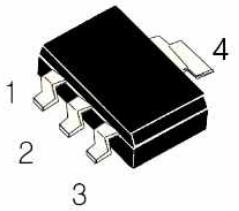
5-V Low Power Low-Drop Fixed-Voltage Regulator with low current consumption

The ILE4264-2G is a Monolithic Integrated Low Power Low-Drop Fixed Voltage Regulator 5-V with low current consumption. The ILE4264-2G is specially designed to create power source with 5V output voltage , loads up to 150mA and drop voltage less than 0.5V. The regulator is designed to supply electronic device in automotive applications and some another applications.
The ILE4264-2G is equipped with additional protection against overvoltage of both polarities, load current limitation, short-circuit and over temperature shutdown of output voltage.



SOT-223

Ordering Information
ILE4264-2G

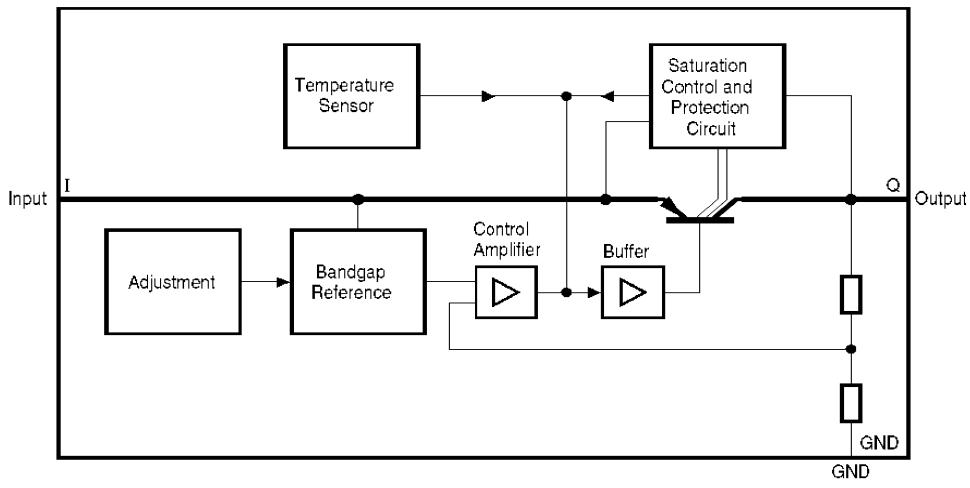
ORDERING INFORMATION

Device	Operating Temperature Range	Package	Packing
ILE4264-2G	T_J= -40°C to 125°C	SOT-223	T&R

Features

- Output voltage tolerance 5V ±3% (±2% up to 50 mA)
- Low-drop voltage
- Current capability up to150 mA
- Very low current consumption
- Over temperature protection
- Reverse polarity proof
- Suitable for use in automotive electronics
- Short-circuit proof
- Low quiescent current of 60μA
- AEC-Q100 Qualified
- ESD Protection : HBM ±8,000V / MM ±400V / CDM ±2,000V
- MSL (Moisture Sensivity Level) 3

Block Diagram



Pin Description (for SOT-223 package)

Pin	Symbol	Function
1	I	Input voltage; block to ground directly with a ceramic capacitor
3	Q	5-V output voltage; block to ground with a capacitor (C_Q ≥10 μF, ESR≤4Ω)
2, 4	GND	Ground

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Note
Input voltage	V_I	-42	45	V	
Input current	I_I				limited internally
Ground pin current	I_{GND}	50	-	mA	
Output voltage	V_Q	-0.3	32	V	
Output current	I_Q				limited internally
Junction temperature	T_J	-40	150	°C	
Storage temperature	T_{stg}	-50	150	°C	

* Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied.
Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Operating Range

Parameter	Symbol	Min	Max	Unit
Input voltage	V_I	6	28	V
Junction temperature	T_J	-40	125	°C

Thermal Resistances

Parameter	Symbol	Min	Max	Unit
Thermal Resistances Junction-case , for conventional case P-SOT223-4-1	$R_{th\ jc}$	-	25*	°C/W
Thermal Resistances Junction-ambient, for conventional case P-SOT223-4-1, - without heat sink	$R_{th\ ja}$	-	220*	°C/W

