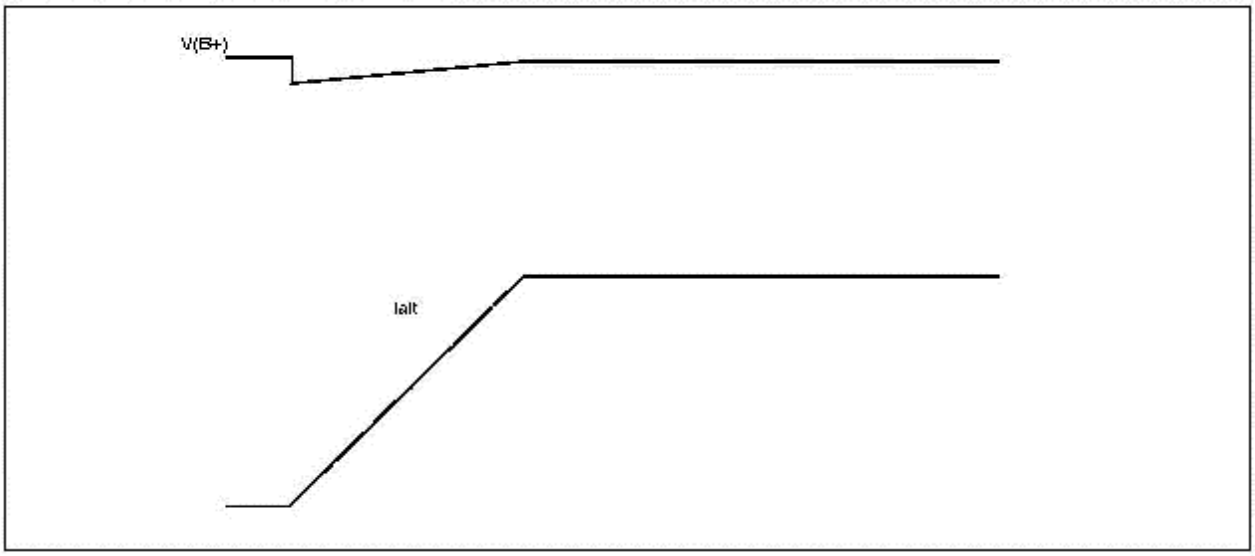


Figure 3. Start-Up Timing

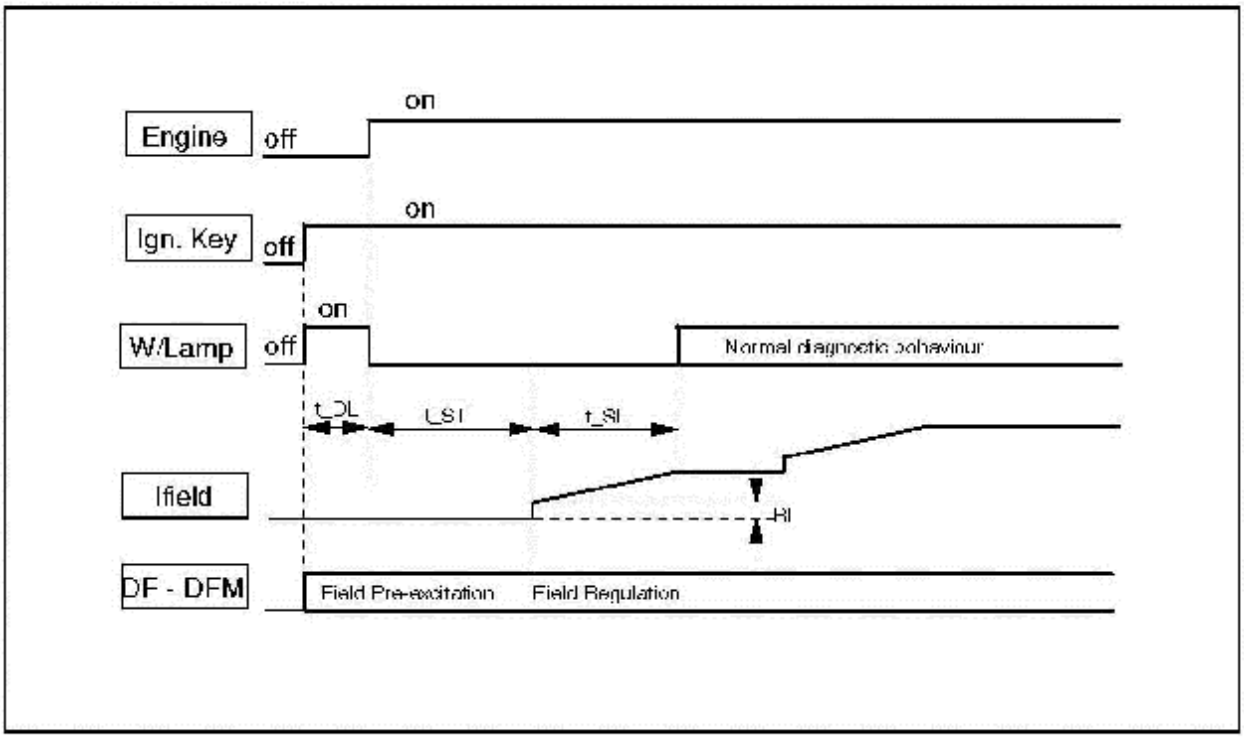


Table 1. Fault Detection

Root Cause	Signal	Effect	Test detect
Alternator belt breaking	W	Alternator disexcitation	VPH<VPHH & VA+<Vreg
Brushes open	W	Alternator disexcitation	VPH<VPHH & VA+<Vreg