* $R_{th\ ja}$ - Thermal Resistances Junction-ambient

Thermal resistance junction ambient for IC with heat dissipater is calculated by formula:

$$R_{th\ ja} = R_{th\ jc} + R_{th\ ca} \quad (1)$$

Rth jc - thermal resistance junction case, °C /W.
Application circuit and heat dissipater have to provide $T_J \leq 125°C$.
Maximum power Ptot, W, dissipated by IC for T_A, is calculated by formula:

$$P_{tot} = (125 - T_A) / R_{th\ ja} \quad (2)$$

125 – maximum permitable operating junction temperature, °C

Electrical Characteristics

(V_I=13.5 V, -40°C ≤ T_J ≤ 125°C, unless specified otherwise)

Parameter	Symbol	Test Conditions	Limit Value			Unit	Note
			Min	Typ	Max		
Output voltage	V_Q	9V ≤ V_I ≤ 16V 5mA ≤ I_Q ≤ 50mA	4.9	5.0	5.1	V	
		6V ≤ V_I ≤ 21V 5mA ≤ I_Q ≤ 100mA	4.85	5.0	5.15		
Output current limiting	I_Q		150		500	mA	2
Current consumption $I_q = I_I - I_Q$	I_q	I_Q=0.1mA, (T_J ≤ 85°C)	-		0.06	mA	
		I_Q = 0.1mA	-		0.07		
		I_Q = 50mA	-		4		
Drop-out voltage	V_{Dr}	I_Q = 100mA	-	0.25	0.5	V	1
Load regulation	$\Delta V_{Q(I)}$	1 mA ≤ I_Q ≤ 100 mA VI = 13.5 V	-		90	mV	
Line regulation	$\Delta V_{Q(V)}$	6V ≤ VI ≤ 28V I_Q = 1mA	-		30	mV	

Note:

[1] Drop voltage $V_{Dr} = V_I - V_Q$ (measured when the output voltage V_Q has dropped 100mV from the nominal value obtained at V_I = 13.5V).

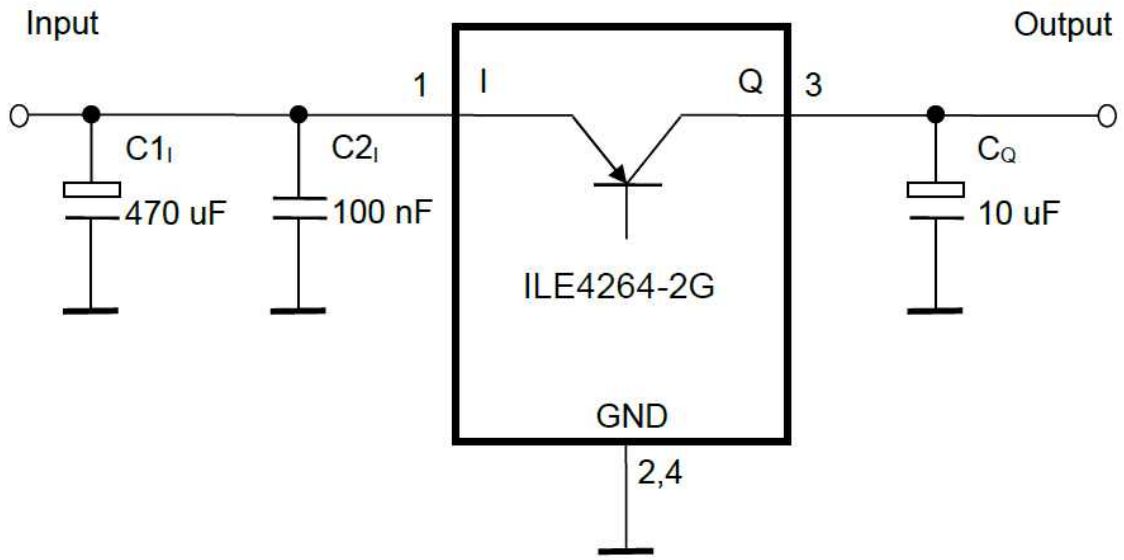
[2] Limiting current is output current when output voltage out from 4.8V ≤ V_Q ≤ 5.2V range.

Typical Performance Parameters

(V_I=13.5 V, -40°C ≤ T_J ≤ 125°C, unless specified otherwise)

Parameter	Symbol	Test Condition	Typical Value	Unit
Power Supply Ripple Rejection	PSRR	f_r = 100 Hz, V_r = 3 V (peek-to-peek)	68	dB

Application Circuit



In the ILE4264-2G the output voltage is divided and compared to an internal reference of 2.5V typical. The regulation loop controls the output to achieve an output voltage of 5V with an accuracy of ±3% at an input voltage range of 5.5V < V_I < 45V.

Figure shows a typical application circuit. For stability of the control loop the ILE4264-2G output requires an output capacitor C_Q of at least 10µF with a maximum permissible ESR of 4Ω. Tantalum as well as multi layer ceramic capacitors are suitable.

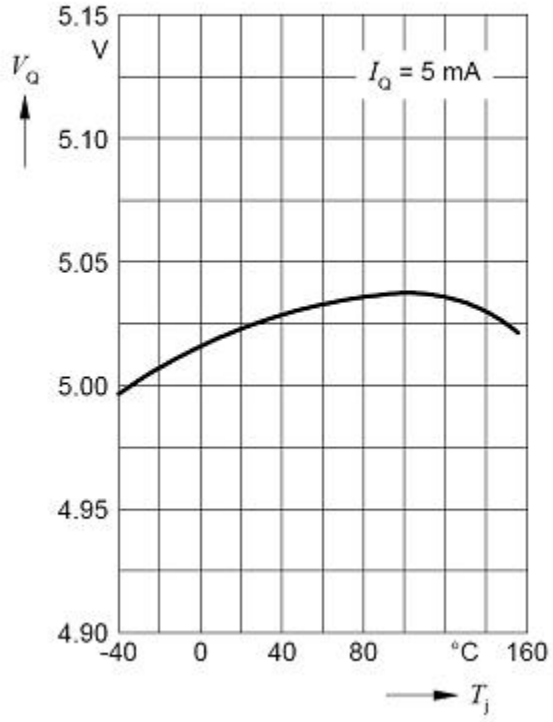
At the input of the regulator an input capacitor is necessary for compensating line influences (100nF ceramic capacitor recommended). A resistor of approx. 1Ω in series with C_I, can damp any oscillation occurring due the input inductivity and the input capacitor.

In the application circuit shown in Figure an additional electrolytic input capacitor of 470µF is added in order to buffer supply line influences. This capacitor is recommended, if the device is sourced via long supply lines of several meters.

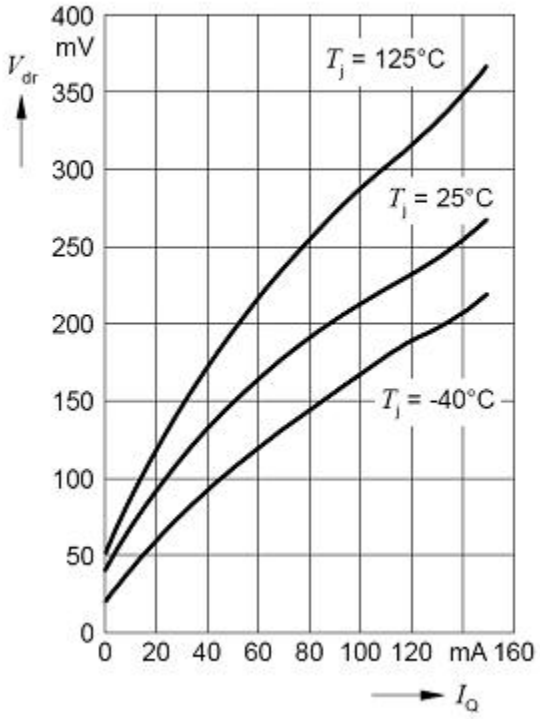
The ILE4264-2G can supply current up to 150mA. However for protection for high input voltage above 25V, the output current is reduced (SOA protection).