Field interruption	W	Alternator disexcitation	VPH<VPHH & VA+<Vreg
Field short circuit to the battery	W	Alternator disexcitation	VPH<VPHH & VA+<Vreg
Field short circuit to the ground	DF	Overvoltage	DF<VS1 & VA+>Vreg

Figure 4. Load Response Control.

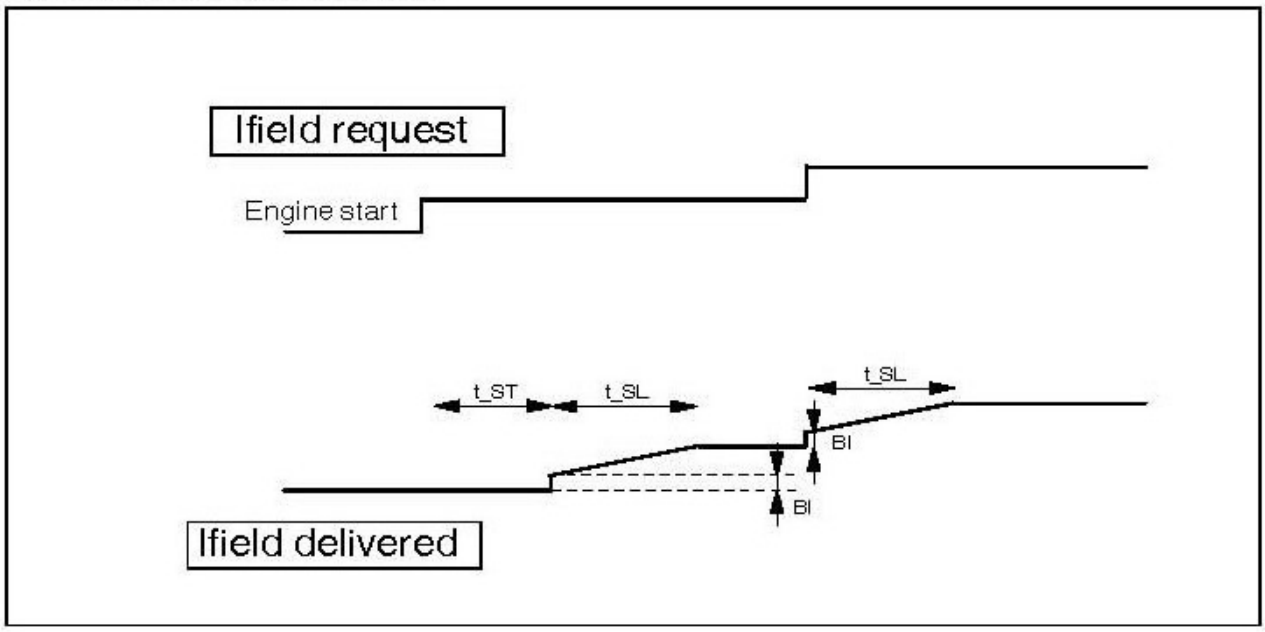


Figure 5. Driver field