Typical Performance Characteristics

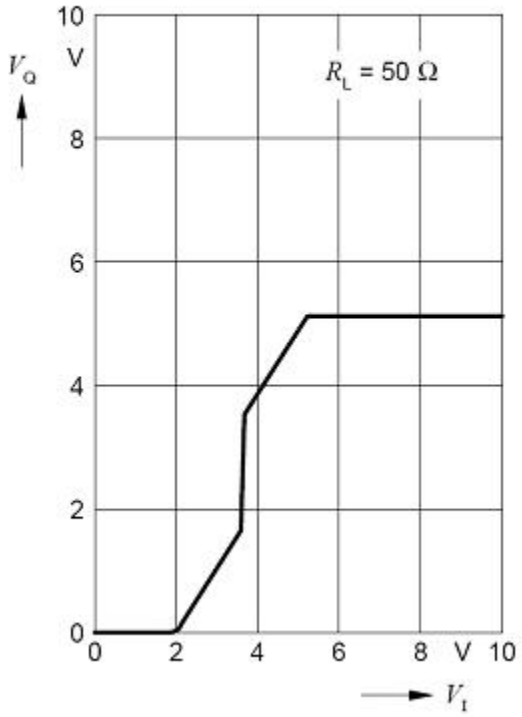
Output Voltage V_Q versus Temperature T_j



Drop Voltage V_{dr} versus Output Current I_Q

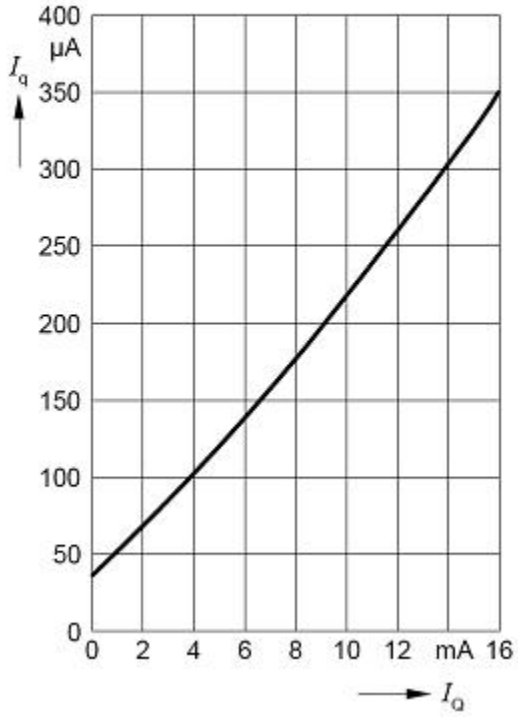


Output Voltage V_Q versus Input Voltage V_I

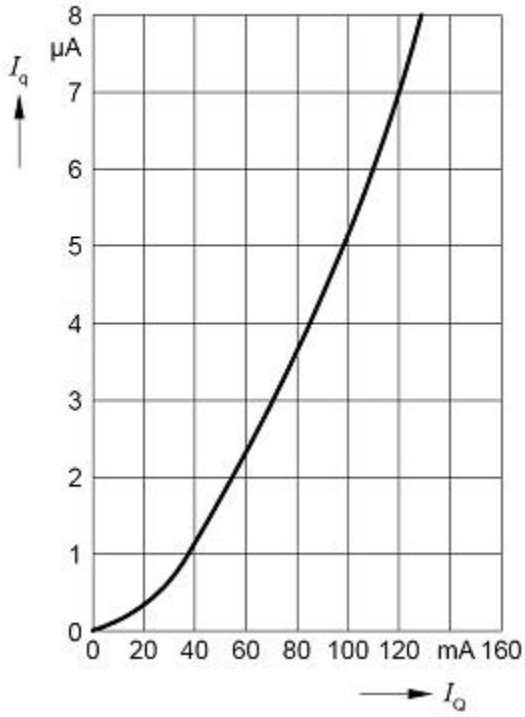


Typical Performance Characteristics (continue)

Current Consumption I_q versus Output Current I_Q



Current Consumption I_q versus Output Current I_Q



Package Dimensions

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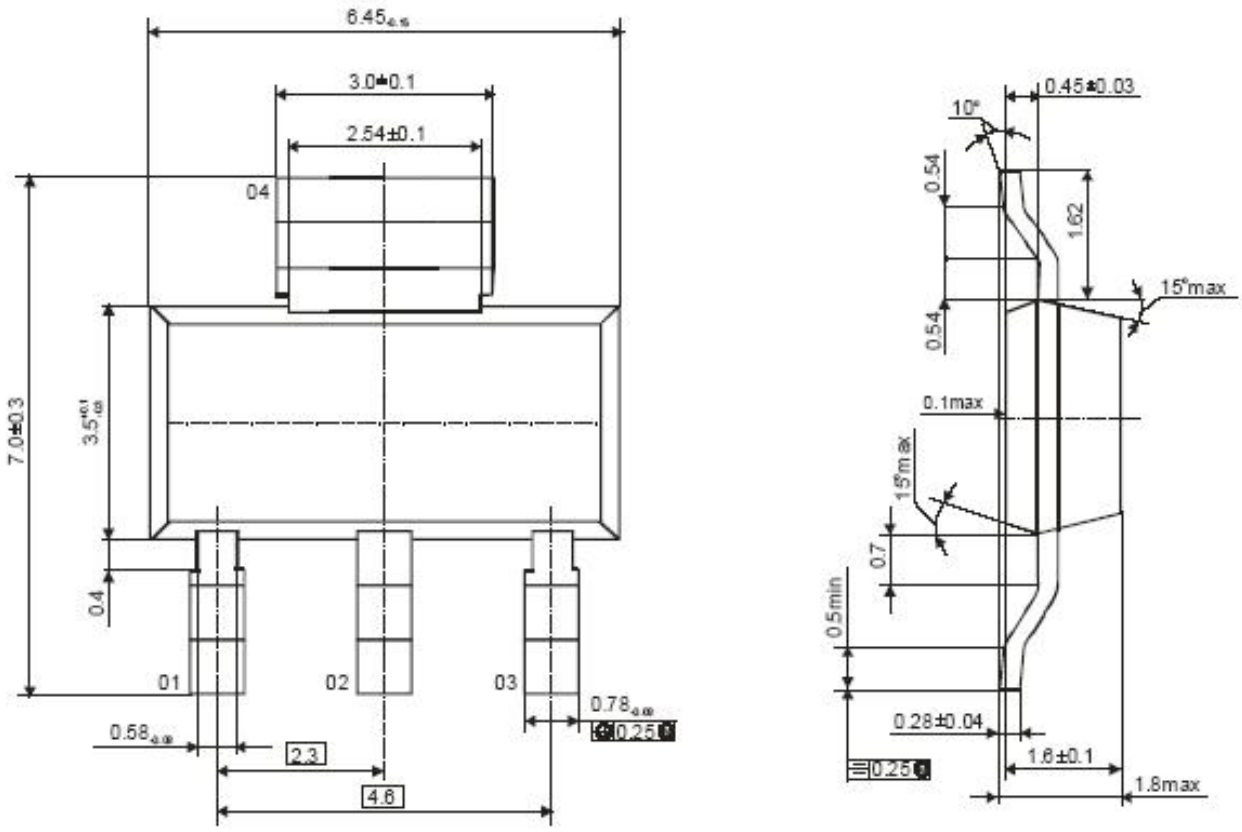

Data Sheet Revision History

Version	Date	Content	Drafter	Drafter Department
0	2006.06.14	New Establishment	SM Jung	Technical dept.
1	2011.01.13	Addition : Notes on page1	Natalya	Technical dept.
2	2012.01.05	Addition : Compliance with AEC-Q100 requirements in future	Natalya	Technical dept.
3	2012.01	Addition : ESD Protection : HBM±8,000V, MM±400V, CDM±2,000V	-	Technical dept.
4	2012.11	Changed Absolute Maximum Rating & Operating Range Table form Addition Application Note(page4)	Natalya	Technical dept.
5	2013.03	Changed input voltage range in the application circuit 5.5V < Vi <45V -> 6.0V < Vi <28V	Natalya	Technical dept.
6	2014.09	Changed operation input max voltage 45V -> 28V	Natalya	Technical dept.
7	2016. 05	Addition Application Note (page 4)	HG Ryu	Quality Control
8	2021.01	Removed input current & output current in the Absolute Maximum Rating	HG Ryu	Quality Control
9	2021.09	1. Addition - MSL Level in future 2. Change load Current(page 1) - Before : loads up to 100mA - After : loads up to 150mA 3. Modify Application Circuit(page 4)	HG Ryu	Quality Control